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APPENDIX A – DATA CHECKING

Table A.1: Monthly Inflows to the Piliyandala Water Tower

Month	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
January	230280	185935	275260	319889	305625	321450	399050	462160	494235	548346
February	159390	159205	264597	297888	271160	310330	393543	433550	452810	456532
March	169410	169840	247914	414632	285949	348925	463715	497705	599500	505170
April	173630	165915	262145	318071	294185	329065	404555	450415	602015	541350
May	165555	170054	292134	328494	310548	341485	404698	483047	596760	561315
June	163066	162816	288917	307328	282710	336032	410070	466350	545360	581350
July	171455	165175	287940	329537	311875	351216	432705	486975	575070	634903
August	168885	168725	282855	342652	315235	379871	428265	477255	582098	557191
September	165673	160959	282154	294147	298295	362875	433595	476330	576530	622825
October	178580	219935	284800	272878	299788	376605	472175	468087	577428	583323
November	179305	247525	302731	271218	296986	400581	429855	476800	509600	576760
December	177181	243527	316967	296857	312562	396766	448885	520845	570044	592348
Average	175201	184968	282368	316133	298743	354600	426759	474960	556788	563451
Maximum	230280	247525	316967	414632	315235	400581	472175	520845	602015	634903
Minimum	159390	159205	247914	271218	271160	310330	393543	433550	452810	456532

Table A.2: Monthly Consumption Data

	January	February	March	April	May	June	July	August	September	October	November	December
2001						552	170	226	237	357	275	284
2002	74627	83786	93801	104169	117170	117586	94647	98492	110294	116644	137182	151591
2003	150450	154140	129354	142505	169597	146649	153318	161400	165691	161672	163901	158094
2004	174516	168639	154346	187598	195375	165694	171527	142107	152279	176165	175887	186818
2005	232291	174151	155999	145468	163100	171763	165621	164707	166104	170465	156109	163799
2006	162063	168526	155428	151757	160584	159098	161200	145271	154403	147524	177280	162063
2007	201119	206220	201788	205706	200365	216554	219091	233939	234150	230126	256248	182615
2008	241877	269346	276072	258080	239271	248043	192245	251188	260342	261565	259525	238999
2009	283056	287347	258398	264338	290708	241194	241553	258689	248153	261864	257364	236522
2010	273003	282110	264217	287948	300683	300855	319241	255608	281497	276421	306734	267472
2011	299896	291436	290798	330645	334566	290300	320166	331079	325845	347141	323092	323441
2012	340448	359292	342129	375409	424822	326387	329705	343215	351259	331009	385004	335866
2013	367039	357648	336569	401439	411227	345687	323674	368278	385368	361016	383826	360292
2014	397567	399234	391756	414300	416538	391277	383178	421794	415442	372322	376584	376616

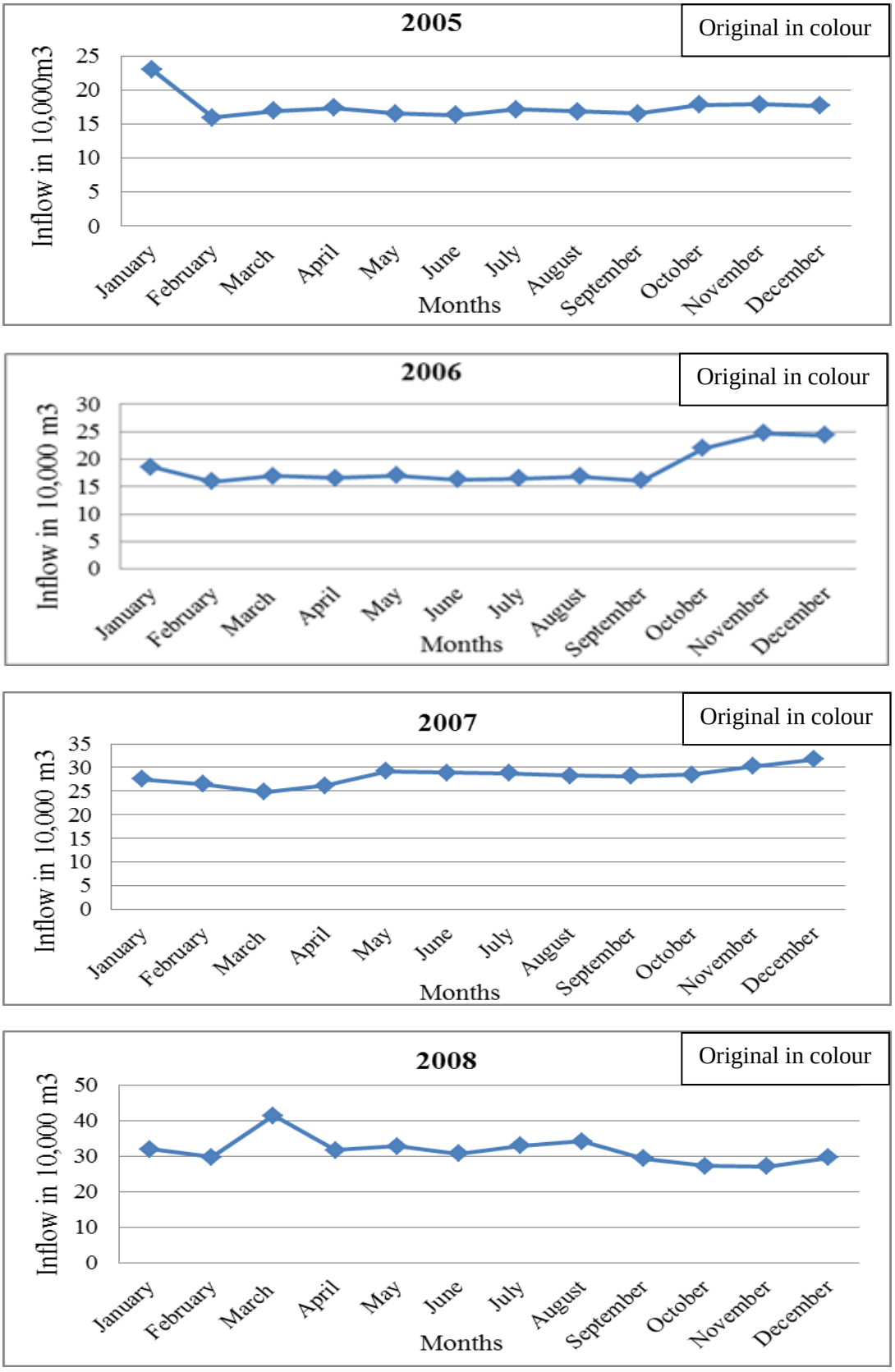


Figure A.1: Water Inflows to the Piliyandala Water Tower

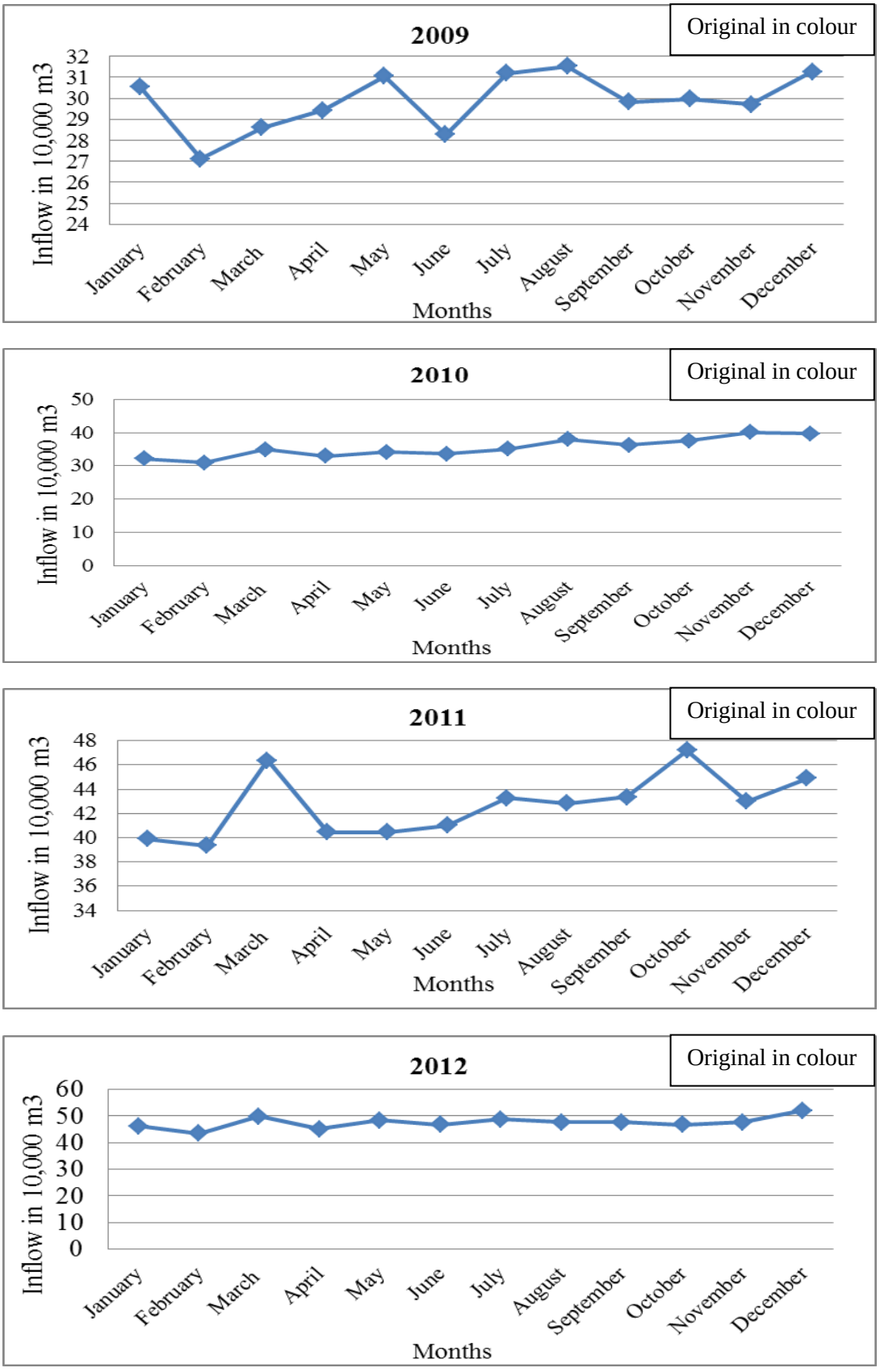


Figure A.2: Water Inflows to the Piliyandala Water Tower

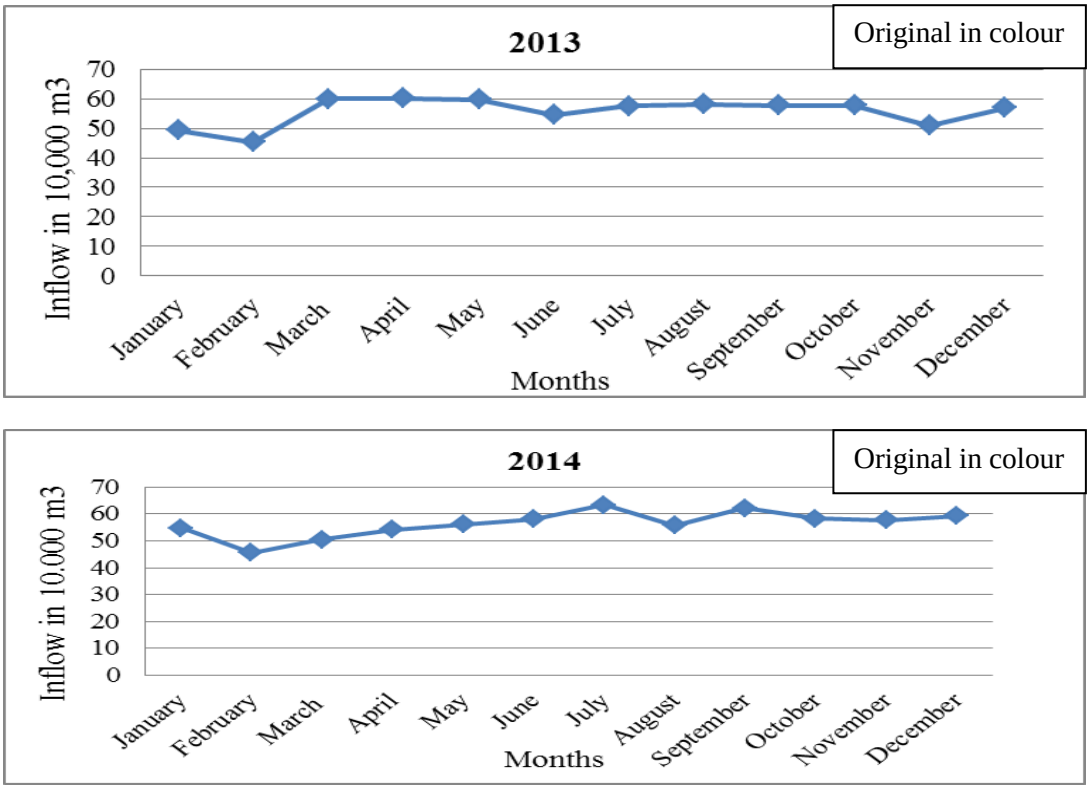


Figure A.3: Water Inflows to the Piliyandala Water Tower

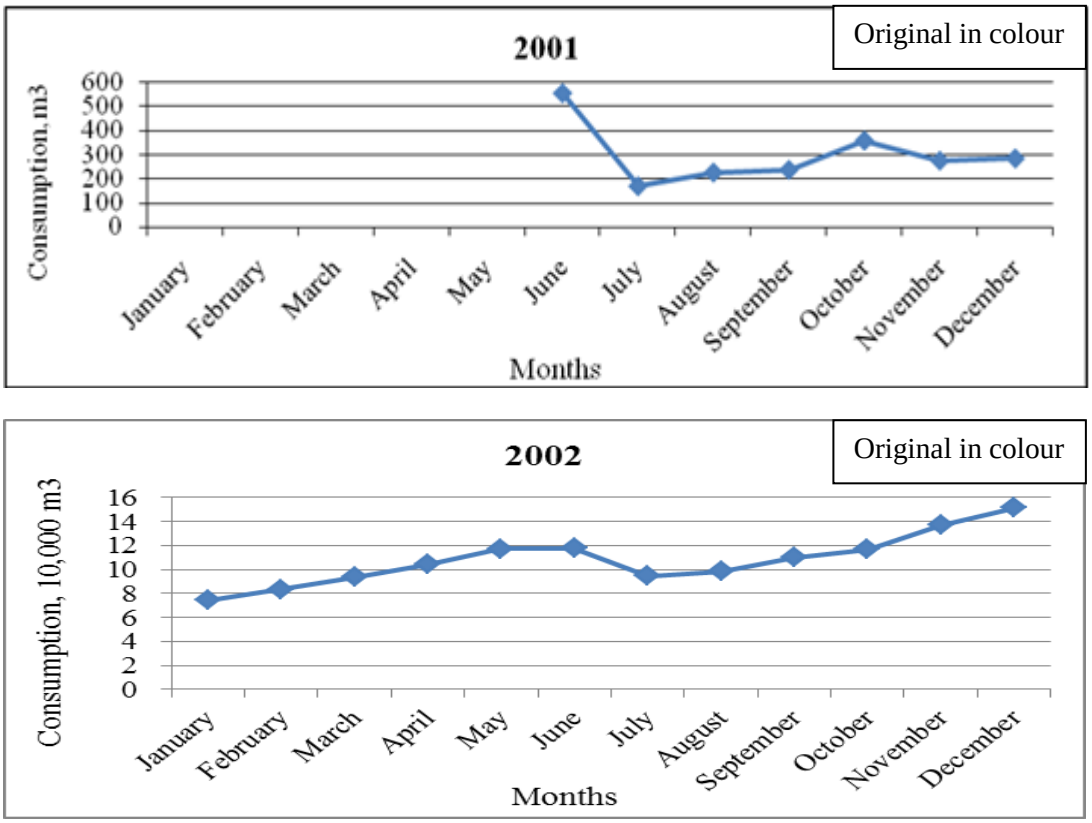
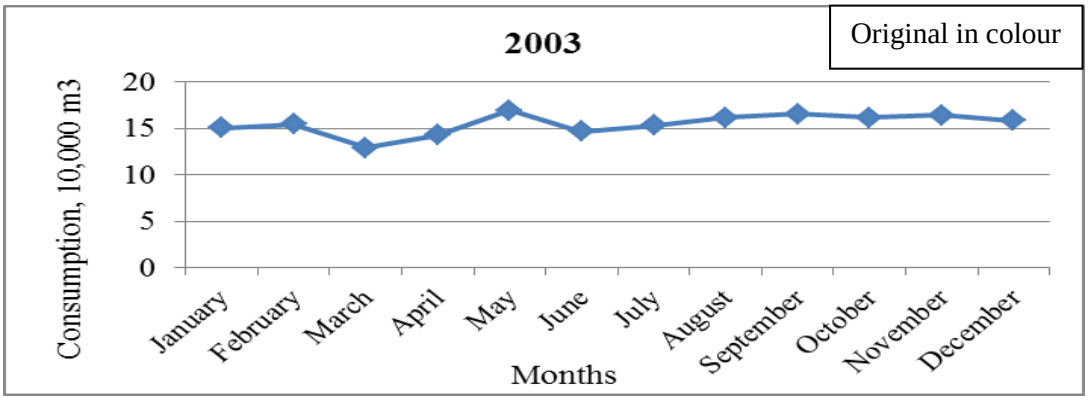
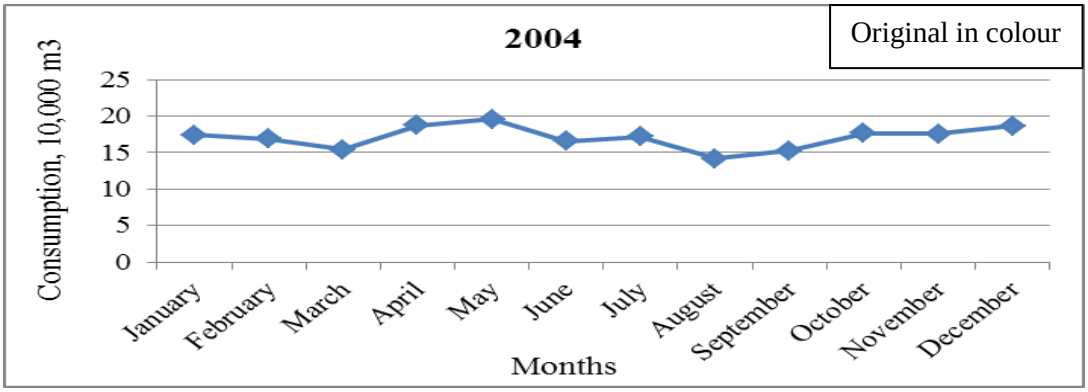
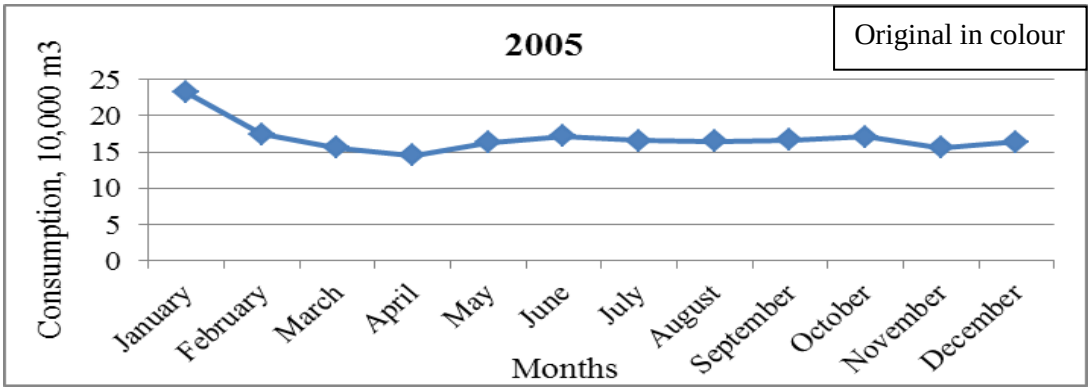


