Table 10.2.24 Projected Domestic, Commercial & Institutional and Industrial Pollution Load by Sewered/Unsewered Area by Sub-basin - T-P (Scenario 2, 2015)

Sub-basin/District	Generated T-P (kg/day)												Concentrated T-P (kg/day)							
	Sewered Area						Unsewered Area						Sewered Area		Unsewered Area					
	Low	Med.	High	C & I	Ind.	Total	Low	Med.	High	C & I	Ind.	Total	STW Dischrge/Irrigation	Total	Low	Med.	High	C & I	Ind.	Total
1. Manyame River (Upstream) S/B																				
Goromonzi Rural	-	-	-	-	-	-	-	-	46	-	-	46	-	-	-	-	2	-	-	2
Harare Rural	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-	-	0	-	-	0
Manyame Rural	-	-	-	-	-	-	-	-	4	-	-	4	-	-	-	-	0	-	-	0
Total	-	-	-	-	-	-	-	-	50	-	-	50		-	-	-	3	-	-	3
2. Ruwa River S/B																				
Harare City	-	-	175	-	274	449	-	-	-	-	-	-	Donnybrook (WSP)	10	-	-	-	-	-	-
Ruwa Local Board	0	0	2	0	74	77	-	-	-	-	-	-	Ruwa (WSP)	4	-	-	-	-	-	-
Epworth Local Board	-	-	81	3	-	84	-	-	-	-	-	-	Harare East (BNR)	100	-	-	-	-	-	-
Goromonzi Rural	-	-	-	-	-	-	-	-	11	-	-	11	-	-	-	-	1	-	-	1
Harare Rural	-	-	-	-	-	-	-	-	7	-	-	7	-	-	-	-	0	-	-	0
Total	0	0	258	3	348	609	-	-	18	-	-	18		114	-	-	1	-	-	1
3. Seke & Harava Dams S/B																				
Harare City	1	-	10	-	-	11	-	-	-	-	-	-	To Harare South	-	-	-	-	-	-	-
Epworth Local Board	-	-	9	0	-	9	-	-	-	-	-	-	To Harare East	-	-	-	-	-	-	-
Goromonzi Rural	-	-	-	-	-	-	-	-	0	-	-	0	-	-	-	-	0	-	-	0
Harare Rural	-	-	-	-	-	-	-	-	4	-	-	4	-	-	-	-	0	-	-	0
Manyame Rural	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	0	-	-	0
Total	1	-	19	0	-	20	-	-	6	-	-	6		-	-	-	0	-	-	0
4. Nyatsime River S/B																				
Chitungwiza Municipality	5	73	838	47	184	1,148	-	-	-	-	-	-	Zengeza (BNR)	200	-	-	-	-	-	-
Manyame Rural	-	-	-	-	-	-	-	-	18	-	-	18	-	-	-	-	1	-	-	1
Marondera Rural	-	-	-	-	-	-	-	-	13	-	-	13	-	-	-	-	1	-	-	1
Total	5	73	838	47	184	1,148	-	-	31	-	-	31		200	-	-	2	-	-	2
5. Mukuvisi River S/B																				
Harare City	75	141	1,056	865	445	2,582	66	-	-	-	3	69	Firle (BNR)	546	-	-	-	-	0	0
Epworth Local Board	-	-	32	1	-	33	-	-	-	-	-	-	To Harare East	-	-	-	-	-	-	-
Harare Rural	-	-	-	-	-	-	-	-	3	-	-	3	-	-	-	-	0	-	-	0
Zvimba Rural	-	-	-	-	-	-	-	-	1	-	-	1	-	-	-	-	0	-	-	0
Total	75	141	1,087	866	445	2,614	66	-	4	-	3	73		546	-	-	0	-	0	0
6. Manyame River (D.stream) S/B																				
Harare City	-	1	15	-	421	436	-	-	-	-	-	-	Harare South (BNR)	112	-	-	-	-	-	-
Chitungwiza Municipality	-	-	245	-	34	279	-	-	-	-	-	-	to Zengeza STW	-	-	-	-	-	-	-
Harare Rural	-	-	-	-	-	-	-	-	5	-	-	5	-	-	-	-	0	-	-	0
Manyame Rural	-	-	-	-	-	-	-	-	3	-	-	3	-	-	-	-	0	-	-	0
Total	-	1	259	-	455	715	-	-	8	-	-	8		112	-	-	0	-	-	0

Table 10.2.24 Projected Domestic, Commercial & Institutional and Industrial Pollution Load by Sewered/Unsewered Area by Sub-basin - T-P (Scenario 2, 2015)

Sub-basin/District	Generated T-P (kg/day)												Concentrated T-P (kg/day)							
	Sewered Area						Unsewered Area						Sewered Area		Unsewered Area					
	Low	Med.	High	C & I	Ind.	Total	Low	Med.	High	C & I	Ind.	Total	STW Dischrge/Irrigation	Total	Low	Med.	High	C & I	Ind.	Total
7. Marimba River S/B																				
Harare City	67	133	873	216	121	1,410	-	-	-	-	-	-	Crowborough (BNR, TF)	271	-	-	-	-	-	-
Zvimba Rural	-	-	-	-	-	-	-	-	5	-	-	5	-	-	-	-	0	-	-	0
Total	67	133	873	216	121	1,410	-	-	5	-	-	5		271	-	-	0	-	-	0
8. Lake Chivero S/B																				
Harare City	-	-	-	-	-	-	-	-	-	-	-	-	Firle STW (Irrigation farm)	22	-	-	-	-	-	-
Chegutu Rural	-	-	-	-	-	-	-	-	2	-	-	2	-	-	-	-	0	-	-	0
Manyame Rural	-	-	-	-	-	-	-	-	4	-	-	4	-	-	-	-	0	-	-	0
Zvimba Rural	-	-	-	-	-	-	-	-	8	-	-	8	-	-	-	-	0	-	-	0
Total	-	-	-	-	-	-	-	-	14	-	-	14		22	-	-	1	-	-	1
9. Muzururu River S/B																				
Harare City	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zvimba Rural	-	-	-	-	-	-	-	-	24	-	-	24	-	-	-	-	1	-	-	1
Total	-	-	-	-	-	-	-	-	24	-	-	24		-	-	-	1	-	-	1
10. Gwebi River S/B																				
Harare City	24	-	-	-	-	24	165	-	-	-	-	165	Marlborough (WSP)	1	-	-	-	-	-	-
Mazowe Rural	-	-	-	-	-	-	-	-	22	-	-	22	-	-	-	-	1	-	-	1
Zvimba Rural	-	-	-	-	-	-	-	-	35	-	-	35	-	-	-	-	2	-	-	2
Total	24	-	-	-	-	24	165	-	57	-	-	222		1	-	-	3	-	-	3
11. Lake Manyame S/B																				
Norton Town	5	5	31	0	143	184	-	-	-	-	21	21	Norton (TF)	10	-	-	-	-	2	2
Chegutu Rural	-	-	-	-	-	-	-	-	11	-	-	11	-	-	-	-	1	-	-	1
Zvimba Rural	-	-	-	-	-	-	-	-	22	-	-	22	-	-	-	-	1	-	-	1
Total	5	5	31	0	143	184	-	-	32	-	21	53		10	-	-	2	-	2	3
Grand Total	177	353	3,366	1,133	1,696	6,725	231	-	250	-	24	505		1,277	-	-	12	-	2	14

Note: 1. Residential density category is based on those shown in Section 12.2.3., Chapter 2, Supporting Report

2. Population in rural districts is categorised to high-density area.

3. Concentration ratios are; for direct discharge (STW): 100% for irrigation reuse (STW): 8% for unsewered area: High; 8% Low & Medium; 0%

4. Pollution load reduction efficiency at STWs:

	BNR	TF	WSP
T-P	75%	30%	30%

Table 10.2.25 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2005, BOD, Dry Season)

(kg/day)

Water Quality Checking Points	Sub-basin	Dom./Com./Ins. Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	122	122	-	53	30	-	-	205
R_{R1}	2. Ruwa River	275	44	319	-	26	12	-	-	357
C_{L1}	3. Seke & Harava Dams	-	14	14	-	21	7	-	-	43
R_{R2}	4. Nyatsime River	370	76	446	-	87	37	-	-	571
R_{R4}	5. Mukuvisi River	4,364	10	4,374	29	7	15	-	-	4,425
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	2,630	18	2,648	-	17	11	-	3	2,679
R_{R5}	7. Marimba River	2,392	11	2,404	-	7	14	-	-	2,424
C_{L2}	8. Lake Chivero	176	35	211	-	28	16	-	-	255
R_{R6}	9. Muzururu River	-	59	59	-	99	20	-	-	178
R_{R7}	10. Gwebi River	5	139	144	-	198	49	-	-	392
C_{L3}	11. Lake Manyame	71	79	150	628	44	38	-	109	969
	Grand Total	10,282	608	10,890	657	589	248	-	113	12,497

*: Before confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works;

Prince Edward WTW;	Amount of water intake;	22,100	m3/day	
	BOD concentration of intake water;	1.9	mg/l	(Seke Dam)
	Concentrated BOD load;	3	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	475,700	m3/day	(Lake Chivero)
	BOD concentration of intake water;	4.8	mg/l	(do)
	Amount of water intake;	110,100	m3/day	(Lake Manyame)
	BOD concentration of intake water;	1.5	mg/l	(do)
	Intake BOD load;	2,431	kg/day	
	from Lake Chivero;	2,262	kg/day	
	from Lake Manyame;	169	kg/day	
	Concentrated BOD load;	109	kg/day	(to Lake Manyame)

Table 10.2.26 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2015, BOD, Dry Season)

(kg/day)

Water Quality Checking Points	Sub-basin	Dom./Com./Ins. Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	147	147	-	53	30	-	-	230
R_{R1}	2. Ruwa River	1,638	53	1,691	-	26	12	-	-	1,730
C_{L1}	3. Seke & Harava Dams	-	17	17	-	21	7	-	-	46
R_{R2}	4. Nyatsime River	700	92	791	-	87	37	-	-	916
R_{R4}	5. Mukuvisi River	5,327	12	5,338	29	7	15	-	-	5,390
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	3,383	22	3,405	-	17	11	-	7	3,440
R_{R5}	7. Marimba River	2,862	14	2,875	-	7	14	-	-	2,896
C_{L2}	8. Lake Chivero	171	42	212	-	28	16	-	-	257
R_{R6}	9. Muzururu River	-	71	71	-	99	20	-	-	190
R_{R7}	10. Gwebi River	9	168	176	-	198	49	-	-	424
C_{L3}	11. Lake Manyame	328	95	423	628	44	38	-	212	1,345
		14,417	732	15,149	657	589	248	-	219	16,862

*: Before confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works;

Prince Edward WTW;	Amount of water intake;	25,400	m3/day	
	BOD concentration of intake water;	3.4	mg/l	(Seke Dam)
	Concentrated BOD load;	7	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	601,900	m3/day	(Lake Chivero)
	BOD concentration of intake water;	5.8	mg/l	(do)
	Amount of water intake;	12,100	m3/day	(Lake Manyame)
	BOD concentration of intake water;	1.7	mg/l	(do)
	Intake BOD load;	3,529	kg/day	
	from Lake Chivero;	3,508	kg/day	
	from Lake Manyame;	21	kg/day	
	Concentrated BOD load;	212	kg/day	(to Lake Manyame)

Table 10.2.27 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2005, COD)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	244	244	-	1,319	5,584	-	-	7,147
R_{R1}	2. Ruwa River	1,062	88	1,150	-	658	2,297	6	-	4,111
C_{L1}	3. Seke & Harava Dams	-	29	29	-	536	1,355	-	-	1,920
R_{R2}	4. Nyatsime River	1,502	152	1,654	-	2,185	6,833	14	-	10,686
R_{R3}	5. Mukuvisi River	20,134	20	20,153	82	184	2,710	-	-	23,128
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	14,011	37	14,048	-	422	1,956	-	39	16,465
R_{R5}	7. Marimba River	10,150	23	10,172	-	172	2,533	-	-	12,877
C_{L2}	8. Lake Chivero	609	69	678	-	704	3,004	-	-	4,386
R_{R6}	9. Muzururu River	-	118	118	-	2,480	3,652	-	-	6,250
R_{R7}	10. Gwebi River	15	279	294	-	4,962	9,071	116	-	14,443
C_{L3}	11. Lake Manyame	358	158	516	2,683	1,105	6,951	13	1,222	12,490
Grand Total		47,840	1,216	49,056	2,765	14,725	45,946	149	1,261	113,903

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	22,100	m3/day	
	COD concentration of intake water;	22.3	mg/l	(Seke Dam)
	Concentrated COD load;	39	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	475,700	m3/day	(Lake Chivero)
	COD concentration of intake water;	38.6	mg/l	(do)
	Amount of water intake;	110,100	m3/day	(Lake Manyame)
	COD concentration of intake water;	18.0	mg/l	(do)
	Intake COD load;	20,363	kg/day	
	from Lake Chivero;	18,386	kg/day	
	from Lake Manyame;	1,977	kg/day	
	Concentrated COD load;	1,222	kg/day	(to Lake Manyame)

Table 10.2.28 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2015, COD)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	294	294	-	1,319	5,584	-	-	7,197
R_{R1}	2. Ruwa River	9,368	106	9,474	-	658	2,297	7	-	12,436
C_{L1}	3. Seke & Harava Dams	-	35	35	-	536	1,355	-	-	1,926
R_{R2}	4. Nyatsime River	2,990	183	3,174	-	2,185	6,833	19	-	12,211
R_{R3}	5. Mukuvisi River	24,380	24	24,404	82	184	2,710	-	-	27,379
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	17,026	44	17,070	-	422	1,956	-	63	19,511
R_{R5}	7. Marimba River	12,079	27	12,106	-	172	2,533	-	-	14,811
C_{L2}	8. Lake Chivero	585	84	669	-	704	3,004	-	-	4,377
R_{R6}	9. Muzururu River	-	142	142	-	2,480	3,652	-	-	6,274
R_{R7}	10. Gwebi River	26	336	361	-	4,962	9,071	147	-	14,541
C_{L3}	11. Lake Manyame	1,902	190	2,092	2,683	1,105	6,951	26	1,632	14,488
	Grand Total	68,357	1,465	69,822	2,765	14,725	45,946	199	1,695	135,152

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	25,400	m3/day	
	COD concentration of intake water;	31.2	mg/l	(Seke Dam)
	Concentrated COD load;	63	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	601,900	m3/day	(Lake Chivero)
	COD concentration of intake water;	44.8	mg/l	(do)
	Amount of water intake;	12,100	m3/day	(Lake Manyame)
	COD concentration of intake water;	20.6	mg/l	(do)
	Intake COD load;	27,197	kg/day	
	from Lake Chivero;	26,948	kg/day	
	from Lake Manyame;	249	kg/day	
	Concentrated COD load;	1,632	kg/day	(to Lake Manyame)

Table 10.2.29 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2005, T-N)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	31	31	-	382	467	-	-	880
R_{R1}	2. Ruwa River	288	11	299	-	189	192	2	-	683
C_{L1}	3. Seke & Harava Dams	-	4	4	-	157	113	-	-	274
R_{R2}	4. Nyatsime River	347	19	366	-	640	572	4	-	1,582
R_{R3}	5. Mukuvisi River	2,879	2	2,882	1	53	227	-	-	3,163
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	676	5	681	-	124	164	-	1	969
R_{R5}	7. Marimba River	2,079	3	2,082	-	50	212	-	-	2,343
C_{L2}	8. Lake Chivero	203	9	212	-	205	251	-	-	668
R_{R6}	9. Muzururu River	-	15	15	-	705	306	-	-	1,025
R_{R7}	10. Gwebi River	7	35	41	-	1,403	759	33	-	2,236
C_{L3}	11. Lake Manyame	52	20	72	10	319	582	4	27	1,014
Grand Total		6,531	152	6,683	11	4,225	3,845	43	29	14,837

