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

						( - 1/2 O T L 1/2 O T	\ \(\frac{1}{2}\)				9-70	600	Concentrated T.P (kg/day)	T.P (kg/d	<u> </u>			
			Sewered Area	Age A	200	-		S <sub>P</sub>	Unsewered Area	] 33		Sewered Area				Unsewered Area	P.C.S	
	wo.	Med.	High	C & 1	Ind.	Total	Low	Mcd. High	h C&1	I Ind.	Total	STW Dischree/Imgation	Total	1,00k	Med. Hi	High C&1	1 Ind.	Total
1. Manyame River (Upstream) S/B	-			-										+	+		-	_
Goromonzi Rural		-	•	•	•	-	•	_	4	•	\$	•	•			2 .	٠	2
Harare Rural	-	-	-	-	-	•	•		0	•	0		•		-	0	4	٩
Manyame Rura		   	-		,	,		-	4	•	4		·	-}	-	۰	4	٥
Total		-   •	-     •	-	•	,	•	•	- 05	·  	20			-	-	-	╬	6
2. Ruwa River S/13						)								+	+	+	4	_
Harate City	•	-	175	•	274	440	-	_	•		,	Donnybrook (WSP)	10	•	1	-	· -	-
Ruwa Local Board	0	0	2	0	74	4	-	-		,	·	Ruwa (WSP)	4		-	1	-	•
Epworth Local Board	•	-  -	81	3	•	¥	-		•	·  	,	Harare East (BNR)	ğ	·		<u> </u>	4	
Goomonzi Rural		•	-  -	-					-	·   -	F	4	•	-		-	-	
Harare Rural		  -	-	 	-		_		7	-	7			·	-	0	-	-
Total	0	0	258	3 {	348	609	-	,	18		18		114			-	4	_
3. Seke & Harava Dams S/B				-			-									-	-	-
Harace City	1	•	10	,	•	11	-	-		•	•	To Harare South		-		-	-	<u>·</u>
Enworth Local Board	,		o	c		6	٠.	•	-	•	•	To Harare East		•	-	-	-	-
Conomonizi Rural	·	•	,	•	-		•	-	- 0	•	0		•	•	-	0	-	
Harare Rural	•	•	-	•	•	1	•		4	•	7		•		•	<u>'</u>	-	°
Manyame Rural	•	 ,	ļ-,	-	•	-	•	_	2	•	63			,	-	0	-	٥
Total	-	-	10	0		20	•	,	- 9	•	9			•	-	٥	-	°
4. Nyatsime River S/B		-		-											+	-	+	-
Chitungwiza Municipality	8	73	838	47	1,84	1,148	'		_	•		Zengeza (BNR)	ğ		۱	+	4	<u>. </u>
Manyame Rural	,	•	•	•	•	4		,	18	-	18		<u>.</u>	•	+	-	-	7
Marondera Rural	·	,	,	•	,	•	•		13	_	13	•	1	-	+		4	
Total	\$	73	838	47	184	1,148	•		31	·	31		200		-	<b>C3</b>	-	"
5. Mukuwai River S/B															-	-	-	1
Warane City	75	141	1,056	898	445	2,582	\$	-	1	۳	99	Fire (BNR)	8		1	1	-	0
Enworth Local Board		1	33	-	-	33	·	-	<u>:</u>	·  -	-	To Harare East	·	<u> </u>	+	}	7	-
Harare Rural	•		•	•	•	1	•	-		•	6.				-		7	9
Zvimba Rumi	•	•	•	•		,	•	•	-	•	1			-	-		4	_
Total	175	141	1,087	998	44.5	2,614	98	•	4	3	3 73		546	1	<del>-</del>	-	-	0
6. Manyame River (D.stream) S/B									-	_					+	_		+
Harace City		-	2	-	421	436	·	-	-	· 	·  -	Harare South (BNR)	12		1		┧	1
Chitungwiza Municipelity	•	•	245	•	8.	3	·	-	-	<u>'</u>		to Zengeza STW		•	+	+		4
Harare Rural				-,			-	    -	<u>د</u>	-	٠		<u> </u>	1	†	-	-	۰ 
Manyame Rural	,	•	•	•	-		•		3	-	3	,	<u> </u>		+	-	<u> </u>	<u>-</u>
Total	,	1	259	•	455	715		-	× ×	<u>'</u>	<b>D</b> O		1:2				-	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)

Med.         High         C.R.1         Ind.         Total         STW Dischige/Inigation           .         .         .         .         .         Crowthornough (RNR, TF)           .         .         .         .         .         .         .           .         .         .         .         .         .         .         .           .         .         .         .         .         .         .         .         .         .           .							Groera	Generated T-P (ky/day)	(dav)						S	Concentrated T-P (kg/dav)	d T-P (kg	e/day)				
Low Model	Sub-basin/District			گ اگ	vered Are	3		-		ĺ	Unsewere	A Area							Unsewe	red Area		
Mornthis Rivers (Ng)         67         137         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         131         67         132         131         67         132         131         67         132         131         67         132         131 <th></th> <th>Low</th> <th>Med.</th> <th>High</th> <th><math>\vdash</math></th> <th>_</th> <th>-</th> <th>Total</th> <th></th> <th><u> </u></th> <th>1</th> <th>C&amp; 1</th> <th>Ind.</th> <th>Total</th> <th>STW Dischree/Imigation</th> <th>Total</th> <th>Low</th> <th>Mcd.</th> <th>High</th> <th>C&amp;1</th> <th>'n</th> <th>Total</th>		Low	Med.	High	$\vdash$	_	-	Total		<u> </u>	1	C& 1	Ind.	Total	STW Dischree/Imigation	Total	Low	Mcd.	High	C&1	'n	Total
Warrante Clyb         67         133         873         216         121         1,410         1         2         2         2         Convolutionage (RNR, TP)         271         2         <	7. Marimba River S/B				_																	
Yorinoba Rurait         67         13         1         2         2         2         3         4	Marate City	23	133		_	1912	121	1,410		-	-	-		,	Crowborough (RNR, TF)	1.72	•	,	•	•		٠.
Total Content of Arian State S	Zvimba Rural	-				_	-		•	,	۶.	,	•	5	•	•	•	٠	0	•	•	С
Lybe Chivero S/JB         1         2         1         2         1         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         2         3         3         4	Total	1.9	133			216	121	1.410	-	-	5	-	,	5		271	,		0	-	٠	0
The continue of the continue	8. Lake Chivero S/B									-		<u> </u>		,257.4								
1	Harare City	- 1		Ŀ		<u>_</u>	  -	  -	-  -	    •	-	 	•	•	Firle STW (Imgation (am)	53	•	,			-	
1   1   1   1   1   1   1   1   1   1	Cheguta Rural	,	١.	  -	_	<u>_</u>	-  -	-			2	-	•	53	•	_	-		0	,	•	0
1	Monvame Rural	•		<u> </u>	_	<u> </u>	-  -		-	,	4	,	•	4		•	•	,	0		•	c
The continue of the continue	Zvimba Rural			Ľ	_	_  -	-  -			-	8	_	•	æ	•	,	٠	,	0	-	-	С
24	Total	,		Ŀ	L	<u> </u>			•		14	•	٠	14		22	_		1	,	•	-
24         25         24         25         24         25         24         25         24         25         24         25         24         25         24         25         24         25<	9. Murumin River S/B				_	_			-		-	١							1		-	
Total Nove Properties Fig. 1. Consider A consistency of the consistenc	Harare City	-		_	_		  -			•	•		·		•	•		,	-	,	-	
Transition (T.) (1.5) (1	Zvimbo Rural	•	•	•	_		_		-		24	•	•	24	•		,		1	-	•	-
24 - 24 - 25 - 25 - 25 - 25 - 25 - 25 -	Total		•	Ŀ		  -	  •	-	-  -  -	,	25	-	-	24			•	·	1	•		-
24         2         24         2         24         2         25         2         25         2         25         2         25         2<	10. Gwebi River S/B							-				-										
24 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3 - 3	Harare City	24	,	,		-	•	ঠ	165	•	•	-	•	165	Marlborough (WSP)			1			-	
24 - 2 - 3 - 165 - 37 - 2 - 21 - 22 - 22 - 22 - 22 - 22 - 22	Mazowe Rural	-			_		-	1	'		ध		•	22		•	-	•	1	,	•	1
24 - 3 - 31	Zvimba Rural		٠	_		_	-	•	•		35	٠	•	35		,	, MEA		2	,	•	61
S 5 31 0 143 184	Total	22		•		_	•	ភ	165		57	•	•	222		1			3		٠	3
Attribute         S         5         31         0         14.3         18.4         -	11. Lake Manyame S/B	~						~				$\dashv$										
And Rural 5 5 5 11 0 143 1546 6.725 231 2 24 505 1 24 505 1 22 1 23 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Norton Town	S	\$		11	c	143	187	-		,	_	12	21	Norton (TF)	10	-		•	•	63	2
A Rural 5 5 5 1 0 143 184 - 25 - 21 53 10 10 1.277 - 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	Chegutu Rumi	-				_			-		11	-	'	1:	-	•		•	1		•	Ē
S 5 5 1 0 143 184 - 52 - 21 53 10 10 - 2 0 2 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0	Zvimba Rural	•		•		_	•	***	•	•	B	-	•	23	•			٠	1	-		-
1777 3553 3.3566 1,133 1,696 6,725 231 - 250 - 24 595	Total		5		11	0	143	25.	-		32	-	21	53		10	-	,	2	•	ra	۳.
	Grand Total	121					969'	6.725	231	•	250	-	24	505		1.277	-		12	•	۲3	4

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

for irrigation reuse (STW): TF WSP 30% 30% BNR 75% 7.7 2. Population in rural districts is categorised to high-density area.

3. Concentration ratios are; for direct discharge (STW): 100%

4. Pollution load reduction efficiency at STWs:

કુ

Low & Medium;

High; 8%

for unsewered area:

% %

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

E.