Figure A.3 : Water Consumption Data







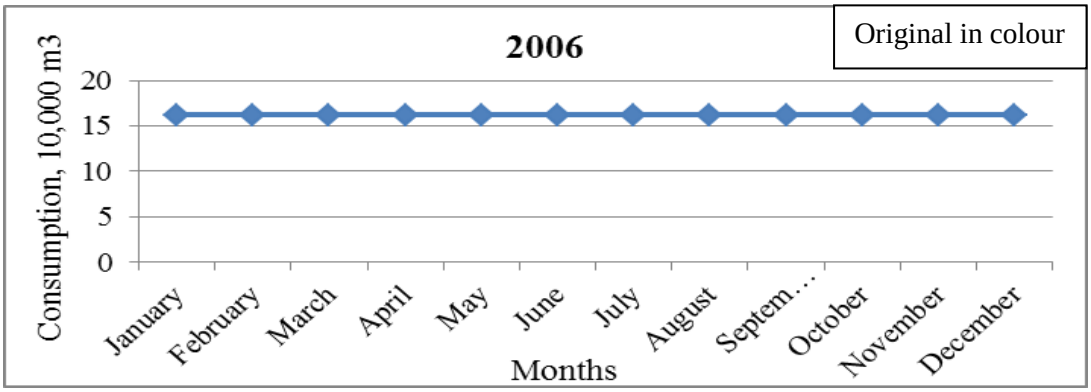


Figure A.4 : Water Consumption Data

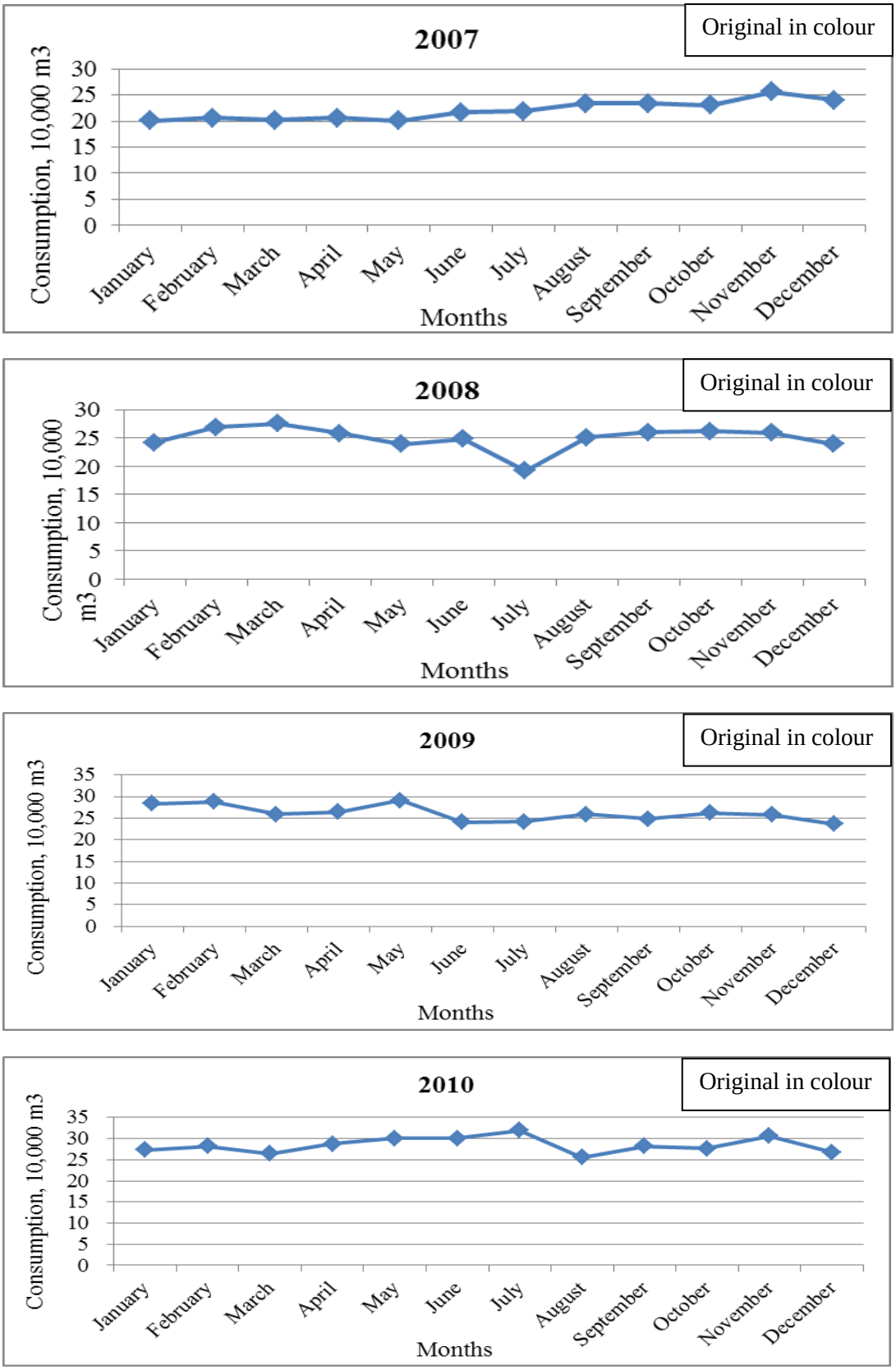


Figure A.5 : Water Consumption Data

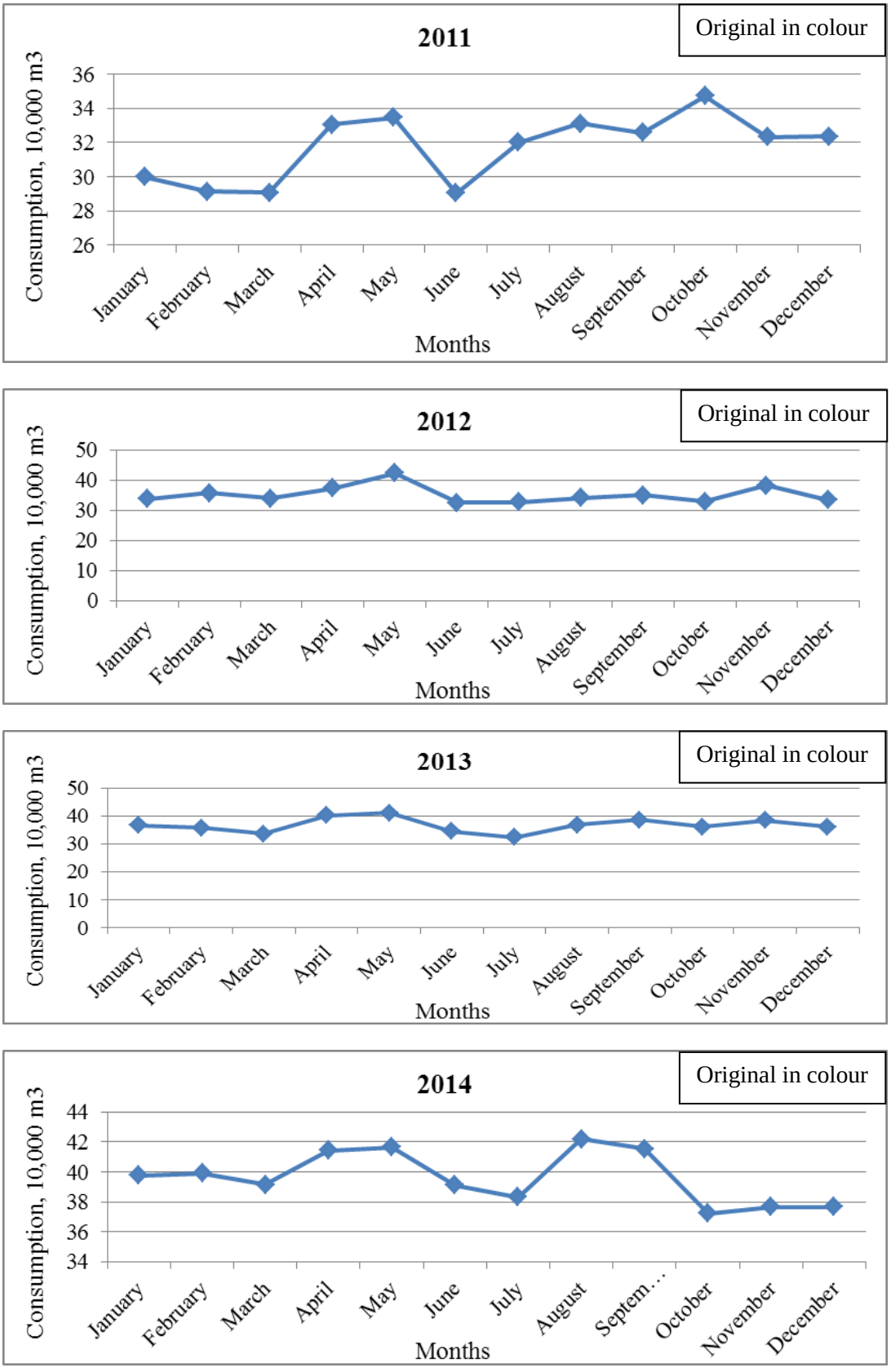


Figure A.6 : Water Consumption Data

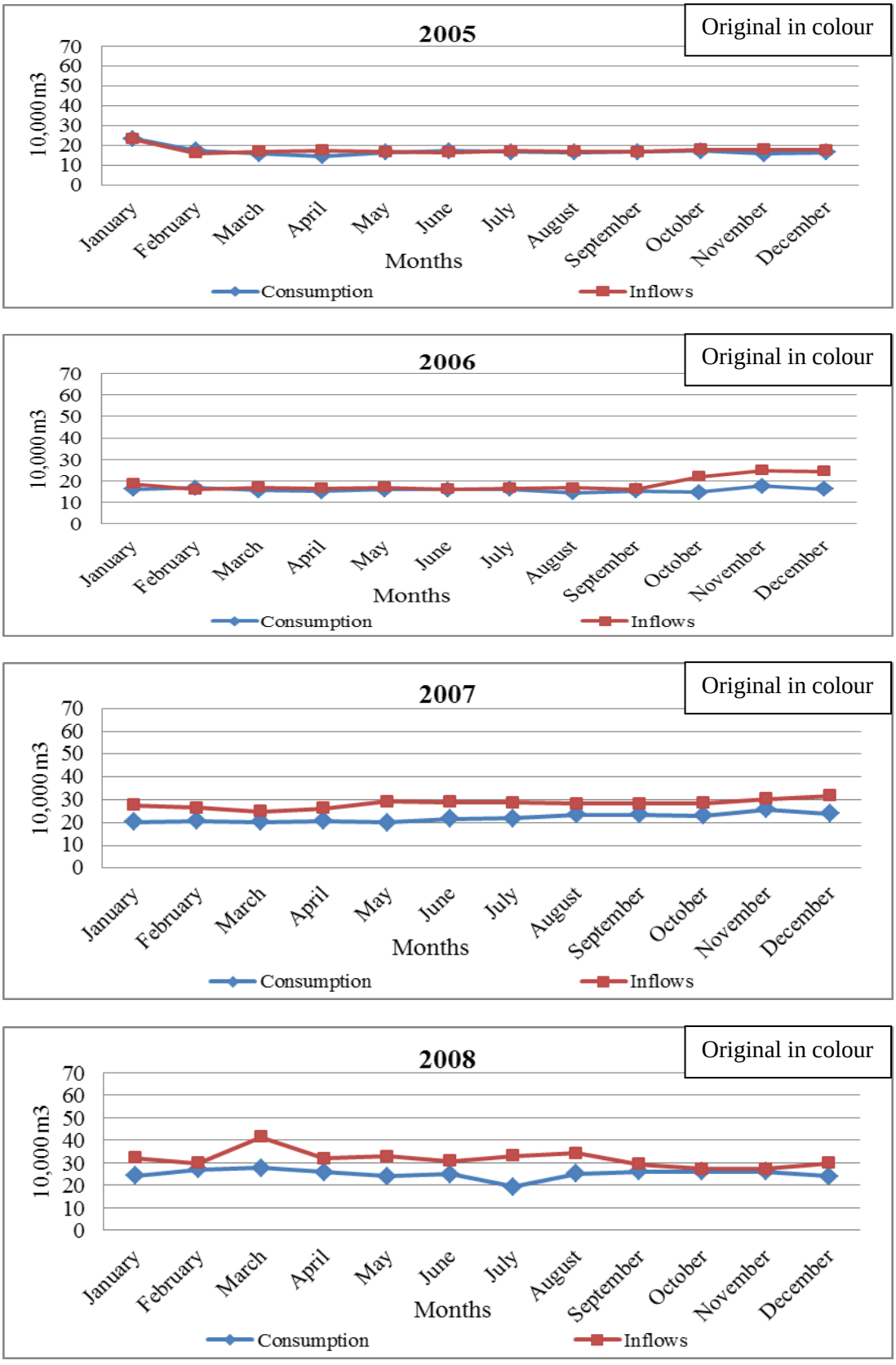


Figure A.7: Comparison of Water Inflows to Water Tower with the Consumption data

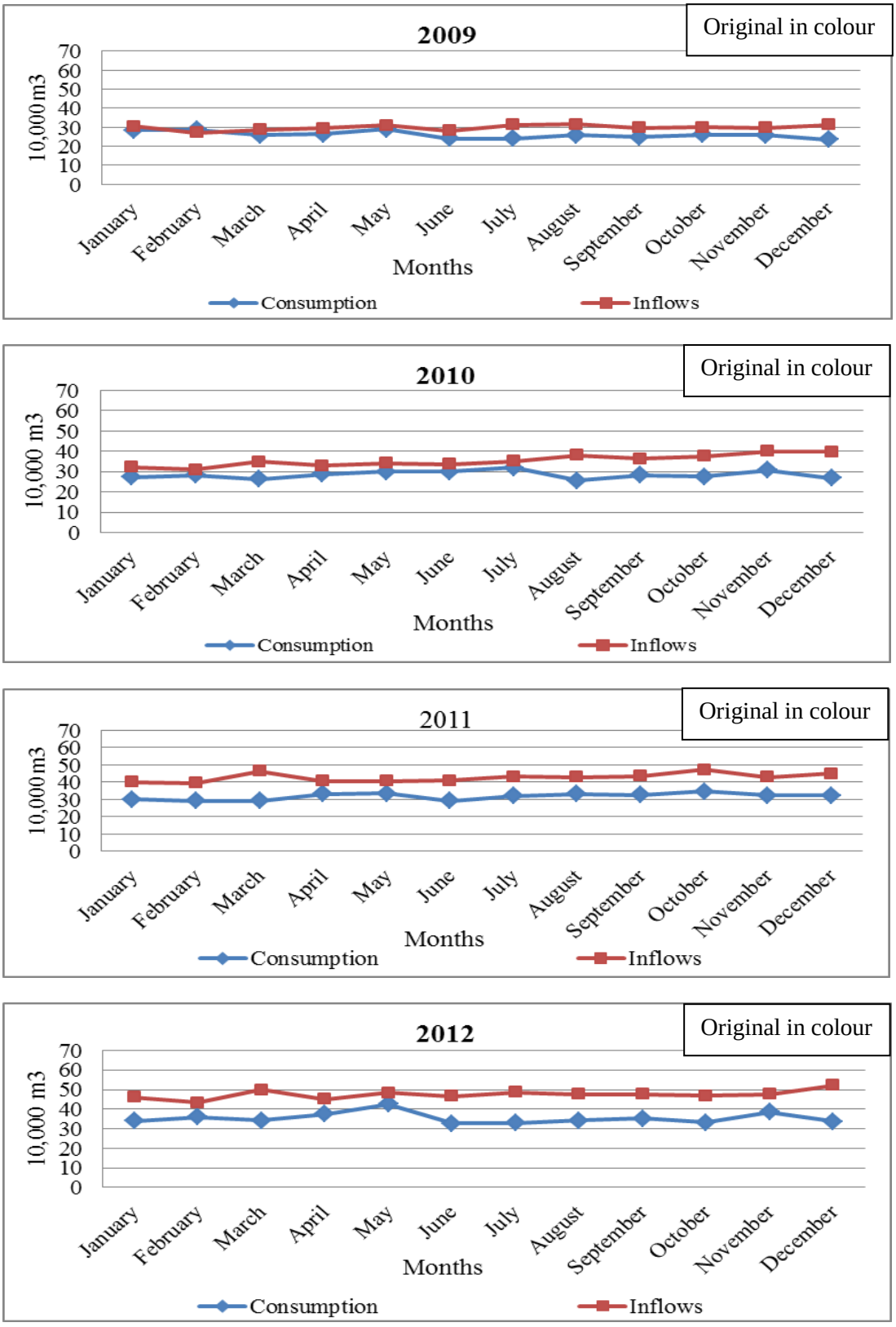


Figure A.8: Comparison of Inflows to the Water Tank with the Consumption data

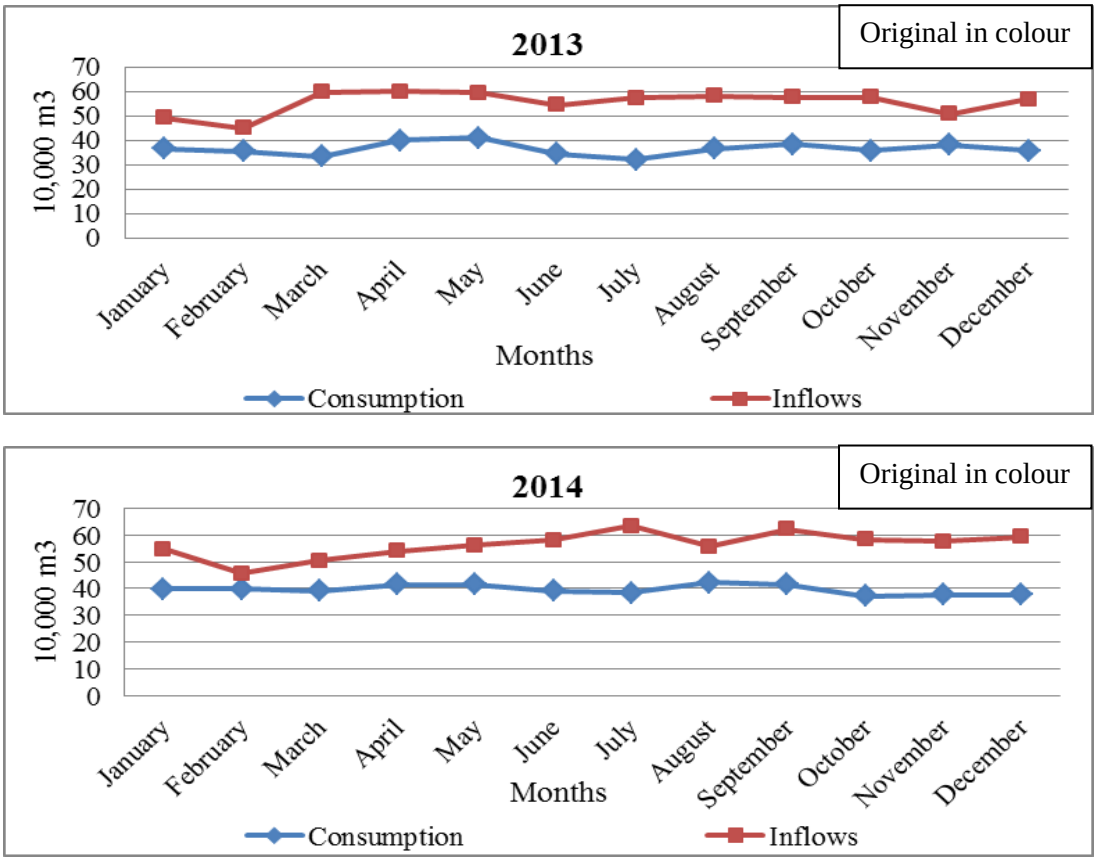


Figure A.9: Comparison of Inflows to the Water Tank with the Consumption data

APPENDIX B – STAKEHOLDER SURVEY

Master Degree Research 2014/2015 - University of Moratuwa Sri Lanka

Student: TKNK Kumari, Senior Engineer, Development Section,

NWSDB Head Office, Ratmalana, Sri Lanka

Dear Sir/Madam,

I am presently carrying out a masters degree research on the Management Prioritisation in Water Supply Systems in the National Water Supply & Drainage Board (NWSDB). This is an attempt to identify priority water supply sub divisions based on the key management parameters considered by a system manager.

.....
TKNK Kumari
...../...../.....

STAGE 1: Identification of Main Parameters

A preliminary study revealed that in a situation where the water supply input, the pipe network, storage, staff and transport are in place and they remain at a near constant stage, then the key management parameters that concerns a system manager would fall into the following groups. Please observe the groups and **comment on any other additional consideration** that requires to be included in the list.

Income Generation System Sustainability	1. Non Revenue Water(NRW) 2. Other (pl specify)……
System Reliability	2.
Problem Solving	1.
System Losses	1. New Connections 2. Bill collection 3. Other (pl specify) ……..

STAGE 2: Identification of Priorities for Main and Sub Parameters

Stage two is further divided for the ease of capturing the relative importance. This is to capture a decision maker's perspective of each an every individual item irrespective of the main parameter consideration. The sub divisions are, a) As a score for each of sub parameter irrespective of a main parameter. b) the priority for each Main Parameter as a standalone entity. The Main Parameter Weights are expected as a percentage.

STAGE 2a) Score for Each of Sub Parameter (Not considering the main parameter).

#	Sub Parameter	Score ?/1000	Remarks *(Sub Parameters are to be ranked in a scale of 1000 in total)*
1	New Connections		Key factor for income generation
2	Bill Collection		Reflects the transfer of connections to finances
3	Operation & Maintenance Cost		Covers routine maintenance and complain repair costs
4	Salaries and Overtime		Looks after expenses for functionality without interruption
5	Transport		Looks after expenses for functionality with inspections and repair
6	Non Revenue Water(NRW)		Minimisation of water income loss
7	Low pressure		A reasonable pressure should be maintained
8	No water		Adequate requirements as per norms must be supplied
9	Water Quality		Standards must be maintained
10	Defective meters		Security against income and also customer confidence in the organisation.
11	Leak - Mains		Leaking Mains lose a high quantity of treated water loss of income
12	Leak - Connections		Loss of treated water leading to reduced income
13	Leak – near meter		Loss of treated water leading to reduced income
14	Leak - Night time		Loss of treated water leading to reduced income
15	Leak - Stop valve		Loss of treated water leading to reduced income
16	Other (pl specify) ……		Pl indicate ……
17	Other (pl specify) ……		Pl indicate ……
18	Other (pl specify) ……		Pl indicate ……
19	Other (pl specify) ……		Pl indicate ……
20	Other (pl specify) ……		Pl indicate ……
	Total	1000	

STAGE 2b) Priority given for each Main Parameter

#	Main Parameter	Weight
1	**Income Generation**	
2	**System Sustainability** (Recurrent Expenditure)	
3	**System Losses**	
4	**System Reliability** (Problem Solving)	
	TOTAL	**100%**

Comments

(ifany)……..…….……

…….……..……

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…….....……

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……

…….....

Name of Respondent: …….

Designation: ……

Division: …….

Date: ……..

Table B.1.1 : Respondent Details of Stakeholder Survey

#	Name	Designation	NWSDB Division
Form 1	S.G.J Rajkumar	Deputy General Manager (Development)	Development
Form 2	B.A Fernando	Senior Engineer	Planning and Design
Form 3	D. Warapitiya	Engineer	Planning and Design
Form 4	G.W.D.P.De Silva	Engineer	Corporte Planing
Form 5	S. Sarankan	Engineer	Planning and Design
Form 6	G.M Mathuranesan	Chief Engineer	Planning and Design
Form 7	J.M.C.G Jayasinghe	Engineer	Additional General Manager (North/Central) office
Form 8	W.D.A.L Devapriya	Engineer	Additional General Manager (Southern/East) office
Form 9	R. S. Karunasena	Engineer	Development
Form 10	D.M.S.S Dissanayake	Area Engineer (Kolonnawa)	Regional Support Centre (Western Central)
Form 11	I.I Weerarathne	Engineer	Development
Form 12	D.A.H. Dissanayaka	Chief Engineer	Planning and Design
Form 13	W.W. Liyanage	Structural Specialist	Planning and Design
Form 14	D Jayawardane	Engineer	Planning and Design
Form 15	S Kalubowila	Senior Engineer	Planning and Design
Form 16	P.K.M Dissanayake	Engineer	Planning and Design
Form 17	H.T Perera	Engineer	Planning and Design
Form 18	R Gurusinghe	Engineer	Planning and Design
Form 19	T.D Peiris	Chief Engineer	Policy and Planning
Form 20	B. H. H Liyanage	Engineer	Planning and Design
Form 21	H.T.T Wimalaweera	Assistant General Manager	Additional General Manager (North/Central) Office
Form 22	S. Kandeepan	Engineer	Planning and Design
Form 23	S. Dharmasinghe	Engineer	Planning and Design
Form 24	A.P Ratnayake	Engineer	Policy & Planning
Form 25	A.K.M De Silva	Engineer	Planning and Design
Form 26	N.R.S Wickramasinghe	Chief Engineer	Planning and Design
Form 27	M.S.M Riswan	Chief Engineer	Development
Form 28	A. Kaluarachchi	Chief Engineer	Planning and Design
Form 29	N. Thilagarajah	Engineer	Corporate Planning
Form 30	G.G.S Lekha	Chief Engineer	Planning and Design
Form 31	U.A Upeksha	Senior Engineer	Planning and Design
Form 32	V. P. Thiranagama	Chief Engineer	Planning and Design
Form 33	Rajika Rajapakshe	Chief Engineer	Planning and Design
Form 34	H.T.N Jayathilake	Engineer	Planning and Design
Form 35	A Munasinghe	Assistant General Manager	Planning and Design
Form 36	S.S Devaraja	Assistant General Manager	General Manager Office
Form 37	A Mahathanthila	Assistant General Manager	Planning and Design
Form 38	D.S.P.R.D.Premachandra	Chief Engineer	Planning and Design
Form 39	H.M.C.P Herath	Chief Engineer	Sewerage Section

Table B.1.2 : Respondent Details of Stakeholder Survey

#	Name	Designation	Section
Form 40	D.M.L.C Pitawala	Assistant General Manager	Research and Development
Form 41	D.G.N. Kumari	Chief Engineer	Regional Support Centre (Western South)
Form 42	P.M.D.T.Pannila	Chief Engineer	Regional Support Centre (Western South)
Form 43	M. Wijesinghe	Assistant General Manager	Additional General Manager (Western) office
Form 44	W.B.G Fernando	Additional General Manager	Corporate Services
Form 45	W.A.S.M Gunasekara	Engineer	Planning and Design
Form 46	A.K Manori	Chief Engineer	Rural Water Supply
Form 47	D.A.D.U Nishantha	Area Engineer (Kotte)	Regional Support Centre (Western Central)
Form 48	G.A Pushpalatha	Area Engineer (Kesbewa)	Regional Support Centre (Western Central)
Form 49	L.G Wadanambi	Chief Engineer	Corporate Planning
Form 50	H.A.E.N Huladdoowaarachchi	Manager (Panadura)	Regional Support Centre (Western South)
Form 51	K.W.P.M Thilakaratne	Area Engineer (Panadura)	Regional Support Centre (Western South)
Form 52	D.S Jayasekara	Area Engineer (Bandaragama)	Regional Support Centre (Western South)
Form 53	B. Thavendrakumar	Chief Engineer	Regional Support Centre (Western South)
Form 54	R.S.C George	Additional General Manager	Policy and Planning
Form 55	T.B.Heenkenda	Manager	Non Revenue Water
Form 56	P. Fernando	Deputy General Manager	Water Supply Projects
Form 57	J.P.G Jayarathne	Deputy Project Director	Waste Water Disposal Project
Form 58	R.D.V.K Silva	Engineer	Japenese Project Unit
Form 59	J.A.K.K Senevirathne	Manager (Kalutara)	Regional Support Centre (Western South)
Form 60	A.G.B Pathmasiri	Project Engineer	Anuradhapura
Form 61	A.D.K.K Wijegunawardane	Manager (Maharagama)	Regional Support Centre (Western Central)
Form 62	H.P Erandika	Engineer	Policy and Strategy
Form 63	S. Jayasinghe	Engineer	Planning and Design
Form 64	I. Karunasena	Engineer	Research and Development
Form 65	N.P. Goonawardana	Chief Engineer	Planning and Design
Form 66	N.W.E.S Nirasha	Engineer	Planning and Design
Form 67	Geethanjali Gunathilake	Chief Engineer	Regional Support Centre (Western North)
Form 68	A.V.A.U. Karunathilaka	Engineer	Water Supply Project
Form 69	D.W.K.D Amaratunga	Chief Engineer	Procurement and Construction
Form 70	P.N.Herath	Chief Engineer	Mapping Section
Form 71	S.K.L.S Rupasinghe	Chief Engineer	Research and Development
Form 72	WRS Fernando	Civil Engineer	Regional Suppport Centre (Western South)
Form 73	C.S. Lokubarana	Chief Engineer	Regional Suppport Centre (North Central)
Form 74	W.C.A Gunarathna	Area Engineer (Maligawatta)	Regional Suppport Centre (Western Central)
Form 75	R.A.S.P Ranaweera	Chief Engineer	Regional Suppport Centre (North Western)
Form 76	J.S Aravindan	Chief Engineer	Regional Suppport Centre (North)
Form 77	A.D.A Ranjani	Chief Engineer	Regional Suppport Centre (Western Central)
Form 78	A.M.H.K Abeykoon	Engineer	Regional Suppport Centre (Western North)

Appendix B 3: Typical Respondent Data

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Master Degree Research 2014/2015 - University of Moratuwa Sri Lanka

Student: TKNK Kumari, Senior Engineer, Development Section, NWSDB Head Office, Ratmalana, Sri Lanka

Dear Sir/Madam

I am presently carrying out a masters degree research on the Management Prioritisation in Water Supply Systems in the National Water Supply & Drainage Board (NWSDB). This is an attempt to identify priority water supply sub divisions based on the key management parameters considered by a system manager.

Nisansha

.....

TKNK Kumari

28/01/2016

STAGE 1: Identification of Main Parameters

A preliminary study revealed that in a situation where the water supply input, the pipe network, storage, staff and transport are in place and they remain at a near constant stage, then the key management parameters that concerns a system manager would fall into the following groups. Please observe the groups and **comment on any other additional consideration** that requires to be included in the list.