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;		22,100	m3/day	
	T-N concentration of intake water;		0.73	mg/l	(Seke Dam)
	Concentrated T-N load;		1	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;		475,700	m3/day	(Lake Chivero)
	T-N concentration of intake water;		0.77	mg/l	(do)
	Amount of water intake;		110,100	m3/day	(Lake Manyame)
	T-N concentration of intake water;		0.81	mg/l	(do)
	Intake T-N load;		455	kg/day	
		from Lake Chivero;		366	kg/day
		from Lake Manyame;		89	kg/day
	Concentrated T-N load;		27	kg/day	(to Lake Manyame)

Table 10.2.30 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2015, T-N)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	37	37	-	382	467	-	-	886
R_{R1}	2. Ruwa River	540	13	553	-	189	192	2	-	937
C_{L1}	3. Seke & Harava Dams	-	4	4	-	157	113	-	-	275
R_{R2}	4. Nyatsime River	485	23	508	-	640	572	6	-	1,725
R_{R3}	5. Mukuvisi River	3,621	3	3,624	1	53	227	-	-	3,905
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	1,430	6	1,435	-	124	164	-	2	1,724
R_{R5}	7. Marimba River	2,524	3	2,528	-	50	212	-	-	2,790
C_{L2}	8. Lake Chivero	203	10	213	-	205	251	-	-	670
R_{R6}	9. Muzururu River	-	18	18	-	705	306	-	-	1,028
R_{R7}	10. Gwebi River	11	42	53	-	1,403	759	42	-	2,256
C_{L3}	11. Lake Manyame	129	24	153	10	319	582	7	35	1,106
	Grand Total	8,943	183	9,126	11	4,225	3,845	57	36	17,302

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;		25,400	m3/day	
	T-N concentration of intake water;		0.83	mg/l	(Seke Dam)
	Concentrated T-N load;		2	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;		601,900	m3/day	(Lake Chivero)
	T-N concentration of intake water;		0.94	mg/l	(do)
	Amount of water intake;		12,100	m3/day	(Lake Manyame)
	T-N concentration of intake water;		0.86	mg/l	(do)
	Intake T-N load;		577	kg/day	
		from Lake Chivero;	567	kg/day	
		from Lake Manyame;	10	kg/day	
	Concentrated T-N load;		35	kg/day	(to Lake Manyame)

Table 10.2.31 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2005, T-P)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	3	3	-	59	39	-	-	101
R_{R1}	2. Ruwa River	41	1	43	-	30	16	-	-	88
C_{L1}	3. Seke & Harava Dams	-	0	0	-	24	9	-	-	34
R_{R2}	4. Nyatsime River	49	2	51	-	96	48	-	-	195
R_{R3}	5. Mukuvisi River	444	0	445	0	8	19	-	-	472
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	160	0	161	-	19	14	-	0	193
R_{R5}	7. Marimba River	292	0	292	-	8	18	-	-	318
C_{L2}	8. Lake Chivero	25	1	26	-	32	21	-	-	79
R_{R6}	9. Muzururu River	-	2	2	-	112	25	-	-	139
R_{R7}	10. Gwebi River	1	4	5	-	224	63	-	-	292
C_{L3}	11. Lake Manyame	6	2	8	1	49	48	-	14	121
Grand Total		1,019	17	1,036	1	661	320	-	14	2,031

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	22,100	m3/day	
	T-P concentration of intake water;	0.08	mg/l	(Seke Dam)
	Concentrated T-N load;	0	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	475,700	m3/day	(Lake Chivero)
	T-P concentration of intake water;	0.46	mg/l	(do)
	Amount of water intake;	110,100	m3/day	(Lake Manyame)
	T-P concentration of intake water;	0.05	mg/l	(do)
	Intake T-P load;	225	kg/day	
	from Lake Chivero;	220	kg/day	
	from Lake Manyame;	6	kg/day	
	Concentrated T-P load;	14	kg/day	(to Lake Manyame)

Table 10.2.32 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 1, 2015, T-P)

(kg/day)

Water Quality Checking Points		Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
			Sewered	Unsewered	Total	Unsewered**					
C_{R1}		1. Manyame R. (Upstream)	-	3	3	-	59	39	-	-	100
	R_{R1}	2. Ruwa River	121	1	122	-	30	16	-	-	168
C_{L1}		3. Seke & Harava Dams	-	0	0	-	24	9	-	-	34
	R_{R2}	4. Nyatsime River	79	2	81	-	96	48	-	-	225
	R_{R3}	5. Mukuvisi River	553	0	553	0	8	19	-	-	581
C_{R2}*	R_{R4}	6. Manyame R. (Downstream)	263	0	264	-	19	14	-	0	296
	R_{R5}	7. Marimba River	353	0	354	-	8	18	-	-	379
C_{L2}		8. Lake Chivero	25	1	26	-	32	21	-	-	78
	R_{R6}	9. Muzururu River	-	1	1	-	112	25	-	-	139
	R_{R7}	10. Gwebi River	2	3	5	-	224	63	-	-	292
C_{L3}		11. Lake Manyame	17	2	18	2	49	48	-	20	138
Grand Total			1,414	12	1,426	2	661	320	-	20	2,429

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	25,400	m3/day		
	T-P concentration of intake water;	0.11	mg/l	(Seke Dam)	
	Concentrated T-P load;	0	kg/day	(to Manyame river (downstream))	
Morton Jaffray WTW;	Amount of water intake;	601,900	m3/day	(Lake Chivero)	
	T-P concentration of intake water;	0.55	mg/l	(do)	
	Amount of water intake;	12,100	m3/day	(Lake Manyame)	
	T-P concentration of intake water;	0.35	mg/l	(do)	
	Intake T-P load;	334	kg/day		
	from Lake Chivero;	330	kg/day		
	from Lake Manyame;	4	kg/day		
	Concentrated T-P load;	20	kg/day	(to Lake Manyame)	

Table 10.2.33 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2005, BOD, Dry Season)

(kg/day)

Water Quality Checking Points	Sub-basin	Dom./Com./Ins. Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	76	76	-	53	30	-	-	159
R_{R1}	2. Ruwa River	251	28	278	-	26	12	-	-	317
C_{L1}	3. Seke & Harava Dams	-	9	9	-	21	7	-	-	38
R_{R2}	4. Nyatsime River	915	48	963	-	87	37	-	-	1,087
R_{R4}	5. Mukuvisi River	3,723	6	3,729	29	7	15	-	-	3,781
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	2,263	11	2,275	-	17	11	-	3	2,305
R_{R5}	7. Marimba River	1,567	7	1,574	-	7	14	-	-	1,594
C_{L2}	8. Lake Chivero	169	22	191	-	28	16	-	-	235
R_{R6}	9. Muzururu River	-	37	37	-	99	20	-	-	156
R_{R7}	10. Gwebi River	5	87	92	-	198	49	-	-	340
C_{L3}	11. Lake Manyame	57	49	106	628	44	38	-	110	926
		8,951	380	9,331	657	589	248	-	113	10,938

*: Before confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works;

Prince Edward WTW;	Amount of water intake;	21,400	m3/day	
	BOD concentration of intake water;	1.8	mg/l	(Seke Dam)
	Concentrated BOD load;	3	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	395,600	m3/day	(Lake Chivero)
	BOD concentration of intake water;	4.2	mg/l	(do)
	Amount of water intake;	109,700	m3/day	(Lake Manyame)
	BOD concentration of intake water;	1.5	mg/l	(do)
	Intake BOD load;	1,825	kg/day	
	from Lake Chivero;	1,664	kg/day	
	from Lake Manyame;	161	kg/day	
	Concentrated BOD load;	110	kg/day	(to Lake Manyame)

Table 10.2.34 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2015, BOD, Dry Season)

(kg/day)

Water Quality Checking Points	Sub-basin	Dom./Com./Ins. Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	92	92	-	53	30	-	-	175
R_{R1}	2. Ruwa River	1,602	33	1,635	-	26	12	-	-	1,674
C_{L1}	3. Seke & Harava Dams	-	11	11	-	21	7	-	-	40
R_{R2}	4. Nyatsime River	1,663	57	1,721	-	87	37	-	-	1,845
R_{R4}	5. Mukuvisi River	5,285	7	5,293	29	7	15	-	-	5,344
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	2,274	14	2,288	-	17	11	-	6	2,322
R_{R5}	7. Marimba River	2,249	9	2,257	-	7	14	-	-	2,278
C_{L2}	8. Lake Chivero	155	26	181	-	28	16	-	-	225
R_{R6}	9. Muzururu River	-	44	44	-	99	20	-	-	163
R_{R7}	10. Gwebi River	7	105	112	-	198	49	-	-	359
C_{L3}	11. Lake Manyame	295	59	354	628	44	38	-	187	1,250
		13,530	458	13,988	657	589	248	-	193	15,676

*: Before confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works;

Prince Edward WTW;	Amount of water intake;	24,300	m3/day	
	BOD concentration of intake water;	3.3	mg/l	(Seke Dam)
	Concentrated BOD load;	6	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	549,300	m3/day	(Lake Chivero)
	BOD concentration of intake water;	5.5	mg/l	(do)
	Amount of water intake;	64,700	m3/day	(Lake Manyame)
	BOD concentration of intake water;	1.7	mg/l	(do)
	Intake BOD load;	3,109	kg/day	
	from Lake Chivero;	3,001	kg/day	
	from Lake Manyame;	108	kg/day	
	Concentrated BOD load;	187	kg/day	(to Lake Manyame)

Table 10.2.35 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2005, COD)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	153	153	-	1,319	5,584	-	-	7,056
R_{R1}	2. Ruwa River	991	55	1,046	-	658	2,297	4	-	4,005
C_{L1}	3. Seke & Harava Dams	-	18	18	-	536	1,355	-	-	1,909
R_{R2}	4. Nyatsime River	3,697	95	3,792	-	2,185	6,833	21	-	12,831
R_{R3}	5. Mukuvisi River	17,506	12	17,518	82	184	2,710	-	-	20,493
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	12,546	23	12,569	-	422	1,956	-	37	14,984
R_{R5}	7. Marimba River	6,763	14	6,778	-	172	2,533	-	-	9,482
C_{L2}	8. Lake Chivero	595	43	639	-	704	3,004	-	-	4,346
R_{R6}	9. Muzururu River	-	74	74	-	2,480	3,652	-	-	6,206
R_{R7}	10. Gwebi River	16	174	190	-	4,962	9,071	80	-	14,303
C_{L3}	11. Lake Manyame	317	99	416	2,683	1,105	6,951	9	960	12,123
Grand Total		42,431	760	43,191	2,765	14,725	45,946	113	998	107,738

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	21,400	m3/day	
	COD concentration of intake water;	21.9	mg/l	(Seke Dam)
	Concentrated COD load;	37	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	395,600	m3/day	(Lake Chivero)
	COD concentration of intake water;	35.5	mg/l	(do)
	Amount of water intake;	109,700	m3/day	(Lake Manyame)
	COD concentration of intake water;	17.8	mg/l	(do)
	Intake COD load;	16,006	kg/day	
	from Lake Chivero;	14,048	kg/day	
	from Lake Manyame;	1,957	kg/day	
	Concentrated COD load;	960	kg/day	(to Lake Manyame)

Table 10.2.36 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2015, COD)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	184	184	-	1,319	5,584	-	-	7,087
R_{R1}	2. Ruwa River	9,260	66	9,326	-	658	2,297	4	-	12,286
C_{L1}	3. Seke & Harava Dams	-	22	22	-	536	1,355	-	-	1,913
R_{R2}	4. Nyatsime River	6,973	115	7,088	-	2,185	6,833	30	-	16,135
R_{R3}	5. Mukuvisi River	24,260	15	24,274	82	184	2,710	-	-	27,249
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	12,589	28	12,617	-	422	1,956	-	59	15,054
R_{R5}	7. Marimba River	9,597	17	9,614	-	172	2,533	-	-	12,319
C_{L2}	8. Lake Chivero	533	52	586	-	704	3,004	-	-	4,293
R_{R6}	9. Muzururu River	-	89	89	-	2,480	3,652	-	-	6,221
R_{R7}	10. Gwebi River	20	210	230	-	4,962	9,071	104	-	14,367
C_{L3}	11. Lake Manyame	1,802	119	1,921	2,683	1,105	6,951	10	1,483	14,152
	Grand Total	65,034	916	65,950	2,765	14,725	45,946	149	1,542	131,077

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	24,300	m3/day	
	COD concentration of intake water;	30.6	mg/l	(Seke Dam)
	Concentrated COD load;	59	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	549,300	m3/day	(Lake Chivero)
	COD concentration of intake water;	42.7	mg/l	(do)
	Amount of water intake;	64,700	m3/day	(Lake Manyame)
	COD concentration of intake water;	19.5	mg/l	(do)
	Intake COD load;	24,713	kg/day	
	from Lake Chivero;	23,449	kg/day	
	from Lake Manyame;	1,264	kg/day	
	Concentrated COD load;	1,483	kg/day	(to Lake Manyame)

Table 10.2.37 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2005, T-N)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	19	19	-	382	467	-	-	868
R_{R1}	2. Ruwa River	259	7	266	-	189	192	1	-	648
C_{L1}	3. Seke & Harava Dams	-	2	2	-	157	113	-	-	273
R_{R2}	4. Nyatsime River	877	12	888	-	640	572	6	-	2,106
R_{R3}	5. Mukuvisi River	2,274	2	2,275	1	53	227	-	-	2,556
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	309	3	311	-	124	164	-	1	600
R_{R5}	7. Marimba River	1,288	2	1,290	-	50	212	-	-	1,552
C_{L2}	8. Lake Chivero	180	5	186	-	205	251	-	-	642
R_{R6}	9. Muzururu River	-	9	9	-	705	306	-	-	1,020
R_{R7}	10. Gwebi River	7	22	29	-	1,403	759	23	-	2,213
C_{L3}	11. Lake Manyame	28	12	40	10	319	582	2	21	975
	Grand Total	5,221	95	5,316	11	4,225	3,845	33	22	13,453

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	21,400	m3/day		
	T-N concentration of intake water;	0.71	mg/l		(Seke Dam)
	Concentrated T-N load;	1	kg/day		(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	395,600	m3/day		(Lake Chivero)
	T-N concentration of intake water;	0.66	mg/l		(do)
	Amount of water intake;	109,700	m3/day		(Lake Manyame)
	T-N concentration of intake water;	0.81	mg/l		(do)
	Intake T-N load;	351	kg/day		
	from Lake Chivero;			262	kg/day
	from Lake Manyame;			89	kg/day
	Concentrated T-N load;	21	kg/day		(to Lake Manyame)

Table 10.2.38 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2015, T-N)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	23	23	-	382	467	-	-	872
R_{R1}	2. Ruwa River	494	8	503	-	189	192	1	-	886
C_{L1}	3. Seke & Harava Dams	-	3	3	-	157	113	-	-	273
R_{R2}	4. Nyatsime River	1,305	14	1,320	-	640	572	9	-	2,540
R_{R3}	5. Mukuvisi River	3,559	2	3,561	1	53	227	-	-	3,842
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	319	3	323	-	124	164	-	1	612
R_{R5}	7. Marimba River	1,923	2	1,925	-	50	212	-	-	2,187
C_{L2}	8. Lake Chivero	183	7	189	-	205	251	-	-	645
R_{R6}	9. Muzururu River	-	11	11	-	705	306	-	-	1,021
R_{R7}	10. Gwebi River	9	26	35	-	1,403	759	29	-	2,226
C_{L3}	11. Lake Manyame	70	15	85	10	319	582	3	26	1,025
	Grand Total	7,863	114	7,977	11	4,225	3,845	43	27	16,130