Water Quality		Dom	Dom./Com./Ins. Sewage	vage	Industrial		Natural	Solid	Water	,
Checking	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ق	1. Manyame R. (Upstream)	-	122	122	-	53	30	٠	•	205
Rei	2. Ruwa River	275	44	319	1	26	12	,		357
ű	3. Seke & Harava Dams	1	14	14	,	21	7	1	٠	43
i S		370	76	446	l .	87	37	Tangga Esta	-	571
R		4.364	10	4,374	29	7	15	,	,	4,425
ئے گ	R <sub>R1</sub> * 6. Manyame R. (Downstream)	2,630	18	2,648	•	17	11		3	2,679
l	7. Marimba River	2,392	11	2,404	· ·	7	14	ı	l Cara	2,424
ť	8. Lake Chivero	176	35	211		28	16	,	1	255
Rak	7		59	89		8	20	,		178
Rg	10. Gwebi River	8	139	144	4 2016/2018 CD	198	49	1		392
ű		Ľ	79	150	628	44	38	,	109	696
	Grand Total	10,282	809	10,890	159	685	248	essare as	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	(op)
	Amount of water intake;	110,100 m3/day	(Lake Manyame)
	BOD concentration of intake water;	1.5 mg/l	(op)
	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)

10-2-49

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

coking         Sub-basin         Sewered         Unsewered         Total         Livestock         Livestock         Pollution         Waste         Treatment           R <sub>R1</sub> 1. Manyame R. Upstream)         -         147         147         -         35         30         -         -         -           R <sub>R2</sub> 2. Ruwa River         1.658         53         1.691         -         26         12         -         <	Vater Quality		Dom	Dom./Com./Ins. Sewage	wage	Industrial		Natural	Solid	Water	
R <sub>k1</sub> 1. Manyame R. (Upstream)         147 </th <th>Checking Points</th> <th>Sub-basin</th> <th>Sewered</th> <th>Unsewered</th> <th>Total</th> <th>Unscwered**</th> <th>Livestock</th> <th>Pollution</th> <th>Waste Dumping</th> <th>Treatment Works</th> <th>Total</th>	Checking Points	Sub-basin	Sewered	Unsewered	Total	Unscwered**	Livestock	Pollution	Waste Dumping	Treatment Works	Total
Rk1         2. Ruwa River         1,638         53         1,691         -         26         12         - </td <td>ري ري</td> <td>1. Manyame R. (Upstream)</td> <td></td> <td>147</td> <td>147</td> <td>l.</td> <td>53</td> <td>30</td> <td>1</td> <td>1</td> <td>230</td>	ري ري	1. Manyame R. (Upstream)		147	147	l.	53	30	1	1	230
Reg       4. Nyatsime River       700       92       791       -       87       37       -       -         Reg       4. Nyatsime River       5,327       12       5,338       29       7       15       -       -         Reg       5. Mukuvisi River       3,383       22       3,405       -       17       11       -       7         Reg       7. Marimba River       2,862       14       2,875       -       17       14       -       7         Reg       7. Marimba River       171       42       2,12       -       28       16       -       -         Reg       9. Muzururu River       -       71       71       -       19       -       -       -         Reg       9. Muzururu River       9       168       176       -       198       49       -       -       -         Reg       9. Muzururu River       9       168       176       -       198       49       -       -       -         11. Lake Manyame       328       423       658       44       38       -       -       -         11. Lake Manyame       14,417       732	Ì		1,638	53	1,691	ı	26	12	,	ì	1,730
R <sub>RA</sub> 4. Nyatsime River         5.327         12         5.336         29         7         15         -         -           R <sub>RA</sub> *         5. Mukuvisi River         5.327         12         5.336         29         7         15         -         -           R <sub>RA</sub> *         6. Manyame R. (Downstream)         3.383         22         3.405         -         17         11         -         7         14         - <td< td=""><td></td><td></td><td></td><td>17</td><td>17</td><td>•</td><td>21</td><td>7</td><td>,</td><td>,</td><td>46</td></td<>				17	17	•	21	7	,	,	46
Res*       S. Mukuvisi River       5.327       12       5.338       29       7       15       -       -       7         Res*       6. Manyame R. (Downstream)       3.383       22       3.405       -       17       11       -       7         Res       7. Marimba River       171       42       2.875       -       7       14       -       7         Res       9. Muzururu River       -       71       71       -       99       20       -       -         Rer       10. Gwebi River       9       168       176       -       99       20       -       -         11. Lake Manyame       328       95       423       628       44       38       -       -         11. Lake Manyame       14,417       732       15,149       657       589       248       -       219	RRZ	4. Nyatsime River	700	92	791		87	37	,		916
Res.*         6. Manyame R. (Downstream)         3.383         22         3.405         -         17         11         -         7         14         -         7           Res.         7. Marimba River         171         42         2.375         -         78         16         -         -           Res.         9. Muzlurur River         -         71         71         -         99         20         -         -           Rep.         10. Gwebi River         9         168         176         -         99         49         -         -           11. Lake Manyame         328         95         423         628         44         38         -         -           11. Lake Manyame         14,417         732         15,149         657         589         248         -         -	RR4	5. Mukuvisi River	5,327	12	5.338	23	7	15	1	1	5,390
Res         7. Marimba River         2.862         14         2.875         -         7         14         -         -           8. Lake Chivero         171         42         212         -         28         16         -         -           Rs         9. Muzururu River         -         71         71         -         99         20         -         -           Rg7         10. Gwebi River         9         176         -         198         49         -         -           11. Lake Manyame         328         95         423         657         589         248         -         212	Cr. Rr.	6. Manyame R. (Downstream)	3,383	22	3,405		17	11	,		3,440
8. Lake Chivero       171       42       212       -       28       16       -       -         9. Muzunun River       -       71       71       -       99       20       -       -         10. Gwebi River       9       176       -       198       49       -       -       -         11. Lake Manyame       328       95       423       657       589       248       -       212         11. Lake Manyame       14,417       732       15,149       657       589       248       -       219	RR		2,862	14	2.875		7	14	,	•	2,896
Rate         9. Muzururu River         -         71         71         -         99         20         -         -           Rat         10. Gwebi River         9         168         176         -         198         49         -         -           11. Lake Manyame         328         95         423         657         589         248         -         212           12. Lake Manyame         14,417         732         15,149         657         589         248         -         219		1	171	42	212	٠	28	16	ļ	-	257
Rg7         10. Gwebi River         9         168         176         -         198         49         -         -           11. Lake Manyame         328         95         423         628         44         38         -         212           13. Lake Manyame         14,417         732         15,149         657         589         248         -         219	RRh		1	71	7.1	٠	8	20			180
11. Lake Manyame 328 95 423 628 44 38 - 212 212 14,417 732 15,149 657 589 248 - 219	RR7		6	168	176	•	198	49	1	1	424
732 15,149 657 589 248 - 219	r <sub>I</sub>	11. Lake Manyame	328	95	423	628	4	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;

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

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

(kg/day)

0

Water Ouality	zii.		Δ	Domestic Sewage	e.	Industrial		Natural	Solid	Water	
Checking Points	80 ,,	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ڻ		1. Manyame R. (Upstream)		244	244	-	1.319	5,584	'	1	7,147
	R <sub>R1</sub>	2. Ruwa River	1,062	88	1,150	•	658	2,297	9	,	4,111
ű		3. Seke & Harava Dams	-	29	29	•	536	1,355	٠	1	1,920
	R.	4. Nyatsime River	1,502	152	1,654	1	2,185	6.833	1.4	,	10,686
) HX	RRT	5. Mukuvisi River	20,134	20	20,153	82	181	2,710	1		23,128
•3 •3	R	6. Manyame R. (Downstream)	14,011	37	14,048	1	422	1,956	•	39	16,465
	R RS	7. Marimba River	10,150	23	10,172	•	172	2,533		1	12,877
ដូ		8. Lake Chivero	609	69	678		704	3,004	1	•	4,386
	RRA	9. Muzururu River	•	118	118		2,480	3,652			6,250
	R <sub>R7</sub>	10. Gwebi River	15	279	294	1	4,962	9,071	116	ı	14,443
ပ်		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
		m. A Comment of the new Additional Contract									

\*: After confluence of Mukuvisi River.
\*\*: Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.

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

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

Water Quality		Ω	Domestic Sewage	ge	Industrial	CATTLE STATE	Natural	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
C <sub>R</sub> ,	1. Manyame R. (Upstream)	,	294	294	1	1,319	5,584	•	1	7,197
RRI	2. Ruwa River	9,368	106	9,474		658	2,297	7		12,436
C <sub>C1</sub>	3. Seke & Harava Dams	-	35	35	,	536	1,355	•	1	1,926
RR2	4. Nyatsime River	2,990	183	3,174		2,185	6.833	19		12,211
RRA	5. Mukuvisi River	24,380	24	24,404	82	184	2,710	1	-	27,379
CR2 RR4	6. Manyame R. (Downstream)	17,026	44	17,070		422	1,956	,	63	19,511
RRS	7. Marimba River	12,079	27	12,106	•	172	2.533	-		14,811
S <sub>L</sub>	8. Lake Chivero	585	28	699		704	3,004			4,377
RRA	9. Muzururu River	,	142	142	1	2,480	3,652			6,274
R <sub>R7</sub>	10. Gwebi River	26	336	361	1	4,962	9,071	147		14,541
$c_{\rm L3}$	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 Edw

25,400 m3/day	31.2 mg/l (Seke Dam)	63 kg/day (to Manyame river (downstream))	601,900 m3/day (Lake Chivero)	44.8 mg/l (do)	>	20.6 mg/l (do)	<b>-</b>	26,948 kg/day	; 249 kg/day	1,632 kg/day (to Lake Manyame)
Amount of water intake;	COD concentration of intake water;	Concentrated COD load;	Amount of water intake; 6	COD concentration of intake water;	Amount of water intake;	COD concentration of intake water;	Intake COD load;	from Lake Chivero;	from Lake Manyame;	Concentrated COD load;
Prince Edward WTW;			Morton Jaffray WTW;				•			

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

(kg/dav)

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Water Ounlifty		Ω	Domestic Sewage	Q.	Industrial		Natural	Solid	Water	
Checking	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
rollins	1. Manyame R. (Uostream)		31	31		382	467		,	380
, is	2. Ruwa River	288	11	299		189	192	2	•	683
ű	3. Seke & Harava Dams	1	4	4		157	113			274
å	4. Nyatsime River	347	19	366	1	640	572	4		1,582
R		2.879	2	2,882	1	53	227	,		3,163
, Š	6. Manyame R. (Downstream)	9/9	5	189	,	124	164	1	r-1	696
1	7. Marimba River	2,079	3	2,082		50	212	•	•	2,343
ပ်	8. Lake Chivero	203	6	212	•	205	251	1	,	899
Ra			15	15	-	705	306		-	1.025
Rg		7	35	41	•	1,403	759	33		2,236
j		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.

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

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

				•			,			(kg/day)
Water Ouality			Domestic Sewage	2,5	Industrial	Locator	Natural	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ະ	1. Manyame R. (Upstream)	-	37	37		382	467	,	•	888
RRI	2. Ruwa River	540	13	553	1	189	192	2		937
C.	3. Seke & Harava Dams	-	4	4	-	157	113	-	•	275
RR2	4. Nyatsime River	485	23	508	-	640	572	9	•	1,725
RR1	5. Mukuvisi River	3,621	3	3,624	F	53	227	-		3,905
CR2 RR4	6. Manyame R. (Downstream)	1,430	9	1,435	1	124	182	1	2	1,724
RRS	7. Marimba River	2,524	3	2,528		50	212	-	-	2,790
CL	8. Lake Chivero	203	10	213	,	205	251	-		670
RR	9. Muzururu River	•	18	81	,	705	306	ı	•	1,028
RR7	10. Gwebi River	11	42	53	•	1,403	759	42	•	2,256
င်း	11. Lake Manyame	129	አ	153	10	319	285	7	SE	1,106
	Grand Total	8,943	183	9.126	F-1	4,225	3.845	57	36	17.302
4 - 47 - 4										

\*: After confluence of Mukavisi River.

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

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

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

(kg/dav)

(3)

Water Quality		Ω	Domestic Sewage	ge	Industrial		Natural	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
່ວົ	1. Manyame R. (Upstream)		3	3	į.	59	39	•		101
R.	2. Ruwa River	41	1	43		30	16	1		8
<u>ن</u>	3. Seke & Harava Dams	1	0	0	l .	24	6	,		3
RR	4. Nyatsime River	49	2	51		96	48	,	-	195
RR3	5. Mukuvisi River	444	0	445	0	8	19	ı		472
C <sub>R2</sub> * R <sub>R4</sub>	6. Manyame R. (Downstream)	160	0	161	1	19	14		0	193
RR	7. Marimba River	292	0	292	agama.	8	18	1	محدوس،	318
ઝ	8. Lake Chivero	25	н	26		32	21	1		79
	Rac 9. Muzururu River	, ,	2	2	1	112	25		-	139
R <sub>R7</sub>	10. Gwebi River	T	4	S	Î	224	63	,	er Lincolneching	292
Çt3	11. Lake Manyame	9	2	8		49	48	l	14	121
	Grand Total	1,019	17.	1,036	<u>~~~</u>	661	320		14	2,031
*. After	*. After confluence of Mulaudici Biver									

\*: After confluence of Mukuvisi River.