Income Generation	1. New Connections 2. Bill collection 3. Other (pl specify) ……..
System Sustainability	**Recurrent Expenditure** 1. Operation & Maintenance 2. Salaries and Overtime 3. Transport 4. Other (pl specify)……
System Losses	1. Non Revenue Water(NRW) 2. Other (pl specify)……
System Reliability	**Problem Solving** 1. Low pressure 2. No water 3. Water Quality 4. Defective meters 5. Leak - Mains 6. Leak - Connections 7. Leak – near meter 8. Leak - Night time 9. Leak - Stop valve 10. Other (pl specify)……

Appendix B 4.1: Typical Respondent Data

STAGE 2: Identification of Priorities for Main and Sub Parameters

Stage two is further divided for the ease of capturing the relative importance. This is to capture a decision maker's perspective of each an every individual item irrespective of the main parameter consideration. The sub divisions are, a) As a score for each of sub parameter irrespective of a main parameter. b) the priority for each Main Parameter as a stand alone entity. The Main Parameter Weights are expected as a percentage.

STAGE 2a) Score for Each of Sub Parameter (Not considering the main parameters).

#	Sub Parameter	Score ?/1000	Remarks *(Sub Parameters are to be ranked in a scale of 1000 in total)*
1	New Connections	160	Key factor for income generation
2	Bill Collection	100	Reflects the transfer of connections to finances
3	Operation & Maintenance Cost	25	Covers routine maintenance and complain repair costs
4	Salaries and Overtime	25	Looks after expenses for functionality without interruption
5	Transport	20	Looks after expenses for functionality with inspections and repair
6	Non Revenue Water(NRW)	150	Minimisation of water income loss
7	Low pressure	50	A reasonable pressure should be maintained
8	No water	70	Adequate requirements as per norms must be supplied
9	Water Quality	100	Standards must be maintained
10	Defective meters	50	Security against income and also customer confidence in the organisation.
11	Leak - Mains	50	Leaking Mains lose a high quantity of treated water loss of income
12	Leak - Connections	50	Loss of treated water leading to reduced income
13	Leak – near meter	50	Loss of treated water leading to reduced income
14	Leak - Night time	50	Loss of treated water leading to reduced income
15	Leak - Stop valve	50	Loss of treated water leading to reduced income
16	Other (pl specify)		Pl indicate .....
17	Other (pl specify)		Pl indicate .....
18	Other (pl specify)		Pl indicate .....
19	Other (pl specify)		Pl indicate .....
20	Other (pl specify)		Pl indicate .....
	Total	1000	

Appendix B 4.2: Typical Respondent Data

STAGE 2b) Priority given for each Main Parameter

#	Main Parameter	Weight
1	**Income Generation**	20
2	**System Sustainability** (Recurrent Expenditure)	10
3	**System Losses**	10
4	**System Reliability** (Problem Solving)	60.
	TOTAL	**100%**

Comments (if any).....

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Name of Respondent: ..... P. Fernando .....

Designation: ..... DGM (PC) .....

Division: ..... WSP Section .....

Date: ..... 28/01/2016. .....

Table B.2.1 :Stakeholder Confirmation of Main and Sub Parameters

	Parameter	Respondent (1 – 26)																								
		1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*	*19*	*20*	*21*	*22*	*23*	*24*	*25*	*26*
1	New Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Bill collection	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Operation & Maintenance	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4	Salaries and Overtime	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Transport	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	Non Revenue Water (NRW)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Low Pressure	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8	No water	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Water Quality	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
10	Defective Meters	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Leak - Mains	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
12	Leak - Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
13	Leak - near meter	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
14	Leak - Night time	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
15	Leak - stop valve	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
16	other							√	√								√	√	√			√			√		
17	other							√	√								√	√	√			√			√		
18	other								√									√	√						√		
19	other								√									√	√						√		
20	other																	√	√						√		

Table B.2.2 :Stakeholder Confirmation of Main and Sub Parameters

		Respondent (27 – 52)																								
	Parameter	***27***	***28***	***29***	***30***	***31***	***32***	***33***	***34***	***35***	***36***	***37***	***38***	***39***	***40***	***41***	***42***	***43***	***44***	***45***	***46***	***47***	***48***	***49***	***50***	***51***	***52***
1	New Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Bill collection	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Operation & Maintenance	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4	Salaries and Overtime	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Transport	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	Non Revenue Water (NRW)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Low Pressure	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8	No water	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Water Quality	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
10	Defective Meters	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Leak - Mains	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
12	Leak - Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
13	Leak - near meter	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
14	Leak - Night time	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
15	Leak - stop valve	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
16	other		√	√	√		√		√			√			√	√	√	√	√	√	√				√		
17	other			√								√			√		√	√	√	√							
18	other											√			√				√	√							
19	other											√			√				√	√							
20	other											√			√												

Table B.2.3 :Stakeholder Confirmation of Main and Sub Parameters

	Parameter	Respondent (53 – 78)																									
		53	*54*	*55*	*56*	*57*	*58*	*59*	*60*	*61*	*62*	*63*	*64*	*65*	*66*	*67*	*68*	*69*	*70*	*71*	*72*	*73*	*74*	*75*	*76*	*77*	*78*
1	New Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
2	Bill collection	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
3	Operation & Maintenance	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
4	Salaries and Overtime	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
5	Transport	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
6	Non Revenue Water (NRW)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
7	Low Pressure	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
8	No water	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
9	Water Quality	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
10	Defective Meters	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
11	Leak - Mains	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
12	Leak - Connections	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
13	Leak - near meter	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
14	Leak - Night time	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
15	Leak - stop valve	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
16	other		√	√				√		√		√						√	√							√	
17	other									√								√									
18	other																	√									
19	other																	√									
20	other																	√									

Table B.3.1 : Stakeholder Inputs as “Other” Parameters

#	Main Parameter			
	Income Generation	System Sustainability	System Losses	System Reliability
Form 1	Other services to rechargeable,	Electricity, Telephone, Chemical	Depreciation of Assets	
Form 2			Insufficient usage of resources, Usage of how quality materials and equipments	
Form 5	External design and consultancy		Energy losses	
Form 7	Water Quality Testing, Organisational standards	Electricity	Scaling of existing pipes, unability of operate source old valve and specials, Service linesdamages due to development works	
Form 8	Tube well construction, Investigation and pump testing, Laboratory testing	Energy		
Form 9	Disconnections, Ferrule/ Meter shifting		Defective meter	Unauthorised house connections
Form 12	Illegal Connections			Replace old lines
Form 13	Action for delay payment			Air release from domestic connections
Form 15		Training	Pipe scaling	Pipe bursting, unforeseen disasters
Form 16	Consultancy service	Capital investment for new projects		
Form 17	Auction of items which are not used, Charges for involving consultation work for external organization organisations	Awareness programs	Damages of plants, pipes, networks and other assets due to disasters	Lack of raw water quality
Form 18	Consultancy services	Training Programs	Material wastage minimize, minimize chemicals	Protect raw water source
Form 19	Quality increase		Increased labour	
Form 21	Laboratory services	Rehabilitation	Power	
Form 24	Consultancy services (outsourcing activities)	Head Office Overhead (Reduction of Overhead cost),		Protection of water sources, Consumer satisfaction, New technologies
Form 26		Plant efficiency, Bonus/ Leave encashment/medical payments , Over staff	Energy losses	Meter reader errors, new connection delays, delay in attending complaints
Form 28				Power facilities

Table B.3.2 : Stakeholder Inputs as “Other” Parameters

#	Main Parameter			
	Income Generation	System Sustainability	System Losses	System Reliability
Form 29	Consultancy Income, Bowser supply, Drilling tubewells	Depreciation of infrastructure, loan interest payment		Air entrap in the pipeline avoid hammer effect
Form 30				Less storage
Form 32		Loan repayment/ Interest payment		
Form 34		Improve Raw Water Quality		
Form 36		System Improvements	Energy loss	
Form 37	Bottling water plant	Public awareness to save water	Lack of raw water availabilty	
Form 38			Energy cost	
Form 39		Loan Repayment		
Form 40	Consultancy services, other possible and relavant services such as quality testing, bottle water		Due to mal practices in O&M, such as lack of assets mgt/ preventive maintenance, energy & chemical optimization	Productivity improvement
Form 41			Energy Loss	
Form 42		System Improvement	Energy Loss	
Form 43		Asset Management Rehabilitation		
Form 45	Consultancy	Training, Workers Safety plan	Illegal connections	
Form 46		Improve the System		
Form 50		System Improvement		
Form 52			Illegal connections	
Form 55			System Loss	
Form 61		Chemical cost	Overflow of Towers	
Form 63		Rehabilitation		
Form 65		Quality and Quantity of water, Defective meter	Poor O&M	NRW
Form 70	Meter shifting , fines for illegal connections, Laboratory service, Ground water activities	Chemicals, Electricity	Estimate bills, Billing errors, Illegal connections, System losses due to low efficiency operations	Bill estimates, Bill errors
Form 71	Bowser Supply		Energy losses	Billing errors, Meter shifting new charges

Table B.4.1 : Priority Scores from Stakeholder Responses – Main Parameter

Main Parameter		Form ID (1 – 15)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Income generation	40	20	25	10	40	50	15	30	30	25	50	10	30	18	35
2	System sustainability	30	35	30	15	15	30	40	30	25	30	30	5	15	15	20
3	System Losses	20	30	10	50	25	10	25	20	20	5	10	25	35	20	20
4	System Reliability	10	15	35	25	20	10	20	20	25	40	10	60	20	48	25
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table B.4.2 : Priority Scores from Stakeholder Responses – Main Parameter

Main Parameter		Form ID (16 – 30)														
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	Income generation	36.5	23	10	50	35	30	15	20	50	20	30	30	20	30	20
2	System sustainability	34.5	23	30	30	25	40	20	50	25	20	25	40	20	20	25
3	System Losses	10	9	20	10	25	20	50	10	12.5	10	20	15	20	30	25
4	System Reliability	19	45	40	10	15	10	15	20	12.5	50	25	15	40	20	30
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table B.4.3 : Priority Scores from Stakeholder Responses – Main Parameter

Main Parameter		Form ID (31 – 45)														
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1	Income generation	30	15	50	25	25	20	40	30	40	20	40	45	30	30	20
2	System sustainability	23	20	10	30	25	30	15	20	30	35	20	25	30	30	15
3	System Losses	22	25	30	25	25	20	20	30	20	15	20	15	20	15	20
4	System Reliability	25	40	10	20	25	30	25	20	10	30	20	15	20	25	45
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table B.4.4 : Priority Scores from Stakeholder Responses – Main Parameter

Main Parameter		Form ID (46 – 60)														
		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	Income generation	30	40	35	30	40	40	45	35	25	25	20	30	20	40	50
2	System sustainability	25	20	40	40	20	25	20	40	40	15	10	30	30	20	20
3	System Losses	15	15	10	10	15	10	15	10	25	40	10	20	30	20	10
4	System Reliability	30	25	15	20	25	25	20	15	10	20	60	20	20	20	20
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table B.4.5 : Priority Scores from Stakeholder Responses – Main Parameter

Main Parameter		Form ID (61 – 78)																	
		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
1	Income generation	40	40	50	35	30	13	20	25	35	50	30	23	30	25	25	30	35	40
2	System sustainability	30	25	30	10	25	25	20	30	30	15	10	23	30	25	20	20	25	10
3	System Losses	15	10	10	30	25	37	20	5	15	20	30	31	20	25	15	10	10	20
4	System Reliability	15	25	10	25	20	25	40	40	20	15	30	23	20	25	40	40	30	30
	Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Table B.5.1 : Priority Scores from Stakeholder Responses – Sub Parameter

		Form ID (1 – 15)														
	Sub Parameter	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	New Connections	200	100	100	75	100	150	72	100	140	70	200	50	150	75	85
2	Bill collection	300	75	40	35	140	50	57	100	100	125	150	130	175	100	65
3	Operation & Maintenance	200	60	60	35	40	100	75	80	125	85	100	80	125	100	70
4	Salaries and Overtime	50	55	75	100	10	50	65	130	115	80	100	20	100	25	80
5	Transport	50	65	30	100	10	50	50	50	90	30	50	30	50	25	70
6	Non Revenue Water (NRW)	50	100	125	180	150	100	80	200	110	10	50	170	50	25	85
7	Low Pressure	30	60	100	100	120	50	68	40	35	65	20	100	75	25	60
8	No water	20	60	150	100	100	50	70	40	45	120	20	200	75	5	80
9	Water Quality	20	65	100	100	150	50	65	40	45	120	50	150	25	300	60
10	Defective Meters	20	50	40	50	50	100	55	40	40	90	50	20	25	150	65
11	Leak - Mains	20	90	60	25	50	100	50	8	45	115	50	10	50	150	80
12	Leak - Connections	10	60	30	25	20	50	45	8	20	30	40	10	25	5	70
13	Leak - near meter	10	40	30	25	10	30	40	8	15	35	40	10	25	5	35
14	Leak - Night time	10	80	30	25	40	50	57	8	55	15	40	10	25	5	65
15	Leak - stop valve	10	40	30	25	10	20	35	8	20	10	40	10	25	5	30
16	other							60	50							
17	other							56	25							
18	other								25							
19	other								40							
20	other															
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.5.2 : Priority Scores from Stakeholder Responses – Sub Parameter

		Form ID (16 – 30)														
	Sub Parameter	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	New Connections	175	110	5	100	150	150	100	100	25	150	150	70	25	150	30
2	Bill collection	175	90	5	200	100	80	50	150	50	100	200	70	50	130	50
3	Operation & Maintenance	120	100	30	100	75	100	100	50	50	50	100	80	125	80	120
4	Salaries and Overtime	125	70	5	70	75	100	100	50	50	50	75	100	50	60	80
5	Transport	75	40	5	60	50	30	50	50	50	50	50	50	25	40	20
6	Non Revenue Water (NRW)	100	60	50	150	100	30	100	100	50	100	75	80	100	90	120
7	Low Pressure	50	60	60	50	75	80	100	50	50	50	20	50	25	80	50
8	No water	25	70	100	20	30	80	50	25	100	50	50	70	50	100	100
9	Water Quality	25	80	100	100	50	80	10	125	150	100	100	100	175	80	50
10	Defective Meters	15	50	10	40	50	100	50	50	50	25	50	30	50	70	50
11	Leak - Mains	15	40	60	70	75	40	100	25	25	100	50	80	125	30	150
12	Leak - Connections	15	20	60	10	50	20	50	25	12.5	25	20	60	25	10	50
13	Leak - near meter	15	20	50	10	40	20	50	50	12.5	25	20	60	25	10	10
14	Leak - Night time	15	40	50	10	50	20	75	100	12.5	100	20	60	100	10	70
15	Leak - stop valve	15	20	50	10	30	20	15	50	12.5	25	20	40	25	10	10
16	other	15	10	60			30			50				25	25	40
17	other	25	20	50			20			50					25	
18	other		20	50						50						
19	other		30	100						100						
20	other		50	100						50						
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.5.3 : Priority Scores from Stakeholder Responses – Sub Parameter

		Form ID (31 – 45)														
	Sub Parameter	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1	New Connections	100	170	180	60	100	50	90	80	200	65	100	150	50	50	90
2	Bill collection	100	90	120	50	100	150	90	160	150	60	140	120	100	75	100
3	Operation & Maintenance	100	100	50	75	50	100	70	80	100	65	80	70	150	75	90
4	Salaries and Overtime	80	40	100	50	50	95	70	40	90	60	60	40	50	50	60
5	Transport	50	80	50	25	30	50	40	40	80	60	60	30	25	25	20
6	Non Revenue Water (NRW)	90	90	80	90	150	40	50	138	75	60	100	70	75	50	30
7	Low Pressure	80	75	70	50	50	65	60	45	65	55	60	50	75	50	70
8	No water	80	80	80	75	80	65	70	40	30	50	60	50	50	100	70
9	Water Quality	80	100	80	100	150	100	80	120	30	65	70	50	100	100	60
10	Defective Meters	50	50	70	70	30	50	40	60	30	50	60	50	50	25	20
11	Leak - Mains	40	25	30	80	80	75	30	45	30	65	100	50	100	50	20
12	Leak - Connections	40	10	30	50	30	70	20	38	30	30	10	40	12.5	50	30
13	Leak - near meter	40	10	20	50	30	10	20	38	30	25	10	30	12.5	25	20
14	Leak - Night time	40	10	20	50	40	70	30	38	30	35	10	50	25	25	20
15	Leak - stop valve	30	10	20	50	30	10	20	38	30	25	10	30	25	25	20
16	other		60		75			50			35	70	80	50	50	75
17	other							30			25		40	50	50	65
18	other							20			50				50	70
19	other							50			55				75	70
20	other							70			65					
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.5.4 : Priority Scores from Stakeholder Responses – Sub Parameter

Water supply sytem management sub Parameters		Form ID (46 – 60)														
		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	New Connections	125	80	160	110	180	130	130	150	150	180	160	175	100	80	200
2	Bill collection	150	120	120	100	120	120	80	120	90	150	100	150	70	120	100
3	Operation & Maintenance	80	80	120	160	80	100	90	80	150	60	25	180	60	110	100
4	Salaries and Overtime	50	50	40	30	10	10	40	50	110	20	25	50	70	30	50
5	Transport	40	50	40	50	10	10	30	40	100	10	20	25	50	20	50
6	Non Revenue Water (NRW)	70	70	110	110	50	80	80	80	90	200	150	175	100	60	50
7	Low Pressure	40	60	70	50	60	60	70	60	50	20	50	25	60	70	25
8	No water	40	50	100	70	80	80	100	90	60	80	70	50	70	80	50
9	Water Quality	100	90	120	100	100	100	60	90	40	70	100	25	100	80	50
10	Defective Meters	40	90	40	40	20	30	60	60	40	10	50	25	50	60	25
11	Leak - Mains	80	100	30	120	100	120	100	80	20	100	50	50	70	80	50
12	Leak - Connections	50	70	20	15	50	80	40	40	10	60	50	30	50	50	50
13	Leak - near meter	20	30	10	15	30	10	40	20	10	10	50	20	50	30	50
14	Leak - Night time	20	30	10	15	30	60	40	20	10	10	50	20	50	30	100
15	Leak - stop valve	20	30	10	15	30	10	40	20	10	10	50	20	50	30	50
16	other	75				50				60	10				70	
17	other															
18	other															
19	other															
20	other															
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1020	1000	1000	1000

Table B.5.5 : Priority Scores from Stakeholder Responses – Sub Parameter

		Form ID (61 – 78)																	
	Sub Parameter	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
1	New Connections	120	100	25	100	80	25	50	80	150	100	130	50	150	100	125	150	120	125
2	Bill collection	300	50	300	50	90	50	40	100	200	100	100	100	150	150	100	100	150	200
3	Operation & Maintenance	110	80	100	80	100	50	50	90	150	100	200	50	150	100	150	100	100	100
4	Salaries and Overtime	200	60	250	70	60	25	50	80	80	50	70	50	90	70	80	50	40	75
5	Transport	15	50	10	50	30	15	30	40	70	50	50	40	60	60	40	40	20	50
6	Non Revenue Water (NRW)	100	80	100	60	150	100	90	25	140	50	100	150	200	100	125	120	70	100
7	Low Pressure	15	50	15	100	90	100	90	70	20	50	30	50	10	80	70	50	70	50
8	No water	15	50	35	80	80	25	90	125	35	50	30	50	40	90	75	80	100	50
9	Water Quality	10	150	50	80	150	10	90	120	25	50	40	200	50	100	100	110	100	50
10	Defective Meters	10	80	5	70	40	100	90	70	10	50	20	50	20	30	40	70	40	75
11	Leak - Mains	20	50	30	60	65	100	90	110	15	100	100	70	30	35	40	40	70	25
12	Leak - Connections	20	50	5	50	20	100	60	30	10	50	20	50	20	30	10	35	35	25
13	Leak - near meter	5	50	5	50	20	100	60	35	5	50	20	30	10	15	10	15	15	25
14	Leak - Night time	5	50	5	50	10	100	60	15	5	50	70	30	10	25	25	25	25	25
15	Leak - stop valve	5	50	5	50	15	100	60	10	5	50	20	30	10	15	10	15	15	25
16	other	25		60						15	50							30	
17	other	25								20									
18	other									20									
19	other									10									
20	other									15									
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.6.1 : Corrected Priority Scores from Stakeholder Responses – Sub Parameters

	Sub Parameter	Form ID (1 – 15)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	New Connections	200	100	100	75	100	150	81	116	140	70	200	50	150	75	85
2	Bill collection	300	75	40	35	140	50	64	116	100	125	150	130	175	100	65
3	Operation & Maintenance	200	60	60	35	40	100	85	93	125	85	100	80	125	100	70
4	Salaries and Overtime	50	55	75	100	10	50	74	151	115	80	100	20	100	25	80
5	Transport	50	65	30	100	10	50	57	58	90	30	50	30	50	25	70
6	Non Revenue Water (NRW)	50	100	125	180	150	100	90	233	110	10	50	170	50	25	85
7	Low Pressure	30	60	100	100	120	50	77	47	35	65	20	100	75	25	60
8	No water	20	60	150	100	100	50	79	47	45	120	20	200	75	5	80
9	Water Quality	20	65	100	100	150	50	74	47	45	120	50	150	25	300	60
10	Defective Meters	20	50	40	50	50	100	62	47	40	90	50	20	25	150	65
11	Leak - Mains	20	90	60	25	50	100	57	9	45	115	50	10	50	150	80
12	Leak - Connections	10	60	30	25	20	50	51	9	20	30	40	10	25	5	70
13	Leak - near meter	10	40	30	25	10	30	45	9	15	35	40	10	25	5	35
14	Leak - Night time	10	80	30	25	40	50	64	9	55	15	40	10	25	5	65
15	Leak - stop valve	10	40	30	25	10	20	40	9	20	10	40	10	25	5	30
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.6.2 : Corrected Priority Scores from Stakeholder Responses – Sub Parameters

Sub Parameter		Form ID (16 – 30)														
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	New Connections	182	126	8	100	150	158	100	100	36	150	150	70	26	158	31
2	Bill collection	182	103	8	200	100	84	50	150	71	100	200	70	51	137	52
3	Operation & Maintenance	125	115	47	100	75	105	100	50	71	50	100	80	128	84	125
4	Salaries and Overtime	130	80	8	70	75	105	100	50	71	50	75	100	51	63	83
5	Transport	78	46	8	60	50	32	50	50	71	50	50	50	26	42	21
6	Non Revenue Water (NRW)	104	69	78	150	100	32	100	100	71	100	75	80	103	95	125
7	Low Pressure	52	69	94	50	75	84	100	50	71	50	20	50	26	84	52
8	No water	26	80	156	20	30	84	50	25	143	50	50	70	51	105	104
9	Water Quality	26	92	156	100	50	84	10	125	214	100	100	100	179	84	52
10	Defective Meters	16	57	16	40	50	105	50	50	71	25	50	30	51	74	52
11	Leak - Mains	16	46	94	70	75	42	100	25	36	100	50	80	128	32	156
12	Leak - Connections	16	23	94	10	50	21	50	25	18	25	20	60	26	11	52
13	Leak - near meter	16	23	78	10	40	21	50	50	18	25	20	60	26	11	10
14	Leak - Night time	16	46	78	10	50	21	75	100	18	100	20	60	103	11	73
15	Leak - stop valve	16	23	78	10	30	21	15	50	18	25	20	40	26	11	10
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.6.3 : Corrected Priority Scores from Stakeholder Responses – Sub Parameters

		Form ID (31 – 45)														
Sub Parameter		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1	New Connections	100	181	180	65	100	50	115	80	200	84	108	170	56	65	125
2	Bill collection	100	96	120	54	100	150	115	160	150	78	151	136	111	97	139
3	Operation & Maintenance	100	106	50	81	50	100	90	80	100	84	86	80	167	97	125
4	Salaries and Overtime	80	43	100	54	50	95	90	40	90	78	65	45	56	65	83
5	Transport	50	85	50	27	30	50	51	40	80	78	65	34	28	32	28
6	Non Revenue Water (NRW)	90	96	80	97	150	40	64	138	75	78	108	80	83	65	42
7	Low Pressure	80	80	70	54	50	65	77	45	65	71	65	57	83	65	97
8	No water	80	85	80	81	80	65	90	40	30	65	65	57	56	129	97
9	Water Quality	80	106	80	108	150	100	103	120	30	84	75	57	111	129	83
10	Defective Meters	50	53	70	76	30	50	51	60	30	65	65	57	56	32	28
11	Leak - Mains	40	27	30	86	80	75	38	45	30	84	108	57	111	65	28
12	Leak - Connections	40	11	30	54	30	70	26	38	30	39	11	45	14	65	42
13	Leak - near meter	40	11	20	54	30	10	26	38	30	32	11	34	14	32	28
14	Leak - Night time	40	11	20	54	40	70	38	38	30	45	11	57	28	32	28
15	Leak - stop valve	30	11	20	54	30	10	26	38	30	32	11	34	28	32	28
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.6.4 : Corrected Priority Scores from Stakeholder Responses – Sub Parameters