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	21,400	m3/day		
	T-N concentration of intake water;	0.80	mg/l		(Seke Dam)
	Concentrated T-N load;	1	kg/day		(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	395,600	m3/day		(Lake Chivero)
	T-N concentration of intake water;	0.86	mg/l		(do)
	Amount of water intake;	109,700	m3/day		(Lake Manyame)
	T-N concentration of intake water;	0.85	mg/l		(do)
	Intake T-N load;	434	kg/day		
	from Lake Chivero;			340	kg/day
	from Lake Manyame;			93	kg/day
	Concentrated T-N load;	26	kg/day		(to Lake Manyame)

Table 10.2.39 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2005, T-P)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	2	2	-	59	39	-	-	100
R_{R1}	2. Ruwa River	37	1	38	-	30	16	-	-	83
C_{L1}	3. Seke & Harava Dams	-	0	0	-	24	9	-	-	33
R_{R2}	4. Nyatsime River	122	1	123	-	96	48	-	-	267
R_{R3}	5. Mukuvisi River	361	0	361	0	8	19	-	-	388
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	110	0	111	-	19	14	-	0	143
R_{R5}	7. Marimba River	183	0	183	-	8	18	-	-	209
C_{L2}	8. Lake Chivero	23	1	23	-	32	21	-	-	76
R_{R6}	9. Muzururu River	-	1	1	-	112	25	-	-	139
R_{R7}	10. Gwebi River	1	2	3	-	224	63	-	-	291
C_{L3}	11. Lake Manyame	4	1	5	1	49	48	-	10	114
	Grand Total	841	10	851	1	661	320	-	10	1,843

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;		21,400	m3/day	
	T-P concentration of intake water;		0.08	mg/l	(Seke Dam)
	Concentrated T-N load;		0	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;		395,600	m3/day	(Lake Chivero)
	T-P concentration of intake water;		0.41	mg/l	(do)
	Amount of water intake;		109,700	m3/day	(Lake Manyame)
	T-P concentration of intake water;		0.05	mg/l	(do)
	Intake T-P load;		168	kg/day	
		from Lake Chivero;	162	kg/day	
		from Lake Manyame;	5	kg/day	
	Concentrated T-P load;		10	kg/day	(to Lake Manyame)

Table 10.2.40 Concentrated Pollution Load by Sub-basin by Pollution Source (Scenario 2, 2015, T-P)

(kg/day)

Water Quality Checking Points	Sub-basin	Domestic Sewage			Industrial	Livestock	Natural Pollution	Solid Waste Dumping	Water Treatment Works***	Total
		Sewered	Unsewered	Total	Unsewered**					
C_{R1}	1. Manyame R. (Upstream)	-	3	3	-	59	39	-	-	100
R_{R1}	2. Ruwa River	114	1	115	-	30	16	-	-	161
C_{L1}	3. Seke & Harava Dams	-	0	0	-	24	9	-	-	34
R_{R2}	4. Nyatsime River	200	2	202	-	96	48	-	-	346
R_{R3}	5. Mukuvisi River	546	0	546	0	8	19	-	-	573
C_{R2}* R_{R4}	6. Manyame R. (Downstream)	112	0	112	-	19	14	-	0	145
R_{R5}	7. Marimba River	271	0	272	-	8	18	-	-	297
C_{L2}	8. Lake Chivero	22	1	23	-	32	21	-	-	76
R_{R6}	9. Muzururu River	-	1	1	-	112	25	-	-	139
R_{R7}	10. Gwebi River	1	3	4	-	224	63	-	-	292
C_{L3}	11. Lake Manyame	10	2	12	2	49	48	-	18	130
	Grand Total	1,277	12	1,289	2	661	320	-	19	2,291

*: After confluence of Mukuvisi River.

**: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

***: Pollution load of Water Treatment Works

Prince Edward WTW;	Amount of water intake;	24,300	m3/day	
	T-P concentration of intake water;	0.11	mg/l	(Seke Dam)
	Concentrated T-P load;	0	kg/day	(to Manyame river (downstream))
Morton Jaffray WTW;	Amount of water intake;	549,300	m3/day	(Lake Chivero)
	T-P concentration of intake water;	0.51	mg/l	(do)
	Amount of water intake;	64,700	m3/day	(Lake Manyame)
	T-P concentration of intake water;	0.35	mg/l	(do)
	Intake T-P load;	305	kg/day	
	from Lake Chivero;	283	kg/day	
	from Lake Manyame;	23	kg/day	
	Concentrated T-P load;	18	kg/day	(to Lake Manyame)

10.3 Pollution Load Run-off Model

Table 10.3.1 Concentrated Pollution Load by Sub-basin (Scenario 1, 2005, BOD, Dry Season)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	205	23										205
R_{R1}	2. Ruwa River	PL2	37	24	PL3	47	14	PL4	83	12	PL5	190	6	357
C_{L1}	3. Seke & Harava Dams	PL6	43	-										43
R_{R2}	4. Nyatsime River	PL8	200	28	PL9	370	8							571
R_{R4}	5. Mukuvisi River	PL12	61	18	PL13	4,364	5							4,425
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	3	24	PL10	46	18	PL11	2,630	12				2,679
R_{R5}	7. Marimba River	PL14	32	12	PL15	2,392	8							2,424
C_{L2}	8. Lake Chivero	PL16	255	-										255
R_{R6}	9. Muzururu River	PL18	178	17										178
R_{R7}	10. Gwebi River	PL19	5	83	PL20	387	41							392
C_{L3}	11. Lake Manyame	PL17***	109	-	PL21	71	-	PL22	789	-				969
													Grand Total	12,497

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.2 Concentrated Pollution Load by Sub-basin (Scenario 1, 2015, BOD, Dry Season)

(kg/day, km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	230	23										230
	R_{R1}	2. Ruwa River	PL2	54	24	PL3	61	14	PL4	92	12	PL5	1,524	6	1,730
C_{L1}		3. Seke & Harava Dams	PL6	46	-										46
	R_{R2}	4. Nyatsime River	PL8	216	28	PL9	700	8							916
	R_{R4}	5. Mukuvisi River	PL12	63	18	PL13	5,327	5							5,390
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	7	24	PL10	49	18	PL11	3,383	12				3,440
	R_{R5}	7. Marimba River	PL14	34	12	PL15	2,862	8							2,896
C_{L2}		8. Lake Chivero	PL16	257	-										257
	R_{R6}	9. Muzururu River	PL18	190	17										190
	R_{R7}	10. Gwebi River	PL19	9	83	PL20	415	41							424
C_{L3}		11. Lake Manyame	PL17***	212	-	PL21	328	-	PL22	805	-				1,345
														Grand Total	16,862

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.3 Concentrated Pollution Load by Sub-basin (Scenario 2, 2005, BOD, Dry Season)

(kg/day. km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	159	23										159
R_{R1}	2. Ruwa River	PL2	40	24	PL3	21	14	PL4	66	12	PL5	190	6	317
C_{L1}	3. Seke & Harava Dams	PL6	38	-										38
R_{R2}	4. Nyatsime River	PL8	172	28	PL9	915	8							1,087
R_{R4}	5. Mukuvisi River	PL12	57	18	PL13	3,723	5							3,781
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	3	24	PL10	39	18	PL11	2,263	12				2,305
R_{R5}	7. Marimba River	PL14	28	12	PL15	1,567	8							1,594
C_{L2}	8. Lake Chivero	PL16	235	-										235
R_{R6}	9. Muzururu River	PL18	156	17										156
R_{R7}	10. Gwebi River	PL19	5	83	PL20	335	41							340
C_{L3}	11. Lake Manyame	PL17***	110	-	PL21	57	-	PL22	759	-				926
													Grand Total	10,938

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.4 Concentrated Pollution Load by Sub-basin (Scenario 2, 2015, BOD, Dry Season)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	175	23										175
R_{R1}	2. Ruwa River	PL2	51	24	PL3	27	14	PL4	72	12	PL5	1,524	6	1,674
C_{L1}	3. Seke & Harava Dams	PL6	40	-										40
R_{R2}	4. Nyatsime River	PL8	182	28	PL9	1,663	8							1,845
R_{R4}	5. Mukuvisi River	PL12	59	18	PL13	5,285	5							5,344
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	6	24	PL10	41	18	PL11	2,274	12				2,322
R_{R5}	7. Marimba River	PL14	29	12	PL15	2,249	8							2,278
C_{L2}	8. Lake Chivero	PL16	225	-										225
R_{R6}	9. Muzururu River	PL18	163	17										163
R_{R7}	10. Gwebi River	PL19	7	83	PL20	352	41							359
C_{L3}	11. Lake Manyame	PL17***	187	-	PL21	295	-	PL22	769	-				1,250
													Grand Total	15,676

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.5 Concentrated Pollution Load by Sub-basin (Scenario 1, 2005, COD)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	7,147	23										7,147
R_{R1}	2. Ruwa River	PL2	112	24	PL3	189	14	PL4	3,049	12	PL5	761	6	4,111
C_{L1}	3. Seke & Harava Dams	PL6	1,920	-										1,920
R_{R2}	4. Nyatsime River	PL8	9,184	28	PL9	1,502	8							10,686
R_{R4}	5. Mukuvisi River	PL12	2,994	18	PL13	20,134	5							23,128
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	39	24	PL10	2,415	18	PL11	14,011	12				16,465
R_{R5}	7. Marimba River	PL14	2,727	12	PL15	10,150	8							12,877
C_{L2}	8. Lake Chivero	PL16	4,386	-										4,386
R_{R6}	9. Muzururu River	PL18	6,250	17										6,250
R_{R7}	10. Gwebi River	PL19	15	83	PL20	14,428	41							14,443
C_{L3}	11. Lake Manyame	PL17***	1,222	-	PL21	358	-	PL22	10,910	-				12,490
													Grand Total	113,903

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.6 Concentrated Pollution Load by Sub-basin (Scenario 1, 2015, COD)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	7,197	23										7,197
R_{R1}	2. Ruwa River	PL2	162	24	PL3	246	14	PL4	3,068	12	PL5	8,961	6	12,436
C_{L1}	3. Seke & Harava Dams	PL6	1,926	-										1,926
R_{R2}	4. Nyatsime River	PL8	9,221	28	PL9	2,990	8							12,211
R_{R4}	5. Mukuvisi River	PL12	2,998	18	PL13	24,380	5							27,379
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	63	24	PL10	2,422	18	PL11	17,026	12				19,511
R_{R5}	7. Marimba River	PL14	2,732	12	PL15	12,079	8							14,811
C_{L2}	8. Lake Chivero	PL16	4,377	-										4,377
R_{R6}	9. Muzururu River	PL18	6,274	17										6,274
R_{R7}	10. Gwebi River	PL19	26	83	PL20	14,516	41							14,541
C_{L3}	11. Lake Manyame	PL17***	1,632	-	PL21	1,902	-	PL22	10,954	-				14,488
													Grand Total	135,152

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.7 Concentrated Pollution Load by Sub-basin (Scenario 2, 2005, COD)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	7,056	23										7,056
R_{R1}	2. Ruwa River	PL2	119	24	PL3	111	14	PL4	3,014	12	PL5	761	6	4,005
C_{L1}	3. Seke & Harava Dams	PL6	1,909	-										1,909
R_{R2}	4. Nyatsime River	PL8	9,134	28	PL9	3,697	8							12,831
R_{R4}	5. Mukuvisi River	PL12	2,987	18	PL13	17,506	5							20,493
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	37	24	PL10	2,401	18	PL11	12,546	12				14,984
R_{R5}	7. Marimba River	PL14	2,719	12	PL15	6,763	8							9,482
C_{L2}	8. Lake Chivero	PL16	4,346	-										4,346
R_{R6}	9. Muzururu River	PL18	6,206	17										6,206
R_{R7}	10. Gwebi River	PL19	16	83	PL20	14,288	41							14,303
C_{L3}	11. Lake Manyame	PL17***	960	-	PL21	317	-	PL22	10,846	-				12,123
													Grand Total	107,738

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.8 Concentrated Pollution Load by Sub-basin (Scenario 2, 2015, COD)

(kg/day. km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	7,087	23										7,087
	R_{R1}	2. Ruwa River	PL2	154	24	PL3	145	14	PL4	3,026	12	PL5	8,961	6	12,286
C_{L1}		3. Seke & Harava Dams	PL6	1,913	-										1,913
	R_{R2}	4. Nyatsime River	PL8	9,162	28	PL9	6,973	8							16,135
	R_{R4}	5. Mukuvisi River	PL12	2,989	18	PL13	24,260	5							27,249
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	59	24	PL10	2,405	18	PL11	12,589	12				15,054
	R_{R5}	7. Marimba River	PL14	2,722	12	PL15	9,597	8							12,319
C_{L2}		8. Lake Chivero	PL16	4,293	-										4,293
	R_{R6}	9. Muzururu River	PL18	6,221	17										6,221
	R_{R7}	10. Gwebi River	PL19	20	83	PL20	14,347	41							14,367
C_{L3}		11. Lake Manyame	PL17***	1,483	-	PL21	1,802	-	PL22	10,868	-				14,152
														Grand Total	131,077

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.9 Concentrated Pollution Load by Sub-basin (Scenario 1, 2005, T-N)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	880	23										880
R_{R1}	2. Ruwa River	PL2	47	24	PL3	52	14	PL4	395	12	PL5	190	6	683
C_{L1}	3. Seke & Harava Dams	PL6	274	-										274
R_{R2}	4. Nyatsime River	PL8	1,235	28	PL9	347	8							1,582
R_{R4}	5. Mukuvisi River	PL12	283	18	PL13	2,879	5							3,163
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	1	24	PL10	292	18	PL11	676	12				969
R_{R5}	7. Marimba River	PL14	265	12	PL15	2,079	8							2,343
C_{L2}	8. Lake Chivero	PL16	668	-										668
R_{R6}	9. Muzururu River	PL18	1,025	17										1,025
R_{R7}	10. Gwebi River	PL19	7	83	PL20	2,229	41							2,236
C_{L3}	11. Lake Manyame	PL17***	27	-	PL21	52	-	PL22	934	-				1,014
													Grand Total	14,837

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.10 Concentrated Pollution Load by Sub-basin (Scenario 1, 2015, T-N)

(kg/day, km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	886	23										886
	R_{R1}	2. Ruwa River	PL2	67	24	PL3	67	14	PL4	397	12	PL5	406	6	937
C_{L1}		3. Seke & Harava Dams	PL6	275	-										275
	R_{R2}	4. Nyatsime River	PL8	1,240	28	PL9	485	8							1,725
	R_{R4}	5. Mukuvisi River	PL12	284	18	PL13	3,621	5							3,905
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	2	24	PL10	293	18	PL11	1,430	12				1,724
	R_{R5}	7. Marimba River	PL14	265	12	PL15	2,524	8							2,790
C_{L2}		8. Lake Chivero	PL16	670	-										670
	R_{R6}	9. Muzururu River	PL18	1,028	17										1,028
	R_{R7}	10. Gwebi River	PL19	11	83	PL20	2,245	41							2,256
C_{L3}		11. Lake Manyame	PL17***	35	-	PL21	129	-	PL22	942	-				1,106
														Grand Total	17,302