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

		(Scke Dam)	(to Manyame river (downstream))	(Lake Chivero)	(op)	(Lake Manyame)	(op)		220 kg/day	6 kg/day	(to Lake Manyame)
	22,100 m3/day	S mg/	<ul><li>kg/day</li></ul>	175,700 m3/day	0.46 mg/l	10,100 m3/day	0.05 mg/l	225 kg/day			14 kg/day
ì	Amount of water intake; 22,10	T-P concentration of intake water; 0.08 1	Concentrated T-N load;	•	T-P concentration of intake water; 0.4	1	T-P concentration of intake water; 0.0	Intake T-P load;	from Lake Chivero;	from Lake Manyame;	Concentrated T-P load;
	Prince Edward WTW;			Morton Jaffray WTW;							

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

				•	•					(kg/day)
Water Quality	λ̂ι	Ω	Domestic Sewage	şe	Industrial		Natural	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ێ	1. Manyame R. (Upstream)	· CPAP	3	3	ı	59	39	,	•	100
R <sub>R</sub> ;	2. Ruwa River	121	1	122	,	30	16	•	ı	391
C <sub>L</sub> ,	3. Seke & Harava Dams	·	0	0	-	52	6	•		34
R <sub>R2</sub>	, 4. Nyatsime River	26	2	81		96	48	•	-	225
RRI	RR3 5. Mukuvisi River	553	0	553	0	8	19	•		581
Crr. Rr4	6. Manyame R. (Downstream)	263	0	264	-	19	14	•	0	296
RRS	7. Marimba River	353	0	354	•	8	18	٠		379
C <sub>L3</sub>	8. Lake Chivero	25	1	26	•	32	21	-	,	282
RRA	, 9. Muzururu River	ı	1	1	,	112	25	1	•	139
RR7	, 10. Gwebi River	7	3	5	•	224	63	ı		292
CL	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

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

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

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Sub-basin         Sewered         Unsewered         Total         Unsewered**         Livestock         Pollution           1. Manyame R. (Upstream)         -         76         76         -         53         30           2. Ruwa River         251         28         278         -         26         12           4. Nyatsime River         915         48         963         -         87         37           5. Mukuvisi River         3,723         6         3,729         29         7         15           6. Manyame R. (Downstream)         2,263         11         2,275         -         7         14           7. Marimba River         1,567         7         1,574         -         7         14           9. Muzurun River         -         37         37         -         99         20           9. Muzurun River         -         37         37         -         198         49           10. Gwebi River         5         87         -         99         -         198         49           10. Gwebi River         57         49         -         99         -         198         49           10. Gwebi River	Water Onality		Dom.	Dom./Com./Ins. Sewage	vage	Industrial		Natural	Solid	Water	
RR1       1. Manyame R. (Upstream)       -       76       76       -       53         RR1       2. Ruwa River       251       28       278       -       26         3. Seke & Harava Dams       -       915       48       963       -       21         RR2       4. Nyatsime River       915       48       963       -       87         RR3       5. Mukuvisi River       3,723       6       3,729       29       7         RR3       6. Manyame R. (Downstream)       2,263       11       2,275       -       17         RR3       7. Manyame R. (Downstream)       1,567       7       17         8. Lake Chivero       169       22       191       -       28         RR4       9. Muzururu River       -       37       -       99         RR5       10. Gwebi River       5       87       92       -       99         11. Lake Manyame       5       865       -       9331       657       589       2	Checking		្រ	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
RR1         2. Ruwa River         251         28         278         -         26           3. Seke & Harava Dams         -         915         48         963         -         87           Re2         4. Nyatsime River         915         48         963         -         87           Re4         5. Mukuvisi River         3,723         6         3,729         29         7           Re5         6. Manyame R. (Downstream)         2,263         11         2,275         -         17           Re5         7. Marimba River         1,567         7         1,574         -         7           Re5         7. Marimba River         169         22         191         -         28           Re6         9. Muzururu River         -         37         37         -         99           Re7         9. Muzururu River         5         87         92         -         198           Re7         10. Gwebi River         5         44         44           11. Lake Manyame         57         49         106         57         44           13. Golden River         57         49         106         57         589         25	نّ	1. Manyame R. (Upstream)		76	76		53	30	•	i i	159
3. Seke & Harava Dams       -       9       9       -       21         R <sub>R2</sub> 4. Nyatsime River       915       48       963       -       87         R <sub>R4</sub> 5. Mukuvisi River       3,723       6       3,729       29       7         R <sub>R5</sub> *       6. Manyame R. (Downstream)       2,263       11       2,275       -       17         R <sub>R5</sub> 7. Marimba River       1,567       7       1,574       -       7         8. Lake Chivero       169       22       191       -       23         R <sub>R6</sub> 9. Muzururu River       -       37       -       99         R <sub>R7</sub> 10. Gwebi River       5       87       92       -       198         11. Lake Manyame       57       49       106       628       44         11. Lake Manyame       57       49       106       627       57       589       2		2. Ruwa River	251	28	278		26	12	-		317
Res         4. Nyatsime River         915         48         963         -         87           Res         5. Mukuvisi River         3,723         6         3,729         29         7           Res         6. Manyame R. (Downstream)         2,263         11         2,275         -         17           Res         7. Marimba River         1,567         7         1,574         -         7           Res         9. Mazururu River         -         37         -         99           Res         10. Gwebi River         5         87         92         -         198           11. Lake Manyame         57         49         106         628         44		3. Seke & Harava Dams		6	6		21		٠		38
Rest         5. Mukuvisi River         3,723         6         3,729         29         7           Rest         6. Manyame R. (Downstream)         2,263         11         2,275         -         17           Rest         7. Marimba River         1,567         7         1,574         -         7           Rest         9. Mazimba River         -         37         22         191         -         28           Rest         9. Muzururu River         -         37         -         99           Rest         10. Gwebi River         5         87         92         -         198           11. Lake Manyame         57         49         106         6228         44			915	87	963		87	37	1	1	1,087
Rest       6. Manyame R. (Downstream)       2,263       11       2,275       -       17         Rest       7. Marimba River       1,567       7       1,574       -       7         8. Lake Chivero       169       22       191       -       28         Rest       9. Muzururu River       -       37       -       99         Rest       10. Gwebi River       5       87       92       -       198         11. Lake Manyame       57       49       106       628       44	Ras		3,723	9	3,729	29	7	15	(	1	3,781
R <sub>Ks</sub> 7. Marimba River         1.567         7         1.574         -         7           8. Lake Chivero         169         22         191         -         28           R <sub>Rs</sub> 9. Muzururu River         -         37         -         99           R <sub>Rs</sub> 10. Gwebi River         5         87         92         -         198           11. Lake Manyame         57         49         106         628         44           8 oss         8 oss         9331         657         89         2		6. Manyame R. (Downstream)	2,263	11	2,275		17	I. I.	•	3	2,305
8. Lake Chivero       169       22       191       -       28         R <sub>RA</sub> 9. Muzururu River       -       37       -       99         R <sub>RY</sub> 10. Gwebi River       5       87       92       -       198         11. Lake Manyame       57       49       106       628       44         8 051       331       657       589       2	ì	7. Marimba River	1,567	7	1,574	,	7	14		****	1,594
RgA         9. Muzururu River         -         37         37         -         99           Rg.         10. Gwebi River         5         87         92         -         198           11. Lake Manyame         57         49         106         628         44           8 of 31         9331         657         589         2			169	22	191		28	16	,		235
Rer, 10. Gwebi River         5         87         92         -         198           11. Lake Manyame         57         49         106         628         44           8.051         380         9331         657         589         2		9. Muzururu River	·	37	37	1	66	20	4	-	156
11. Lake Manyame 57 49 106 628 44 8.051 380 9.331 657 589 2	RR	10. Gwebi River	W	87	92		198	49	,		340
8 8 951 380 9.331 657 589	1		57	49	106	628	44	38	1	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;

			(to Manyame river (downstream))			(a)					ume )
		(Seke Dam)	(to Manyame ri	(Lake Chivero)	(op)	(Lake Manyame)	(op)		1,664 kg/day	161 kg/day	(to Lake Manyame
	21,400 m3/day	1.8 mg/l	kg/day	m3/day	4.2 mg/l	m3/day	1.5 mg/l	1,825 kg/day	1,664	161	110 kg/day
	21,400	1.8	ťΩ	395,600 m3/day	4.2	109,700 m3/day	1.5	1,825	ero;	yame;	110
icun.	Amount of water intake;	BOD concentration of intake water;	Concentrated BOD load;	Amount of water intake;	BOD concentration of intake water;	Amount of water intake;	BOD concentration of intake water;	Intake BOD load;	from Lake Chivero;	from Lake Manyame;	Concentrated BOD load:
i vicini vicini i vic	Prince Edward WTW;			Morton Jaffray WTW;							

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

Water Quality	ıty	Dom	Dom./Com./Ins. Sewage	wage	Industrial		Natural	Solid	Water	tu Te 220
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
<u>ج</u>	1. Manyame R. (Upstream)		92	92		53	30			175
RRI	tı 2. Ruwa River	1,602	33	1,635	~1.00.01	26	12	•	-	1,674
င်း	3. Seke & Harava Dams	•	11	11	1	21	7			0+
RRZ	2. Nyatsime River	1,663	22	1,721		87	37	,		1,845
R	Rgs 5. Mukuvisi River	5,285	2	5,293	29	7	15	-		5,344
CR: RR	RR1" 6. Manyame R. (Downstream)	2,274	14	2,288	1	17	11	1	9	2,322
Rec	25 7. Marimba River	2,249	6	2,257	4	7	14	anuosa.	1	2,278
S <sub>L</sub>	8. Lake Chivero	155	26	181	1	28	16	-		222
RRA	ge 9. Muzururu River	,	44	44		66	20	, and the second	-	163
R <sub>R7</sub>	27 10. Gwebi River	7	105	112		198	49		•	359
Ç,	11. Lake Manyame	295	59	354	628	44	38	,	187	1,250
		13,530	458	13,988	259	685	248	· ·	193	15,676

\*: Before confluence of Mukuvisi River.

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

\*\*: Pollution load of Water Treatment Works;

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

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

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									7.5.6		TASH CAN
Water Quality	hality		Ω	Domestic Sewage	2	Industrial		Natural	Sond	Water	,
Checking Points	cing	Sub-basin	Sewered	Unsewered	Total	Unsewered	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ڻ		1. Manyame R. (Upstream)	·	153	153	•	1,319	5,584	,	•	7.056
	Z.	2. Ruwa River	991	55	1,046	•	658	2,297	4		4,005
ۍ	ı	3. Seke & Harava Dams	,	18	18	•	536	1,355	1	1	1,909
	2.2 2.2	4. Nyatsime River	3,697	95	3,792	1	2,185	6,833	21		12,831
		5. Mukuvisi River	17,506	12	17.518	82	184	2,710	,		20,493
ق		6. Manyame R. (Downstream)	12,546	23	12,569	-	422	1,956		37	14,984
1	Š,	7. Marimba River	6,763	14	8.77.8		172	2.533	1		9,482
<u>ئ</u>		8. Lake Chivero	595	43	629		704	3,004	,	,	4,346
	č,	9. Muzururu River	-	74	7.4	e e e e e e e e e e e e e e e e e e e	2,480	3,652	•	·	6,206
<u></u>	R <sub>R7</sub>	10. Gwebi River	91	174	190		4,962	9,071	8	,	14,303
ئ		11. Lake Manyame	317	66	416	2,683	1,105	6,951	6	096	12,123
		Grand Total	42,431	760	43,191	2,765	14,725	45,946	113	866	107,738
	A ftor A	* A feer san fluence of Mulvinies Divor									

\*: After confluence of Mukuvisi River.