Sub	Parameter	Form ID (46 – 60)														
		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
1	New Connections	135	80	160	110	189	130	130	150	160	182	160	172	100	86	200
2	Bill collection	162	120	120	100	126	120	80	120	96	152	100	147	70	129	100
3	Operation & Maintenance	86	80	120	160	84	100	90	80	160	61	25	176	60	118	100
4	Salaries and Overtime	54	50	40	30	11	10	40	50	117	20	25	49	70	32	50
5	Transport	43	50	40	50	11	10	30	40	106	10	20	25	50	22	50
6	Non Revenue Water (NRW)	76	70	110	110	53	80	80	80	96	202	150	172	100	65	50
7	Low Pressure	43	60	70	50	63	60	70	60	53	20	50	25	60	75	25
8	No water	43	50	100	70	84	80	100	90	64	81	70	49	70	86	50
9	Water Quality	108	90	120	100	105	100	60	90	43	71	100	25	100	86	50
10	Defective Meters	43	90	40	40	21	30	60	60	43	10	50	25	50	65	25
11	Leak - Mains	86	100	30	120	105	120	100	80	21	101	50	49	70	86	50
12	Leak - Connections	54	70	20	15	53	80	40	40	11	61	50	29	50	54	50
13	Leak - near meter	22	30	10	15	32	10	40	20	11	10	50	20	50	32	50
14	Leak - Night time	22	30	10	15	32	60	40	20	11	10	50	20	50	32	100
15	Leak - stop valve	22	30	10	15	32	10	40	20	11	10	50	20	50	32	50
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.6.5 : Corrected Priority Scores from Stakeholder Responses – Sub Parameters

Sub	Parameter	Form ID (61 – 78)																	
		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
1	New Connections	126	100	27	100	80	25	50	80	163	105	130	50	150	100	125	150	124	125
2	Bill collection	316	50	319	50	90	50	40	100	217	105	100	100	150	150	100	100	155	200
3	Operation & Maintenance	116	80	106	80	100	50	50	90	163	105	200	50	150	100	150	100	103	100
4	Salaries and Overtime	211	60	266	70	60	25	50	80	87	53	70	50	90	70	80	50	41	75
5	Transport	16	50	11	50	30	15	30	40	76	53	50	40	60	60	40	40	21	50
6	Non Revenue Water (NRW)	105	80	106	60	150	100	90	25	152	53	100	150	200	100	125	120	72	100
7	Low Pressure	16	50	16	100	90	100	90	70	22	53	30	50	10	80	70	50	72	50
8	No water	16	50	37	80	80	25	90	125	38	53	30	50	40	90	75	80	103	50
9	Water Quality	11	150	53	80	150	10	90	120	27	53	40	200	50	100	100	110	103	50
10	Defective Meters	11	80	5	70	40	100	90	70	11	53	20	50	20	30	40	70	41	75
11	Leak - Mains	21	50	32	60	65	100	90	110	16	105	100	70	30	35	40	40	72	25
12	Leak - Connections	21	50	5	50	20	100	60	30	11	53	20	50	20	30	10	35	36	25
13	Leak - near	5	50	5	50	20	100	60	35	5	53	20	30	10	15	10	15	15	25
14	Leak - Night time	5	50	5	50	10	100	60	15	5	53	70	30	10	25	25	25	26	25
15	Leak - stop valve	5	50	5	50	15	100	60	10	5	53	20	30	10	15	10	15	15	25
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.7.1 : Aggregated Sub Criteria Responses Corresponding to each Main Criteria

		Form ID (1 – 15)														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Income Generation																
1	New Connections	200	100	100	75	100	150	81	116	140	70	200	50	150	75	85
2	Bill collection	300	75	40	35	140	50	64	116	100	125	150	130	175	100	65
	Sub Total	500	175	140	110	240	200	146	233	240	195	350	180	325	175	150
	Sub Total %	**50**	**18**	**14**	**11**	**24**	**20**	**15**	**23**	**24**	**20**	**35**	**18**	**33**	**18**	**15**
	System Sustainability															
3	Operation & Maintenance	200	60	60	35	40	100	85	93	125	85	100	80	125	100	70
4	Salaries and Overtime	50	55	75	100	10	50	74	151	115	80	100	20	100	25	80
5	Transport	50	65	30	100	10	50	57	58	90	30	50	30	50	25	70
	Sub Total	300	180	165	235	60	200	215	302	330	195	250	130	275	150	220
	Sub Total %	**30**	**18**	**17**	**24**	**6**	**20**	**21**	**30**	**33**	**20**	**25**	**13**	**28**	**15**	**22**
	System Losses															
6	Non Revenue Water (NRW)	50	100	125	180	150	100	90	233	110	10	50	170	50	25	85
	Sub Total	50	100	125	180	150	100	90	233	110	10	50	170	50	25	85
	Sub Total %	**5**	**10**	**13**	**18**	**15**	**10**	**9**	**23**	**11**	**1**	**5**	**17**	**5**	**3**	**9**
	System Reliability															
7	Low Pressure	30	60	100	100	120	50	77	47	35	65	20	100	75	25	60
8	No water	20	60	150	100	100	50	79	47	45	120	20	200	75	5	80
9	Water Quality	20	65	100	100	150	50	74	47	45	120	50	150	25	300	60
10	Defective Meters	20	50	40	50	50	100	62	47	40	90	50	20	25	150	65
11	Leak - Mains	20	90	60	25	50	100	57	9	45	115	50	10	50	150	80
12	Leak - Connections	10	60	30	25	20	50	51	9	20	30	40	10	25	5	70
13	Leak - near meter	10	40	30	25	10	30	45	9	15	35	40	10	25	5	35
14	Leak - Night time	10	80	30	25	40	50	64	9	55	15	40	10	25	5	65
15	Leak - stop valve	10	40	30	25	10	20	40	9	20	10	40	10	25	5	30
	Sub Total	150	545	570	475	550	500	549	233	320	600	350	520	350	650	545
	Sub Total %	**15**	**55**	**57**	**48**	**55**	**50**	**55**	**23**	**32**	**60**	**35**	**52**	**35**	**65**	**55**
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.7.2 : Aggregated Sub Criteria Responses Corresponding to each Main Criteria

		Form ID (16 – 30)														
		16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
	Income Generation															
1	New Connections	182	126	8	100	150	158	100	100	36	150	150	70	26	158	31
2	Bill collection	182	103	8	200	100	84	50	150	71	100	200	70	51	137	52
	Sub Total	365	230	16	300	250	242	150	250	107	250	350	140	77	295	83
	Sub Total %	**36**	**23**	**2**	**30**	**25**	**24**	**15**	**25**	**11**	**25**	**35**	**14**	**8**	**29**	**8**
	System Sustainability															
3	Operation & Maintenance	125	115	47	100	75	105	100	50	71	50	100	80	128	84	125
4	Salaries and Overtime	130	80	8	70	75	105	100	50	71	50	75	100	51	63	83
5	Transport	78	46	8	60	50	32	50	50	71	50	50	50	26	42	21
	Sub Total	333	241	63	230	200	242	250	150	214	150	225	230	205	189	229
	Sub Total %	**33**	**24**	**6**	**23**	**20**	**24**	**25**	**15**	**21**	**15**	**23**	**23**	**21**	**19**	**23**
	System Losses															
6	Non Revenue Water (NRW)	104	69	78	150	100	32	100	100	71	100	75	80	103	95	125
	Sub Total	104	69	78	150	100	32	100	100	71	100	75	80	103	95	125
	Sub Total %	**10**	**7**	**8**	**15**	**10**	**3**	**10**	**10**	**7**	**10**	**8**	**8**	**10**	**9**	**13**
	System Reliability															
7	Low Pressure	52	69	94	50	75	84	100	50	71	50	20	50	26	84	52
8	No water	26	80	156	20	30	84	50	25	143	50	50	70	51	105	104
9	Water Quality	26	92	156	100	50	84	10	125	214	100	100	100	179	84	52
10	Defective Meters	16	57	16	40	50	105	50	50	71	25	50	30	51	74	52
11	Leak - Mains	16	46	94	70	75	42	100	25	36	100	50	80	128	32	156
12	Leak - Connections	16	23	94	10	50	21	50	25	18	25	20	60	26	11	52
13	Leak - near meter	16	23	78	10	40	21	50	50	18	25	20	60	26	11	10
14	Leak - Night time	16	46	78	10	50	21	75	100	18	100	20	60	103	11	73
15	Leak - stop valve	16	23	78	10	30	21	15	50	18	25	20	40	26	11	10
	Sub Total	198	460	844	320	450	484	500	500	607	500	350	550	615	421	563
	Sub Total %	**20**	**46**	**84**	**32**	**45**	**48**	**50**	**50**	**61**	**50**	**35**	**55**	**62**	**42**	**56**
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.7.3 : Aggregated Sub Criteria Responses Corresponding to each Main Criteria

		Form ID (31 – 45)														
		31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
	Income Generation															
1	New Connections	100	181	180	65	100	50	115	80	200	84	108	170	56	65	125
2	Bill collection	100	96	120	54	100	150	115	160	150	78	151	136	111	97	139
	Sub Total	200	277	300	119	200	200	231	240	350	162	258	307	167	161	264
	Sub Total %	**20**	**28**	**30**	**12**	**20**	**20**	**23**	**24**	**35**	**16**	**26**	**31**	**17**	**16**	**26**
	System Sustainability															
3	Operation & Maintenance	100	106	50	81	50	100	90	80	100	84	86	80	167	97	125
4	Salaries and Overtime	80	43	100	54	50	95	90	40	90	78	65	45	56	65	83
5	Transport	50	85	50	27	30	50	51	40	80	78	65	34	28	32	28
	Sub Total	230	234	200	162	130	245	231	160	270	240	215	159	250	194	236
	Sub Total %	**23**	**23**	**20**	**16**	**13**	**25**	**23**	**16**	**27**	**24**	**22**	**16**	**25**	**19**	**24**
	System Losses															
6	Non Revenue Water (NRW)	90	96	80	97	150	40	64	138	75	78	108	80	83	65	42
	Sub Total	90	96	80	97	150	40	64	138	75	78	108	80	83	65	42
	Sub Total %	**9**	**10**	**8**	**10**	**15**	**4**	**6**	**14**	**8**	**8**	**11**	**8**	**8**	**6**	**4**
	System Reliability															
7	Low Pressure	80	80	70	54	50	65	77	45	65	71	65	57	83	65	97
8	No water	80	85	80	81	80	65	90	40	30	65	65	57	56	129	97
9	Water Quality	80	106	80	108	150	100	103	120	30	84	75	57	111	129	83
10	Defective Meters	50	53	70	76	30	50	51	60	30	65	65	57	56	32	28
11	Leak - Mains	40	27	30	86	80	75	38	45	30	84	108	57	111	65	28
12	Leak - Connections	40	11	30	54	30	70	26	38	30	39	11	45	14	65	42
13	Leak - near meter	40	11	20	54	30	10	26	38	30	32	11	34	14	32	28
14	Leak - Night time	40	11	20	54	40	70	38	38	30	45	11	57	28	32	28
15	Leak - stop valve	30	11	20	54	30	10	26	38	30	32	11	34	28	32	28
	Sub Total	480	394	420	622	520	515	474	462	305	519	419	455	500	581	458
	Sub Total %	**48**	**39**	**42**	**62**	**52**	**52**	**47**	**46**	**31**	**52**	**42**	**45**	**50**	**58**	**46**
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.7.4 : Aggregated Sub Criteria Responses Corresponding to each Main Criteria

		Form ID (46 – 60)														
		46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	Income Generation															
1	New Connections	135	80	160	110	189	130	130	150	160	182	160	172	100	86	200
2	Bill collection	162	120	120	100	126	120	80	120	96	152	100	147	70	129	100
	Sub Total	297	200	280	210	316	250	210	270	255	333	260	319	170	215	300
	Sub Total %	**30**	**20**	**28**	**21**	**32**	**25**	**21**	**27**	**26**	**33**	**26**	**32**	**17**	**22**	**30**
	System Sustainability															
3	Operation & Maintenance	86	80	120	160	84	100	90	80	160	61	25	176	60	118	100
4	Salaries and Overtime	54	50	40	30	11	10	40	50	117	20	25	49	70	32	50
5	Transport	43	50	40	50	11	10	30	40	106	10	20	25	50	22	50
	Sub Total	184	180	200	240	105	120	160	170	383	91	70	250	180	172	200
	Sub Total %	**18**	**18**	**20**	**24**	**11**	**12**	**16**	**17**	**38**	**9**	**7**	**25**	**18**	**17**	**20**
	System Losses															
6	Non Revenue Water (NRW)	76	70	110	110	53	80	80	80	96	202	150	172	100	65	50
	Sub Total	76	70	110	110	53	80	80	80	96	202	150	172	100	65	50
	Sub Total %	**8**	**7**	**11**	**11**	**5**	**8**	**8**	**8**	**10**	**20**	**15**	**17**	**10**	**6**	**5**
	System Reliability															
7	Low Pressure	43	60	70	50	63	60	70	60	53	20	50	25	60	75	25
8	No water	43	50	100	70	84	80	100	90	64	81	70	49	70	86	50
9	Water Quality	108	90	120	100	105	100	60	90	43	71	100	25	100	86	50
10	Defective Meters	43	90	40	40	21	30	60	60	43	10	50	25	50	65	25
11	Leak - Mains	86	100	30	120	105	120	100	80	21	101	50	49	70	86	50
12	Leak - Connections	54	70	20	15	53	80	40	40	11	61	50	29	50	54	50
13	Leak - near meter	22	30	10	15	32	10	40	20	11	10	50	20	50	32	50
14	Leak - Night time	22	30	10	15	32	60	40	20	11	10	50	20	50	32	100
15	Leak - stop valve	22	30	10	15	32	10	40	20	11	10	50	20	50	32	50
	Sub Total	443	550	410	440	526	550	550	480	266	374	520	260	550	548	450
	Sub Total %	**44**	**55**	**41**	**44**	**53**	**55**	**55**	**48**	**27**	**37**	**52**	**26**	**55**	**55**	**45**
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.7.5 : Aggregated Sub Criteria Responses Corresponding to each Main Criteria

		Form ID (61 – 78)																	
		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Income Generation																			
1	New Connections	126	100	27	100	80	25	50	80	163	105	130	50	150	100	125	150	124	125
2	Bill collection	316	50	319	50	90	50	40	100	217	105	100	100	150	150	100	100	155	200
	Sub Total	442	150	346	150	170	75	90	180	380	211	230	150	300	250	225	250	278	325
	Sub Total %	**44**	**15**	**35**	**15**	**17**	**8**	**9**	**18**	**38**	**21**	**23**	**15**	**30**	**25**	**23**	**25**	**28**	**33**
System Sustainability																			
3	Operation &	116	80	106	80	100	50	50	90	163	105	200	50	150	100	150	100	103	100
4	Salaries and Overtime	211	60	266	70	60	25	50	80	87	53	70	50	90	70	80	50	41	75
5	Transport	16	50	11	50	30	15	30	40	76	53	50	40	60	60	40	40	21	50
	Sub Total	342	190	383	200	190	90	130	210	326	211	320	140	300	230	270	190	165	225
	Sub Total %	**34**	**19**	**38**	**20**	**19**	**9**	**13**	**21**	**33**	**21**	**32**	**14**	**30**	**23**	**27**	**19**	**16**	**23**
System Losses																			
6	Non Revenue Water	105	80	106	60	150	100	90	25	152	53	100	150	200	100	125	120	72	100
	Sub Total	105	80	106	60	150	100	90	25	152	53	100	150	200	100	125	120	72	100
	Sub Total %	**11**	**8**	**11**	**6**	**15**	**10**	**9**	**3**	**15**	**5**	**10**	**15**	**20**	**10**	**13**	**12**	**7**	**10**
System Reliability																			
7	Low Pressure	16	50	16	100	90	100	90	70	22	53	30	50	10	80	70	50	72	50
8	No water	16	50	37	80	80	25	90	125	38	53	30	50	40	90	75	80	103	50
9	Water Quality	11	150	53	80	150	10	90	120	27	53	40	200	50	100	100	110	103	50
10	Defective Meters	11	80	5	70	40	100	90	70	11	53	20	50	20	30	40	70	41	75
11	Leak - Mains	21	50	32	60	65	100	90	110	16	105	100	70	30	35	40	40	72	25
12	Leak - Connections	21	50	5	50	20	100	60	30	11	53	20	50	20	30	10	35	36	25
13	Leak - near meter	5	50	5	50	20	100	60	35	5	53	20	30	10	15	10	15	15	25
14	Leak - Night time	5	50	5	50	10	100	60	15	5	53	70	30	10	25	25	25	26	25
15	Leak - stop valve	5	50	5	50	15	100	60	10	5	53	20	30	10	15	10	15	15	25
	Sub Total	111	580	165	590	490	735	690	585	141	526	350	560	200	420	380	440	485	350
	Sub Total %	**11**	**58**	**16**	**59**	**49**	**74**	**69**	**59**	**14**	**53**	**35**	**56**	**20**	**42**	**38**	**44**	**48**	**35**
	Total	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

Table B.8.1 : Comparison of Main Criteria from Direct Weights and from Summation of Sub Criteria

	Water supply sytem management main Criteria	Form ID (1 – 20)																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	Income Generation																				
1	From sub Parameters	50	18	14	11	24	20	15	23	24	20	35	18	33	18	15	36	23	2	30	25
2	From main Parameters	40	20	25	10	40	50	15	30	30	25	50	10	30	18	35	37	23	10	50	35
	System Sustainability																				
1	From sub Parameters	30	18	17	24	6	20	21	30	33	20	25	13	28	15	22	33	24	6	23	20
2	From main Parameters	30	35	30	15	15	30	40	30	25	30	30	5	15	15	20	35	23	30	30	25
	System Losses																				
1	From sub Parameters	5	10	13	18	15	10	9	23	11	1	5	17	5	3	9	10	7	8	15	10
2	From main Parameters	20	30	10	50	25	10	25	20	20	5	10	25	35	20	20	10	9	20	10	25
	System Reliability																				
1	From sub Parameters	15	55	57	48	55	50	55	23	32	60	35	52	35	65	55	20	46	84	32	45
2	From main Parameters	10	15	35	25	20	10	20	20	25	40	10	60	20	48	25	19	45	40	10	15

Table B.8.2 : Comparison of Main Criteria from Direct Weights and from Summation of Sub Criteria

	Water supply sytem management main Criteria	Form ID (21 – 40)																			
		21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
	Income Generation																				
1	From sub Parameters	24	15	25	11	25	35	14	8	29	8	20	28	30	12	20	20	23	24	35	16
2	From main Parameters	30	15	20	50	20	30	30	20	30	20	30	15	50	25	25	20	40	30	40	20
	System Sustainability																				
1	From sub Parameters	24	25	15	21	15	23	23	21	19	23	23	23	20	16	13	25	23	16	27	24
2	From main Parameters	40	20	50	25	20	25	40	20	20	25	23	20	10	30	25	30	15	20	30	35
	System Losses																				
1	From sub Parameters	3	10	10	7	10	8	8	10	9	13	9	10	8	10	15	4	6	14	8	8
2	From main Parameters	20	50	10	13	10	20	15	20	30	25	22	25	30	25	25	20	20	30	20	15
	System Reliability																				
1	From sub Parameters	48	50	50	61	50	35	55	62	42	56	48	39	42	62	52	52	47	46	31	52
2	From main Parameters	10	15	20	13	50	25	15	40	20	30	25	40	10	20	25	30	25	20	10	30

Table B.8.3 : Comparison of Main criteria from direct weights and from summation of sub criteria

	Water supply sytem management main Criteria	Form ID (41 – 60)																			
		41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
	Income Generation																				
1	From sub Parameters	26	31	17	16	26	30	20	28	21	32	25	21	27	26	33	26	32	17	22	30
2	From main Parameters	40	45	30	30	20	30	40	35	30	40	40	45	35	25	25	20	30	20	40	50
	System Sustainability																				
1	From sub Parameters	22	16	25	19	24	18	18	20	24	11	12	16	17	38	9	7	25	18	17	20
2	From main Parameters	20	25	30	30	15	25	20	40	40	20	25	20	40	40	15	10	30	30	20	20
	System Losses																				
1	From sub Parameters	11	8	8	6	4	8	7	11	11	5	8	8	8	10	20	15	17	10	6	5
2	From main Parameters	20	15	20	15	20	15	15	10	10	15	10	15	10	25	40	10	20	30	20	10
	System Reliability																				
1	From sub Parameters	42	45	50	58	46	44	55	41	44	53	55	55	48	27	37	52	26	55	55	45
2	From main Parameters	20	15	20	25	45	30	25	15	20	25	25	20	15	10	20	60	20	20	20	20

Table B.8.4 : Comparison of Main Criteria from Direct Weights and from Summation of Sub Criteria

Water supply sytem management main Criteria		Form ID (61 – 78)																	
		61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78
Income Generation																			
1	From sub Parameters	44	15	35	15	17	8	9	18	38	21	23	15	30	25	23	25	28	33
2	From main Parameters	40	40	50	35	30	13	20	25	35	50	30	23	30	25	25	30	35	40
	System Sustainability																		
1	From sub Parameters	34	19	38	20	19	9	13	21	33	21	32	14	30	23	27	19	16	23
2	From main Parameters	30	25	30	10	25	25	20	30	30	15	10	23	30	25	20	20	25	10
	System Losses																		
1	From sub Parameters	11	8	11	6	15	10	9	3	15	5	10	15	20	10	13	12	7	10
2	From main Parameters	15	10	10	30	25	37	20	5	15	20	30	31	20	25	15	10	10	20
	System Reliability																		
1	From sub Parameters	11	58	16	59	49	74	69	59	14	53	35	56	20	42	38	44	48	35
2	From main Parameters	15	25	10	25	20	25	40	40	20	15	30	23	20	25	40	40	30	30

APPENDIX C – ANALYSIS AND RESULTS

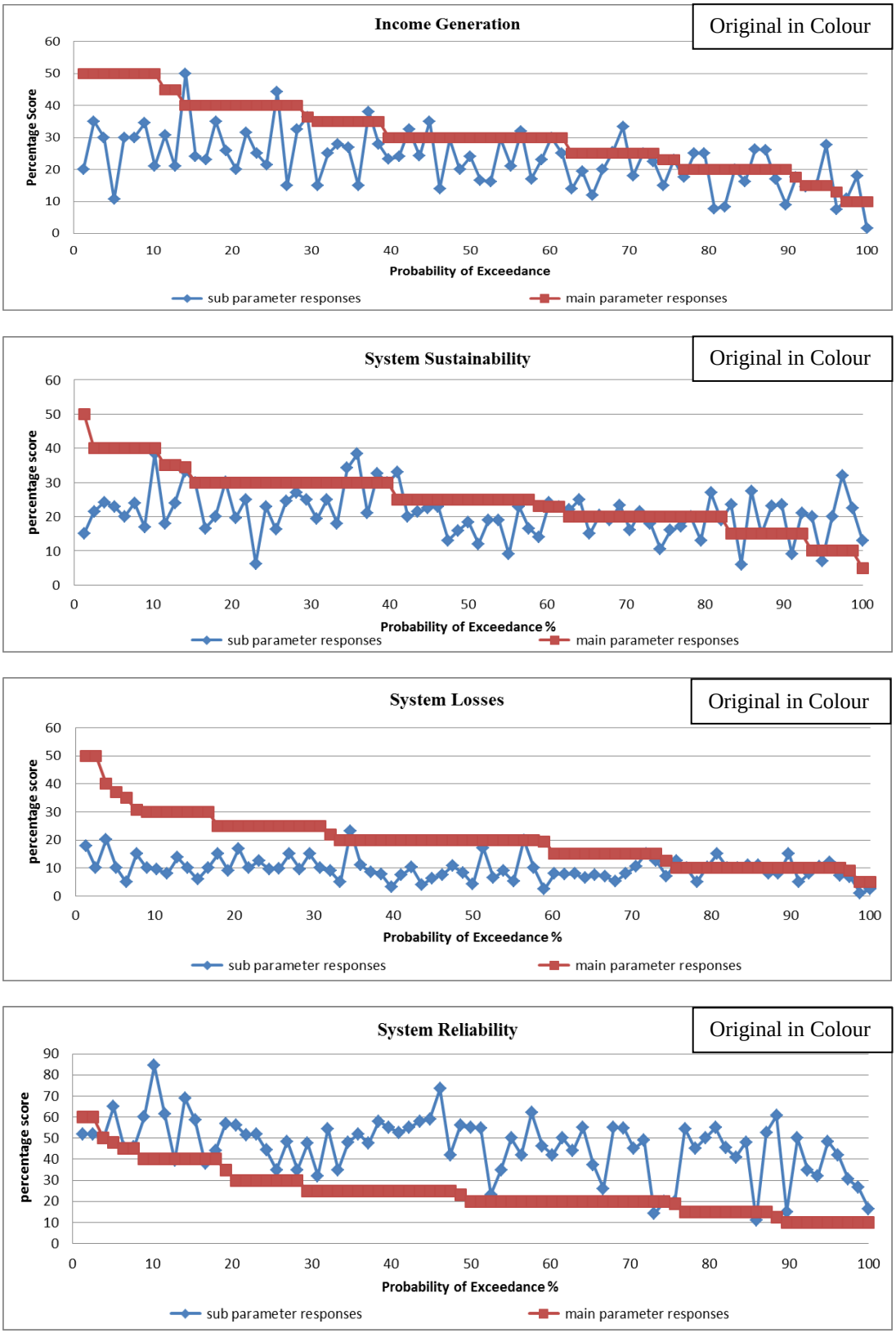

Figure C.1: Comparison of Responses of Main Criteria and Sub Criteria using Probability of Exceedance