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.11 Concentrated Pollution Load by Sub-basin (Scenario 2, 2005, T-N)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	868	23										868
R_{R1}	2. Ruwa River	PL2	50	24	PL3	19	14	PL4	390	12	PL5	190	6	648
C_{L1}	3. Seke & Harava Dams	PL6	273	-										273
R_{R2}	4. Nyatsime River	PL8	1,230	28	PL9	877	8							2,106
R_{R4}	5. Mukuvisi River	PL12	282	18	PL13	2,274	5							2,556
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	1	24	PL10	290	18	PL11	309	12				600
R_{R5}	7. Marimba River	PL14	264	12	PL15	1,288	8							1,552
C_{L2}	8. Lake Chivero	PL16	642	-										642
R_{R6}	9. Muzururu River	PL18	1,020	17										1,020
R_{R7}	10. Gwebi River	PL19	7	83	PL20	2,206	41							2,213
C_{L3}	11. Lake Manyame	PL17***	21	-	PL21	28	-	PL22	926	-				975
													Grand Total	13,453

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.12 Concentrated Pollution Load by Sub-basin (Scenario 2, 2015, T-N)

(kg/day, km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	872	23										872
	R_{R1}	2. Ruwa River	PL2	64	24	PL3	25	14	PL4	391	12	PL5	406	6	886
C_{L1}		3. Seke & Harava Dams	PL6	273	-										273
	R_{R2}	4. Nyatsime River	PL8	1,235	28	PL9	1,305	8							2,540
	R_{R4}	5. Mukuvisi River	PL12	283	18	PL13	3,559	5							3,842
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	1	24	PL10	291	18	PL11	319	12				612
	R_{R5}	7. Marimba River	PL14	264	12	PL15	1,923	8							2,187
C_{L2}		8. Lake Chivero	PL16	645	-										645
	R_{R6}	9. Muzururu River	PL18	1,021	17										1,021
	R_{R7}	10. Gwebi River	PL19	9	83	PL20	2,217	41							2,226
C_{L3}		11. Lake Manyame	PL17***	26	-	PL21	70	-	PL22	929	-				1,025
														Grand Total	16,130

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.13 Concentrated Pollution Load by Sub-basin (Scenario 1, 2005, T-P)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	101	23										101
R_{R1}	2. Ruwa River	PL2	7	24	PL3	8	14	PL4	47	12	PL5	26	6	88
C_{L1}	3. Seke & Harava Dams	PL6	34	-										34
R_{R2}	4. Nyatsime River	PL8	146	28	PL9	49	8							195
R_{R4}	5. Mukuvisi River	PL12	28	18	PL13	444	5							472
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	0	24	PL10	33	18	PL11	160	12				193
R_{R5}	7. Marimba River	PL14	26	12	PL15	292	8							318
C_{L2}	8. Lake Chivero	PL16	79	-										79
R_{R6}	9. Muzururu River	PL18	139	17										139
R_{R7}	10. Gwebi River	PL19	1	83	PL20	291	41							292
C_{L3}	11. Lake Manyame	PL17***	14	-	PL21	6	-	PL22	101	-				121
													Grand Total	2,031

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.14 Concentrated Pollution Load by Sub-basin (Scenario 1, 2015, T-P)

(kg/day, km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	100	23										100
	R_{R1}	2. Ruwa River	PL2	10	24	PL3	11	14	PL4	47	12	PL5	100	6	168
C_{L1}		3. Seke & Harava Dams	PL6	34	-										34
	R_{R2}	4. Nyatsime River	PL8	145	28	PL9	79	8							225
	R_{R4}	5. Mukuvisi River	PL12	28	18	PL13	553	5							581
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	0	24	PL10	33	18	PL11	263	12				296
	R_{R5}	7. Marimba River	PL14	26	12	PL15	353	8							379
C_{L2}		8. Lake Chivero	PL16	78	-										78
	R_{R6}	9. Muzururu River	PL18	139	17										139
	R_{R7}	10. Gwebi River	PL19	2	83	PL20	290	41							292
C_{L3}		11. Lake Manyame	PL17***	20	-	PL21	17	-	PL22	101	-				138
														Grand Total	2,429

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.15 Concentrated Pollution Load by Sub-basin (Scenario 2, 2005, T-P)

(kg/day, km)

Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}	1. Manyame R. (Upstream)	PL1	100	23										100
R_{R1}	2. Ruwa River	PL2	8	24	PL3	3	14	PL4	47	12	PL5	26	6	83
C_{L1}	3. Seke & Harava Dams	PL6	33	-										33
R_{R2}	4. Nyatsime River	PL8	145	28	PL9	122	8							267
R_{R4}	5. Mukuvisi River	PL12	27	18	PL13	361	5							388
C_{R2} R_{R3}*	6. Manyame R. (Downstream)	PL7**	0	24	PL10	33	18	PL11	110	12				143
R_{R5}	7. Marimba River	PL14	26	12	PL15	183	8							209
C_{L2}	8. Lake Chivero	PL16	76	-										76
R_{R6}	9. Muzururu River	PL18	139	17										139
R_{R7}	10. Gwebi River	PL19	1	83	PL20	290	41							291
C_{L3}	11. Lake Manyame	PL17***	10	-	PL21	4	-	PL22	100	-				114
													Grand Total	1,843

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

Table 10.3.16 Concentrated Pollution Load by Sub-basin (Scenario 2, 2015, T-P)

(kg/day, km)

Water Quality Checking Points		Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
C_{R1}		1. Manyame R. (Upstream)	PL1	100	23										100
	R_{R1}	2. Ruwa River	PL2	10	24	PL3	4	14	PL4	47	12	PL5	100	6	161
C_{L1}		3. Seke & Harava Dams	PL6	34	-										34
	R_{R2}	4. Nyatsime River	PL8	145	28	PL9	200	8							346
	R_{R4}	5. Mukuvisi River	PL12	28	18	PL13	546	5							573
C_{R2}	R_{R3}*	6. Manyame R. (Downstream)	PL7**	0	24	PL10	33	18	PL11	112	12				145
	R_{R5}	7. Marimba River	PL14	26	12	PL15	271	8							297
C_{L2}		8. Lake Chivero	PL16	76	-										76
	R_{R6}	9. Muzururu River	PL18	139	17										139
	R_{R7}	10. Gwebi River	PL19	1	83	PL20	290	41							292
C_{L3}		11. Lake Manyame	PL17***	18	-	PL21	10	-	PL22	101	-				130
														Grand Total	2,291

*: Before confluence of Mukuvisi River.

**: Pollution load from Prince Edward WTW

***: Pollution load from Morton Jaffray WTW

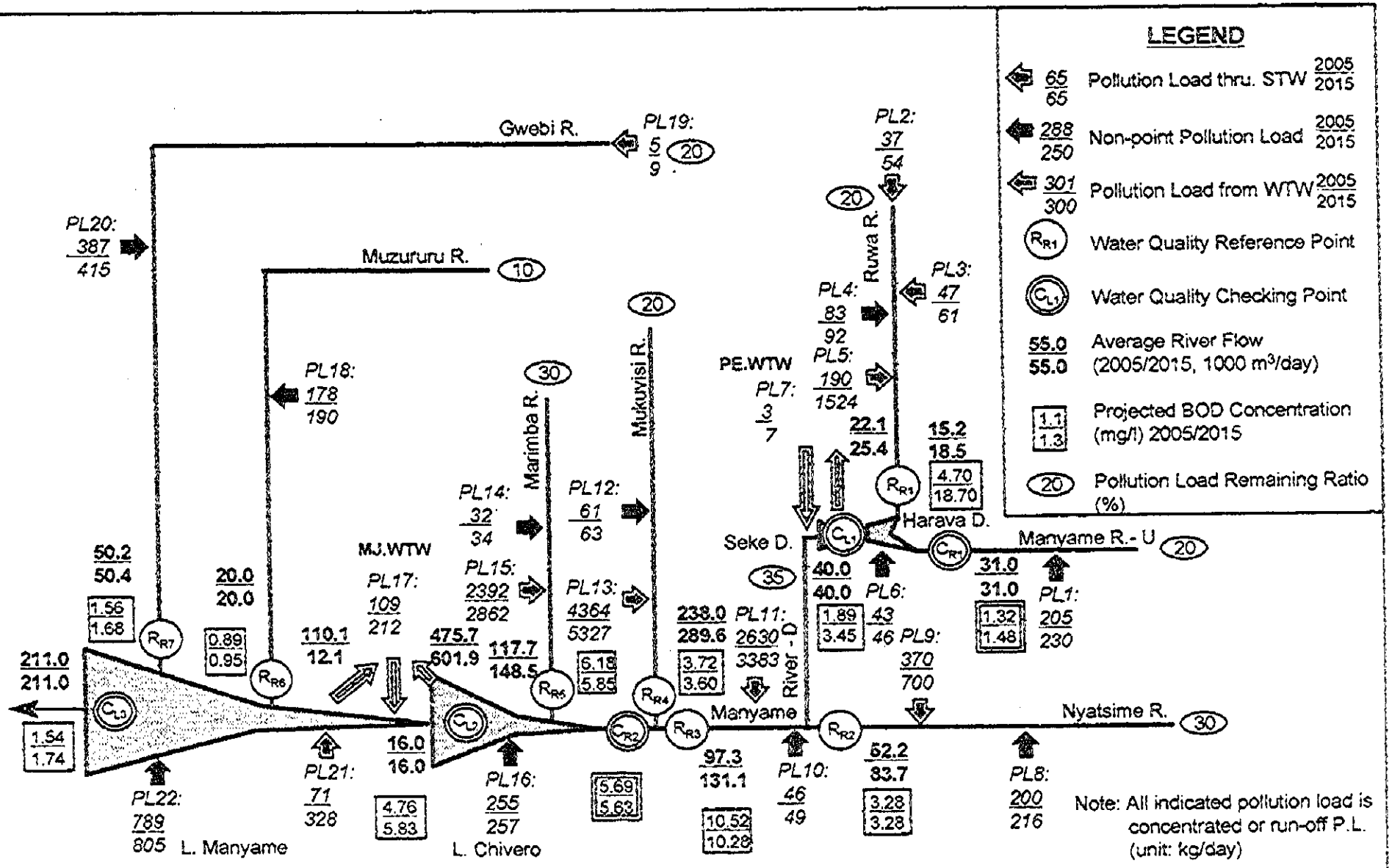

Figure 10.3.1 Pollution Load Run-off Model for Future Water Pollution Analysis (BOD, Scenario 1, Dry Season)

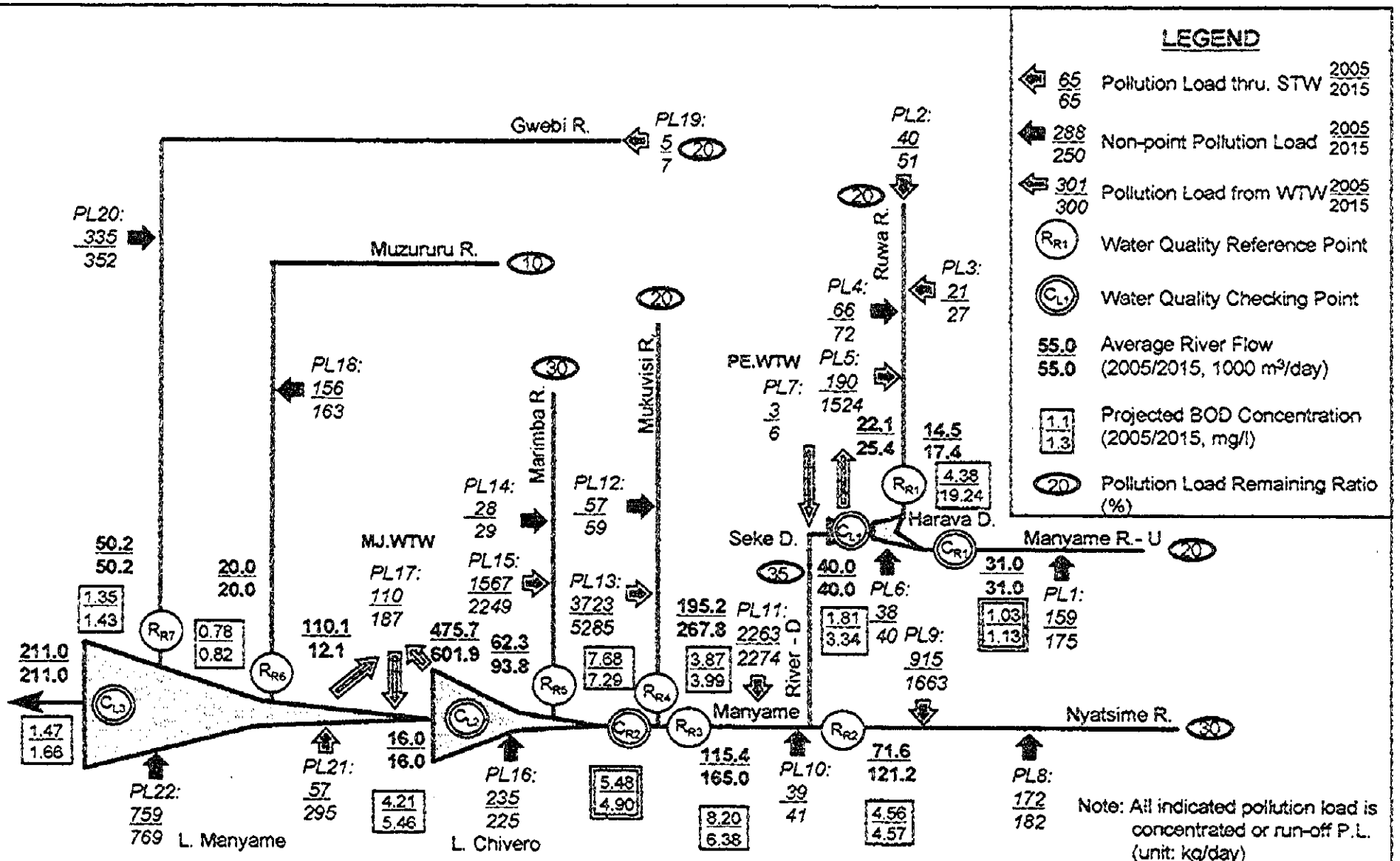

Figure 10.3.2 Pollution Load Run-off Model for Future Water Pollution Analysis (BOD, Scenario 2, Dry Season)