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

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

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

(kg/day)

Water Ouality		A	Domestic Sewage	) 22	Industrial		Naturai	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works	Total
CR1	1. Manyame R. (Upstream)		184	184	1	1,319	5.584	•	1	7,087
RRI	2. Ruwa River	9,260	99	9,326	1	658	2,297	4		12,286
ပ်	3. Seke & Harava Dams	-	22	22	•	536	1,355	-		1,913
RRZ	4. Nyatsime River	6.973	115	7,083		2,185	6,833	30		16,135
RR1	5. Mukuvisi River	24,260	15	24,274	82	184	2,710	_		27,249
C <sub>R2</sub> * R <sub>R4</sub>	6. Manyame R. (Downstream)	12,589	28	12,617	•	422	1,956	1	59	15,054
RR	7. Marimba River	9,597	71	9,614	1	172	2,533	•		12,319
S.	8. Lake Chivero	533	\$2	586	-	704	3,004		1	4,293
RRA	9. Muzururu River		68	89		2,480	3,652	•		6,221
R <sub>R</sub> ,	10. Gwebi River	20	210	230	,	4.962	9.071	104	)	14,367
C <sub>L</sub>	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
*. A feet of	* After and name of Martinger Direct									

\*: 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

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



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

	Table Avier				•				-	(kg/day)
Water Ouality		ď	Domestic Sewage	e)	Industrial		Natural	Solid	Water	
Checking	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works	Total
ئ	1. Manyame R. (Upstrcam)		19	19		382	467		ʻ	898
RRI	2. Ruwa River	259	7	266	•	189	192	¢-1	,	648
تن	3. Seke & Harava Dams		2	2	1	157	113	ı		273
Res	4. Nyatsime River	877	12	888	•	640	572	9		2,106
Rgi	RR. S. Mukuvisi River	2,274	2	2,275		53	722	•	1	2,556
Cr. R.	6. Manyame R. (Downstream)	309	8	311	1	124	164		1	009
	R <sub>Re</sub> 7. Marimba River	1.288	2	1,290		90	212		1	1,552
3	8. Lake Chivero	180	5	186	-	205	251	1	GONTEN	\$42
RRA	9. Muzururu River	•	6	6		705	306	1		1,020
RR7	10. Gwebi River	7	22	29	2473	1,403	759	ß		2,213
J	11. Lake Manyame	28	12	40	10	319	582	73	21	975
	Grand Total	5,221	95	5.316	11	4,225	3.845	33	22	13,453

\*; After confluence of Mukuvisi River.

	ion load of sewered area.		21,400 m3/day	0.71 mg/l (Seke Dam)	1 kg/day (to Manyame river (downstream))	395,600 m3/day (Lake Chivero)	0,66 mg/l (do)	109,700 m3/day (Lake Manyame)	0.81 mg/l (do)	351 kg/day	from Lake Chivero; 262 kg/day	from Lake Manyame; 89 kg/day	
	**. Pollution load of industries in sewered area is counted as a part of domestic pollution load of sewered area.	orks	Amount of water intake;	T-N concentration of intake water;	Concentrated T-N load;	Amount of water intake;	T-N concentration of intake water;	Amount of water intake;	T-N concentration of intake water;	Intake T-N load;	from La	from La	
.; Aller conflicence of intervention rates.	**: Pollution load of industries in sewered	***: Pollution load of Water Treatment Works	Prince Edward WTW;			Morton Jaffray WTW:							

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

										(kg/day)
Water Quality		α	Domestic Sewage	9	Industrial		Natural	Solid	Water	:
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered***	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
ڻ	1. Manyame R. (Upstream)	1	23	23		382	467	'		872
RR1	2. Ruwa River	494	8	503		189	192	٢	1	888
ઝ	3. Seke & Harava Dams	-	3	3		157	113		1333.50	273
RR2	4. Nyatsime River	1,305	14	1,320	i i	640	572	6		2,540
RRJ	5. Mukuvisi River	3.559	7	3,561	F-1	53	227	, ,,,,,,,	1	3,842
Crr. RR4	6. Manyame R. (Downstream)	319	3	323		124	164	,	-	612
RRS	7. Marimba River	1,923	2	1.925	ļ	50	212		l 	2,187
Cts	8. Lake Chivero	183	7	189	1	205	251	t	1	645
RRA	9. Muzururu River	•	11	11	•	705	306	•	CACHADA.	1,021
RR7	10. Gwebi River	6	26	35	1	1,403	759	29	i i	2,226
ပ်	11. Lake Manyame	70	15	85	10	319	585	3	26	1.025
	Grand Total	7.863	114	7,977		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

(Safe Dam)	(to Manyame river (downstream))	(Lake Chivero)	(op)	(Lake Manyame)	(op)		340 kg/day	93 kg/day	(to Lake Manyame)
m3/day	kg/day	m3/day	1/300	m3/day	mg/l	kg/day			26 kg/day
21,400 m3/day	3 ~	395,600 m3/day	0.86 mg/l	109,700 m3/day	0.85	<del>2</del>			%
Amount of water intake;	Concentrated T-N load;	Amount of water intake;	T-N concentration of intake water;	Amount of water intake;	T-N concentration of intake water;	Intake T-N load;	from Lake Chivero;	from Lake Manyame;	Concentrated T-N load;
Prince Edward WTW;		Morton Jaffray WTW;							

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

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Checking Points		Δ	Domestic Sewage	ō.	Industrial		Natural	Solid	Water	
	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works	Total
<u>ئ</u> ق	1. Manyame R. (Upstream)		2	2		59	39	٠	,	100
RR	2. Ruwa River	37	1	38	-	30	16	ŀ	,	æ
i i	3. Seke & Harava Dams	,	0	0	,	24	6	,	•	33
Rez	4. Nyatsime River	122	r4	123		96	48		1	267
	5. Mukuvisi River	361	0	361	0	8	19	,		388
C <sub>R2</sub> * R <sub>R4</sub> 6.	R <sub>R4</sub> 6. Manyame R. (Downstream)	110	0	111		19	14	1	0	143
	7. Marimba River	183	0	183		8	18			209
	8. Lake Chivero	23	1	23	1	32	21	1	1	76
Ryk 9.	9. Muzururu River	-	1	groß.		112	25		•	139
R <sub>R7</sub> 10	10. Gwebi River	Ľ	2	3		224	63		,	291
	11. Lake Manyame	4	τ	5	1	49	48		10	114
	Grand Total	841	01	851	<b>p</b> -1	661	320	1	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.

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

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

										(kg/day)
Water Quality		Ω	Domestic Sewage	že	Industrial		Natural	Solid	Water	
Checking Points	Sub-basin	Sewered	Unsewered	Total	Unsewered**	Livestock	Pollution	Waste Dumping	Treatment Works***	Total
Ω	1. Manyame R. (Upstream)		3	3	,	59	39	4	1	100
R <sub>K1</sub>	2. Ruwa River	114	ř	115	1	30	16	1	,	161
Ċ.,	3. Seke & Harava Dams		0	0	1	24	6	•	•	32
R SR	4. Nyatsime River	200	2	202	•	96	48	•	,	346
RRY	5. Mukuvisi River	546	0	546	0	8	19		1	573
CR: RR4	6. Manyame R. (Downstream)	112	0	112	•	19	14	•	0	145
RRS	7. Marimba River	271	0	272	•	8	18	,	,	397
C <sub>tt</sub>	8. Lake Chivero	22	1	23	1	32	21			76
RRA	9. Muzururu River	4	1	1		112	જ			139
R <sub>R7</sub>	10. Gwebi River		. 3	4	•	222	63	•	,	332
$C_{L_3}$	11. Lake Manyame	10	2	12	2	49	48	,	18	130
-	Grand Total	1.277	12	1,289	2	199	320		19	2291
*. After of	* After confluence of Mislamici Birer									

": After confluence of Mukuvisi River.

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

	24,300 m3/day	0.11 mg/l (Seke Dam)	0 kg/day (to Manyame river (downstream))	_	Ĭ	Α.		305 kg/day	from Lake Chivero; 283 kg/day	from Lake Manyame; 23 kg/day	18 kg/day (to Lake Manyame)
. 0.163	Amount of water intake;	T-P concentration of intake water;	Concentrated T-P load;	Amount of water intake;	T-P concentration of intake water;	Amount of water intake;	T-P concentration of intake water;	Intake T-P load;	from Lak	from Lak	Concentrated T-P load;
CALL TENEDRALE AND TO WOOD IN THE TANK A .	Prince Edward WTW;			Morton Jaffray WTW;							-

Pollution Load Run-off Model 10.3

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

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PL.No.         Quantity         Longth         PL.No.         Quantity         Length         TG           PL3         47         14         PL4         83         12         PL5         190         6           PL3         47         14         PL4         83         12         PL5         190         6           PL13         4.364         5         2			H		Ę			1			20			Flow	(kg/day, km)
PL3         47         14         PL4         83         12         PL5         15           PL9         370         8         20         20         20         20         20         20           PL13         4.364         5         PL11         2.630         12         20         20           PL15         2.392         8         PL11         2.630         12         20           PL20         387         41         20         20         20         20         20           PL21         71         71         72         789         -         10         20	Sub-basin PL No. Quantity Flow	Quantity		Flov	្ ភ	PL No.	Quantity		PL No.	Quantity	Length	PL No.	Quantity	Length	
PL3         47         14         PL4         83         12         PL5         190         6           PL3         370         8         2	1. Manyame R. (Upstream) PL1 205		205		23										2
PL9         370         8         6         6         7         6         7         8         7         8         9 <td>2. Ruwa River 37</td> <td></td> <td>37</td> <td></td> <td>24</td> <td>PL3</td> <td>47</td> <td>14</td> <td>PĽ4</td> <td>83</td> <td>12</td> <td>PLS</td> <td>190</td> <td>9</td> <td>35.</td>	2. Ruwa River 37		37		24	PL3	47	14	PĽ4	83	12	PLS	190	9	35.
PL5         370         8         Color of the	3. Scke & Harava Dams PL6 43		43		-										43
PL13         4,364         5         PL11         2,630         12           PL15         2,392         8         2,630         12           PL15         2,392         8         4         4           PL20         387         41         41         41           PL21         71         -         PL22         789         -           Grand Total         And	4. Nyatsirae River 200		200		28	6Td	370	<b>*</b>							571
PL10         46         18         PL11         2,630         12           PL15         2,392         8         2,630         12           PL16         3         41         41         41           PL20         387         41         41         41           PL21         71         -         PL22         789         -           Grand Total         And Total         And Total         And Total	S. Mukuvisi River 61		61	l	18	PL13	4,364	S							4,425
PL15       2.392       8       Residue to the control of the control	R <sub>R3</sub> " 6. Manyame R. (Downstream) PL7** 3		3		24	PL10	46	18	PL11	2,630	12				2,679
PL20 387 41	R <sub>Rs</sub> 7. Marimba River 32		32		12	PL15	2,392	80							2,424
PL20         387         41         Cand Total	8. Lake Chivero PL16 255		255		•										255
PL20         387         41         -         PL21         71         -         PL22         789         -         Grand Total	9. Muzururu River 178		178		17										178
71 - PL22 789 - Grand Total	R <sub>R7</sub> 10. Gwebi River 5		S	∤	83	PL20	387	41							392
e a company	11. Lake Manyame PL17*** 109				,	PL21	71	•	PL22	789	1				696
													Gr	ind Total	12,497

<sup>\*:</sup> Before confluence of Mukuvisi River.