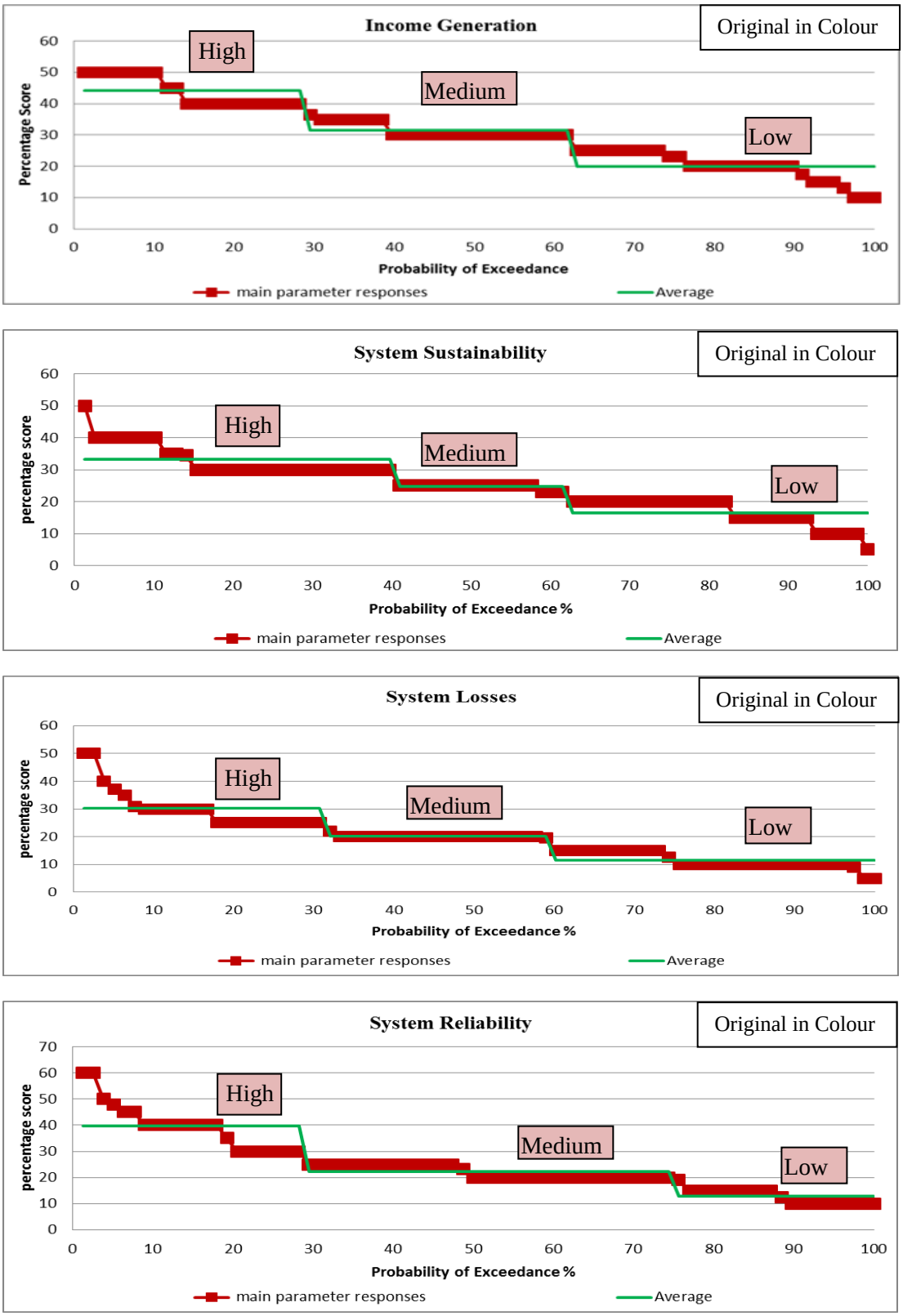

Figure C.2: Probability of Exceedance Curves for Main Criteria

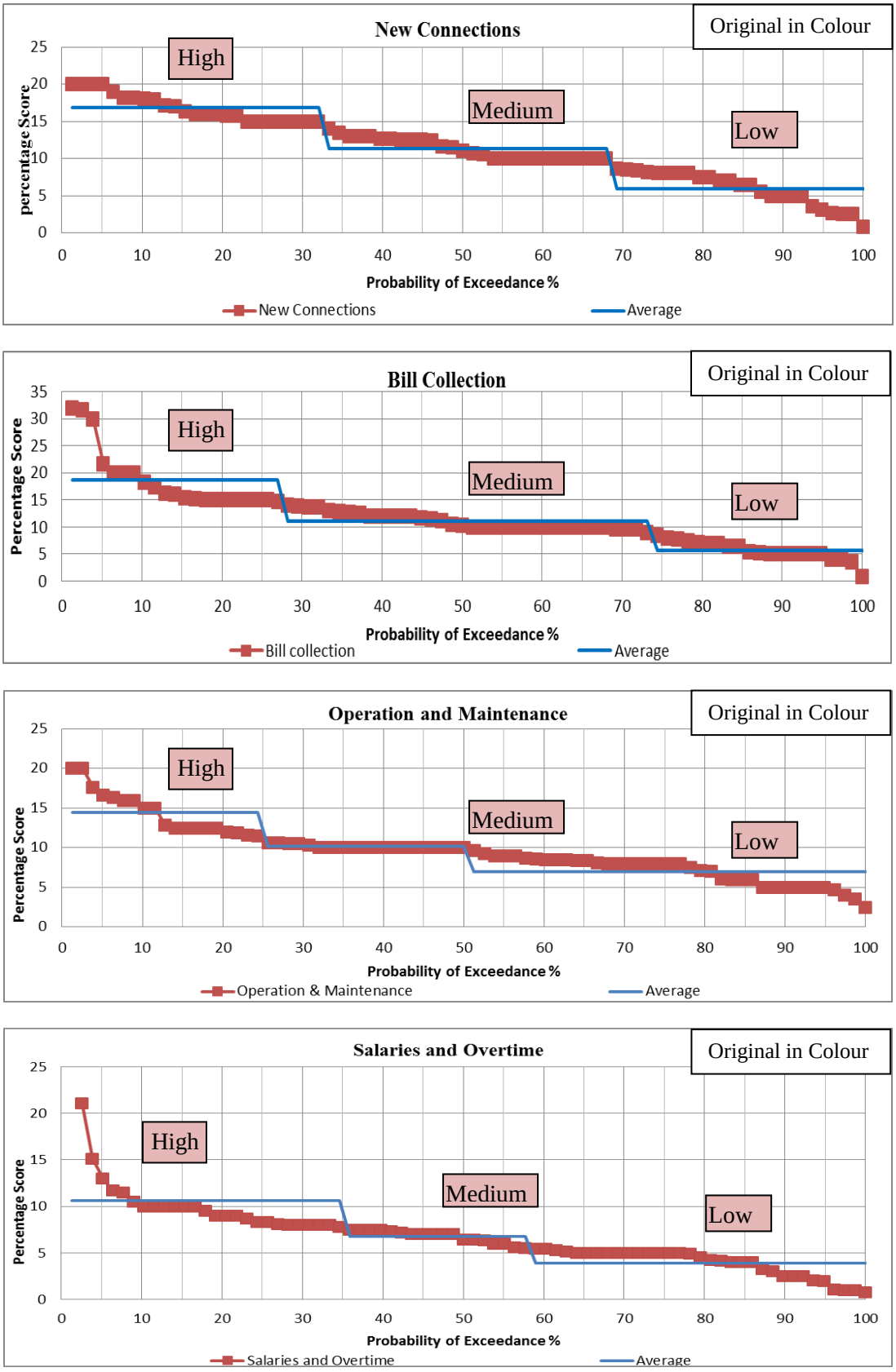

Figure C.3: Probability of Exceedance Curves for Sub Criteria

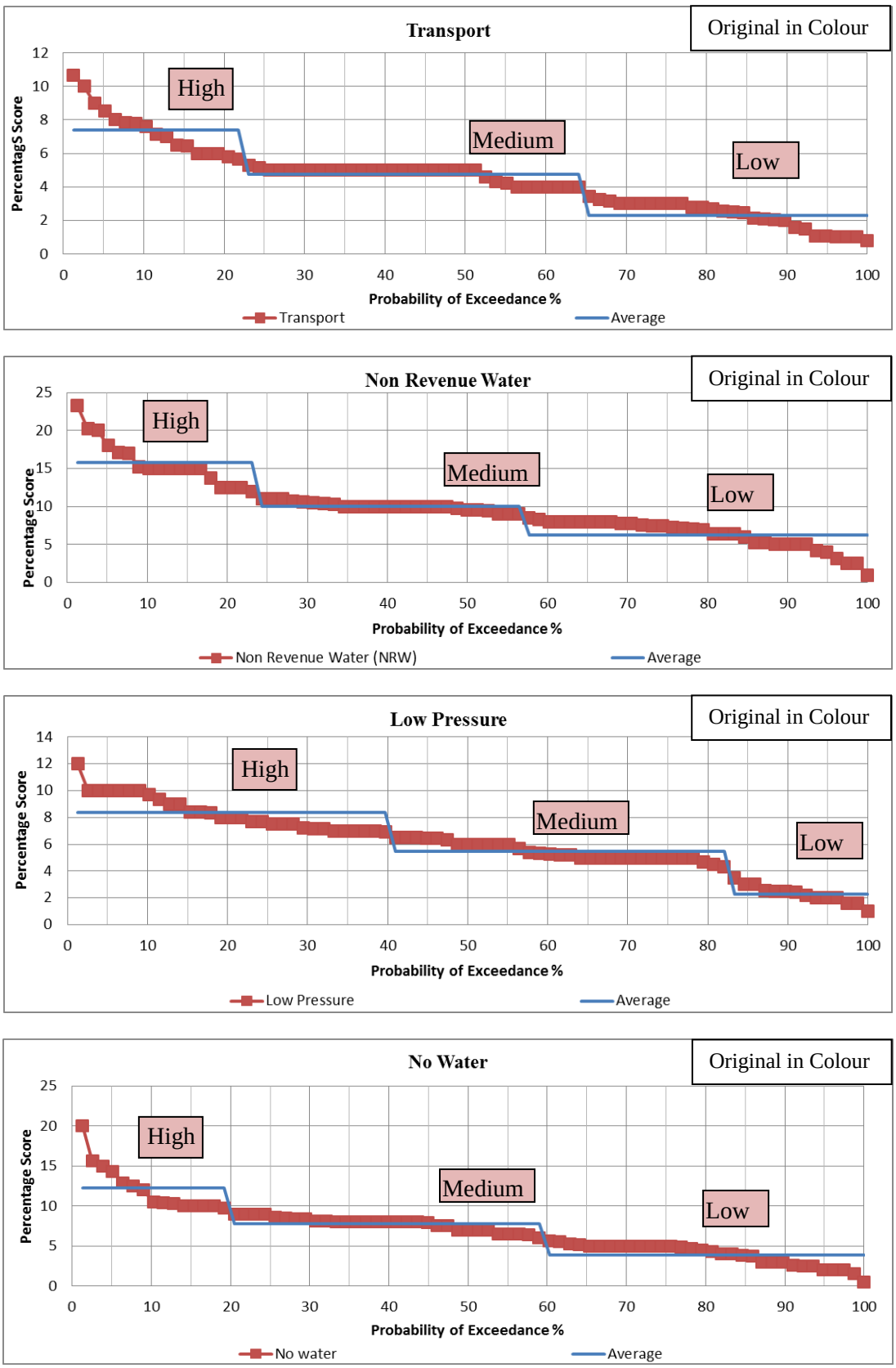

Figure C.4: Probability of Exceedance Curves for Sub Criteria

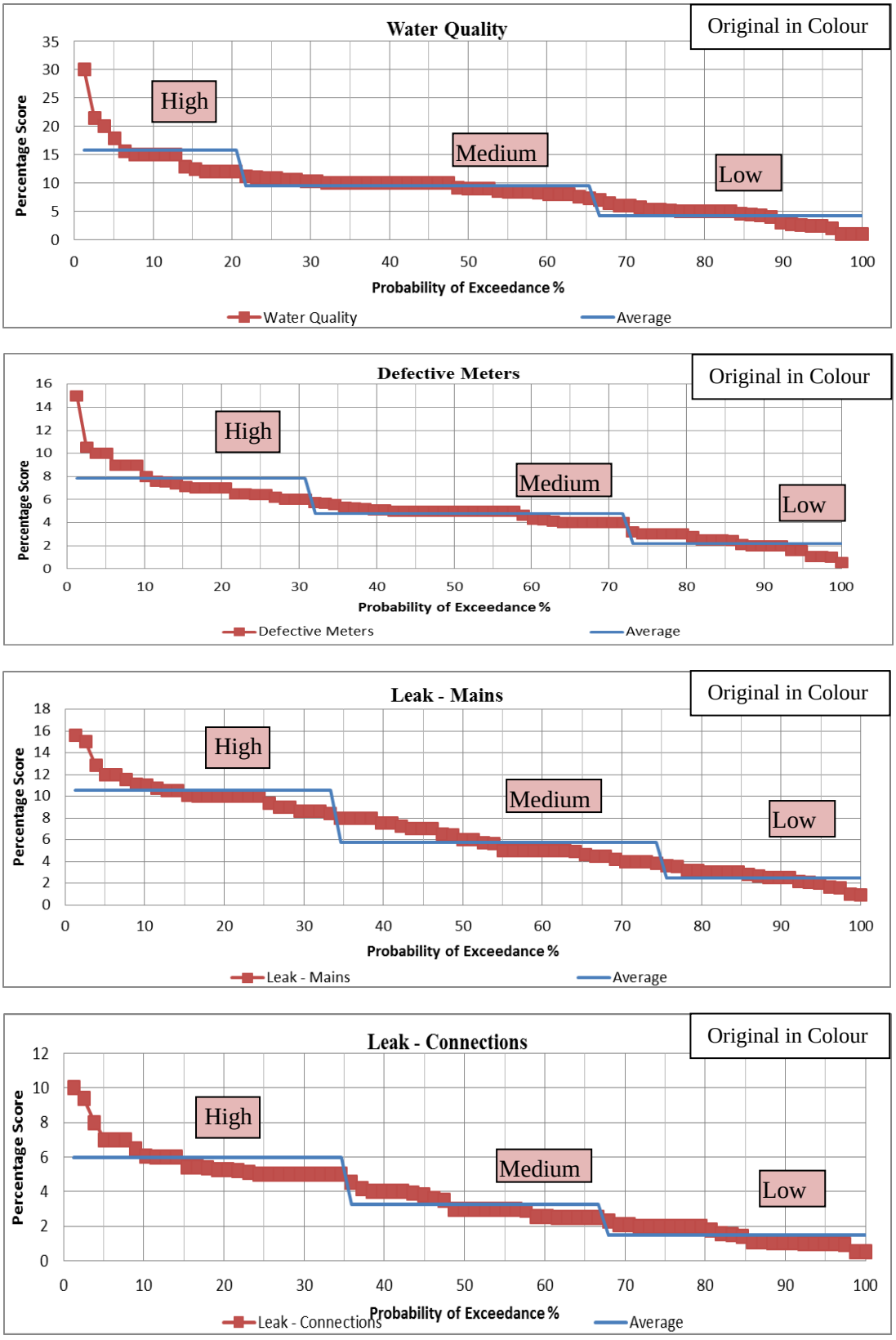

Figure C.5: Probability of Exceedance Curves for Sub Criteria

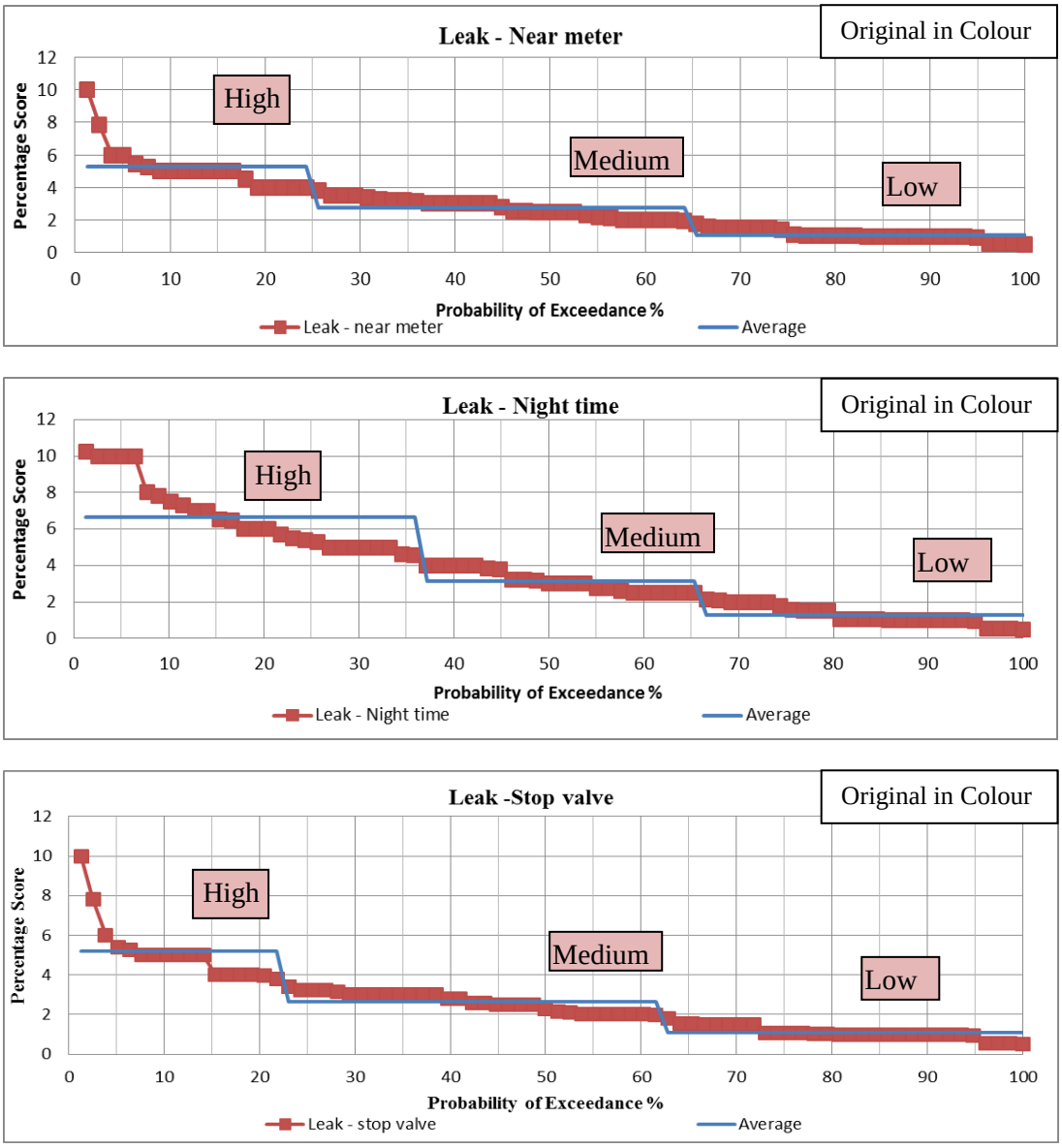

Figure C 6: Probability of Exceedance Curves for Sub Criteria

Table C.1: Pairwise Preferences for Alternatives for Sub Criterion – New Connections

Mgt Zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00	1.19	5.15	4.58	2.50	1.60	1.78	3.25	5.81	2.84	2.99	2.13	5.68	1.77	5.34	3.34	1.67	7.00	3.03	6.86	3.74	3.22
2	0.84	1.00	4.32	3.84	2.10	1.34	1.49	2.72	4.87	2.38	2.51	1.79	4.76	1.48	4.48	2.80	1.40	5.87	2.54	5.75	3.14	2.70
3	0.19	0.23	1.00	0.89	0.49	0.31	0.35	0.63	1.13	0.55	0.58	0.41	1.10	0.34	1.04	0.65	0.33	1.36	0.59	1.33	0.73	0.59
4	0.22	0.26	1.13	1.00	0.55	0.35	0.39	0.71	1.27	0.62	0.65	0.47	1.24	0.39	1.17	0.73	0.37	1.53	0.66	1.50	0.82	0.66
5	0.40	0.48	2.06	1.83	1.00	0.64	0.71	1.30	2.32	1.14	1.19	0.85	2.27	0.71	2.13	1.33	0.67	2.79	1.21	2.74	1.49	1.29
6	0.62	0.74	3.21	2.85	1.56	1.00	1.11	2.02	3.63	1.77	1.86	1.33	3.54	1.10	3.33	2.08	1.04	4.36	1.89	4.28	2.33	2.01
7	0.56	0.67	2.89	2.57	1.40	0.90	1.00	1.82	3.26	1.59	1.68	1.19	3.18	0.99	3.00	1.87	0.94	3.92	1.70	3.84	2.10	1.81
8	0.31	0.37	1.59	1.41	0.77	0.49	0.55	1.00	1.79	0.88	0.92	0.66	1.75	0.54	1.65	1.03	0.52	2.16	0.93	2.11	1.15	0.99
9	0.17	0.21	0.89	0.79	0.43	0.28	0.31	0.56	1.00	0.49	0.51	0.37	0.98	0.30	0.92	0.57	0.29	1.20	0.52	1.18	0.64	0.52
10	0.35	0.42	1.81	1.61	0.88	0.56	0.63	1.14	2.05	1.00	1.05	0.75	2.00	0.62	1.88	1.17	0.59	2.46	1.06	2.41	1.32	1.13
11	0.33	0.40	1.72	1.53	0.84	0.54	0.60	1.09	1.94	0.95	1.00	0.71	1.90	0.59	1.79	1.12	0.56	2.34	1.01	2.29	1.25	1.08
12	0.47	0.56	2.42	2.15	1.18	0.75	0.84	1.52	2.73	1.33	1.40	1.00	2.66	0.83	2.51	1.57	0.79	3.28	1.42	3.22	1.76	1.51
13	0.18	0.21	0.91	0.81	0.44	0.28	0.31	0.57	1.02	0.50	0.53	0.38	1.00	0.31	0.94	0.59	0.29	1.23	0.53	1.21	0.66	0.53
14	0.57	0.68	2.91	2.59	1.42	0.91	1.01	1.84	3.29	1.61	1.69	1.21	3.21	1.00	3.02	1.89	0.95	3.96	1.71	3.88	2.12	1.83
15	0.19	0.22	0.96	0.86	0.47	0.30	0.33	0.61	1.09	0.53	0.56	0.40	1.06	0.33	1.00	0.62	0.31	1.31	0.57	1.28	0.70	0.57
16	0.30	0.36	1.54	1.37	0.75	0.48	0.53	0.97	1.74	0.85	0.90	0.64	1.70	0.53	1.60	1.00	0.50	2.10	0.91	2.05	1.12	0.97
17	0.60	0.71	3.08	2.73	1.50	0.96	1.07	1.94	3.47	1.70	1.79	1.27	3.39	1.06	3.19	1.99	1.00	4.18	1.81	4.10	2.24	1.93
18	0.14	0.17	0.74	0.65	0.36	0.23	0.25	0.46	0.83	0.41	0.43	0.30	0.81	0.25	0.76	0.48	0.24	1.00	0.43	0.98	0.53	0.43
19	0.33	0.39	1.70	1.51	0.83	0.53	0.59	1.07	1.92	0.94	0.99	0.70	1.88	0.58	1.77	1.10	0.55	2.31	1.00	2.27	1.24	1.07
20	0.15	0.17	0.75	0.67	0.37	0.23	0.26	0.47	0.85	0.41	0.44	0.31	0.83	0.26	0.78	0.49	0.24	1.02	0.44	1.00	0.55	0.44
21	0.27	0.32	1.38	1.22	0.67	0.43	0.48	0.87	1.55	0.76	0.80	0.57	1.52	0.47	1.43	0.89	0.45	1.87	0.81	1.83	1.00	0.86
22	0.31	0.37	1.70	1.51	0.78	0.50	0.55	1.01	1.92	0.88	0.93	0.66	1.88	0.55	1.77	1.03	0.52	2.31	0.94	2.27	1.16	1.00

Table C.2: Pairwise Preferences for Alternatives for Sub Criterion – Bill Collection