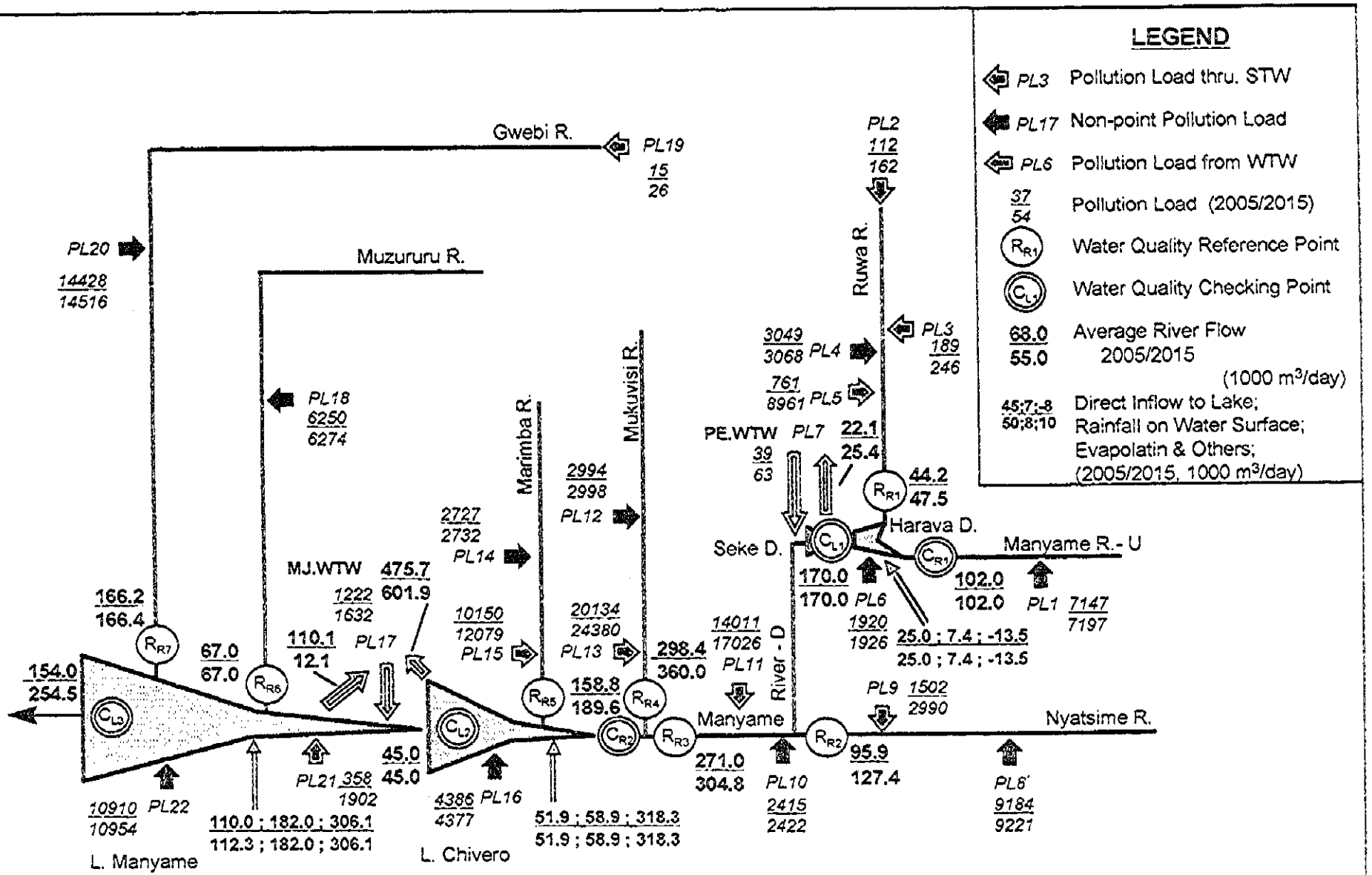

Figure 10.3.3 Pollution Load Run-off Model for Future Water Pollution Analysis (COD, Scenario 1)

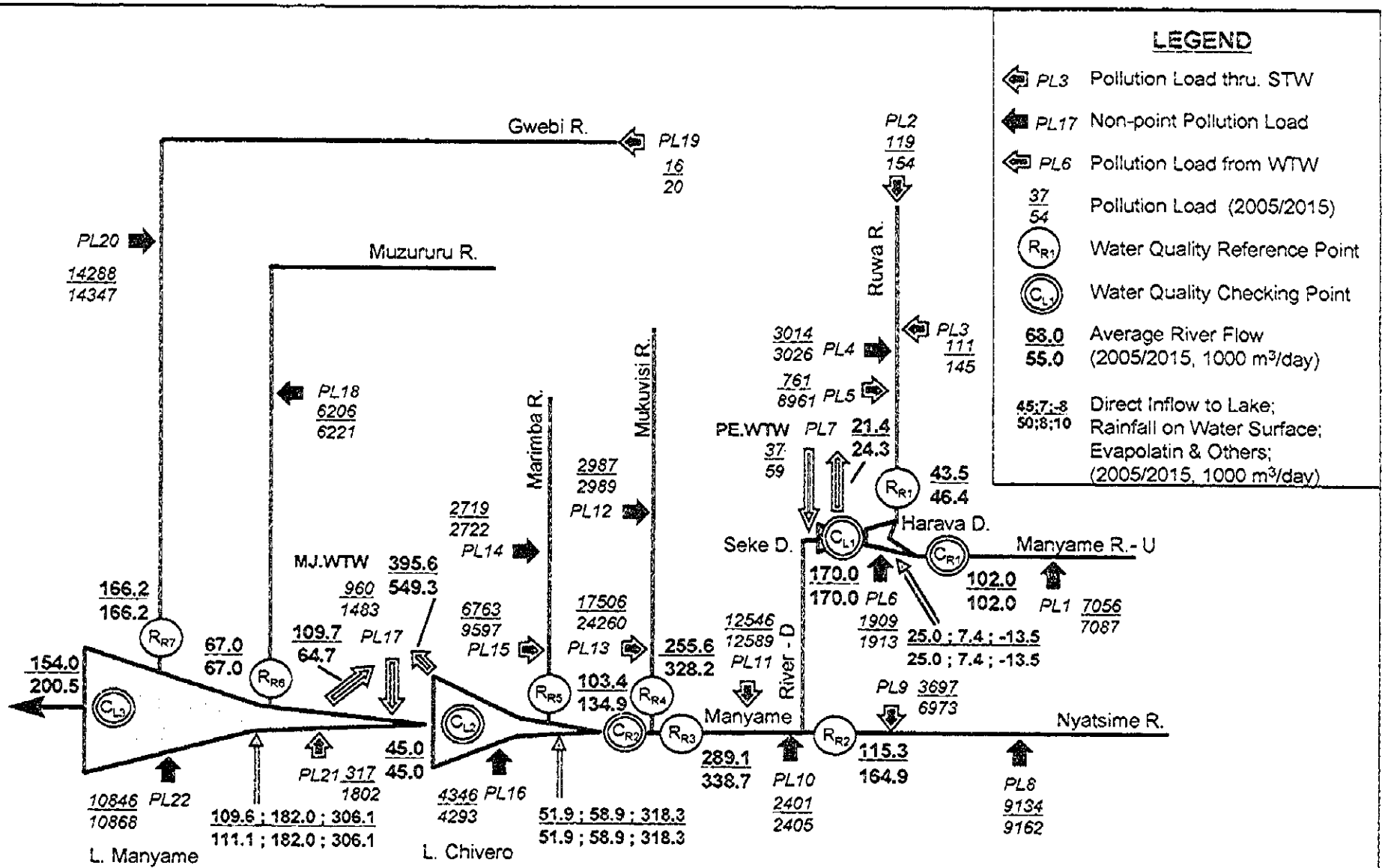

Figure 10.3.4 Pollution Load Run-off Model for Future Water Pollution Analysis (COD, Scenario 2)

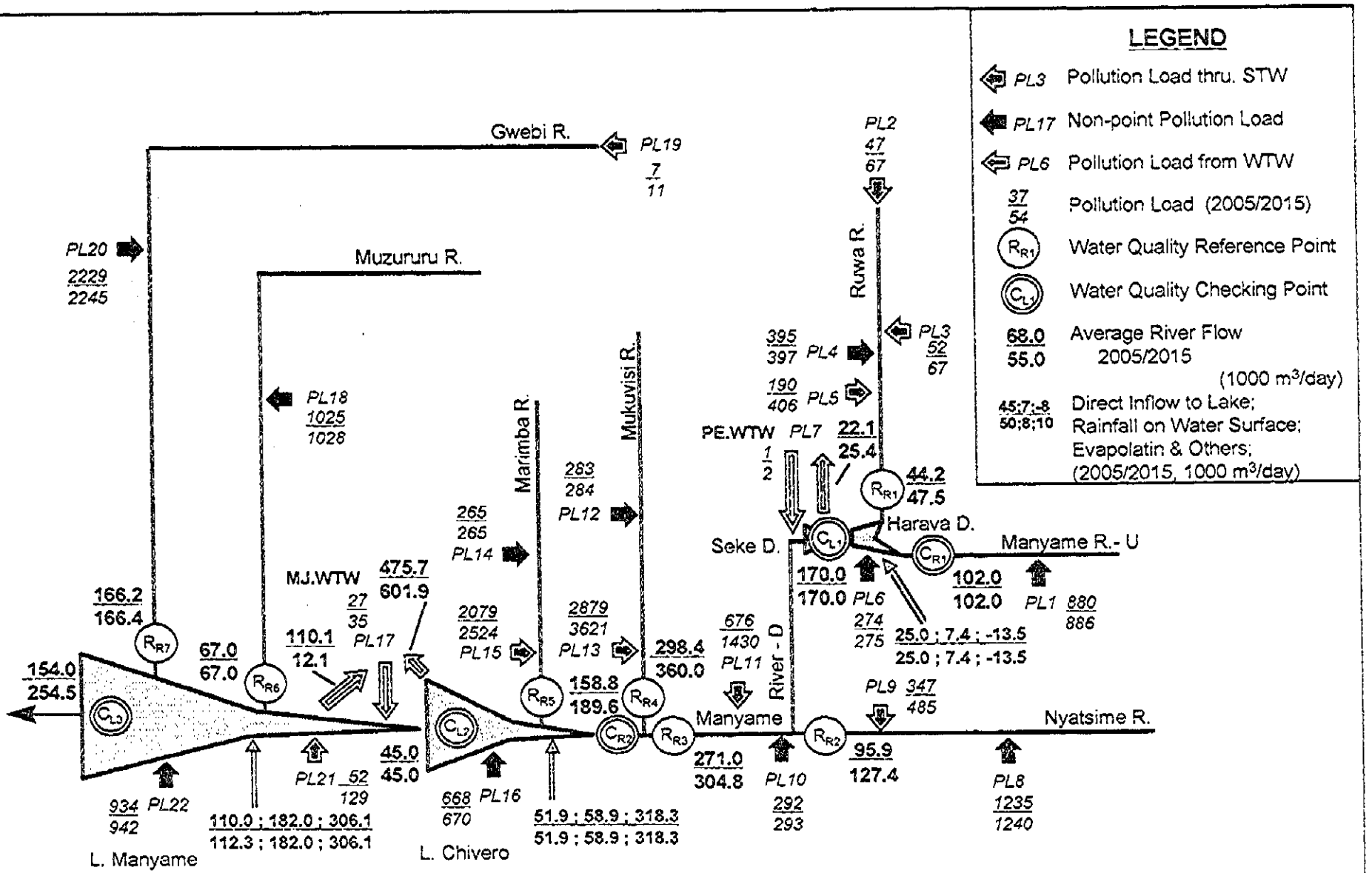

Figure 10.3.5 Pollution Load Run-off Model for Future Water Pollution Analysis (T-N, Scenario 1)

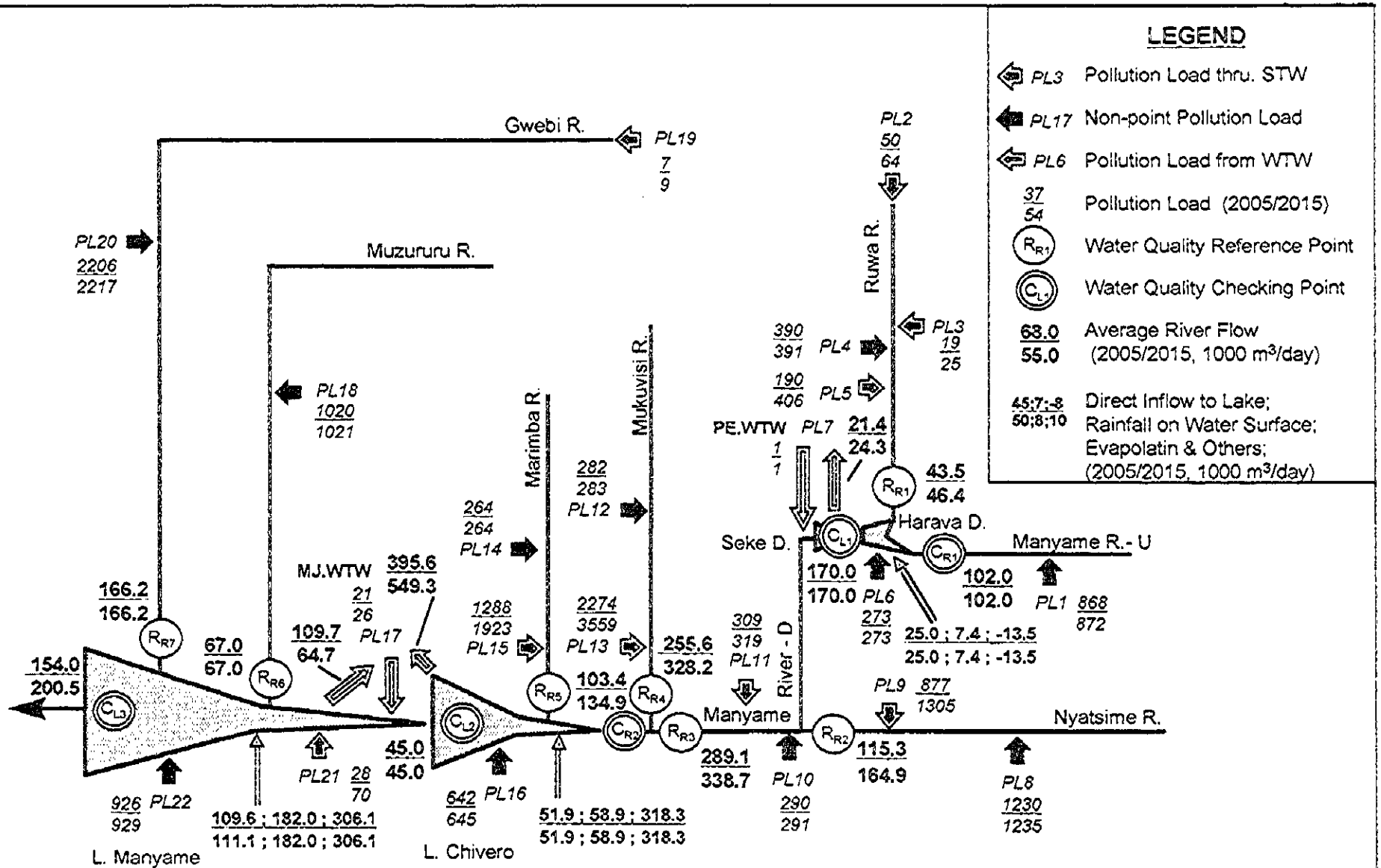

Figure 10.3.6 Pollution Load Run-off Model for Future Water Pollution Analysis (T-N, Scenario 2)