<sup>\*\*:</sup> 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)

Water Quality Checking Points	Suality King hts	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow	PL No.	Quantity	Flow Length	Total
ڻّ		1. Manyame R. (Upstream)	PL1	230	23										230
	RRI	2. Ruwa River	PL2	54	24	PL3	61	14	PI.4	92	12	PLS	1,524	9	1,730
ပ်		3. Seke & Harava Dams	PL6	46	•										46
	RRC	4. Nyatsime River	Pr.8	216	28	PL9	700	8							916
	RRA	5. Mukuvisi River	PLIZ	63	18	PL13	5,327	Ŋ							5,390
ပ္မ	RR1	R <sub>R1</sub> * 6. Manyame R. (Downstream)	PL7**	7	24	PL10	49	18	PL11	3,383	12				3,440
	RRS	7. Marimba River	PL14	34	12	PL15	2,862	8							2,896
ပ်		8. Lake Chivero	PL16	257	•										257
	RRK	9. Muzururu River	PL18	190	17										061
	R <sub>R7</sub>	10. Gwebi River	PL19	9	83	PL.20	415	41							424
ű		11. Lake Manyame	PL17***	212	*	PL21	328		PL 22	805	•				1,345
													සි	Grand Total	16,862

": Before confluence of Mukuvisi River.

\*\*\*: Pollution load from Morton Jaffray WTW

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

10,938	Grand Total	Gra								i				
926			***		759	PI.22		57	PL21	1	110	PL17	11. Lake Manyame	C <sub>G</sub>
340							41	335	PL20	83	S	PL19	10. Gwebi River	RR7
156										17	156	PL18	9. Muzururu River	R
235										•	235	PL16	8. Lake Chivero	C <sub>L2</sub>
1.594							8	1,567	PL15	12	28	PL14	7. Marimba River	RR
2,305				12	2,263	PL11	18	39	PL10	24	3	PL7**	6. Manyame R. (Downstream)	CR: RR:
3,781							S	3,723	PL13	18	57	PL12	5. Mukuvisi River	R
1,087							8	915	PL9	28	172	PLS	4. Nyatsime River	RRZ
38	- NA (T-)									,	38	PIG	3. Seke & Harava Dams	ن ن
317	9	190	PLS	12	99	P1.4	14	21	PL3	24	40	PI.2	2. Ruwa River	RR1
159										23	159	PL.1	1. Manyame R. (Upstream)	نج
Total	Flow Length	Quantity	PL No.	Flow Length	Quantity	PL No.	Flow Length	Quantity	PL No.	Flow Length	Quantity	PĽ No.	Sub-basin	Water Quality Checking Points
(kg/day, km)														

<sup>\*:</sup> Before confluence of Mukuvisi River.
\*\*: Pollution load from Prince Edward WTW

<sup>\*\*\*:</sup> Pollution load from Morton Jaffray WTW

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

Á				1	Flow		-	Flow	2		Flow	i		Flow	(kg/day, km)
Checking Sub-basin PL No. Quantity Length	PL No.   Quantity	Quantity	Quantity	Lengt	, <u>,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	P.C. No.	Quantity	Length	P.C. No.	Quantity	Length	PL No.	Quantity	Length	Total
1. Manyame R. (Upstream) PL1 175	PL1 175	175		. 7	23										175
RR1 2. Ruwa River 51	PL2		51		24	PL3	27	17	27.4	72	12	PLS	1,524	9	1,674
3. Seke & Harava Dams PL6 40	PL6		40		1										40
R <sub>R2</sub> 4. Nyatsime River PL8 182	PI.8		182		28	PL9	1,663	တ							1,845
Rrd S. Mukuvisi River 89	PL12		59		18	PL13	5,285	5							5,344
RR1" 6. Manyame R. (Downstream) PL7** 6	PL7**		9		24	PL10	41	18	PL11	2,274	12				2,322
R <sub>Rs</sub> 7. Marimba River PL14 29	PL14		29		12	PL15	2,249	8							2,278
8. Lake Chivero PL16 225	PL16		225		'										225
R <sub>Re</sub> 9. Muzunuru River 163	PL18		163		17										163
R <sub>R</sub> , 10. Gwebi River 7	PLIS		7		83	PL20	352	41							359
11. Lake Manyame PL117*** 187	PL17***		187		•	PL21	295	3	PL22	769	1				1,250
													Gra	Grand Total	15,676

\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW

\*\*\*: Pollution load from Morton Jaffray WTW

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

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	compared the results of the results		Juccusta Juccusta	3		Concentration Foundation Loads by Sub-Basin (Sections)		1			<b>.</b>			(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
ن	1. Manyame R. (Upstream)	PL1	7,147	23										7,147
RR	1	PL2	112	24	PL3	189	14	PI24	3,049	12	PLS	761	9	4,111
J	3. Seke & Harava Dams	እርራ	1,920	1										1,920
R	4. Nyatsime River	PY.8	9,184	28	PL9	1,502	8							10.686
, and	R <sub>Rs</sub> 5. Mukuvisi River	PL12	2,994	18	PL13	20,134	V							23,128
C <sub>22</sub> R <sub>23</sub> .	* 6. Manyame R. (Downstream)	PL7**	39	24	PL10	2,415	18	PĽ11	14,011	12				16,465
į.	7. Marimba River	PL14	2,727	12	PL15	10,150	8							12,877
ਹੁ	8. Lake Chivero	PL16	4,386											4,386
R	9. Muzururu River	PL18	6,250	17										6,250
RR	, 10. Gwebi River	PL.19	15	83	PL20	14,428	41							14,443
ပ္ပ	1	PL17**	1,222		P1.21	358	1	PL22	10,910	, l				12,490
				,								Gra	Grand Total	113,903

\*: Before confluence of Mukuvisi River.

<sup>••:</sup> Pollution load from Prince Edward WTW

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

															(kg/dav, km)
Water Che Po	Water Quality Checking Points	Sub-basin	PL No.	Quantity	Flow Length	PL No.	Flow Length	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow	Total
ڻُ		1. Manyame R. (Upstream)	PL1	7,197	23										7,197
	χ R1	2. Ruwa River	PL2	162	24	PL3	246	14	PLA	3,068	12	PLS	8,961	9	12,436
ن		3. Seke & Harava Dams	PIS	1,926	•			~~~							1,926
	R.	4. Nyatsime River	PL8	9,221	28	67d	2,990	8							12,211
	R R	5. Mukuvisi River	PL12	2,998	18	PL13	24,380	3							27.379
ပ္ပ	R <sub>R3</sub>	R <sub>R3</sub> * 6. Manyame R. (Downstream)	PL7**	63	24	PLIO	2,422	18	PL11	17,026	12				115,61
	RRS	7. Marimba River	PL14	2,732	12	PL15	12,079	8							14,811
ပ္ပ		8. Lake Chivero	PL16	4,377	1										4,377
	R kk	9. Muzururu River	PL18	6,274	17										6.274
	R <sub>K7</sub>	10. Gwebi River	PL19	26	83	PL20	14,516	41							14,541
ਹ		11. Lake Manyame	PL17***	1,632	1	PL21	1,902	-	PL22	10,954	*				14,488
*****													ريدعا	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)

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						•		•		,				(kg/dav. 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
	1. Manyame R. (Upstream)	PL1	7,056	23										7,056
R <sub>R1</sub>	2. Ruwa River	PL2	119	24	PL3	111	14	PL4	3,014	12	PLS	761	9	4,005
	3. Seke & Harava Dams	P1.6	1,909	-										1,909
<b>78</b>	4. Nyatsime River	PL.8	9,134	28	67d	3,697	8							12,831
RRA	5. Mukavisi River	PL12	2,987	18	PL13	17.506	Ŋ							20,493
RRS	6. Manyame R. (Downstream)	PL7**	37	24	PL10	2,401	18	PL11	12,546	12				14,984
RRS	7. Marimba River	PL14	2,719	12	PL15	6.763	တ							9,482
	8. Lake Chivero	PL16	4,346	•										4,346
RRA	9. Muzururu River	PL18	6,206	17										6,206
R <sub>R7</sub>	10. Gwebi River	PL19	16	83	PL20	14,288	41							14,303
	11. Lake Manyame	PL17***	096	'	PL21	317	ı	PL22	10,846	•				12,123
												E	Grand Total	107.738
,	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1													

\*: 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	uality cing its	Sub-basin	PL No.	PL No.   Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
نَّ		1. Manyame R. (Upstream)	PL1	7,087	23			·							7,087
	RRI	2. Ruwa River	PL2	154	24	PL3	145	14	P1.4	3,026	12	PLS	8,961	9	12,286
ບີ		3. Seke & Harava Dams	974	1,913				<del>(************</del>							1,913
	RR2	4. Nyatsime River	PLS	9,162	28	PL9	6,973	O)			100.24.26				16,135
	R	5. Mukuvisi River	PL12	2,989	18	PL13	24,260	Ŋ							27,249
Ç.	R <sub>K3</sub> •	R <sub>R3</sub> *   6. Manyame R. (Downstream)	pr./""	59	24	PL10	2,405	18	PL11	12,589	12				15,054
	RRS	7. Marimba River	PL14	2,722	12	PL15	9.597	00							12,319
Ç		8. Lake Chivero	PL16	4,293	i			richidosadi in							4,293
	RRA	9. Muzururu River	PL18	6,221	17			rat finera			e in marine (				6,221
	R <sub>R</sub> ,	10. Gwebi River	PL19	20	83	PL20	14,347	41	,						14,367
ည်		11. Lake Manyame	PL17***	1,483	1	PL21	1,802	l	PL22	10,868	1				14,152
													Gra	Grand Total	131,077

\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW

\*\*\*: Pollution load from Morton Jaffray WTW

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

		Table 1000		Concerns				}	<u> </u>		\ \ \ \				(kg/day, km)
Water Quality Checking Points	uality ing	Sub-basin	PL No.	PL No.   Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Pt. No.	Quantity	Flow Length	Total
5		1. Manyame R. (Upstream)	PL1	880	23										880
	R.R.	2. Ruwa River	PL2	47	24	PL3	52	14	PL4	395	12	PLS	190	9	683
ن		3. Seke & Harava Dams	PI.6	274	,										274
	R.	4. Nyatsime River	PLS	1,235	28	PL9	347	8							1,582
		5. Mukuvisi River	PL12	283	18	PL13	2.879	Ş							3,163
<u>ئ</u>	l l	6. Manyame R. (Downstream)	PL7**	1	24	PL10	292	18	PL11	676	12	ossanče			696
•		7. Marimba River	PL14	265	12	PL15	2,079	8							2,343
S		8. Lake Chivero	PL16	899	,	and of the									899
	RRG	9. Muzururu River	PL18	1,025	17										1,025
	<b>15</b>	10. Gwebi River	EL19	7	83	PL.20	2,229	41							2,236
J		11. Lake Manyame	PL17**	27	<u>'</u>	PL21	52	'	PL22	934	,	2516.60			1,014
													Gra	Grand Total	14.837
												1			

": 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)