Mgt Zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
1	1.00	0.74	17.00	0.65	0.64	1.02	0.59	0.28	0.34	0.21	0.31	0.64	0.67	0.95	0.14	0.26	0.57	0.21	0.73	0.77	0.33	0.59
2	1.34	1.00	5.00	0.88	0.86	1.38	0.80	0.38	0.46	0.28	0.41	0.86	0.90	1.28	0.19	0.35	0.76	0.29	0.98	1.03	0.44	0.80
3	0.06	0.20	1.00	0.05	0.05	7.40	0.06	0.08	0.50	0.33	0.09	0.05	0.17	0.25	1.00	0.05	0.13	0.10	0.06	0.11	0.07	0.08
4	1.53	1.14	21.00	1.00	0.98	1.57	0.94	0.43	0.52	0.32	0.47	0.98	1.02	1.46	0.21	0.40	0.87	0.33	1.12	1.17	0.50	0.91
5	1.57	1.17	20.00	1.03	1.00	1.61	0.97	0.44	0.53	0.33	0.48	1.00	1.05	1.50	0.22	0.41	0.89	0.34	1.15	1.20	0.52	0.93
6	0.98	0.73	0.14	0.64	0.62	1.00	0.58	0.28	0.33	0.21	0.30	0.62	0.65	0.93	0.14	0.26	0.55	0.21	0.71	0.75	0.32	0.58
7	1.68	1.25	18.00	1.06	1.04	1.72	1.00	0.46	0.55	0.34	0.50	1.04	1.13	1.61	0.23	0.43	0.92	0.35	1.23	1.29	0.54	0.97
8	3.55	2.64	13.00	2.32	2.26	3.63	2.18	1.00	1.21	0.75	1.09	2.26	2.38	3.39	0.49	0.93	2.01	0.76	2.59	2.71	1.17	2.11
9	2.94	2.19	2.00	1.92	1.87	3.01	1.81	0.83	1.00	0.62	0.91	1.88	1.97	2.81	0.41	0.77	1.67	0.63	2.15	2.25	0.97	1.75
10	4.73	3.52	3.00	3.09	3.01	4.84	2.91	1.33	1.61	1.00	1.46	3.02	3.17	4.52	0.66	1.24	2.69	1.01	3.46	3.62	1.56	2.81
11	3.25	2.42	11.00	2.12	2.07	3.33	2.00	0.92	1.10	0.69	1.00	2.07	2.18	3.10	0.45	0.85	1.84	0.70	2.37	2.49	1.07	1.93
12	1.57	1.17	22.00	1.02	1.00	1.60	0.96	0.44	0.53	0.33	0.48	1.00	1.05	1.50	0.22	0.41	0.89	0.34	1.15	1.20	0.52	0.93
13	1.49	1.11	6.00	0.98	0.95	1.53	0.89	0.42	0.51	0.32	0.46	0.95	1.00	1.43	0.21	0.39	0.85	0.32	1.09	1.14	0.49	0.89
14	1.05	0.78	4.00	0.68	0.67	1.07	0.62	0.30	0.36	0.22	0.32	0.67	0.70	1.00	0.15	0.28	0.59	0.22	0.77	0.80	0.35	0.62
15	7.20	5.36	1.00	4.71	4.59	7.38	4.43	2.03	2.45	1.52	2.22	4.60	4.82	6.88	1.00	1.89	4.09	1.54	5.27	5.51	2.38	4.28
16	3.80	2.83	19.00	2.48	2.42	3.89	2.34	1.07	1.29	0.80	1.17	2.43	2.55	3.63	0.53	1.00	2.16	0.81	2.78	2.91	1.25	2.26
17	1.76	1.31	8.00	1.15	1.12	1.80	1.08	0.50	0.60	0.37	0.54	1.12	1.18	1.68	0.24	0.46	1.00	0.38	1.29	1.35	0.58	1.05
18	4.67	3.48	10.00	3.05	2.98	4.79	2.88	1.32	1.59	0.99	1.44	2.98	3.13	4.46	0.65	1.23	2.65	1.00	3.42	3.58	1.54	2.78
19	1.37	1.02	16.00	0.89	0.87	1.40	0.81	0.39	0.47	0.29	0.42	0.87	0.92	1.31	0.19	0.36	0.78	0.29	1.00	1.05	0.45	0.81
20	1.31	0.97	9.00	0.85	0.83	1.34	0.78	0.37	0.44	0.28	0.40	0.83	0.88	1.25	0.18	0.34	0.74	0.28	0.96	1.00	0.43	0.78
21	3.03	2.26	14.00	1.98	1.93	3.10	1.87	0.85	1.03	0.64	0.93	1.93	2.03	2.89	0.42	0.80	1.72	0.65	2.22	2.32	1.00	1.80
22	1.68	1.25	12.00	1.10	1.07	1.72	1.03	0.47	0.57	0.36	0.52	1.07	1.13	1.61	0.23	0.44	0.95	0.36	1.23	1.29	0.55	1.00

Table C.3: Pairwise Preferences for Alternatives for Sub Criterion – Operation and Maintenance Cost

Mgt zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00	1.69	1.03	321.00	11.07	3.91	0.83	1.56	4.46	0.95	1.69	2.38	2.18	2.01	0.60	2.82	160.50	1.49	1.47	3.69	2.74	5.63
2	0.59	1.00	0.61	190.00	6.55	2.32	0.49	0.92	2.64	0.56	1.00	1.41	1.29	1.19	0.35	1.67	95.00	0.88	0.87	2.18	1.62	3.33
3	0.98	1.65	1.00	313.00	10.79	3.82	0.81	1.52	4.35	0.92	1.65	2.32	2.13	1.96	0.58	2.75	156.50	1.45	1.43	3.60	2.68	5.49
4	0.00	0.01	0.00	1.00	0.03	0.01	0.00	0.00	0.01	0.00	0.01	0.01	0.01	0.01	0.00	0.01	0.50	0.00	0.00	0.01	0.01	0.02
5	0.09	0.15	0.09	29.00	1.00	0.35	0.07	0.14	0.40	0.09	0.15	0.21	0.18	0.18	0.05	0.25	14.50	0.13	0.13	0.33	0.25	0.51
6	0.26	0.43	0.26	82.00	2.83	1.00	0.21	0.40	1.14	0.24	0.43	0.61	0.51	0.51	0.15	0.72	41.00	0.38	0.37	0.94	0.70	1.44
7	1.21	2.04	1.24	388.00	13.38	4.73	1.00	1.88	5.39	1.14	2.04	2.87	2.64	2.43	0.72	3.40	194.00	1.80	1.77	4.46	3.32	6.81
8	0.64	1.08	0.66	206.00	7.10	2.51	0.53	1.00	2.86	0.61	1.08	1.53	1.40	1.29	0.38	1.81	103.00	0.95	0.94	2.37	1.76	3.61
9	0.22	0.38	0.23	72.00	2.48	0.88	0.19	0.35	1.00	0.21	0.38	0.53	0.45	0.45	0.13	0.63	36.00	0.33	0.33	0.83	0.62	1.26
10	1.06	1.78	1.08	339.00	11.69	4.13	0.87	1.65	4.71	1.00	1.78	2.51	2.31	2.12	0.63	2.97	169.50	1.57	1.55	3.90	2.90	5.95
11	0.59	1.00	0.61	190.00	6.55	2.32	0.49	0.92	2.64	0.56	1.00	1.41	1.29	1.19	0.35	1.67	95.00	0.88	0.87	2.18	1.62	3.33
12	0.42	0.71	0.43	135.00	4.66	1.65	0.35	0.66	1.88	0.40	0.71	1.00	0.92	0.84	0.25	1.18	67.50	0.63	0.62	1.55	1.15	2.37
13	0.46	0.77	0.47	160.00	5.52	1.95	0.38	0.71	2.22	0.43	0.77	1.09	1.00	0.92	0.27	1.29	80.00	0.68	0.67	1.84	1.26	2.81
14	0.50	0.84	0.51	160.00	5.52	1.95	0.41	0.78	2.22	0.47	0.84	1.19	1.09	1.00	0.30	1.40	80.00	0.74	0.73	1.84	1.37	2.81
15	1.68	2.84	1.72	539.00	18.59	6.57	1.39	2.62	7.49	1.59	2.84	3.99	3.67	3.37	1.00	4.73	269.50	2.50	2.46	6.20	4.61	9.46
16	0.36	0.60	0.36	114.00	3.93	1.39	0.29	0.55	1.58	0.34	0.60	0.84	0.78	0.71	0.21	1.00	57.00	0.53	0.52	1.31	0.97	2.00
17	0.01	0.01	0.01	2.00	0.07	0.02	0.01	0.01	0.03	0.01	0.01	0.01	0.01	0.01	0.00	0.02	1.00	0.01	0.01	0.02	0.02	0.04
18	0.67	1.14	0.69	216.00	7.45	2.63	0.56	1.05	3.00	0.64	1.14	1.60	1.47	1.35	0.40	1.89	108.00	1.00	0.99	2.48	1.85	3.79
19	0.68	1.15	0.70	219.00	7.55	2.67	0.56	1.06	3.04	0.65	1.15	1.62	1.49	1.37	0.41	1.92	109.50	1.01	1.00	2.52	1.87	3.84
20	0.27	0.46	0.28	87.00	3.00	1.06	0.22	0.42	1.21	0.26	0.46	0.64	0.54	0.54	0.16	0.76	43.50	0.40	0.40	1.00	0.74	1.53
21	0.36	0.62	0.37	117.00	4.03	1.43	0.30	0.57	1.63	0.35	0.62	0.87	0.80	0.73	0.22	1.03	58.50	0.54	0.53	1.34	1.00	2.05
22	0.18	0.30	0.18	57.00	1.97	0.70	0.15	0.28	0.79	0.17	0.30	0.42	0.36	0.36	0.11	0.50	28.50	0.26	0.26	0.66	0.49	1.00

Table C.4: Pairwise Preferences for Alternatives for Sub Criterion – Salaries and Overtime Cost

Mgt zone	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**
1	1.00	0.76	17.00	0.65	0.64	1.03	0.55	0.34	0.35	0.22	0.36	0.63	0.67	0.89	0.15	0.25	0.51	0.22	0.70	0.76	0.33	0.55
2	1.31	1.00	5.00	0.86	0.84	1.34	0.72	0.45	0.46	0.28	0.47	0.83	0.88	1.16	0.19	0.33	0.67	0.29	0.92	1.00	0.43	0.72
3	0.06	0.20	1.00	0.05	0.05	7.18	0.06	0.09	0.07	0.33	0.50	0.05	0.17	0.25	1.00	0.05	0.13	0.10	0.06	0.11	0.08	0.08
4	1.53	1.17	21.00	1.00	0.98	1.57	0.93	0.52	0.54	0.33	0.55	0.97	1.03	1.36	0.22	0.38	0.78	0.34	1.08	1.17	0.50	0.84
5	1.57	1.20	22.00	1.02	1.00	1.61	0.96	0.53	0.55	0.34	0.56	0.99	1.06	1.39	0.23	0.39	0.80	0.35	1.10	1.20	0.52	0.86
6	0.97	0.74	0.14	0.64	0.62	1.00	0.54	0.33	0.34	0.21	0.35	0.62	0.66	0.86	0.14	0.24	0.50	0.22	0.69	0.74	0.32	0.54
7	1.82	1.39	18.00	1.07	1.05	1.86	1.00	0.56	0.58	0.36	0.59	1.04	1.22	1.61	0.24	0.41	0.84	0.37	1.28	1.39	0.54	0.90
8	2.93	2.24	11.00	1.92	1.87	3.01	1.79	1.00	1.03	0.64	1.06	1.86	1.97	2.60	0.43	0.74	1.50	0.65	2.07	2.24	0.97	1.61
9	2.84	2.17	14.00	1.86	1.81	2.92	1.73	0.97	1.00	0.62	1.02	1.80	1.91	2.52	0.42	0.71	1.45	0.63	2.00	2.17	0.93	1.56
10	4.61	3.52	3.00	3.01	2.94	4.73	2.81	1.57	1.62	1.00	1.66	2.92	3.10	4.08	0.68	1.16	2.36	1.03	3.25	3.52	1.52	2.54
11	2.77	2.12	2.00	1.81	1.77	2.85	1.69	0.95	0.98	0.60	1.00	1.76	1.87	2.46	0.41	0.70	1.42	0.62	1.95	2.12	0.91	1.53
12	1.58	1.21	20.00	1.03	1.01	1.62	0.96	0.54	0.56	0.34	0.57	1.00	1.06	1.40	0.23	0.40	0.81	0.35	1.11	1.21	0.52	0.87
13	1.48	1.13	6.00	0.97	0.95	1.52	0.82	0.51	0.52	0.32	0.54	0.94	1.00	1.32	0.22	0.37	0.76	0.33	1.05	1.13	0.49	0.82
14	1.13	0.86	4.00	0.74	0.72	1.16	0.62	0.38	0.40	0.24	0.41	0.72	0.76	1.00	0.17	0.28	0.58	0.25	0.80	0.86	0.37	0.62
15	6.80	5.20	1.00	4.45	4.34	6.98	4.15	2.32	2.39	1.48	2.45	4.31	4.58	6.03	1.00	1.71	3.48	1.52	4.79	5.20	2.24	3.74
16	3.98	3.04	19.00	2.60	2.54	4.08	2.43	1.36	1.40	0.86	1.43	2.52	2.68	3.52	0.58	1.00	2.03	0.89	2.80	3.04	1.31	2.19
17	1.96	1.49	8.00	1.28	1.25	2.01	1.19	0.67	0.69	0.42	0.71	1.24	1.32	1.73	0.29	0.49	1.00	0.44	1.38	1.49	0.64	1.08
18	4.49	3.43	10.00	2.93	2.86	4.61	2.74	1.53	1.58	0.97	1.62	2.84	3.02	3.98	0.66	1.13	2.29	1.00	3.16	3.43	1.48	2.47
19	1.42	1.08	16.00	0.93	0.91	1.46	0.78	0.48	0.50	0.31	0.51	0.90	0.96	1.26	0.21	0.36	0.73	0.32	1.00	1.08	0.47	0.78
20	1.31	1.00	9.00	0.86	0.84	1.34	0.72	0.45	0.46	0.28	0.47	0.83	0.88	1.16	0.19	0.33	0.67	0.29	0.92	1.00	0.43	0.72
21	3.04	2.32	13.00	1.99	1.94	3.12	1.85	1.04	1.07	0.66	1.10	1.93	2.05	2.69	0.45	0.76	1.55	0.68	2.14	2.32	1.00	1.67
22	1.82	1.39	12.00	1.19	1.16	1.86	1.11	0.62	0.64	0.39	0.65	1.15	1.22	1.61	0.27	0.46	0.93	0.40	1.28	1.39	0.60	1.00

Table C.5: Pairwise Preferences for Alternatives for Sub Criterion – Transport Cost

Mgt zone	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00	2.46	2.69	4.63	3.14	1.05	6.13	1.68	1.19	1.08	1.13	1.11	2.79	1.48	0.68	1.20	3.00	1.05	1.09	1.76	1.04	2.84
2	0.41	1.00	1.09	1.88	1.27	0.43	2.49	0.68	0.48	0.44	0.46	0.45	1.13	0.60	0.28	0.48	6.00	0.42	0.44	0.72	0.42	1.15
3	0.37	0.92	1.00	1.72	1.17	0.39	2.28	0.63	0.44	0.40	0.42	0.41	1.04	0.55	0.25	0.44	16.00	0.39	0.41	0.66	0.39	1.06
4	0.22	0.53	0.58	1.00	0.68	0.23	1.32	0.36	0.26	0.23	0.24	0.24	0.60	0.32	0.15	0.26	17.00	0.23	0.24	0.38	0.22	0.61
5	0.32	0.78	0.86	1.48	1.00	0.33	1.95	0.53	0.38	0.34	0.36	0.35	0.89	0.47	0.22	0.38	4.00	0.33	0.35	0.56	0.33	0.90
6	0.95	2.35	2.56	4.42	2.99	1.00	5.84	1.60	1.14	1.03	1.08	1.06	2.66	1.42	0.65	1.14	13.00	1.00	1.04	1.68	0.99	2.71
7	0.16	0.40	0.44	0.76	0.51	0.17	1.00	0.27	0.19	0.18	0.18	0.18	0.46	0.24	0.11	0.19	0.10	0.17	0.18	0.29	0.17	0.46
8	0.60	1.47	1.60	2.76	1.87	0.62	3.65	1.00	0.71	0.64	0.67	0.66	1.66	0.88	0.41	0.71	22.00	0.62	0.65	1.05	0.62	1.69
9	0.84	2.07	2.25	3.89	2.64	0.88	5.14	1.41	1.00	0.90	0.95	0.93	2.34	1.25	0.57	1.01	12.00	0.88	0.92	1.48	0.87	2.38
10	0.93	2.29	2.49	4.30	2.91	0.97	5.69	1.56	1.11	1.00	1.05	1.03	2.59	1.38	0.63	1.11	11.00	0.97	1.02	1.64	0.96	2.63
11	0.88	2.18	2.37	4.09	2.77	0.93	5.41	1.48	1.05	0.95	1.00	0.98	2.46	1.31	0.60	1.06	8.00	0.92	0.97	1.56	0.91	2.51
12	0.90	2.23	2.43	4.19	2.84	0.95	5.54	1.52	1.08	0.97	1.02	1.00	2.52	1.34	0.62	1.08	2.00	0.95	0.99	1.59	0.94	2.57
13	0.36	0.88	0.96	1.66	1.13	0.38	2.20	0.60	0.43	0.39	0.41	0.40	1.00	0.53	0.24	0.43	5.00	0.37	0.39	0.63	0.37	1.02
14	0.67	1.66	1.81	3.12	2.11	0.71	4.13	1.13	0.80	0.73	0.76	0.75	1.88	1.00	0.46	0.81	20.00	0.70	0.74	1.19	0.70	1.91
15	1.47	3.61	3.93	6.79	4.60	1.54	8.98	2.46	1.75	1.58	1.66	1.62	4.09	2.18	1.00	1.75	1.00	1.53	1.60	2.59	1.52	4.16
16	0.83	2.07	2.25	3.89	2.64	0.88	5.14	1.40	0.99	0.90	0.95	0.92	2.34	1.24	0.57	1.00	18.00	0.87	0.91	1.47	0.86	2.38
17	0.33	0.17	0.06	0.06	0.25	0.08	9.68	0.05	0.08	0.09	0.13	0.50	0.20	0.05	1.00	0.06	7.00	0.05	0.07	0.05	0.10	0.11
18	0.96	2.36	2.57	4.43	3.00	1.00	5.86	1.61	1.14	1.03	1.08	1.06	2.67	1.42	0.65	1.15	19.00	1.00	1.05	1.69	0.99	2.71
19	0.91	2.25	2.45	4.23	2.87	0.96	5.60	1.54	1.09	0.98	1.04	1.01	2.55	1.36	0.62	1.10	14.00	0.96	1.00	1.61	0.95	2.60
20	0.57	1.40	1.52	2.62	1.78	0.59	3.47	0.95	0.68	0.61	0.64	0.63	1.58	0.84	0.39	0.68	21.00	0.59	0.62	1.00	0.59	1.61
21	0.97	2.38	2.59	4.47	3.03	1.01	5.92	1.62	1.15	1.04	1.09	1.07	2.69	1.43	0.66	1.16	10.00	1.01	1.06	1.70	1.00	2.74
22	0.35	0.87	0.95	1.63	1.11	0.37	2.16	0.59	0.42	0.38	0.40	0.39	0.98	0.52	0.24	0.42	9.00	0.37	0.39	0.62	0.36	1.00

Table C.6: Pairwise Preferences for Alternatives for Sub Criterion – Non Revenue Water

Mgt Zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00	0.65	0.73	0.59	0.71	0.60	0.61	1.47	0.78	0.70	1.01	0.61	0.65	0.50	0.82	0.55	0.53	0.70	0.60	0.65	0.68	0.59
2	1.53	1.00	1.11	0.89	1.09	0.90	0.92	2.25	1.19	1.06	1.55	0.92	0.97	0.75	1.25	0.83	0.80	1.05	0.90	0.98	1.02	0.89
3	1.38	0.90	1.00	0.81	0.98	0.82	0.84	2.02	1.07	0.97	1.39	0.84	0.89	0.69	1.13	0.76	0.73	0.96	0.82	0.90	0.93	0.82
4	1.69	1.12	1.23	1.00	1.21	1.01	1.03	2.48	1.31	1.19	1.71	1.03	1.09	0.84	1.39	0.93	0.90	1.18	1.01	1.10	1.14	1.00
5	1.40	0.92	1.02	0.83	1.00	0.84	0.86	2.06	1.09	0.99	1.42	0.86	0.91	0.70	1.15	0.77	0.75	0.98	0.84	0.92	0.95	0.83
6	1.67	1.11	1.21	0.99	1.19	1.00	1.02	2.45	1.30	1.18	1.69	1.02	1.08	0.83	1.37	0.92	0.89	1.16	1.00	1.09	1.13	0.99
7	1.64	1.09	1.19	0.97	1.17	0.98	1.00	2.40	1.27	1.15	1.65	1.00	1.06	0.82	1.34	0.90	0.87	1.14	0.98	1.07	1.11	0.97
8	0.68	0.45	0.49	0.40	0.49	0.41	0.42	1.00	0.53	0.48	0.69	0.42	0.44	0.34	0.56	0.38	0.36	0.48	0.41	0.45	0.46	0.40
9	1.28	0.84	0.93	0.76	0.92	0.77	0.79	1.89	1.00	0.90	1.30	0.79	0.83	0.64	1.05	0.71	0.69	0.90	0.77	0.84	0.87	0.76
10	1.42	0.94	1.03	0.84	1.01	0.85	0.87	2.09	1.11	1.00	1.43	0.87	0.92	0.71	1.16	0.78	0.76	0.99	0.85	0.93	0.96	0.84
11	0.99	0.65	0.72	0.59	0.71	0.59	0.61	1.45	0.77	0.70	1.00	0.61	0.64	0.49	0.81	0.55	0.53	0.69	0.59	0.65	0.67	0.59
12	1.63	1.08	1.19	0.97	1.16	0.98	1.00	2.40	1.27	1.15	1.65	1.00	1.06	0.82	1.34	0.90	0.87	1.14	0.98	1.07	1.10	0.97
13	1.55	1.03	1.12	0.91	1.10	0.93	0.94	2.27	1.20	1.09	1.56	0.95	1.00	0.77	1.27	0.85	0.82	1.08	0.92	1.01	1.04	0.92
14	2.00	1.33	1.45	1.18	1.43	1.20	1.22	2.94	1.56	1.41	2.02	1.23	1.29	1.00	1.64	1.10	1.07	1.40	1.20	1.31	1.35	1.19
15	1.22	0.80	0.89	0.72	0.87	0.73	0.75	1.79	0.95	0.86	1.23	0.75	0.79	0.61	1.00	0.67	0.65	0.85	0.73	0.80	0.82	0.72
16	1.81	1.20	1.32	1.07	1.29	1.09	1.11	2.66	1.41	1.28	1.83	1.11	1.17	0.91	1.49	1.00	0.97	1.27	1.08	1.19	1.23	1.08
17	1.87	1.24	1.36	1.11	1.34	1.12	1.15	2.75	1.46	1.32	1.89	1.15	1.21	0.94	1.54	1.03	1.00	1.31	1.12	1.22	1.27	1.11
18	1.43	0.95	1.04	0.85	1.02	0.86	0.88	2.10	1.12	1.01	1.45	0.88	0.93	0.72	1.17	0.79	0.76	1.00	0.86	0.94	0.97	0.85
19	1.67	1.11	1.22	0.99	1.19	1.00	1.02	2.46	1.30	1.18	1.69	1.03	1.08	0.84	1.37	0.92	0.89	1.17	1.00	1.09	1.13	0.99
20	1.53	1.02	1.11	0.91	1.09	0.92	0.94	2.25	1.19	1.08	1.55	0.94	0.99	0.76	1.25	0.84	0.82	1.07	0.91	1.00	1.03	0.91
21	1.48	0.98	1.08	0.88	1.06	0.89	0.90	2.17	1.15	1.04	1.49	0.91	0.96	0.74	1.21	0.82	0.79	1.03	0.88	0.97	1.00	0.88
22	1.68	1.12	1.22	1.00	1.20	1.01	1.03	2.47	1.31	1.19	1.70	1.03	1.09	0.84	1.38	0.93	0.90	1.18	1.01	1.10	1.14	1.00

Table C.7: Pairwise Preferences for Alternatives for Sub Criterion – Low Pressure

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
2	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
3	40.0	40.0	1.0	40.0	40.0	4.0	0.8	2.0	4.0	0.6	2.0	4.0	2.0	4.0	0.6	40.0	40.0	4.0	2.0	40.0	4.0	40.0
4	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
5	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
6	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
7	50.0	50.0	1.3	50.0	50.0	5.0	1.0	2.5	5.0	0.7	2.5	5.0	2.5	5.0	0.7	50.0	50.0	5.0	2.5	50.0	5.0	50.0
8	20.0	20.0	0.5	20.0	20.0	2.0	0.4	1.0	2.0	0.3	1.0	2.0	1.0	2.0	0.3	20.0	20.0	2.0	1.0	20.0	2.0	20.0
9	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
10	70.0	70.0	1.8	70.0	70.0	7.0	1.4	3.5	7.0	1.0	3.5	7.0	3.5	7.0	1.0	70.0	70.0	7.0	3.5	70.0	7.0	70.0
11	20.0	20.0	0.5	20.0	20.0	2.0	0.4	1.0	2.0	0.3	1.0	2.0	1.0	2.0	0.3	20.0	20.0	2.0	1.0	20.0	2.0	20.0
12	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
13	20.0	20.0	0.5	20.0	20.0	2.0	0.4	1.0	2.0	0.3	1.0	2.0	1.0	2.0	0.3	20.0	20.0	2.0	1.0	20.0	2.0	20.0
14	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
15	70.0	70.0	1.8	70.0	70.0	7.0	1.4	3.5	7.0	1.0	3.5	7.0	3.5	7.0	1.0	70.0	70.0	7.0	3.5	70.0	7.0	70.0
16	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
17	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
18	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
19	20.0	20.0	0.5	20.0	20.0	2.0	0.4	1.0	2.0	0.3	1.0	2.0	1.0	2.0	0.3	20.0	20.0	2.0	1.0	20.0	2.0	20.0
20	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0
21	10.0	10.0	0.3	10.0	10.0	1.0	0.2	0.5	1.0	0.1	0.5	1.0	0.5	1.0	0.1	10.0	10.0	1.0	0.5	10.0	1.0	10.0
22	1.0	1.0	0.0	1.0	1.0	0.1	0.0	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.0	1.0	1.0	0.1	0.1	1.0	0.1	1.0