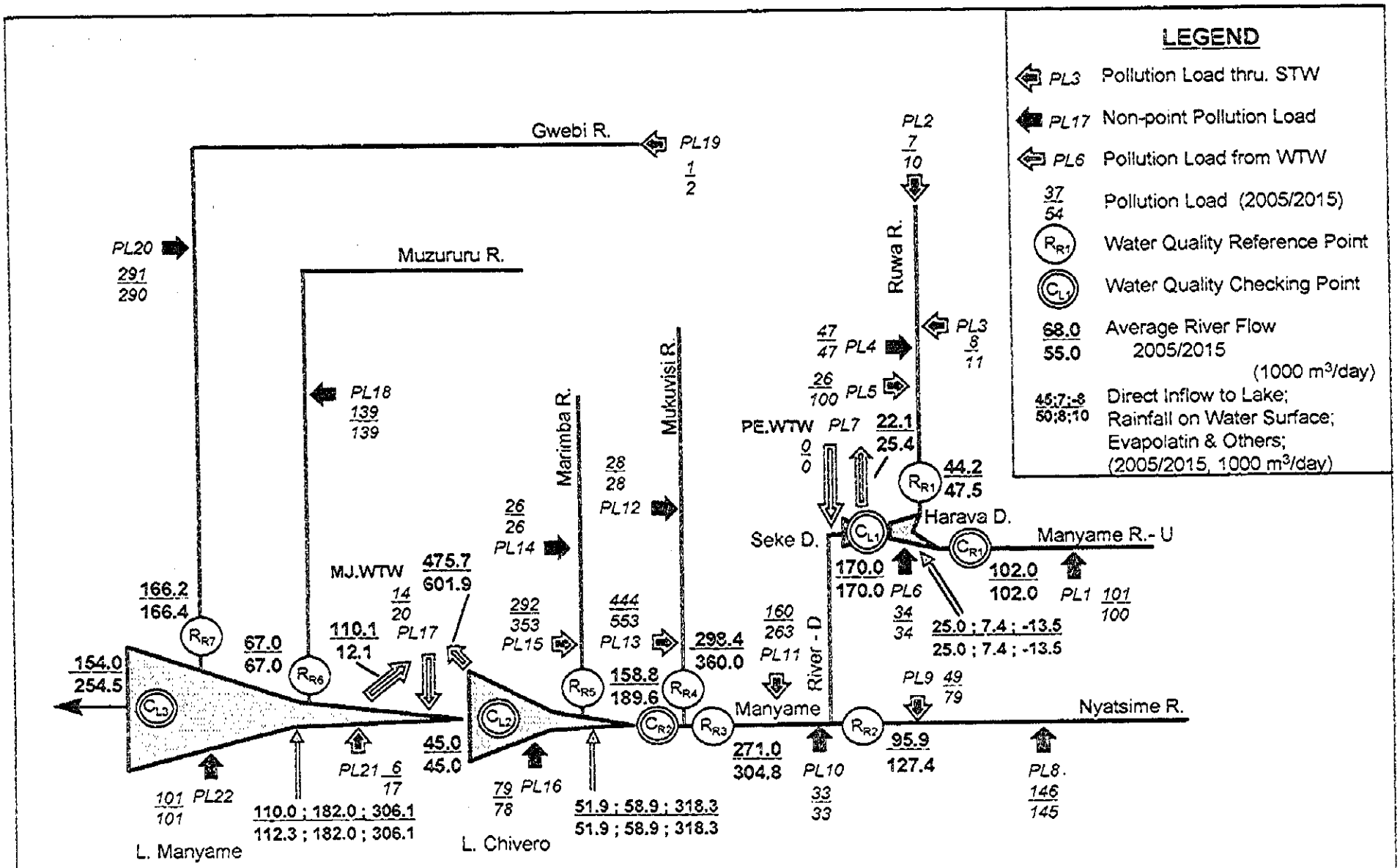

Figure 10.3.7 Pollution Load Run-off Model for Future Water Pollution Analysis (T-P, Scenario 1)

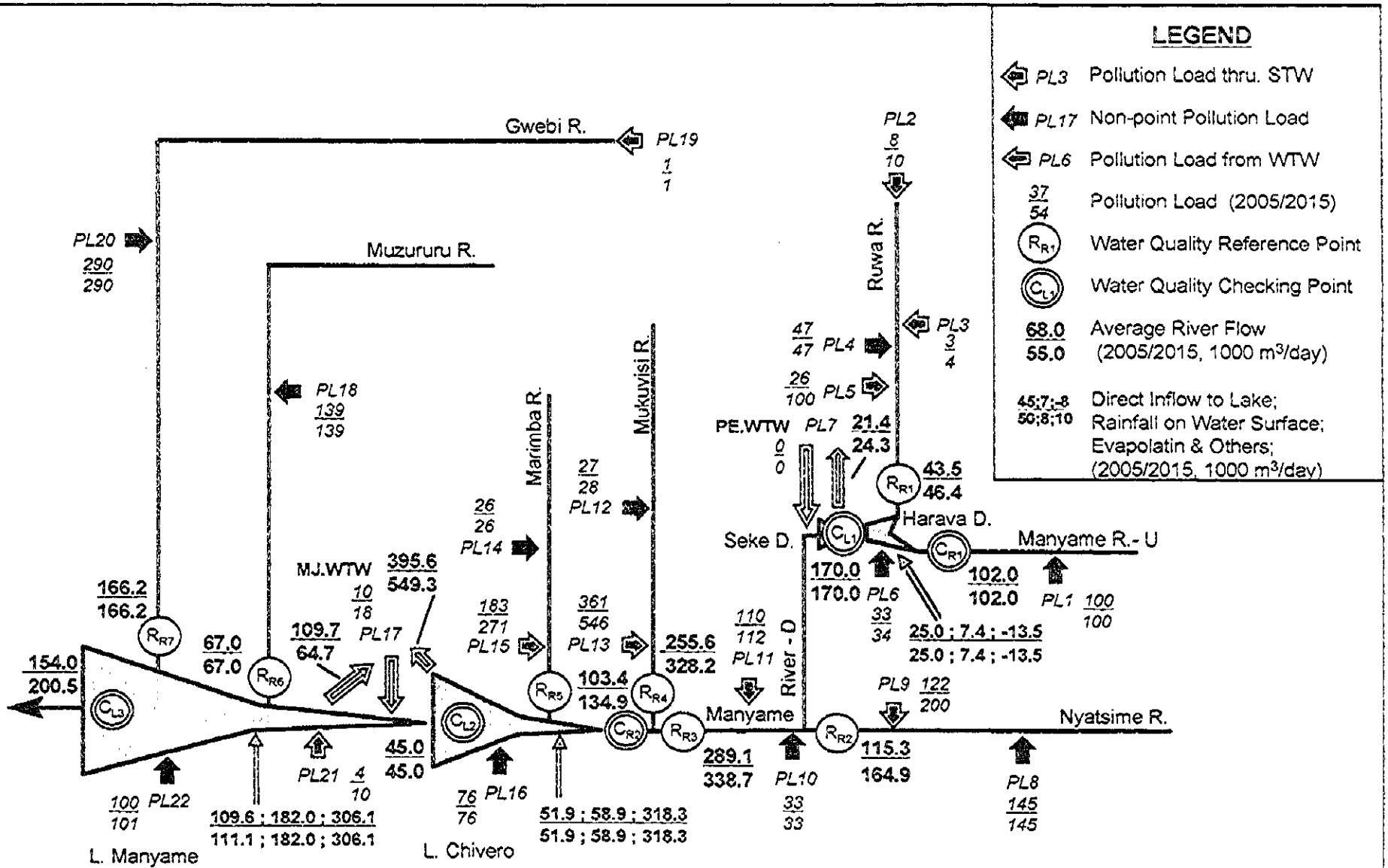

Figure 10.3.8 Pollution Load Run-off Model for Future Water Pollution Analysis (T-P, Scenario 2)

10.4 Future Water Pollution Analysis

Table 10.4.1 Projected Water Quality of Rivers (Scenario 1, 2005, BOD, Dry Season)

Water Quality Checking Points	Sub-basin	Run-off BOD Load at Upstream (kg/day)	Concentrated BOD Load in Sub-basin (kg/day)	Total BOD Load (kg/day)	Pollution Load Remaining Ratio (%)	Flow Rate at Downstream (m3/day)	Run-off BOD Load at Downstream (kg/day)	BOD Concentration at WQCP (mg/l)
C_{R1}	1. Manyame R. (Upstream)	0	205	205	20%	31,000	41	1.32
R_{R1}	2. Ruwa River	0	357	357	20%	15,200	71	4.70
C_{L1}	3. Seke & Harava Dams	112	43	156	49%	40,000	76	1.89
R_{R2}	4. Nyatsime River	0	571	571	30%	52,200	171	3.28
R_{R3}	5. Manyame R. (Downstream)	247	2,679	2,925	35%	97,300	1,024	10.52
R_{R4}	6. Mukuvisi River	0	4,425	4,425	20%	238,000	885	3.72
C_{R2}*	7. Manyame R. (Downstream)	1,909	-	1,909	100%	335,300	1,909	5.69
R_{R5}	8. Marimba River	0	2,424	2,424	30%	117,700	727	6.18
C_{L2}	9. Lake Chivero	2,636	255	2,891	3%	16,000	76	4.76
R_{R6}	10. Muzururu River	0	178	178	10%	20,000	18	0.89
R_{R7}	11. Gwebi River	0	392	392	20%	50,200	78	1.56
C_{L3}	12. Lake Manyame	172	969	1,141	28%	211,000	325	1.54

Note: 1. C_{R2}*; After confluence of Mukuvisi River.

2. Run-off BOD load at upstream for the Manyame River (downstream) is the pollution load from Prince Edward STW.

3. Total BOD Load of Manyame River (downstream) includes Run-off Load from Nyatsime River.

Table 10.4.2 Projected Water Quality of Rivers (Scenario 1, 2015, BOD, Dry Season)

Water Quality Checking Points	Sub-basin	Run-off BOD Load at Upstream (kg/day)	Concentrated BOD Load in Sub-basin (kg/day)	Total BOD Load (kg/day)	Pollution Load Remaining Ratio (%)	Flow Rate at Downstream (m3/day)	Run-off BOD Load at Downstream (kg/day)	BOD Concentration at WQCP (mg/l)
C_{R1}	1. Manyame R. (Upstream)	0	230	230	20%	31,000	46	1.48
R_{R1}	2. Ruwa River	0	1,730	1,730	20%	18,500	346	18.70
C_{L1}	3. Seke & Harava Dams	392	46	438	31%	40,000	138	3.45
R_{R2}	4. Nyatsime River	0	916	916	30%	83,700	275	3.28
R_{R3}	5. Manyame R. (Downstream)	413	3,440	3,852	35%	131,100	1,348	10.28
R_{R4}	6. Mukuvisi River	0	5,390	5,390	20%	299,600	1,078	3.60
C_{R2}*	7. Manyame R. (Downstream)	2,426	-	2,426	100%	430,700	2,426	5.63
R_{R5}	8. Marimba River	0	2,896	2,896	30%	148,500	869	5.85
C_{L2}	9. Lake Chivero	3,295	257	3,552	3%	16,000	93	5.83
R_{R6}	10. Muzururu River	0	190	190	10%	20,000	19	0.95
R_{R7}	11. Gwebi River	0	424	424	20%	50,400	85	1.68
C_{L3}	12. Lake Manyame	197	1,345	1,542	29%	254,500	442	1.74

Note: 1. C_{R2}*; After confluence of Mukuvisi River.

2. Run-off BOD load at upstream for the Manyame River (downstream) is the pollution load from Prince Edward STW.

3. Total BOD Load of Manyame River (downstream) includes Run-off Load from Nyatsime River.

Table 10.4.3 Projected Water Quality of Rivers (Scenario 2, 2005, BOD, Dry Season)

Water Quality Checking Points	Sub-basin	Run-off BOD Load at Upstream (kg/day)	Concentrated BOD Load in Sub-basin (kg/day)	Total BOD Load (kg/day)	Pollution Load Remaining Ratio (%)	Flow Rate at Downstream (m3/day)	Run-off BOD Load at Downstream (kg/day)	BOD Concentration at WQCP (mg/l)
C_{R1}	1. Manyame R. (Upstream)	0	159	159	20%	31,000	32	1.03
R_{R1}	2. Ruwa River	0	317	317	20%	14,500	63	4.38
C_{L1}	3. Seke & Harava Dams	95	38	133	54%	40,000	72	1.81
R_{R2}	4. Nyatsime River	0	1,087	1,087	30%	71,600	326	4.56
R_{R3}	5. Manyame R. (Downstream)	399	2,305	2,704	35%	115,400	946	8.20
R_{R4}	6. Mukuvisi River	0	3,781	3,781	20%	195,200	756	3.87
C_{R2}*	7. Manyame R. (Downstream)	1,703	-	1,703	100%	310,600	1,703	5.48
R_{R5}	8. Marimba River	0	1,594	1,594	30%	62,300	478	7.68
C_{L2}	9. Lake Chivero	2,181	235	2,416	3%	16,000	67	4.21
R_{R6}	10. Muzururu River	0	156	156	10%	20,000	16	0.78
R_{R7}	11. Gwebi River	0	340	340	20%	50,200	68	1.35
C_{L3}	12. Lake Manyame	151	926	1,076	29%	211,000	311	1.47

Note: 1. C_{R2}*; After confluence of Mukuvisi River.

2. Run-off BOD load at upstream for the Manyame River (downstream) is the pollution load from Prince Edward STW.

3. Total BOD Load of Manyame River (downstream) includes Run-off Load from Nyatsime River.

Table 10.4.4 Projected Water Quality of Rivers (Scenario 2, 2015, BOD, Dry Season)

Water Quality Checking Points	Sub-basin	Run-off BOD Load at Upstream (kg/day)	Concentrated BOD Load in Sub-basin (kg/day)	Total BOD Load (kg/day)	Pollution Load Remaining Ratio (%)	Flow Rate at Downstream (m3/day)	Run-off BOD Load at Downstream (kg/day)	BOD Concentration at WQCP (mg/l)
C_{R1}	1. Manyame R. (Upstream)	0	175	175	20%	31,000	35	1.13
R_{R1}	2. Ruwa River	0	1,674	1,674	20%	17,400	335	19.24
C_{L1}	3. Seke & Harava Dams	370	40	409	33%	40,000	134	3.34
R_{R2}	4. Nyatsime River	0	1,845	1,845	30%	121,200	553	4.57
R_{R3}	5. Manyame R. (Downstream)	687	2,322	3,009	35%	165,000	1,053	6.38
R_{R4}	6. Mukuvisi River	0	5,344	5,344	20%	267,800	1,069	3.99
C_{R2}^{*}	7. Manyame R. (Downstream)	2,122	-	2,122	100%	432,800	2,122	4.90
R_{R5}	8. Marimba River	0	2,278	2,278	30%	93,800	683	7.29
C_{L2}	9. Lake Chivero	2,805	225	3,031	3%	16,000	87	5.46
R_{R6}	10. Muzururu River	0	163	163	10%	20,000	16	0.82
R_{R7}	11. Gwebi River	0	359	359	20%	50,200	72	1.43
C_{L3}	12. Lake Manyame	176	1,250	1,426	25%	211,000	351	1.66

Note: 1. C_{R2}^{*}; After confluence of Mukuvisi River.