Quantity Flow Total	988	>>>	406 6 937	9	9	φ • • • • • • • • • • • • • • • • • • •	V	V	V	9	9	σ
PL No.			PLS	PIS	SIG	PIS	S I D D D D D D D D D D D D D D D D D D	STOCKER SCHOOLS SCHOOLS SCHOOLS	S I I	V III	S I I	
Flow		12					12	12	12	12	12	12
Quantity		397					1,430	1,430	1,430	1,430	1,430	1,430
PL No.		PL4					PL11	PL11	PL11	PL11	PL11	PL11
Flow Length		14			8	8 3	8 5 18	8 18 8	8 18 8	8 8 8	8 8 8	8 8 8 41
Ouantity		29			485	3,621	3,621	485 3,621 293 2,524	485 3,621 293 2,524	485 3,621 293 2,524	485 3,621 293 2,524 2,245	485 3,621 2,524 2,245 129
PL No.		PL3			PL9	PL9 PL13	PL9 PL13 PL10	PLI3 PLI0 PLI5	PLS PLIS PLIS	PLI3 PLI0 PLI5	PL3 PL13 PL16 PL15	PL3 PL13 PL16 PL20 PL20
Flow Length	23	24		ı	- 28	28	28 18	28 18 24 12	28 18 24 12	28 18 24 12 17	28 18 24 24 17 17	28 18 24 24 - 17 83
Quantity	988	29		275	275	275 1,240 284	275 1,240 284 2	275 1,240 284 2 2 2 2 2 2 2	275 1,240 284 2 2 2 2 265 265 670	275 1,240 284 284 265 265 670 670	275 1,240 284 284 265 265 670 670 1,028	275 1,240 284 284 265 265 670 670 11,028
PL No.	PL.1	PI.2	) Ja	~	<u> </u>	PL.8	PLS PL12 PL7**	PL12 PL7**	PL.8 PL.12 PL.7** PL.14	PL.8 PL.12 PL.14 PL.14 PL.16	PL12 PL12 PL14 PL16 PL16 PL18 PL18	PL12 PL12 PL14 PL16 PL16 PL18 PL19 PL19
Sub-basin	1. Manyame R. (Upstream)	2. Ruwa River	2 Cales & Marrie Dames	5. SCRC OF FLATOR LATINS	Seke & Indiava Lams     Nyatsime River	Serie & Indiava Dams     Nyatsime River     Mukuvisi River	R <sub>R2</sub> 4. Nyatsime River R <sub>R4</sub> 5. Mukuvisi River R <sub>R5</sub> * 6. Manyame R. (Downstream)	4. Nyatsime River 5. Mukuvisi River 6. Manyame R. (Downstream) 7. Marimba River	4. Nyatsime River 5. Mukuvisi River 6. Manyame R. (Downstream) 7. Marimba River 8. Lake Chivero	4. Nyatsime River  5. Mukuvisi River  6. Manyame R. (Downstream)  7. Marimba River  8. Lake Chivero  9. Muzururu River	4. Nyatsime River  5. Mukuvisi River  6. Manyame R. (Downstream)  7. Marimba River  8. Lake Chivero  9. Muzururu River  10. Gwebi River	4. Nyatsime River  5. Mukuvisi River  6. Manyame R. (Downstream)  7. Marimba River  8. Lake Chivero  9. Muzururu River  10. Gwebi River  11. Lake Manyame
Water Quality Checking Points		RR, 2	43		Rp2 4		RR2 4	R <sub>R2</sub> 4 R <sub>R4</sub> 5 R <sub>R3</sub> 6	Rrs 6	Rrs 4 Rrs 7 Rrs 7 Rrs 8 Rrs 9	RR2 4 RR4 5 RR4 6 RR5 7 RR6 7 RR7 1	RR2 6 6 8 7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Water Che Po	نّ		ڻ				نٔی	ڭ	g g	G G	S J	<b>3</b> 3 3

\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW
\*\*\*: Pollution load from Morton Jaffray WTW

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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 PL No.	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
ؿٞ	1. Manyame R. (Upstream)	PL1	868	23			amendar be							898
R.	2. Ruwa River	P1.2	50	24	PL3	19	14	P. 7.	390	12	PLS	190	9	648
تی	3. Seke & Harava Dams	PLG	273	,			**************************************							273
RR2	4. Nyatsime River	PI.8	1,230	28	PI.9	877	8							2,106
RR	5. Mukuvisi River	PL12	282	18	PL13	2,274	5							2,556
C <sub>R2</sub> R <sub>R3</sub> *	R <sub>R1</sub> * 6. Manyame R. (Downstream)	PL7	eđ	24	PL10	290	18	PL11	309	12				009
RRS	7. Marimba River	PL14	264	12	PL15	1,288	8							1,552
C <sub>L</sub>	8. Lake Chivero	PL16	642	•							-0-150			642
RRA	9. Muzururu River	PL18	1,020	17			2.4							1,020
RR7	10. Gwebi River	PL19	7	83	PL20	2,206	41							2,213
$C_{L3}$	11. Lake Manyame	PL17***	21	•	PL21	28	•	PL22	926	1				975
												S	Grand Total	13,453

\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW

\*\*\*: Pollution load from Morton Jaffray WTW

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

16,130	Grand Total	Gran													
1,025	ACURE			1	929	PI.22	-	2	PL21		26	PL17***	11. Lake Manyame		ર્ડે
2,226	room l						41	2,217	PL20	83	6	PL.19	10. Gwebi River	R <sub>R7</sub>	
1,021	× = +1->									17	1,021	PL18	9. Muzururu River	RRA	- 1
645										,	645	PL16	8. Lake Chivero		સુ
2,187	*1.22						8	1,923	PL15	12	264	PL14	7. Marimba River	RRS	
612				12	319	PL11	18	291	PL10	24	p-4	PL7**	6. Manyame R. (Downstream)	R <sub>R3</sub> *	လို
3,842							v	3,559	PL13	18	283	PL12	5. Mukuvisi River	RR4	•
2,540							8	1,305	PL9	28	1,235	PLS	4. Nyatsime River	RRZ	1
273										r	273	PI.6	3. Seke & Harava Dams		S
988	9	406	PLS	12	391	P1.4	14	25	PL3	24	64	PI.2	2. Ruwa River	R KI	į
872										23	872	PL1	1. Manyame R. (Upstream)		ڻ
Total	Flow Length	Quantity	PL No.	Flow Length	Quantity	PL No.	Flow Length	Quantity	PL No.	Flow Length	Quantity	PL No.	Sub-basin	ater Quality Checking Points	यु है की
(kg/day. km) Total 872 886 273	Flow Length	Quantity 406			Quantity 391	PL No.	Flow Length			Flow Length 23	Quantity 872 64 64 273	PL No.	Sub-basin  1. Manyame R. (Upstream)  2. Ruwa River  3. Seke & Harava Dams		Water Quality Checking Points C <sub>R1</sub> R <sub>R1</sub>

\*: 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)

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(kg/day, km)	Total	101	88	34	195	472	193	318	79	139	292	121	2,031
B	Flow Length		ý					-					Grand Total
	Quantity		26										Gra
	PL No.		PLS					-530×54				ognes	
	Flow PL No.		12				12						
	Quantity		47				160					101	
,	PL No.		7.7 2.7				PLII				****	PI.22	
	Flow Length		4		S	5	18	8			41	•	
	Quantity		80		49	444	33	292			291	9	
	PL No.		PL3		PL.9	PL13	PL10	PL15			PL20	PL21	
	Flow Length	23	24		28	18	24	12	1	17	83	•	
	PL No. Quantity	101	7	34	146	28	0	26	79	139	1	14	
	PL No.	PL1	PI.2	PL6	PLS	PL12	/Td	PL14	PL16	PL18	9174	pr17***	
	Sub-basin	1. Manyame R. (Upstream)	2. Ruwa River	3. Seke & Harava Dams	4. Nyatsime River	5. Mukuvisi River	R <sub>R3</sub> * 6. Manyame R. (Downstream)	7. Marimba River	8. Lake Chivero	9. Muzururu River	10. Gwebi River	11. Lake Manyame	
	Water Quality Checking Points		RRI	Ü	RR		S. R.		1	RRK		S	

\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW
\*\*\*: Pollution load from Morton Jaffray WTW

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

PL No. Quantity
PL1
PI.2
PL6
PLS
PL12
PL7**
PL14
PL16
PL18
PL19
PL17***

\*: Before confluence of Mukuvisi River.
\*\*: Pollution load from Prince Edward WTW

\*\*\*: Pollution load from Morton Jaffray WTW

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

Flow Longth         PL No.         Quantity         Flow Longth         Total           24         PLS         3         14         PLA         47         12         PLS         6         6           28         PLIS         8         12	114	Grand Total	Gra		1	100	PL22	14 ,	280	PI20 PI21	83	1	PL17		10. Gwebi River 11. Lake Manyame
Flow Longth         Flow Longth         Flow Longth         PL No.         Quantity Longth         Flow Longth         PL No.         PL N	291	64,65¢					of engage	41	290	PL20	83			PL19	10. Gwebi River PL19
Flow Longth         PL No.         Quantity         Flow Longth         PL No.         P	139	retees#e		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,						oor, take	17	139		PL18	
Flow Longth         PL No.         Quantity         Flow Longth         PL No.         PL No. </td <td>76</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>'</td> <td>76</td> <td></td> <td>PL16</td> <td>S. Lake Chivero</td>	76										'	76		PL16	S. Lake Chivero
Flow Longth         PL No.         Chantity Length         Flow Length         PL No.         Quantity Length         Flow Length         PL No.         PL N	209							8	183	PL15	12	52		PL14	
Flow Longth         PL No.         Quantity         Flow Longth         PL No.         PL No.         Quantity         Flow Longth         PL No.	143				12	110	PL11	18	33	PL10	24	ं		PL7**	RR3 6. Manyame R. (Downstream) PL7**
Flow Longth         PL No.         Quantity         Flow Longth         Total           23         PL3         14         PL4         47         12         PLS         26         6           -         -         -         -         -         -         -         -         -           28         PL9         122         8         -         -         -         -         -	388						200	S	361	PL13	18	7	27	PL12 2	
Flow Longth         PL No.         Quantity         Flow Longth         Total           23         24         PL3         3         14         PL4         47         12         PLS         26         6           -         -         -         -         -         -         -         -         -	267	-						ω	122	PL9	28	145	77	71.8 1.4	
Flow Longth         PL No.         Quantity         Flow Length         PL No.         Quantity         Flow Length         PL No.         Quantity         Flow Length         Total           23         24         PLS         3         14         PLA         47         12         PLS         26         6	33	te successfülle									1	33		PL6	
Flow Flow PL No. Quantity Flow PL No. Quantity Length PL No. Quantity Length Tota Length Leng	83	8	78	Prs	12	47	PI.4	14	3	PL3	24	90		P1.2	2. Ruwa River
Flow FL No. Quantity Flow PL No. Quantity Flow PL No. Quantity Length Length Length	100	, <u>, , , , , , , , , , , , , , , , , , </u>					beretze.				23	Q	100	PL1 10	
	Total	Flow Length	Quantity	PL No.	Flow Length			Flow Length	Quantity	PL No.	Flow Length	25	Quantil	PL No. Quantity	Sub-basin PL No. Quantil

<sup>\*:</sup> 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)