Table C.8: Pairwise Preferences for Alternatives for Sub Criterion – No Water

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.0	2.0	1.2	1120.0	1120.0	1120.0	0.9	2.1	1120.0	1.2	1.9	2.6	1.6	2.0	3.0	1120.0	1120.0	2.6	1.4	4.5	1120.0	1120.0
2	0.5	1.0	0.6	550.0	550.0	550.0	0.5	1.0	550.0	0.6	0.9	1.3	0.8	1.0	8.0	550.0	550.0	1.3	0.7	2.2	550.0	550.0
3	0.9	1.7	1.0	950.0	950.0	950.0	0.8	1.8	950.0	1.0	1.6	2.2	1.3	1.7	10.0	950.0	950.0	2.2	1.2	3.8	950.0	950.0
4	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	17.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
5	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	9.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
6	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	16.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
7	1.1	2.2	1.3	1200.0	1200.0	1200.0	1.0	2.2	1200.0	1.3	2.0	2.8	1.7	2.1	1.0	1200.0	1200.0	2.8	1.5	4.8	1200.0	1200.0
8	0.5	1.0	0.6	540.0	540.0	540.0	0.5	1.0	540.0	0.6	0.9	1.3	0.8	1.0	12.0	540.0	540.0	1.3	0.7	2.2	540.0	540.0
9	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	4.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
10	0.8	1.7	1.0	940.0	940.0	940.0	0.8	1.7	940.0	1.0	1.6	2.2	1.3	1.7	19.0	940.0	940.0	2.2	1.2	3.8	940.0	940.0
11	0.5	1.1	0.6	590.0	590.0	590.0	0.5	1.1	590.0	0.6	1.0	1.4	0.8	1.0	14.0	590.0	590.0	1.4	0.8	2.4	590.0	590.0
12	0.4	0.8	0.5	540.0	540.0	540.0	0.4	0.8	540.0	0.5	0.7	1.0	0.6	0.8	18.0	540.0	540.0	1.0	0.5	1.7	540.0	430.0
13	0.6	1.3	0.8	720.0	720.0	720.0	0.6	1.3	720.0	0.8	1.2	1.7	1.0	1.3	11.0	720.0	720.0	1.7	0.9	2.9	720.0	720.0
14	0.5	1.0	0.6	570.0	570.0	570.0	0.5	1.1	570.0	0.6	1.0	1.3	0.8	1.0	2.0	570.0	570.0	1.3	0.7	2.3	570.0	570.0
15	0.3	0.1	0.1	0.1	0.1	0.1	1.0	0.1	0.3	0.1	0.1	0.1	0.1	0.5	1.0	0.2	1820.0	0.1	0.1	0.1	0.2	0.1
16	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	5.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
17	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
18	0.4	0.8	0.5	430.0	430.0	430.0	0.4	0.8	430.0	0.5	0.7	1.0	0.6	0.8	20.0	430.0	430.0	1.0	0.5	1.7	430.0	430.0
19	0.7	1.4	0.8	790.0	790.0	790.0	0.7	1.5	790.0	0.8	1.3	1.8	1.1	1.4	13.0	790.0	790.0	1.8	1.0	3.2	790.0	790.0
20	0.2	0.5	0.3	250.0	250.0	250.0	0.2	0.5	250.0	0.3	0.4	0.6	0.4	0.4	22.0	250.0	250.0	0.6	0.3	1.0	250.0	250.0
21	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	6.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0
22	0.0	0.0	0.0	1.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	21.0	1.0	1.0	0.0	0.0	0.0	1.0	1.0

Table C.9: Pairwise Preferences for Alternatives for Sub Criterion – Water Quality

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	0.8	1	40	40	40	1	40	40	4	4	40	4	40	3	40	40	1.33	40	4	2	40
2	1.25	1	1.25	50	50	50	1.3	50	50	5	5	50	5	50	1	50	50	1.67	50	5	2.5	50
3	1	0.8	1	40	40	40	1	40	40	4	4	40	4	40	10	40	40	1.33	40	4	2	40
4	0.03	0	0.03	1	1	1	0	1	10	0.1	0.1	10	0.1	10	18	10	10	0.03	10	0.1	0.05	10
5	0.03	0	0.03	1	1	1	0	1	1	0.1	0.1	1	0.1	1	20	1	1	0.03	1	0.1	0.05	1
6	0.03	0	0.03	1	1	1	0	1	1	0.1	0.1	1	0.1	1	22	1	1	0.03	1	0.1	0.05	1
7	1	0.8	1	40	40	40	1	40	40	4	4	40	4	40	19	40	40	1.33	40	4	2	40
8	0.03	0	0.03	1	1	1	0	1	1	0.1	0.1	1	0.1	1	21	1	1	0.03	1	0.1	0.05	1
9	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	6	1	1	0.03	1	0.1	0.05	1
10	0.25	0.2	0.25	10	10	10	0.3	10	10	1	1	10	1	10	14	10	10	0.33	10	1	0.5	10
11	0.25	0.2	0.25	10	10	10	0.3	10	10	1	1	10	1	10	2	10	10	0.33	10	1	0.5	10
12	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	16	1	1	0.03	1	0.1	0.05	1
13	0.25	0.2	0.25	10	10	10	0.3	10	10	1	1	10	1	10	8	10	10	0.33	10	1	0.5	10
14	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	5	1	1	0.03	1	0.1	0.05	1
15	0.33	1	0.1	0.06	0.05	0.05	0.1	0.05	0.17	0.07	0.5	0.1	0.13	0.2	7	0.11	0.25	0.08	0.06	0.08	0.09	90
16	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	9	1	1	0.03	1	0.1	0.05	1
17	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	4	1	1	0.03	1	0.1	0.05	1
18	0.75	0.6	0.75	30	30	30	0.8	30	30	3	3	30	3	30	13	30	30	1	30	3	1.5	30
19	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	17	1	1	0.03	1	0.1	0.05	1
20	0.25	0.2	0.25	10	10	10	0.3	10	10	1	1	10	1	10	12	10	10	0.33	10	1	0.5	10
21	0.5	0.4	0.5	20	20	20	0.5	20	20	2	2	20	2	20	11	20	20	0.67	20	2	1	20
22	0.03	0	0.03	0.1	1	1	0	1	1	0.1	0.1	1	0.1	1	0	1	1	0.03	1	0.1	0.05	1

Table C.10: Pairwise Preferences for Alternatives for Sub Criterion – Defective Meters

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	2	0.67	60	60	1.2	1.5	3	1	3	6	2	0.86	0.86	13	2	60	60	0.75	2	1.5	6
2	0.5	1	0.33	30	30	0.6	0.75	1.5	0.5	1.5	3	1	0.43	0.43	12	1	30	30	0.38	1	0.75	3
3	1.5	3	1	90	90	1.8	2.25	4.5	1.5	4.5	9	3	1.29	1.29	1	3	90	90	1.13	3	2.25	9
4	0.02	0.03	0.01	1	1	0.02	0.03	0.05	0.02	0.05	0.1	0	0.01	0.01	9	0.03	1	1	0.01	0.03	0.03	0.1
5	0.02	0.03	0.01	1	1	0.02	0.03	0.05	0.02	0.05	0.1	0	0.01	0.01	4	0.03	1	1	0.01	0.03	0.03	0.1
6	0.83	1.67	0.56	50	50	1	1.25	2.5	0.83	2.5	5	1.7	0.71	0.71	14	1.67	50	50	0.63	1.67	1.25	5
7	0.67	1.33	0.44	40	40	0.8	1	2	0.67	2	4	1.3	0.57	0.57	2	1.33	40	40	0.5	1.33	1	4
8	0.33	0.67	0.22	20	20	0.4	0.5	1	0.33	1	2	0.7	0.29	0.29	21	0.67	20	20	0.25	0.67	0.5	2
9	1	2	0.67	60	60	1.2	1.5	3	1	3	6	2	0.86	0.86	11	2	60	60	0.75	2	1.5	6
10	0.33	0.67	0.22	20	20	0.4	0.5	1	0.33	1	2	0.7	0.29	0.29	6	0.67	20	20	0.25	0.67	0.5	2
11	0.17	0.33	0.11	10	10	0.2	0.25	0.5	0.17	0.5	1	0.3	0.14	0.14	16	0.33	10	10	0.13	0.33	0.25	1
12	0.5	1	0.33	30	30	0.6	0.75	1.5	0.5	1.5	3	1	0.43	0.43	18	1	30	30	0.38	1	0.75	3
13	1.17	2.33	0.78	70	70	1.4	1.75	3.5	1.17	3.5	7	2.3	1	1	10	2.33	70	70	0.88	2.33	1.75	7
14	1.17	2.33	0.78	70	70	1.4	1.75	3.5	1.17	3.5	7	2.3	1	1	19	2.33	70	70	0.88	2.33	1.75	7
15	0.08	0.08	1	0.11	0.25	0.07	0.5	0.05	0.09	0.17	0.06	0.1	0.1	0.05	7	0.05	0.06	120	0.33	0.05	0.13	0.2
16	0.5	1	0.33	30	30	0.6	0.75	1.5	0.5	1.5	3	1	0.43	0.43	20	1	30	30	0.38	1	0.75	3
17	0.02	0.03	0.01	1	1	0.02	0.03	0.05	0.02	0.05	0.1	0	0.01	0.01	17	0.03	1	1	0.01	0.03	0.03	0.1
18	0.02	0.03	0.01	1	1	0.02	0.03	0.05	0.02	0.05	0.1	0	0.01	0.01	0	0.03	1	1	0.01	0.03	0.03	0.1
19	1.33	2.67	0.89	80	80	1.6	2	4	1.33	4	8	2.7	1.14	1.14	3	2.67	80	80	1	2.67	2	8
20	0.5	1	0.33	30	30	0.6	0.75	1.5	0.5	1.5	3	1	0.43	0.43	22	1	30	30	0.38	1	0.75	3
21	0.67	1.33	0.44	40	40	0.8	1	2	0.67	2	4	1.3	0.57	0.57	8	1.33	40	40	0.5	1.33	1	4
22	0.17	0.33	0.11	10	10	0.2	0.25	0.5	0.17	0.5	1	0.3	0.14	0.14	5	0.33	10	10	0.13	0.33	0.25	1

Table C.11: Pairwise Preferences for Alternatives for Sub Criterion – Water Supply Mains Leak

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	0.9	1.07	440	11	2.095	0.6	0.79	2.444	0.69	1.19	1.9	3.667	2.44	0.3	1.05	22	0.55	2	2.75	1.76	2.75
2	1.114	1	1.2	490	12.25	2.333	0.7	0.88	2.722	0.77	1.32	2.1	4.083	2.72	0.4	1.17	24.5	0.61	2.23	3.06	1.96	3.063
3	0.932	0.8	1	410	10.25	1.952	0.6	0.73	2.278	0.64	1.11	1.8	3.417	2.28	0.3	0.98	20.5	0.51	1.86	2.56	1.64	2.563
4	0.002	0	0	1	0.025	0.005	0	0	0.006	0	0	0	0.008	0.01	0	0	0.05	0	0.01	0.01	0.004	0.006
5	0.091	0.1	0.1	40	1	0.19	0.1	0.07	0.222	0.06	0.11	0.2	0.333	0.22	0	0.1	2	0.05	0.18	0.25	0.16	0.25
6	0.477	0.4	0.51	210	5.25	1	0.3	0.38	1.167	0.33	0.57	0.9	1.75	1.17	0.2	0.5	10.5	0.26	0.96	1.31	0.84	1.313
7	1.614	1.4	1.73	710	17.75	3.381	1	1.27	3.944	1.11	1.92	3.1	5.917	3.94	0.6	1.69	35.5	0.89	3.23	4.44	2.84	4.438
8	1.273	1.1	1.37	560	14	2.667	0.8	1	3.111	0.88	1.51	2.4	4.667	3.11	0.4	1.33	28	0.7	2.55	3.5	2.24	3.5
9	0.409	0.4	0.44	180	4.5	0.857	0.3	0.32	1	0.28	0.49	0.8	1.5	1	0.1	0.43	9	0.23	0.82	1.13	0.72	1.125
10	1.455	1.3	1.56	640	16	3.048	0.9	1.14	3.556	1	1.73	2.8	5.333	3.56	0.5	1.52	32	0.8	2.91	4	2.56	4
11	0.841	0.8	0.9	370	9.25	1.762	0.5	0.66	2.056	0.58	1	1.6	3.083	2.06	0.3	0.88	18.5	0.46	1.68	2.31	1.48	2.313
12	0.523	0.5	0.56	250	6.25	1.095	0.3	0.41	1.278	0.36	0.62	1	2.083	1.39	0.2	0.55	12.5	0.29	1.05	1.56	0.92	1.563
13	0.273	0.2	0.29	120	3	0.571	0.2	0.21	0.667	0.19	0.32	0.5	1	0.67	0.1	0.29	6	0.15	0.55	0.75	0.48	0.75
14	0.409	0.4	0.44	180	4.5	0.857	0.3	0.32	1	0.28	0.49	0.7	1.5	1	0.1	0.43	9	0.23	0.82	1.13	0.72	1.125
15	2.909	2.6	3.12	1280	32	6.095	1.8	2.29	7.111	2	3.46	5.6	10.67	7.11	1	3.05	64	1.6	5.82	8	5.12	8
16	0.955	0.9	1.02	420	10.5	2	0.6	0.75	2.333	0.66	1.14	1.8	3.5	2.33	0.3	1	21	0.53	1.91	2.63	1.68	2.625
17	0.045	0	0.05	20	0.5	0.095	0	0.04	0.111	0.03	0.05	0.1	0.167	0.11	0	0.05	1	0.03	0.09	0.13	0.08	0.125
18	1.818	1.6	1.95	800	20	3.81	1.1	1.43	4.444	1.25	2.16	3.5	6.667	4.44	0.6	1.91	40	1	3.64	5	3.2	5
19	0.5	0.4	0.54	220	5.5	1.048	0.3	0.39	1.222	0.34	0.6	1	1.833	1.22	0.2	0.52	11	0.28	1	1.38	0.88	1.375
20	0.364	0.3	0.39	160	4	0.762	0.2	0.29	0.889	0.25	0.43	0.6	1.333	0.89	0.1	0.38	8	0.2	0.73	1	0.64	1
21	0.568	0.5	0.61	250	6.25	1.19	0.4	0.45	1.389	0.39	0.68	1.1	2.083	1.39	0.2	0.6	12.5	0.31	1.14	1.56	1	1.563
22	0.364	0.3	0.39	160	4	0.762	0.2	0.29	0.889	0.25	0.43	0.6	1.333	0.89	0.1	0.38	8	0.2	0.73	1	0.64	1

Table C.12: Pairwise Preferences for Alternatives for Sub Criterion – Water Connections Leak

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.00	2.33	0.97	1070.00	13.38	5.10	0.91	2.10	5.10	0.91	1.47	2.33	3.82	2.10	0.68	3.06	1070.00	1.65	1.53	4.12	2.49	9.73
2	0.43	1.00	0.42	460.00	5.75	2.19	0.39	0.90	2.19	0.39	0.63	1.00	1.64	0.90	0.29	1.31	460.00	0.71	0.66	1.77	1.07	4.18
3	1.03	2.39	1.00	1100.00	13.75	5.24	0.93	2.16	5.24	0.94	1.51	2.39	3.93	2.16	0.70	3.14	1100.00	1.69	1.57	4.23	2.56	10.00
4	0.00	0.00	0.00	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.01
5	0.07	0.17	0.07	80.00	1.00	0.38	0.07	0.16	0.38	0.07	0.11	0.17	0.29	0.16	0.05	0.23	80.00	0.12	0.11	0.31	0.19	0.73
6	0.20	0.46	0.19	210.00	2.63	1.00	0.18	0.41	1.00	0.18	0.29	0.46	0.75	0.41	0.13	0.60	210.00	0.32	0.30	0.81	0.49	1.91
7	1.10	2.57	1.07	1180.00	14.75	5.62	1.00	2.31	5.62	1.01	1.62	2.57	4.21	2.31	0.75	3.37	1180.00	1.82	1.69	4.54	2.74	10.73
8	0.48	1.11	0.46	510.00	6.38	2.43	0.43	1.00	2.43	0.44	0.70	1.11	1.82	1.00	0.32	1.46	510.00	0.78	0.73	1.96	1.19	4.64
9	0.20	0.46	0.19	210.00	2.63	1.00	0.18	0.41	1.00	0.18	0.29	0.46	0.75	0.41	0.13	0.60	210.00	0.32	0.30	0.81	0.49	1.91
10	1.09	2.54	1.06	1170.00	14.63	5.57	0.99	2.29	5.57	1.00	1.60	2.54	4.18	2.29	0.75	3.34	1170.00	1.80	1.67	4.50	2.72	10.64
11	0.68	1.59	0.66	730.00	9.13	3.48	0.62	1.43	3.48	0.62	1.00	1.59	2.61	1.43	0.46	2.09	730.00	1.12	1.04	2.81	1.70	6.64
12	0.43	1.00	0.42	460.00	5.75	2.19	0.39	0.90	2.19	0.39	0.63	1.00	1.64	0.90	0.29	1.31	460.00	0.71	0.66	1.77	1.07	4.18
13	0.26	0.61	0.25	280.00	3.50	1.33	0.24	0.55	1.33	0.24	0.38	0.61	1.00	0.55	0.18	0.80	280.00	0.43	0.40	1.08	0.65	2.55
14	0.48	1.11	0.46	510.00	6.38	2.43	0.43	1.00	2.43	0.44	0.70	1.11	1.82	1.00	0.32	1.46	510.00	0.78	0.73	1.96	1.19	4.64
15	1.47	3.41	1.43	1570.00	19.63	7.48	1.33	3.08	7.48	1.34	2.15	3.41	5.61	3.08	1.00	4.49	1570.00	2.42	2.24	6.04	3.65	14.27
16	0.33	0.76	0.32	350.00	4.38	1.67	0.30	0.69	1.67	0.30	0.48	0.76	1.25	0.69	0.22	1.00	350.00	0.54	0.50	1.35	0.81	3.18
17	0.00	0.00	0.00	1.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.00	0.00	0.00	0.01
18	0.61	1.41	0.59	650.00	8.13	3.10	0.55	1.27	3.10	0.56	0.89	1.41	2.32	1.27	0.41	1.86	650.00	1.00	0.93	2.50	1.51	5.91
19	0.65	1.52	0.64	700.00	8.75	3.33	0.59	1.37	3.33	0.60	0.96	1.52	2.50	1.37	0.45	2.00	700.00	1.08	1.00	2.69	1.63	6.36
20	0.24	0.57	0.24	260.00	3.25	1.24	0.22	0.51	1.24	0.22	0.36	0.57	0.93	0.51	0.17	0.74	260.00	0.40	0.37	1.00	0.60	2.36
21	0.40	0.93	0.39	430.00	5.38	2.05	0.36	0.84	2.05	0.37	0.59	0.93	1.54	0.84	0.27	1.23	430.00	0.66	0.61	1.65	1.00	3.91
22	0.10	0.24	0.10	110.00	1.38	0.52	0.09	0.22	0.52	0.09	0.15	0.24	0.39	0.22	0.07	0.31	110.00	0.17	0.16	0.42	0.26	1.00

Table C.13: Pairwise Preferences for Alternatives for Sub Criterion – Leaks near Meter

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1.0	1.6	0.9	350.0	17.5	2.7	0.7	1.1	2.3	0.7	2.7	2.7	1.6	2.1	1.2	2.2	350.0	1.9	1.1	3.5	2.1	11.7
2	0.6	1.0	0.6	220.0	11.0	1.7	0.4	0.7	1.5	0.5	1.7	1.7	1.0	1.3	0.8	1.4	220.0	1.2	0.7	2.2	1.3	7.3
3	1.1	1.8	1.0	390.0	19.5	3.0	0.7	1.2	2.6	0.8	3.0	3.0	1.8	2.3	1.3	2.4	390.0	2.2	1.2	3.9	2.3	13.0
4	0.0	0.0	0.0	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
5	0.1	0.1	0.1	20.0	1.0	0.2	0.0	0.1	0.1	0.0	0.2	0.2	0.1	0.1	0.1	0.1	20.0	0.1	0.1	0.2	0.1	0.7
6	0.4	0.6	0.3	130.0	6.5	1.0	0.2	0.4	0.9	0.3	1.0	1.0	0.6	0.8	0.4	0.8	130.0	0.7	0.4	1.3	0.8	4.3
7	1.5	2.4	1.4	530.0	26.5	4.1	1.0	1.6	3.5	1.1	4.1	4.1	2.4	3.1	1.8	3.3	530.0	2.9	1.6	5.3	3.1	17.7
8	0.9	1.5	0.8	330.0	16.5	2.5	0.6	1.0	2.2	0.7	2.5	2.5	1.5	1.9	1.1	2.1	330.0	1.8	1.0	3.3	1.9	11.0
9	0.4	0.7	0.4	150.0	7.5	1.2	0.3	0.5	1.0	0.3	1.2	1.2	0.7	0.9	0.5	0.9	150.0	0.8	0.5	1.5	0.9	5.0
10	1.3	2.1	1.2	470.0	23.5	3.6	0.9	1.4	3.1	1.0	3.6	3.6	2.1	2.8	1.6	2.9	470.0	2.6	1.4	4.7	2.8	15.7
11	0.4	0.6	0.3	130.0	6.5	1.0	0.2	0.4	0.9	0.3	1.0	1.0	0.6	0.8	0.4	0.8	130.0	0.7	0.4	1.3	0.8	4.3
12	0.4	0.6	0.3	130.0	6.5	1.0	0.2	0.4	0.9	0.3	1.0	1.0	0.6	0.8	0.4	0.8	130.0	0.7	0.4	1.3	0.8	4.3
13	0.6	1.0	0.6	220.0	11.0	1.7	0.4	0.7	1.5	0.5	1.7	1.7	1.0	1.3	0.8	1.4	220.0	1.2	0.7	2.2	1.3	7.3
14	0.5	0.8	0.4	170.0	8.5	1.3	0.3	0.5	1.1	0.4	1.3	1.3	0.8	1.0	0.6	1.1	170.0	0.9	0.5	1.7	1.0	5.7
15	0.8	1.3	0.7	290.0	14.5	2.2	0.5	0.9	1.9	0.6	2.2	2.2	1.3	1.7	1.0	1.8	290.0	1.6	0.9	2.9	1.7	9.7
16	0.5	0.7	0.4	160.0	8.0	1.2	0.3	0.5	1.1	0.3	1.2	1.2	0.7	0.9	0.6	1.0	160.0	0.9	0.5	1.6	0.9	5.3
17	0.0	0.0	0.0	1.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0
18	0.5	0.8	0.5	180.0	9.0	1.4	0.3	0.5	1.2	0.4	1.4	1.4	0.8	1.1	0.6	1.1	180.0	1.0	0.5	1.8	1.1	6.0
19	0.9	1.5	0.8	330.0	16.5	2.5	0.6	1.0	2.2	0.7	2.5	2.5	1.5	1.9	1.1	2.1	330.0	1.8	1.0	3.3	1.9	11.0
20	0.3	0.5	0.3	100.0	5.0	0.8	0.2	0.3	0.7	0.2	0.8	0.8	0.5	0.6	0.3	0.6	100.0	0.6	0.3	1.0	0.6	3.3
21	0.5	0.8	0.4	170.0	8.5	1.3	0.3	0.5	1.1	0.4	1.3	1.3	0.8	1.0	0.6	1.1	170.0	0.9	0.5	1.7	1.0	5.7
22	0.1	0.1	0.1	30.0	1.5	0.2	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	30.0	0.2	0.1	0.3	0.2	1.0

Table C.14: Pairwise Preferences for Alternatives for Sub Criterion – Night time Leaks

Mgt zones	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
2	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
6	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
8	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
10	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
12	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
15	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
16	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
22	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

Table C.15: Pairwise Preferences for Alternatives for Sub Criterion – Leaks at Stop Valve