2. Run-off BOD load at upstream for the Manyame River (downstream) is the pollution load from Prince Edward STW.

3. Total BOD Load of Manyame River (downstream) includes Run-off Load from Nyatsime River.

Table 10.4.5 Water Quality Projection for Lakes (Scenario 1, 2005, Seke & Harava Dams)

Volume of Dams:		12,406,000		m3
Inflow Water Volume:		192,100		m3/day
Rivers;	Manyame;		102,000	m3/day
	Ruwa;		44,200	m3/day
Direct Inflow;			25,000	m3/day
Rainfall;			7,400	m3/day
Evaporation & Others;			13,500	m3/day
Outflow Water Volume:		192,100		m3/day
to Manyame River;			170,000	m3/day
56.0000			22,100	m3/day
Detention Time of Dam Lake:		64.6		days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Manyame	880	101	7,147
Ruwa	683	88	4,111
Direct	274	34	1,920
Total	1,837	223	13,178

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	1,837,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	223,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	13,178,000
rw:	Rate of change of water (1/day)	=	0.015484
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.18797*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.20574*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.07551*
V:	Volume of lake (m3)	=	12,406,000
DCOD:	Secondary produced COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.8246*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.73**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.08**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**22.31**	(mg/l) =	**1.89**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**10.64**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.6 Water Quality Projection for Lakes (Scenario 1, 2005, Lake Chivero)

Volume of Dams:		257,181,000		m3
Inflow Water Volume:		520,700		m3/day
Rivers;	Manyame;		271,000	m3/day
	Mukuvisi;		298,400	m3/day
	Marimba;		158,800	m3/day
Direct Inflow;			51,900	m3/day
Rainfall;			58,900	m3/day
Evaporation & Others;			(318,300)	m3/day
Outflow Water Volume:		520,700		m3/day
to Lake Manyame;			45,000	m3/day
Morton Jaffray WTW;			475,700	m3/day

Detention Time of Lake: 494 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD	
Manyame	2,675	402	30,944	Seke + Nyatsime + Manyame
Mukuvisi	3,163	472	23,128	
Marimba	2,343	318	12,877	
Direct;	668	79	4,386	
Total	8,849	1,270	71,335	

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	8,849,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	1,270,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	71,335,000
rw:	Rate of change of water (1/day)	=	0.002025
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.04270*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.00868*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00908*
V:	Volume of lake (m3)	=	257,181,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*1.0024*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.77**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.46**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**38.65**	(mg/l) =	**4.76**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**13.67**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.7 Water Quality Projection for Lakes (Scenario 1, 2005, Lake Manyame)

Volume of Lake:		480,236,000		m3
Inflow Water Volume:		264,100		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
	Muzururu		67,000	m3/day
	Gwebi		166,200	m3/day
Direct Inflow;			110,000	m3/day
Rainfall;			182,000	m3/day
Evaporation & Others;			(306,100)	m3/day
Outflow Water Volume:		264,100		m3/day
to Manyame River;			154,000	m3/day
Morton Jaffray WTW;			110,100	m3/day

Detention Time of Lake: 1,818 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Lake Chivero	35	21	1,739
Muzururu	1,025	139	6,250
Gwebi	2,236	292	14,443
Direct;	1,014	121	12,490
Total	4,275	573	34,922

Formula for Pollution Analysis: (Vollenweider Model)

N = L(N) / ((rw+sN) x V)

P = L(P) / ((rw+sP) x V)

COD = L(COD) / ((rw+sCOD) x V) + DCOD

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	4,275,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	573,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	34,922,000
rw:	Rate of change of water (1/day)	=	0.000550
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.01151*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.02769*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00440*
V:	Volume of lake (m3)	=	480,236,000
DCOD:	Secondary production COD		

DCOD = a(N) x T-N x 17.73

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.4287*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	L(N) / ((rw+sN) x V) =	**0.74**	(mg/l)		
T-P =	L(P) / ((rw+sP) x V) =	**0.04**	(mg/l)		
COD =	L(COD) / ((rw+sCOD) x V) + DCOD =	**20.30**	(mg/l) =	**1.54**	equiv. BOD *(mg/l)
DCOD = a(N) x T-N x 17.73 =		**5.61**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.8 Water Quality Projection for Lakes (Scenario 1, 2015, Seke & Harava Dams)

Volume of Dams:		12,406,000		m3
Inflow Water Volume:		195,400		m3/day
Rivers;	Manyame;		102,000	m3/day
	Ruwa;		47,500	m3/day
Direct Inflow;			25,000	m3/day
Rainfall;			7,400	m3/day
Evaporation & Others;			13,500	m3/day
Outflow Water Volume:		195,400		m3/day
to Manyame River;			170,000	m3/day
Prince Edward WTW;			25,400	m3/day
Detention Time of Dam Lake:		63.5		days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Manyame	886	100	7,197
Ruwa	937	168	12,436
Direct	275	34	1,926
Total	2,098	301	21,559

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	2,098,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	301,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	21,559,000
rw:	Rate of change of water (1/day)	=	0.015750
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.18797*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.20574*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.07551*
V:	Volume of lake (m3)	=	12,406,000
DCOD:	Secondary produced COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.8246*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.83**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.11**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**31.18**	(mg/l) =	**3.45**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**12.14**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.9 Water Quality Projection for Lakes (Scenario 1, 2015, Lake Chivero)

Volume of Dams:		257,181,000		m3
Inflow Water Volume:		646,900		m3/day
Rivers;	Manyame;		304,800	m3/day
	Mukuvisi;		360,000	m3/day
	Marimba;		189,600	m3/day
Direct Inflow;			51,900	m3/day
Rainfall;			58,900	m3/day
Evaporation & Others;			(318,300)	m3/day
Outflow Water Volume:		646,900		m3/day
to Lake Manyame;			45,000	m3/day
Morton Jaffray WTW;			601,900	m3/day

Detention Time of Lake: 398 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD	
Manyame	3,591	540	37,022	Seke + Nyatsime + Manyame
Mukuvisi	3,905	581	27,379	
Marimba	2,790	379	14,811	
Direct;	670	78	4,377	
Total	10,955	1,578	83,589	

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	10,955,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	1,578,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	83,589,000
rw:	Rate of change of water (1/day)	=	0.002515
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.04270*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.00868*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00908*
V:	Volume of lake (m3)	=	257,181,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*1.0024*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.94**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.55**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**44.77**	(mg/l) =	**5.83**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**16.74**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.10 Water Quality Projection for Lakes (Scenario 1, 2015, Lake Manyame)

Volume of Lake:		480,236,000		m3
Inflow Water Volume:		266,600		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
	Muzururu		67,000	m3/day
	Gwebi		166,400	m3/day
Direct Inflow;			112,300	m3/day
Rainfall;			182,000	m3/day
Evaporation & Others;			(306,100)	m3/day
Outflow Water Volume:		266,600		m3/day
to Manyame River;			254,500	m3/day
Morton Jaffray WTW;			12,100	m3/day
Detention Time of Lake:		1,801		days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Lake Chivero	42	25	2,015
Muzururu	1,028	139	6,274
Gwebi	2,256	292	14,541
Direct;	1,106	138	14,488
Total	4,390	593	37,319

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	4,390,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	593,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	37,319,000
rw:	Rate of change of water (1/day)	=	0.000555
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.01151*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.02769*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00440*
V:	Volume of lake (m3)	=	480,236,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.4287*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.76**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.04**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**21.44**	(mg/l) =	**1.74**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**5.76**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.11 Water Quality Projection for Lakes (Scenario 2, 2005, Seke & Harava Dams)

Volume of Dams:		12,406,000		m3
Inflow Water Volume:		191,400		m3/day
Rivers;	Manyame;		102,000	m3/day
	Ruwa;		43,500	m3/day
Direct Inflow;			25,000	m3/day
Rainfall;			7,400	m3/day
Evaporation & Others;			13,500	m3/day
Outflow Water Volume:		191,400		m3/day
to Manyame River;			170,000	m3/day
Prince Edward WTW;			21,400	m3/day

Detention Time of Dam Lake: 64.8 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Manyame	868	100	7,056
Ruwa	648	83	4,005
Direct	273	33	1,909
Total	1,789	216	12,970

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	1,789,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	216,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	12,970,000
rw:	Rate of change of water (1/day)	=	0.015428
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.18797*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.20574*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.07551*
V:	Volume of lake (m3)	=	12,406,000
DCOD:	Secondary produced COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.8246*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	L(N) / ((rw+sN) x V) =	**0.71**	(mg/l)		
T-P =	L(P) / ((rw+sP) x V) =	**0.08**	(mg/l)		
COD =	L(COD) / ((rw+sCOD) x V) + DCOD =	**21.86**	(mg/l) =	**1.81**	equiv. BOD *(mg/l)
DCOD = a(N) x T-N x 17.73 =		**10.37**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.12 Water Quality Projection for Lakes (Scenario 2, 2005, Lake Chivero)

Volume of Dams:		257,181,000		m3
Inflow Water Volume:		440,600		m3/day
Rivers;	Manyame;		289,100	m3/day
	Mukuvisi;		255,600	m3/day
	Marimba;		103,400	m3/day
Direct Inflow;			51,900	m3/day
Rainfall;			58,900	m3/day
Evaporation & Others;			(318,300)	m3/day
Outflow Water Volume:		440,600		m3/day
to Lake Manyame;			45,000	m3/day
Morton Jaffray WTW;			395,600	m3/day

Detention Time of Lake: 584 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD	
Manyame	2,827	424	31,531	Seke + Nyatsime + Manyame
Mukuvisi	2,556	388	20,493	
Marimba	1,552	209	9,482	
Direct;	642	76	4,346	
Total	7,577	1,097	65,852	

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	7,577,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	1,097,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	65,852,000
rw:	Rate of change of water (1/day)	=	0.001713
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.04270*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.00868*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00908*
V:	Volume of lake (m3)	=	257,181,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*1.0024*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.66**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.41**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**35.51**	(mg/l) =	**4.21**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**11.79**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.13 Water Quality Projection for Lakes (Scenario 2, 2005, Lake Manyame)

Volume of Lake:		480,236,000		m3
Inflow Water Volume:		263,700		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
	Muzururu		67,000	m3/day
	Gwebi		166,200	m3/day
Direct Inflow;			109,600	m3/day
Rainfall;			182,000	m3/day
Evaporation & Others;			(306,100)	m3/day
Outflow Water Volume:		263,700		m3/day
to Manyame River;			154,000	m3/day
Morton Jaffray WTW;			109,700	m3/day

Detention Time of Lake: 1,821 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Lake Chivero	30	18	1,598
Muzururu	1,020	139	6,206
Gwebi	2,213	291	14,303
Direct;	975	114	12,123
Total	4,207	562	34,231

Formula for Pollution Analysis: (Vollenweider Model)

N = L(N) / ((rw+sN) x V)

P = L(P) / ((rw+sP) x V)

COD = L(COD) / ((rw+sCOD) x V) + DCOD

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	4,207,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	562,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	34,231,000
rw:	Rate of change of water (1/day)	=	0.000549
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.01151*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.02769*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00440*
V:	Volume of lake (m3)	=	480,236,000
DCOD:	Secondary production COD		

DCOD = a(N) x T-N x 17.73

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.4287*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	L(N) / ((rw+sN) x V) =	**0.73**	(mg/l)		
T-P =	L(P) / ((rw+sP) x V) =	**0.04**	(mg/l)		
COD =	L(COD) / ((rw+sCOD) x V) + DCOD =	**19.92**	(mg/l) =	**1.47**	equiv. BOD *(mg/l)
DCOD = a(N) x T-N x 17.73 =		**5.52**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.14 Water Quality Projection for Lakes (Scenario 2, 2015, Seke & Harava Dams)

Volume of Dams:		12,406,000		m3
Inflow Water Volume:		194,300		m3/day
Rivers;	Manyame;		102,000	m3/day
	Ruwa;		46,400	m3/day
Direct Inflow;			25,000	m3/day
Rainfall;			7,400	m3/day
Evaporation & Others;			13,500	m3/day
Outflow Water Volume:		194,300		m3/day
to Manyame River;			170,000	m3/day
Prince Edward WTW;			24,300	m3/day

Detention Time of Dam Lake: 63.8 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Manyame	872	100	7,087
Ruwa	886	161	12,286
Direct	273	34	1,913
Total	2,031	294	21,286

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	2,031,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	294,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	21,286,000
rw:	Rate of change of water (1/day)	=	0.015662
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.18797*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.20574*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.07551*
V:	Volume of lake (m3)	=	12,406,000
DCOD:	Secondary produced COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.8246*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.80**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.11**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**30.57**	(mg/l) =	**3.34**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**11.75**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.15 Water Quality Projection for Lakes (Scenario 2, 2015, Lake Chivero)

Volume of Dams:		257,181,000		m3
Inflow Water Volume:		594,300		m3/day
Rivers;	Manyame;		338,700	m3/day
	Mukuvisi;		328,200	m3/day
	Marimba;		134,900	m3/day
Direct Inflow;			51,900	m3/day
Rainfall;			58,900	m3/day
Evaporation & Others;			(318,300)	m3/day
Outflow Water Volume:		594,300		m3/day
to Lake Manyame;			45,000	m3/day
Morton Jaffray WTW;			549,300	m3/day

Detention Time of Lake: 433 days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD	
Manyame	3,288	509	36,387	Seke + Nyatsime + Manyame
Mukuvisi	3,842	573	27,249	
Marimba	2,187	297	12,319	
Direct;	645	76	4,293	
Total	9,963	1,454	80,248	

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	9,963,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	1,454,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	80,248,000
rw:	Rate of change of water (1/day)	=	0.002311
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.04270*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.00868*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00908*
V:	Volume of lake (m3)	=	257,181,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*1.0024*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.86**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.51**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**42.69**	(mg/l) =	**5.46**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ = **15.30**				

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

Table 10.4.16 Water Quality Projection for Lakes (Scenario 2, 2015, Lake Manyame)

Volume of Lake:		480,236,000		m3
Inflow Water Volume:		265,200		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
	Muzururu		67,000	m3/day
	Gwebi		166,200	m3/day
Direct Inflow;			111,100	m3/day
Rainfall;			182,000	m3/day
Evaporation & Others;			(306,100)	m3/day
Outflow Water Volume:		265,200		m3/day
to Manyame River;			200,500	m3/day
Morton Jaffray WTW;			64,700	m3/day
Detention Time of Lake:		1,811		days

Pollution Load Inflow: (kg/day)

	T-N	T-P	COD
Lake Chivero	39	23	1,921
Muzururu	1,021	139	6,221
Gwebi	2,226	292	14,367
Direct;	1,025	130	14,152
Total	4,272	583	36,662

Formula for Pollution Analysis: (Vollenweider Model)

$N = L(N) / ((rw+sN) \times V)$

$P = L(P) / ((rw+sP) \times V)$

$COD = L(COD) / ((rw+sCOD) \times V) + DCOD$

where;

N:	Concentration of Nitrogen of lake (g/m3)		
P:	Concentration of Phosphorus of lake (g/m3)		
COD:	Concentration of COD of lake (g/m3)		
L(N):	Quantity of inflow Nitrogen to lake (g/day)	=	4,272,000
L(P):	Quantity of inflow Phosphorus to lake (g/day)	=	583,000
L(COD):	Quantity of inflow COD to lake (g/day)	=	36,662,000
rw:	Rate of change of water (1/day)	=	0.000552
sN:	Self-purification (reduction) coefficient for Nitrogen	=	*0.01151*
sP:	Self-purification (reduction) coefficient for Phosphorus	=	*0.02769*
sCOD:	Self-purification (reduction) coefficient for inflow COD	=	*0.00440*
V:	Volume of lake (m3)	=	480,236,000
DCOD:	Secondary production COD		

$DCOD = a(N) \times T\text{-}N \times 17.73$

where;

a(N);	Conversion rate of Nitrogen to DCOD	=	*0.4287*
17.73;	Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity		

Computation of Water Quality:

T-N =	$L(N) / ((rw+sN) \times V)$ =	**0.74**	(mg/l)		
T-P =	$L(P) / ((rw+sP) \times V)$ =	**0.04**	(mg/l)		
COD =	$L(COD) / ((rw+sCOD) \times V) + DCOD$ =	**21.02**	(mg/l) =	**1.66**	equiv. BOD *(mg/l)
	$DCOD = a(N) \times T\text{-}N \times 17.73$ =	**5.60**			

*; equiv. BOD = COD x 0.1753 - 2.0199 (based on survey results of river water by the Study Team)