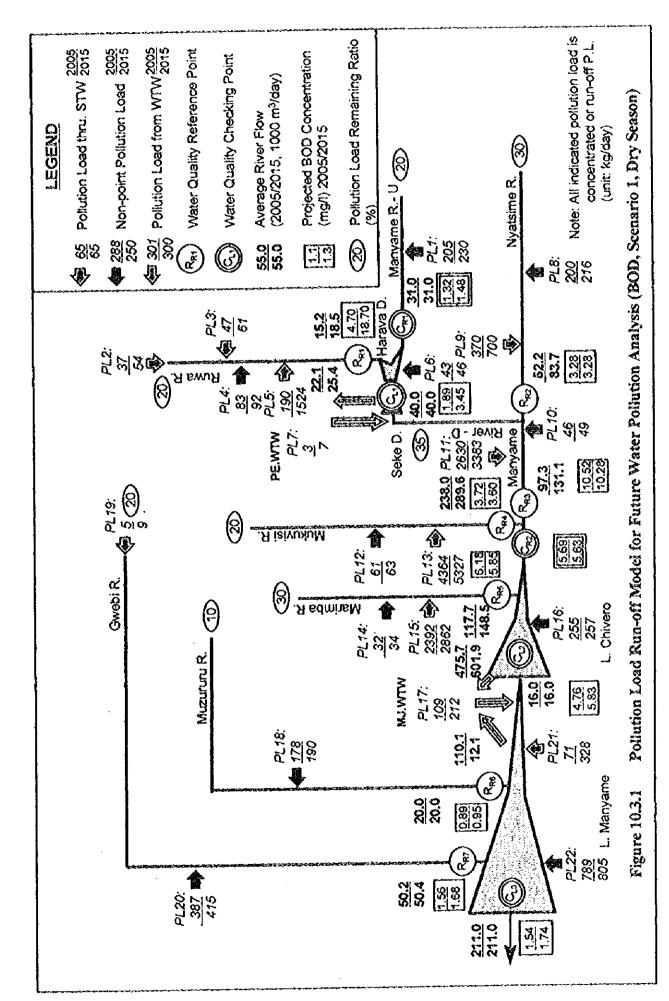
		-												(kg/day, km)
	Sub-basin	PL No.	PL No. Quantity	Flow	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	PL No.	Quantity	Flow Length	Total
	1. Manyame R. (Upstream)	PL1	100	23										100
- (4	2. Ruwa River	PI.2	10	24	PL3	4	14	PI.4	47	12	PLS	100	9	191
	3. Seke & Harava Dams	PI.6	34	•										34
	4. Nyatsime River	PLS	145	28	67d	200	8							346
	5. Mukuvisi River	PL12	28	18	PL13	546	Ŋ							573
	R <sub>R1</sub> * 6. Manyame R. (Downstream)	PL7**	0	24	PL.10	33	18	PL11	112	12				145
	7. Marimba River	PL14	26	12	STTA	271	S						74151	297
	8. Lake Chivero	PL16	76	1										76
	9. Muzururu River	PL18	139	17										139
	10. Gwebi River	PL19	н	æ	PL 20	290	41							292
	11. Lake Manyame	PL17***	18	1	PL21	10	1	PL22	101	í				130
												Gra	Grand Total	2,291

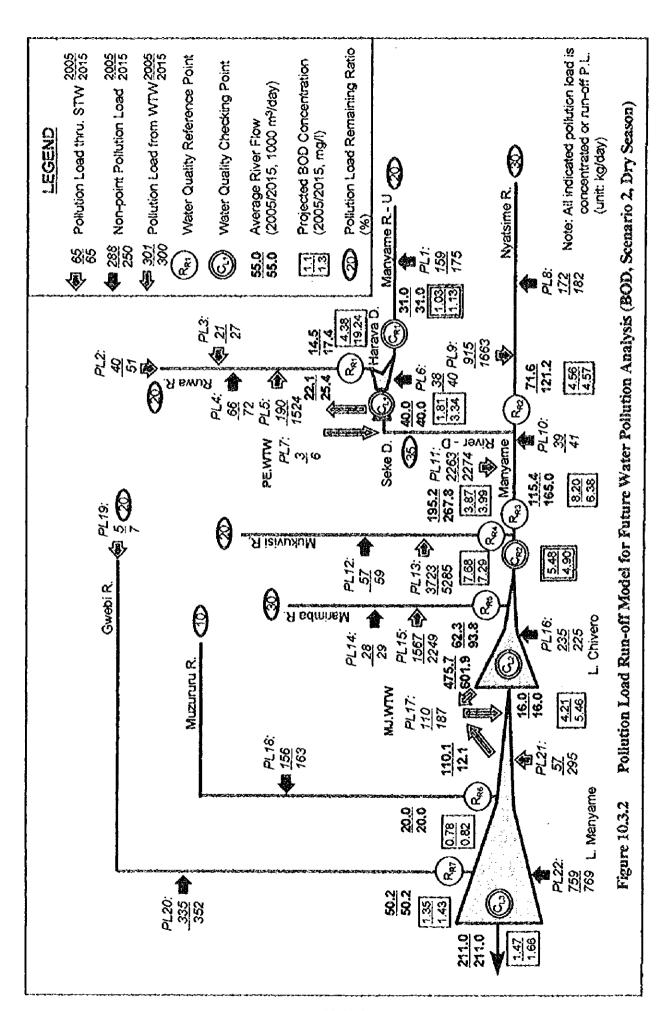
\*: Before confluence of Mukuvisi River.

\*\*: Pollution load from Prince Edward WTW

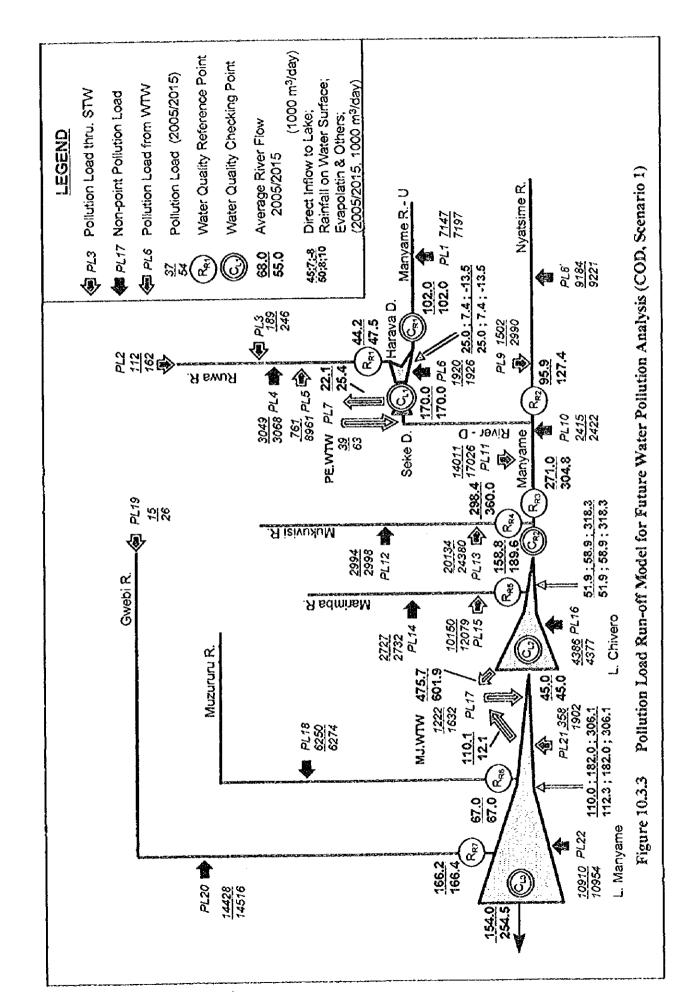
\*\*\*: Pollution load from Morton Jaffray WIW

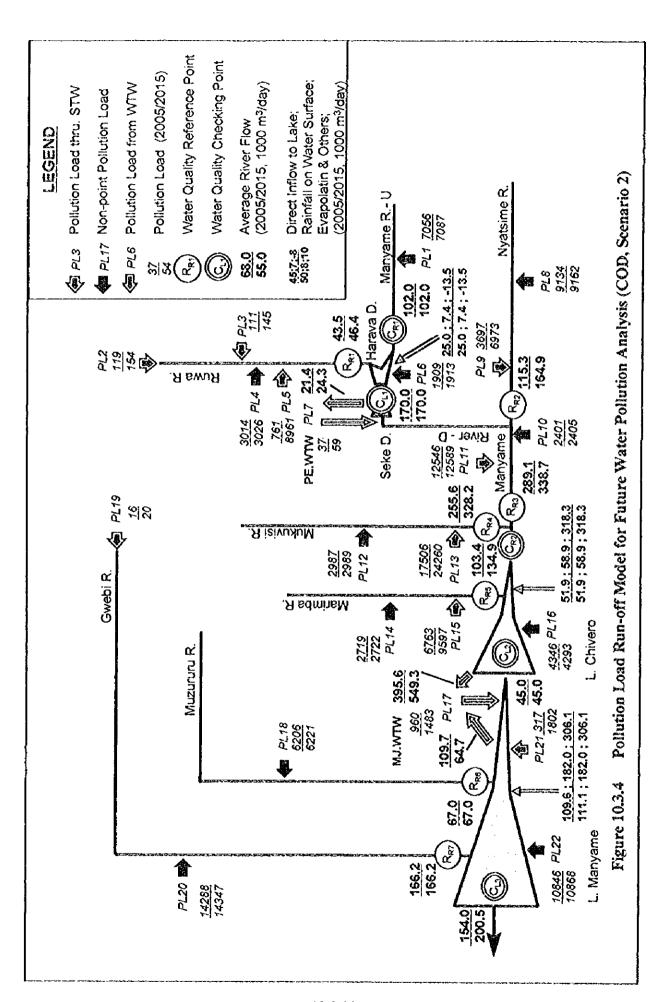
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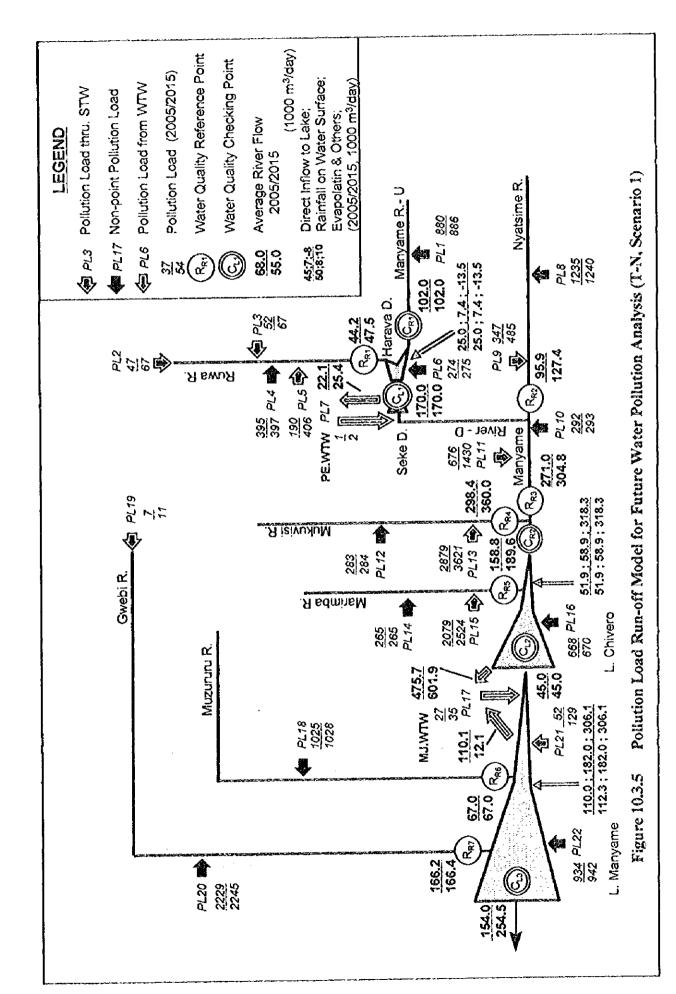