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	1	1	0.89	80	4	2.67	0.7	1	4	1.14	8	2	4	0.89	0.89	8	80	1.6	1.6	2	2.67	8
2	1	1	0.89	80	4	2.67	0.7	1	4	1.14	8	2	4	0.89	0.89	8	80	1.6	1.6	2	2.67	8
3	1.13	1.1	1	90	4.5	3	0.8	1.13	4.5	1.29	9	2.25	4.5	1	1	9	90	1.8	1.8	2.25	3	9
4	0.01	0	0.01	1	0.05	0.03	0	0.01	0.05	0.01	0.1	0.03	0.05	0.01	0.01	0.1	1	0.02	0.02	0.03	0.03	0.1
5	0.25	0.3	0.22	20	1	0.67	0.2	0.25	1	0.29	2	0.5	1	0.22	0.22	2	20	0.4	0.4	0.5	0.67	2
6	0.38	0.4	0.33	30	1.5	1	0.3	0.38	1.5	0.43	3	0.75	1.5	0.33	0.33	3	30	0.6	0.6	0.75	1	3
7	1.5	1.5	1.33	120	6	4	1	1.5	6	1.71	12	3	6	1.33	1.33	12	120	2.4	2.4	3	4	12
8	1	1	0.89	80	4	2.67	0.7	1	4	1.14	8	2	4	0.89	0.89	8	80	1.6	1.6	2	2.67	8
9	0.25	0.3	0.22	20	1	0.67	0.2	0.25	1	0.29	2	0.5	1	0.22	0.22	2	20	0.4	0.4	0.5	0.67	2
10	0.88	0.9	0.78	70	3.5	2.33	0.6	0.88	3.5	1	7	1.75	3.5	0.78	0.78	7	70	1.4	1.4	1.75	2.33	7
11	0.13	0.1	0.11	10	0.5	0.33	0.1	0.13	0.5	0.14	1	0.25	0.5	0.11	0.11	1	10	0.2	0.2	0.25	0.33	1
12	0.5	0.5	0.44	40	2	1.33	0.3	0.5	2	0.57	4	1	2	0.44	0.44	4	40	0.8	0.8	1	1.33	4
13	0.25	0.3	0.22	20	1	0.67	0.2	0.25	1	0.29	2	0.5	1	0.22	0.22	2	20	0.4	0.4	0.5	0.67	2
14	1.13	1.1	1	90	4.5	3	0.8	1.13	4.5	1.29	9	2.25	4.5	1	1	9	90	1.8	1.8	2.25	3	9
15	1.13	1.1	1	90	4.5	3	0.8	1.13	4.5	1.29	9	2.25	4.5	1	1	9	90	1.8	1.8	2.25	3	9
16	0.13	0.1	0.11	10	0.5	0.33	0.1	0.13	0.5	0.14	1	0.25	0.5	0.11	0.11	1	10	0.2	0.2	0.25	0.33	1
17	0.01	0	0.01	1	0.05	0.03	0	0.01	0.05	0.01	0.1	0.03	0.05	0.01	0.01	0.1	1	0.02	0.02	0.03	0.03	0.1
18	0.63	0.6	0.56	50	2.5	1.67	0.4	0.63	2.5	0.71	5	1.25	2.5	0.56	0.56	5	50	1	1	1.25	1.67	5
19	0.63	0.6	0.56	50	2.5	1.67	0.4	0.63	2.5	0.71	5	1.25	2.5	0.56	0.56	5	50	1	1	1.25	1.67	5
20	0.5	0.5	0.44	40	2	1.33	0.3	0.5	2	0.57	4	1	2	0.44	0.44	4	40	0.8	0.8	1	1.33	4
21	0.38	0.4	0.33	30	1.5	1	0.3	0.38	1.5	0.43	3	0.75	1.5	0.33	0.33	3	30	0.6	0.6	0.75	1	3
22	0.13	0.1	0.11	10	0.5	0.33	0.1	0.13	0.5	0.14	1	0.25	0.5	0.11	0.11	1	10	0.2	0.2	0.25	0.33	1

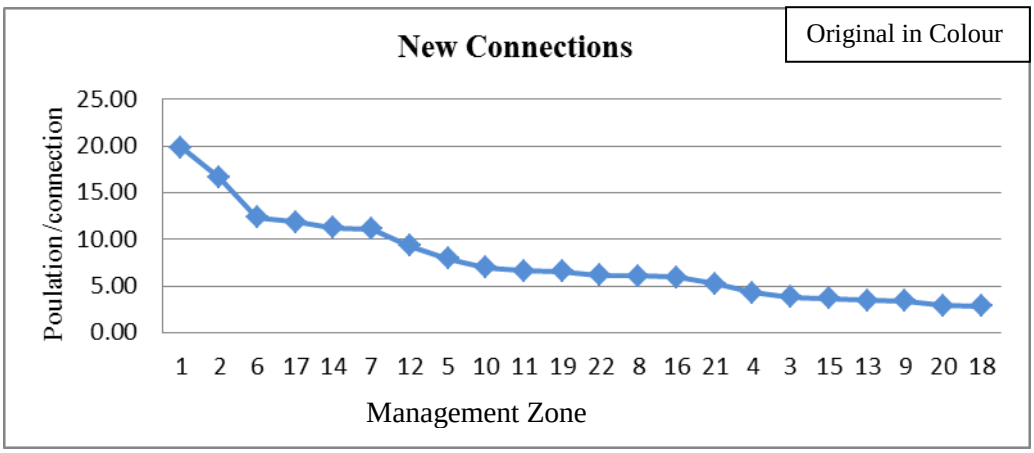

Figure C.7: Probability of Exceedance Curves for Sub Criteria – New Connection

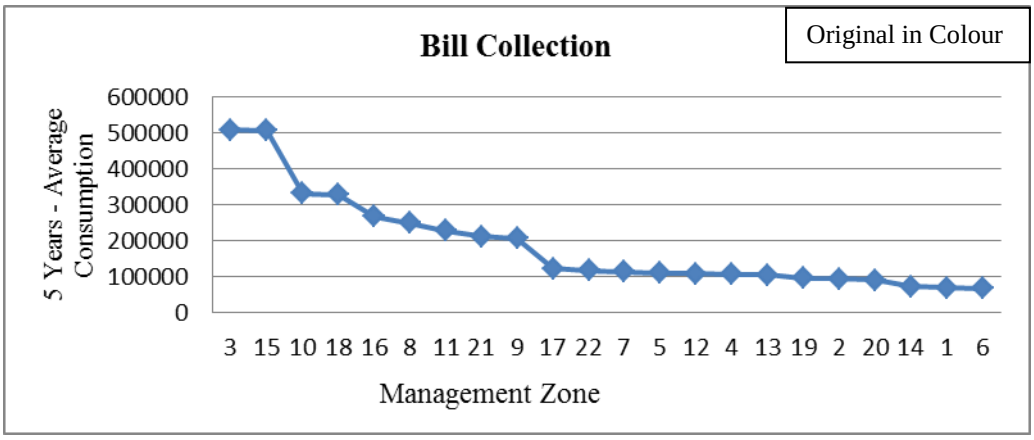

Figure C.8: Probability of Exceedance Curves for Sub Criteria – Bill Collection

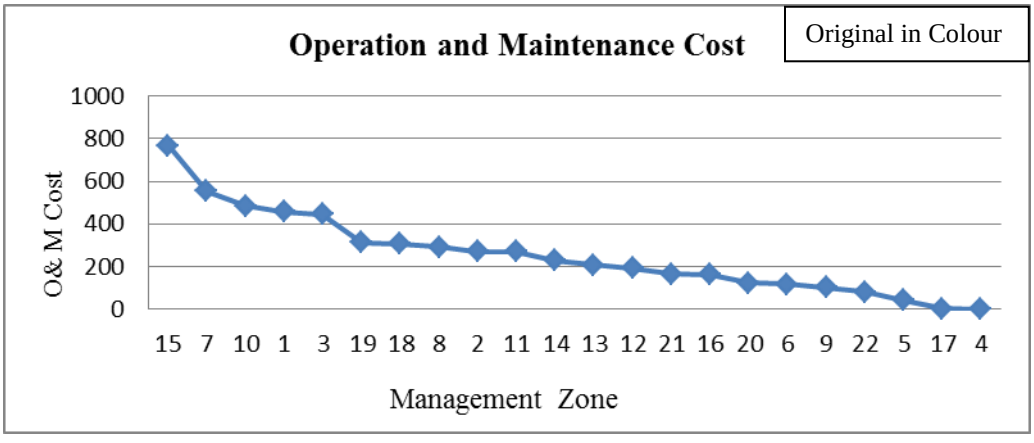

Figure C.9: Probability of Exceedance Curves for Sub Criteria – O&M Cost

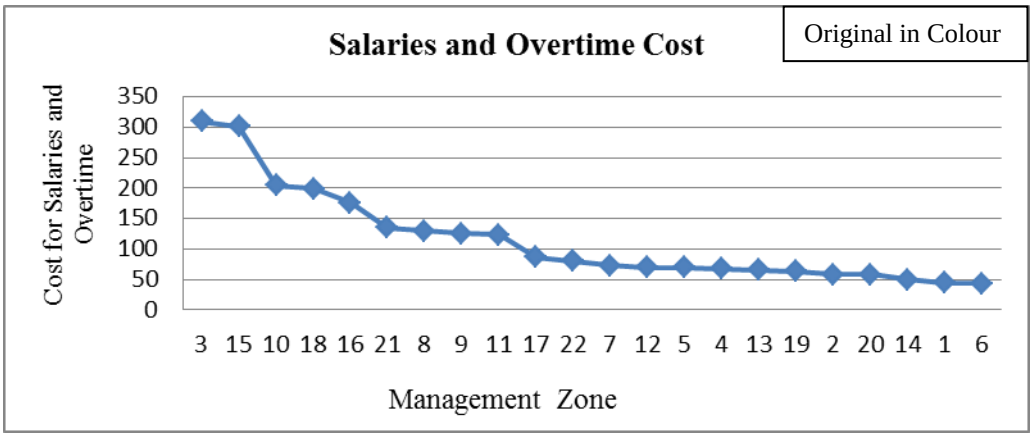

Figure C.10: Probability of Exceedance Curves for Sub Criteria – Salaries and Overtime Cost

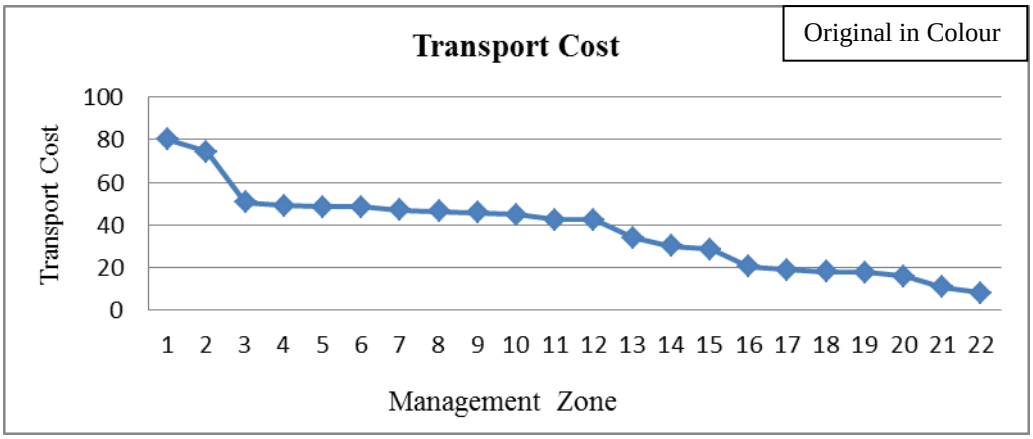

Figure C.11: Probability of Exceedance Curves for Sub Criteria – Transport Cost

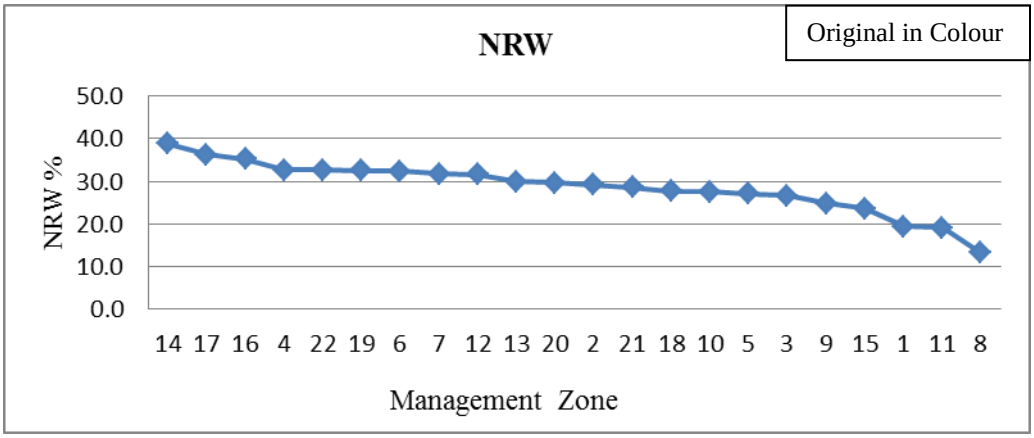

Figure C.12: Probability of Exceedance Curves for Sub Criteria -NRW

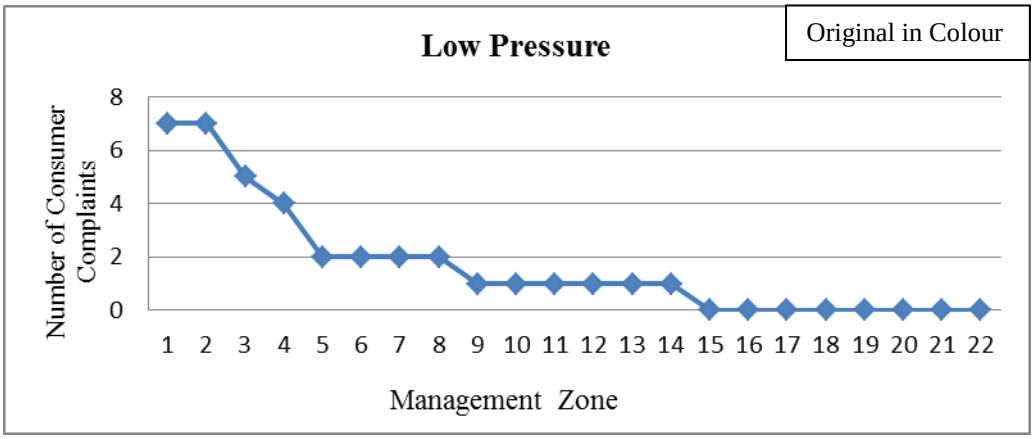

Figure C.13: Probability of Exceedance Curves for Sub Criteria – Low Pressure

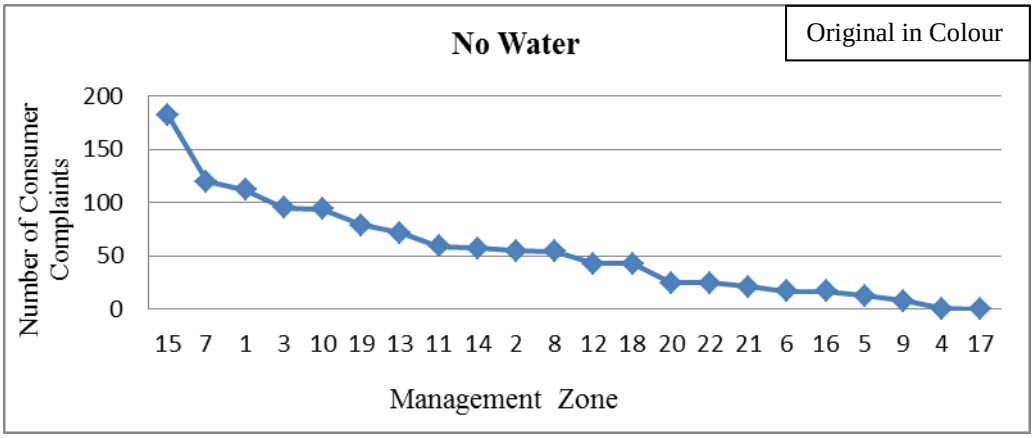

Figure C.14: Probability of Exceedance Curves for Sub Criteria – No Water

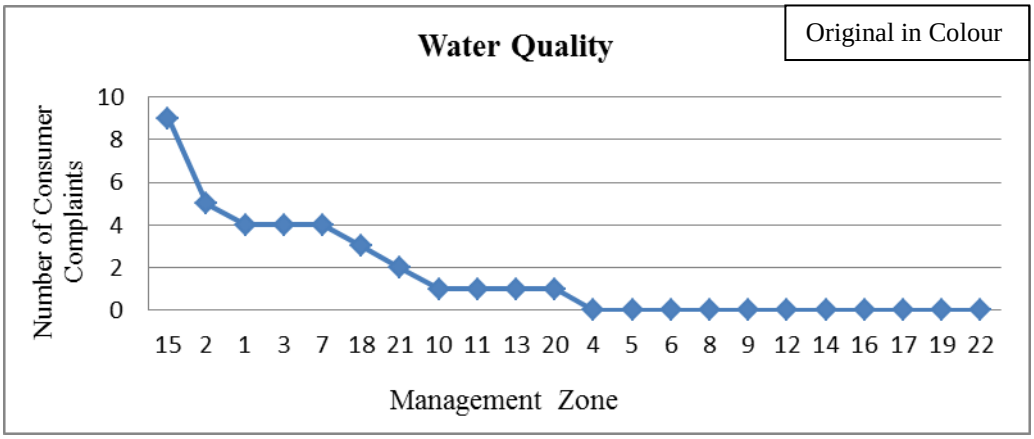

Figure C.15: Probability of Exceedance Curves for Sub Criteria – Water Quality

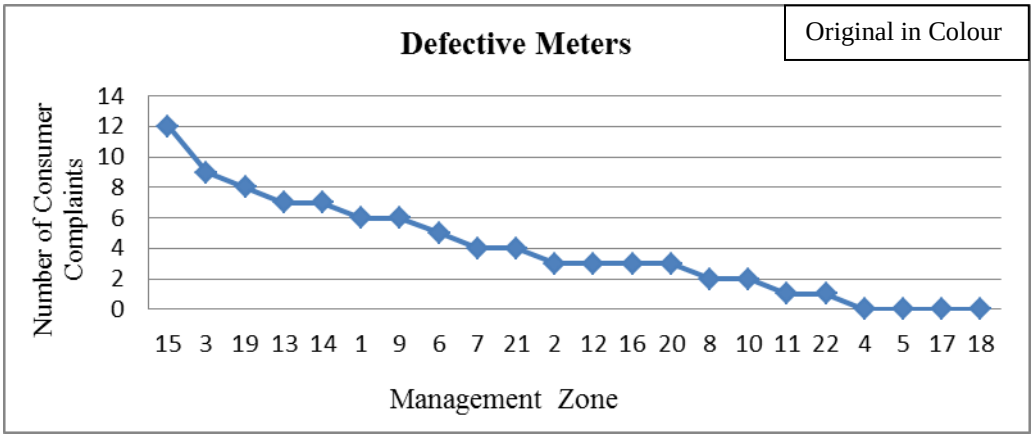

Figure C.16: Probability of Exceedance Curves for Sub Criteria –Defective Meters

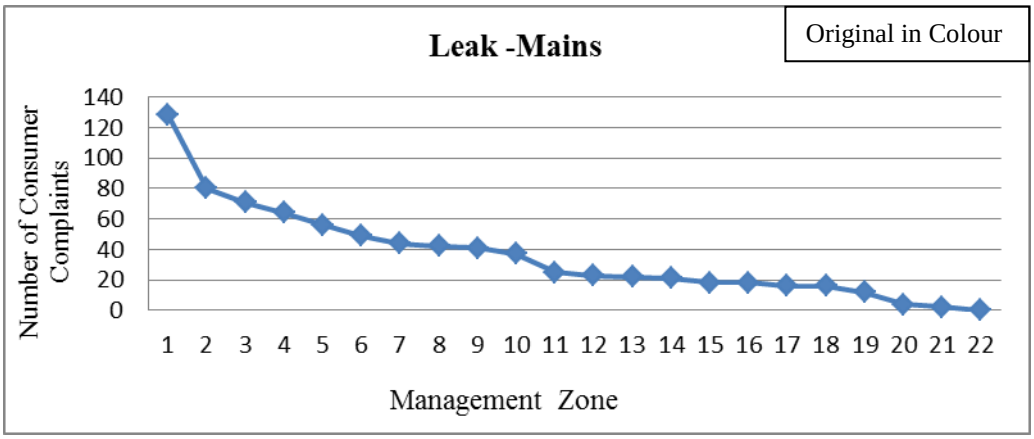

Figure C.17: Probability of Exceedance Curves for Sub Criteria – Leak Mains

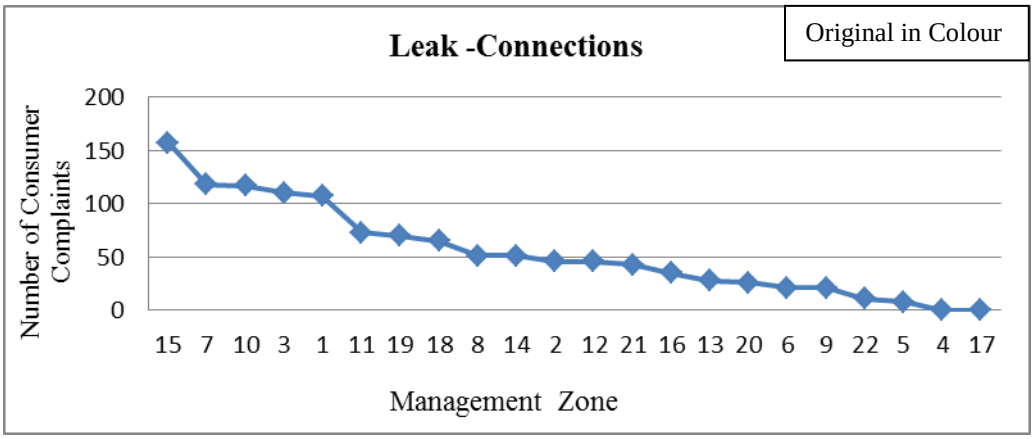

Figure C.18: Probability of Exceedance Curves for Sub Criteria - Connections Leak

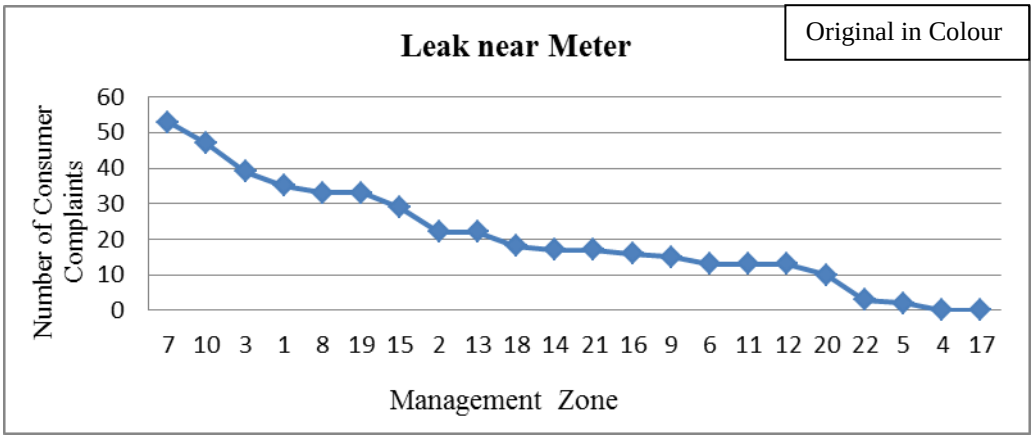

Figure C.19: Probability of Exceedance Curves for Sub Criteria –Leak near Meter

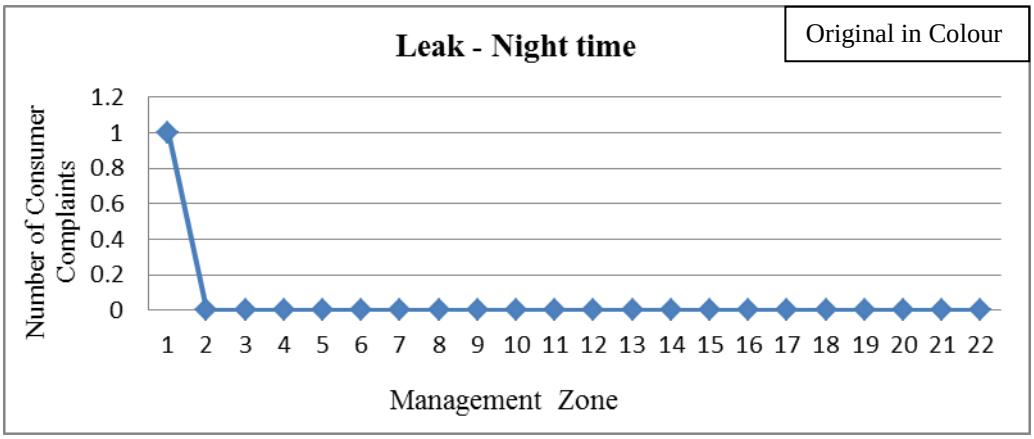

Figure C.20: Probability of Exceedance Curves for Sub Criteria – Night time Leak

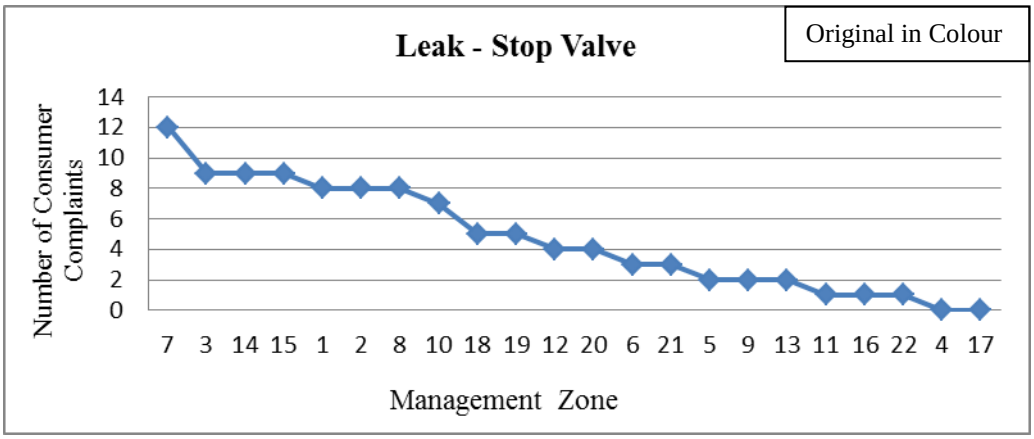

Figure C.21: Probability of Exceedance Curves for Sub Criteria – Leak at stop valve