11.2 Composition of Present Pollution Load by Pollution Source of Respective WQCPs

Table 11.2.1 Composition of Present Run-off BOD Load by Pollution Source

Water Quality Checking Point	Pollution Load Remaining Ratio by Sub-basin		BOD Load Source Category	Inflow BOD to Section			WQCP Run-off BOD Load				Composition of Run-off BOD Load (%)	
	Sub-basin	PLRR		Concentrated Load of Sub-basin (kg/day)	Run-off Load from Upstream (kg/day)	Run-off Load from Upstream WQCP (CR) (kg/day)	Sub-basin Origin (kg/day)	Upstream Origin (kg/day)	Upstream WQCP Origin (kg/day)	Total (kg/day)	Total	Sub-basin
C_{R3}	Manyame R. - Downstream (after confluence w/ Mukuvisi)	1.000	Domestic	0.0	132.8	2.6	0.0	132.8	2.6	135.4	74.44%	80.28%
			Ind.(Unsewered)	0.0	11.4	0.0	0.0	11.4	0.0	11.4	6.28%	6.91%
			Livestock	0.0	20.3	1.4	0.0	20.3	1.4	21.6	11.90%	12.25%
			Natural	0.0	11.7	0.8	0.0	11.7	0.8	12.5	6.87%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.9	0.0	0.0	0.9	0.0	0.9	0.52%	0.57%
			Total	0.0	177.1	4.8	0.0	177.1	4.8	181.9	100.00%	100.00%
(R_{R5})	Marimba R.	0.315	Domestic	559.0	0.0	0.0	176.2	0.0	0.0	176.2	96.46%	98.79%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	6.9	0.0	0.0	2.2	0.0	0.0	2.2	1.18%	1.21%
			Natural	13.7	0.0	0.0	4.3	0.0	0.0	4.3	2.36%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	579.5	0.0	0.0	182.7	0.0	0.0	182.7	100.00%	100.00%
(C_{L2})	Lake Chivero	0.029	Domestic	924.0	176.2	135.4	26.8	5.1	3.9	35.8	92.70%	97.32%
			Ind.(Unsewered)	0.0	0.0	11.4	0.0	0.0	0.3	0.3	0.86%	0.00%
			Livestock	28.1	2.2	21.6	0.8	0.1	0.6	1.5	3.90%	2.68%
			Natural	16.2	4.3	12.5	0.5	0.1	0.4	1.0	2.48%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.07%	0.00%
			Total	968.4	182.7	181.9	28.1	5.3	5.3	38.6	100.00%	100.00%
(R_{R6})	Muzururu R.	0.060	Domestic	48.0	0.0	0.0	2.9	0.0	0.0	2.9	28.76%	32.61%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	99.2	0.0	0.0	5.9	0.0	0.0	5.9	59.43%	67.39%
			Natural	19.7	0.0	0.0	1.2	0.0	0.0	1.2	11.81%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	166.9	0.0	0.0	10.0	0.0	0.0	10.0	100.00%	100.00%
(R_{R7})	Gwebi R.	0.217	Domestic	122.0	0.0	0.0	26.5	0.0	0.0	26.5	33.02%	38.07%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	198.5	0.0	0.0	43.1	0.0	0.0	43.1	53.72%	61.93%
			Natural	49.0	0.0	0.0	10.6	0.0	0.0	10.6	13.26%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	369.4	0.0	0.0	80.3	0.0	0.0	80.3	100.00%	100.00%
(C_{L3})	Lake Manyame	0.324	Domestic	176.0	61.3	3.9	57.1	19.9	1.3	78.2	18.92%	19.46%
			Ind.(Unsewered)	628.0	0.0	0.3	203.7	0.0	0.1	203.8	49.28%	51.49%
			Livestock	44.2	50.0	0.6	14.3	16.2	0.2	30.7	7.43%	7.72%
			Natural	37.5	12.4	0.4	12.2	4.0	0.1	16.3	3.95%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	260.2	0.0	0.0	84.4	0.0	0.0	84.4	20.41%	21.34%
			Total	1,145.9	123.7	5.3	371.6	40.1	1.7	413.4	100.00%	100.00%

Note: Composition of Run-off Load:
Total; Share in Total Run-off Load (incl. upstream WQCP)
Sub-basin; Share in Run-off Load (excl. Upstream WQCP and natural load)

Table 11.2.1 Composition of Present Run-off BOD Load by Pollution Source

Water Quality Checking Point	Pollution Load Remaining Ratio by Sub-basin		BOD Load Source Category	Inflow BOD to Section			WQCP Run-off BOD Load				Composition of Run-off BOD Load (%)	
	Sub-basin	PLRR		Concentrated Load of Sub-basin (kg/day)	Run-off Load from Upstream (kg/day)	Run-off Load from Upstream WQCP (CR) (kg/day)	Sub-basin Origin (kg/day)	Upstream Origin (kg/day)	Upstream WQCP Origin (kg/day)	Total (kg/day)	Total	Sub-basin
C_{R1}	Manyame R. - Upstream	0.186	Domestic	100.0	0.0	0.0	18.6	0.0	0.0	18.6	54.67%	65.46%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	52.8	0.0	0.0	9.8	0.0	0.0	9.8	28.85%	34.54%
			Natural	30.1	0.0	0.0	5.6	0.0	0.0	5.6	16.48%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	182.9	0.0	0.0	34.1	0.0	0.0	34.1	100.00%	100.00%
(R_{R1})	Ruwa R.	0.174	Domestic	258.0	0.0	0.0	44.9	0.0	0.0	44.9	86.95%	90.74%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	26.3	0.0	0.0	4.6	0.0	0.0	4.6	8.87%	9.26%
			Natural	12.4	0.0	0.0	2.2	0.0	0.0	2.2	4.18%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	296.7	0.0	0.0	51.7	0.0	0.0	51.7	100.00%	100.00%
(C_{L1})	Seke & Harava Dams	0.393	Domestic	48.0	44.9	18.6	18.9	17.7	7.3	43.8	68.64%	78.12%
			Ind.(Unsewered)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Livestock	21.5	4.6	9.8	8.4	1.8	3.9	14.1	22.07%	21.88%
			Natural	7.3	2.2	5.6	2.9	0.8	2.2	5.9	9.29%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	76.8	51.7	34.1	30.2	20.3	13.4	63.9	100.00%	100.00%
(R_{R2})	Nyatsime R.	0.293	Domestic	62.0	0.0	0.0	18.1	0.0	0.0	18.1	25.48%	30.04%
			Ind.(Unsewered)	57.0	0.0	0.0	16.7	0.0	0.0	16.7	23.43%	27.62%
			Livestock	87.4	0.0	0.0	25.6	0.0	0.0	25.6	35.92%	42.34%
			Natural	36.9	0.0	0.0	10.8	0.0	0.0	10.8	15.16%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	243.3	0.0	0.0	71.2	0.0	0.0	71.2	100.00%	100.00%
(R_{R3})	Manyame R. - Downstream (before confluence w/ Mukuvisi)	0.359	Domestic	41.0	54.7	7.3	14.7	19.6	2.6	36.9	49.96%	57.06%
			Ind.(Unsewered)	0.0	16.7	0.0	0.0	6.0	0.0	6.0	8.09%	9.95%
			Livestock	16.9	35.8	3.9	6.1	12.8	1.4	20.3	27.44%	31.43%
			Natural	10.6	14.5	2.2	3.8	5.2	0.8	9.8	13.24%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	2.6	0.0	0.0	0.9	0.0	0.0	0.9	1.27%	1.56%
			Total	71.1	121.7	13.4	25.5	43.6	4.8	73.9	100.00%	100.00%
(R_{RA})	Mukuvisi R.	0.186	Domestic	530.0	0.0	0.0	98.5	0.0	0.0	98.5	91.18%	93.54%
			Ind.(Unsewered)	29.3	0.0	0.0	5.4	0.0	0.0	5.4	5.04%	5.17%
			Livestock	7.3	0.0	0.0	1.4	0.0	0.0	1.4	1.26%	1.30%
			Natural	14.6	0.0	0.0	2.7	0.0	0.0	2.7	2.52%	-
			Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			WTW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
			Total	581.3	0.0	0.0	108.0	0.0	0.0	108.0	100.00%	100.00%

Table 11.2.2 Composition of Present Inflow Pollution Load by Pollution Source (T-N)

			Inflow T-N Load to Lake/Dam by Sub-basin (kg/day)							Composition of Inflow T-N Load (%)		
										Total-1	Total-2	excl. Natural
	Sub-basin		C_{R1}	R_{R1}	C_{L1}				Total			
C_{L1}	Seke & Harava Dams	Domestic	25.0	88.0	12.0				125.0	7.68%	7.68%	14.63%
		Ind.(Unsewered)	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
		Livestock	381.9	189.4	157.0				728.3	44.76%	44.76%	85.26%
		Natural	467.4	192.3	113.4				773.0	47.51%	47.51%	-
		Solid Waste	0.0	0.9	0.0				0.9	0.06%	0.06%	0.11%
		WTW	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
		Total	874.2	470.6	282.4				1,627.2	100.00%	100.00%	100.00%
	Sub-basin		C_{L1}	R_{R2}	R_{R3}	R_{R4}	R_{R5}	C_{L2}	Total			
C_{L2}	Lake Chivero	Domestic	8.4	2,182.0	10.0	388.0	270.0	267.0	3,125.4	54.40%	55.31%	74.04%
		Ind.(Unsewered)	0.0	2.0	0.0	0.9	0.0	0.0	2.9	0.05%	0.05%	0.07%
		Livestock	49.1	639.6	123.7	53.3	49.8	205.0	1,120.5	19.50%	19.01%	25.45%
		Natural	52.1	571.9	163.7	226.8	212.0	251.4	1,477.8	25.72%	25.30%	-
		Solid Waste	0.1	3.6	0.0	0.0	13.8	0.0	17.5	0.30%	0.31%	0.41%
		WTW	0.0	0.0	1.1	0.0	0.0	0.0	1.1	0.02%	0.02%	0.03%
		Total	109.7	3,399.1	298.5	669.0	545.6	723.4	5,745.2	100.00%	100.00%	100.00%
	Sub-basin		C_{L2}	R_{R6}	R_{R7}	C_{L3}			Total			
C_{L3}	Lake Manyame	Domestic	12.5	12.0	34.0	30.0			88.5	1.99%	1.72%	2.74%
		Ind.(Unsewered)	0.0	0.0	0.0	10.5			10.5	0.24%	0.24%	0.38%
		Livestock	4.5	704.6	1,402.5	318.5			2,430.2	54.73%	54.92%	87.56%
		Natural	5.9	305.7	759.2	581.7			1,652.5	37.22%	37.28%	-
		Solid Waste	0.1	0.0	2.9	1.8			4.8	0.11%	0.11%	0.17%
		WTW	0.0	0.0	0.0	253.5			253.6	5.71%	5.74%	9.15%
		Total	23.0	1,022.3	2,198.6	1,196.1			4,440.1	100.00%	100.00%	100.00%

Note: Composition of Inflow Pollution Load:

Total-1; Share in Total Inflow Pollution Load (incl. PL from upstream WQCP)

Total-2; Share in Total Inflow Pollution Load (excl. PL from upstream WQCP)

excl. Natural; Share in Inflow Pollution Load (excl. PL from upstream WQCP and natural load)

Table 11.2.3 Composition of Present Inflow Pollution Load by Pollution Source (T-P)

			Inflow T-P Load to Lake/Dam by Sub-basin (kg/day)							Composition of Inflow T-P Load (%)		
										Total-1	Total-2	excl. Natural
	Sub-basin		C_{R1}	R_{R1}	C_{L1}				Total			
C_{L1}	Seke & Harava Dams	Domestic	3.0	11.0	1.0				15.0	7.83%	7.83%	11.78%
		Ind.(Unsewered)	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
		Livestock	58.7	29.8	23.8				112.3	58.61%	58.61%	88.22%
		Natural	38.9	16.0	9.4				64.3	33.56%	33.56%	-
		Solid Waste	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
		WTW	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
		Total	100.6	56.8	34.2				191.5	100.00%	100.00%	100.00%
	Sub-basin		C_{L1}	R_{R2}	R_{R3}	R_{R4}	R_{R5}	C_{L2}	Total			
C_{L2}	Lake Chivero	Domestic	0.9	135.0	1.0	117.0	70.0	49.0	372.9	55.95%	56.82%	69.39%
		Ind.(Unsewered)	0.0	1.0	0.0	0.2	0.0	0.0	1.2	0.19%	0.19%	0.23%
		Livestock	7.0	96.4	18.7	8.3	7.8	31.6	169.7	25.46%	24.86%	30.36%
		Natural	4.0	47.6	13.6	18.9	17.6	20.9	122.6	18.39%	18.11%	-
		Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%	0.00%
		WTW	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.02%	0.02%	0.02%
		Total	11.9	279.9	33.4	144.4	95.4	101.5	666.6	100.00%	100.00%	100.00%
	Sub-basin		C_{L2}	R_{R6}	R_{R7}	C_{L3}			Total			
C_{L3}	Lake Manyame	Domestic	6.8	1.0	4.0	5.0			16.8	2.80%	1.70%	2.21%
		Ind.(Unsewered)	0.0	0.0	0.0	1.7			1.7	0.28%	0.29%	0.37%
		Livestock	3.1	112.1	224.4	49.4			389.0	64.73%	65.54%	85.40%
		Natural	2.2	25.4	63.1	48.4			139.2	23.16%	23.26%	-
		Solid Waste	0.0	0.0	0.0	0.0			0.0	0.00%	0.00%	0.00%
		WTW	0.0	0.0	0.0	54.3			54.3	9.04%	9.22%	12.02%
		Total	12.2	138.6	291.5	158.8			601.0	100.00%	100.00%	100.00%

Note: Composition of Inflow Pollution Load:

Total-1; Share in Total Inflow Pollution Load (incl. PL from upstream WQCP)

Total-2; Share in Total Inflow Pollution Load (excl. PL from upstream WQCP)

excl. Natural; Share in Inflow Pollution Load (excl. PL from upstream WQCP and natural load)

Table 11.2.4 Composition of Present Inflow Pollution Load by Pollution Source (COD)

			Inflow COD Load to Lake/Dam by Sub-basin (kg/day)							Composition of Inflow COD Load (%)		
										Total-1	Total-2	excl. Natural
C_{L1}	Sub-basin		C_{R1}	R_{R1}	C_{L1}				Total			
	Seke & Harava Dams	Domestic	199.0	577.0	97.0				873	6.91%	6.91%	25.75%
		Ind.(Unsewered)	0.0	0.0	0.0				0	0.00%	0.00%	0.00%
		Livestock	1,319.1	658.0	536.3				2,513	19.91%	19.91%	74.15%
		Natural	5,584	2,297	1,355				9,236	73.15%	73.15%	-
		Solid Waste	0	3	0				3	0.03%	0.03%	0.10%
		WTW	0	0	0				0	0.00%	0.00%	0.00%
		Total	7,102	3,536	1,988				12,626	100.00%	100.00%	100.00%
C_{L2}	Sub-basin		C_{L1}	R_{R2}	R_{R3}	R_{R4}	R_{R5}	C_{L2}	Total			
	Lake Chivero	Domestic	242.5	9,952.0	82.0	2,931.0	2,368.0	1,856.0	17,431	41.79%	44.99%	81.20%
		Ind.(Unsewered)	0.0	136.0	0.0	81.6	0.0	0.0	218	0.52%	0.57%	1.03%
		Livestock	698	2,185	422	184	172	704	4,364	10.46%	9.60%	17.32%
		Natural	2,566	6,833	1,956	2,710	2,533	3,004	19,601	46.99%	44.59%	-
		Solid Waste	1	13	0	0	50	0	64	0.15%	0.16%	0.30%
		WTW	0	0	34	0	0	0	34	0.08%	0.09%	0.16%
		Total	3,507	19,119	2,494	5,906	5,122	5,564	41,711	100.00%	100.00%	100.00%
C_{L3}	Sub-basin		C_{L2}	R_{R6}	R_{R7}	C_{L3}			Total			
	Lake Manyame	Domestic	475.8	96.0	253.0	386.0			1,211	2.88%	1.80%	3.46%
		Ind.(Unsewered)	5.9	0.0	0.0	2,668.7			2,675	6.36%	6.52%	12.56%
		Livestock	119	2,480	4,962	1,105			8,665	20.60%	20.88%	40.21%
		Natural	535	3,652	9,071	6,951			20,209	48.04%	48.07%	-
		Solid Waste	2	0	10	7			19	0.04%	0.04%	0.08%
		WTW	1	0	0	9,285			9,286	22.07%	22.69%	43.69%
		Total	1,139	6,228	14,296	20,402			42,064	100.00%	100.00%	100.00%

Note: Composition of Inflow Pollution Load:

Total-1; Share in Total Inflow Pollution Load (incl. PL from upstream WQCP)

Total-2; Share in Total Inflow Pollution Load (excl. PL from upstream WQCP)

excl. Natural; Share in Inflow Pollution Load (excl. PL from upstream WQCP and natural load)