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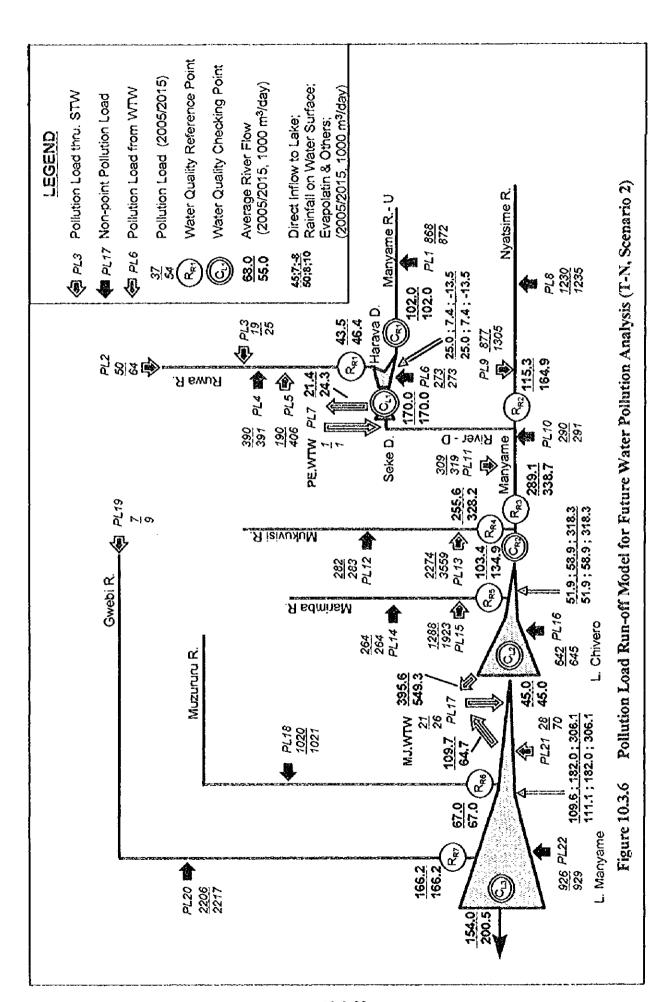


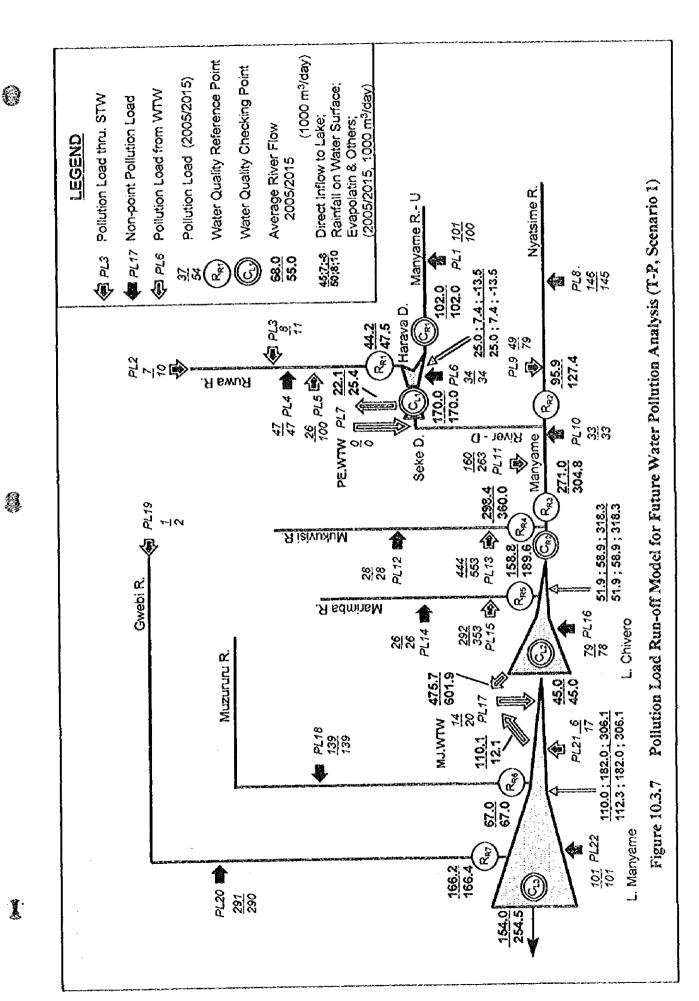


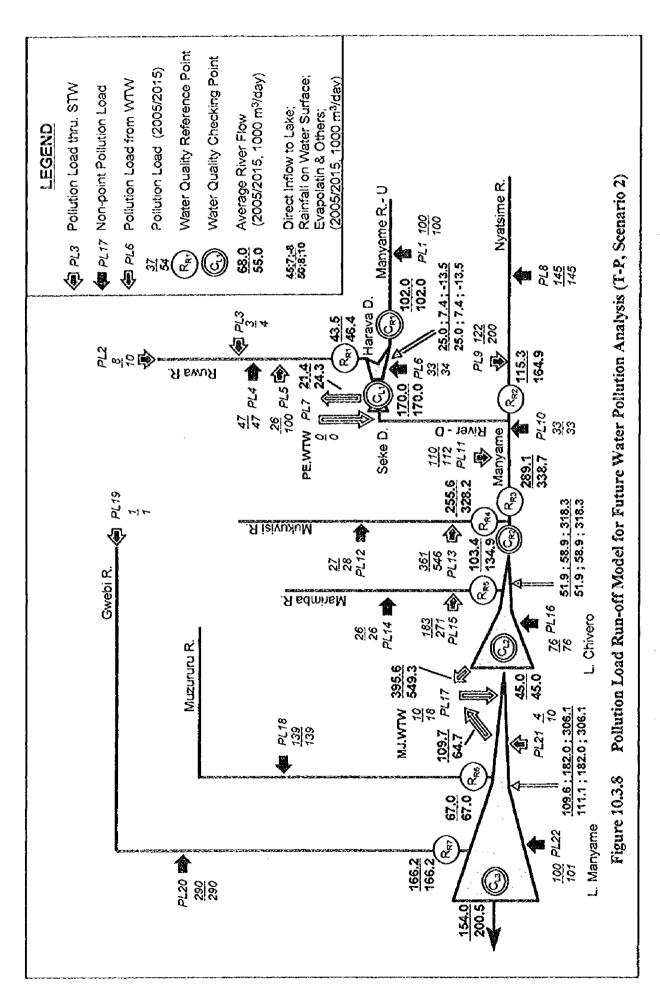
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10.4 Future Water Pollution Analysis

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

11/000		Run off BOD	Concentrated		Pollution Load		Run-off BOD	3
Quality	Sub-basin	Load at	BOD Load	Total BOD Load	Remaining	Flow Rate at Downstream	Load at Downstream	Concentration
Cnecking Points		(kg/day)	(kg/day)	(kg/day)	(%)	(m3/day)	(kg/day)	at WQCP (mg/l)
ڻ	1. Manyame R. (Upstream)	0	205	205	20%	31,000	41	1.32
•	Rr. 2. Ruwa River	0	357	357	20%	15,200	71	4.70
C.	3. Seke & Harava Dams	112	43	156	49%	40,000	76	1.89
RR2	R <sub>R2</sub> 4. Nyatsime River	0	271	571	30%	52,200	171	3.28
, W	RR: 5. Manyame R. (Downstream)	247	2,679	2,925	35%	97,300	1,024	10.52
RRA	R <sub>ks.</sub> 6. Mukuvisi River	0	4,425	4,425	20%	238,000	882	3.72
• " "	7. Manyame R. (Downstream)	1,909	ţ	1,909	100%	335,300	1,909	5.69
1	R <sub>R5</sub> 8. Marimba River	0	2,424	2,424	30%	117,700	727	6.18
ر <sub>د</sub> .	9. Lake Chivero	2,636	255	2,891	3%	16,000	76	4.76
RRA	RR, 10. Muzururu River	0	178	178	10%	20,000	18	0.89
RR7	R <sub>R7</sub> 111. Gwebi River	0	392	392	20%	50,200	78	1.56
સુ	12. Lake Manyame	172	696	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 10.42 Projected Water Quality of Rivers (Scenario 1, 2015, BOD, Dry Season)

Water		Run-off BOD Load at	Concentrated BOD Load	Total BOD	Pollution Load Remaining	Flow Rate	Run-off BOD Load at	BOD
Checking Points	Sub-basın	Upstream (kg/day)	in Sub-basin (kg/day)	(kg/day)	Ratio (%)	Downstream (m3/day)	Downstream (kg/day)	at WOCP (mg/l)
تَّی	1. Manyame R. (Upstream)	0	230	230	20%	31,000	46	1.48
RR	2. Ruwa River	0	1,730	1,730	20%	18,500	346	18.70
ان ت	3. Seke & Harava Dams	392	46	438	31%	40,000	138	3.45
R	4. Nyatsime River	0	916	916	30%	83,700	275	3.28
R	RR1 5. Manyame R. (Downstream)	413	3,440	3,852	35%	131,100	1,348	10.28
Ŋ,	R <sub>k4</sub> 6. Mukuvisi River	0	5,390	5,390	20%	299,600	1,078	3.60
, zz	7. Manyame R. (Downstream)	2,426		2,426	100%	430,700	2,426	5.63
RRS	R <sub>R5</sub> S. Marimba River	0	2,896	2,896	30%	148,500	869	5.85
સ	9. Lake Chivero	3,295	257	3,552	3%	16,000	93	5.83
RRK	R <sub>RA</sub> 10. Muzururu River	0	190	190	10%	20,000	19	0.95
R <sub>R7</sub>	R <sub>R7</sub> 111. Gwebi River	0	424	424	20%	50,400	85	1.68
S.	12. Lake Manyame	197	1.345	1,542	29%	254,500	442	1.74

Note: 1. CR2; After confluence of Mukuvisi River.

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

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



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

Quantily.

Water Ouality 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)
Çĸı	1. Manyame R. (Upstream)	0	159	159	20%	31,000	32	1.03
RRI	2. Ruwa River	0	317	317	20%	14,500	63	4.38
C <sub>C</sub> ,	3. Seke & Harava Dams	95	38	133	54%	40,000	72	1.81
RR2	4. Nyatsime River	0	1,087	1,087	30%	71,600	326	4.56
Res	R <sub>R3</sub> 5. Manyame R. (Downstream)	399	2,305	2,704	35%	115,400	946	8.20
RR4	R <sub>RA</sub> 6. Mukuvisi River	0	3,781	3,781	20%	195,200	756	3.87
C <sub>R2</sub> *	7. Manyame R. (Downstream)	1,703	•	1,703	100%	310,600	1,703	5.48
	R <sub>R5</sub> 8. Marimba River	0	1,594	1,594	30%	62,300	478	7.68
$C_{L_2}$	9. Lake Chivero	2,181	235	2,416	3%	16,000	29	4.21
RRK	R <sub>Re</sub> 10. Muzururu River	0	156	156	10%	20,000	16	0.78
R <sub>R7</sub>	R <sub>R7</sub> 111. Gwebi River	0	340	340	20%	50,200	89	1.35
ပ်	12. Lake Manyame	151	926	1.076	29%	211,000	311	1.47

Note: 1. Cr2; 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 Scason)

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)
نځ	1. Manyame R. (Upstream)	0	175	175	20%	31,000	35	1.13
RRI	R <sub>RI</sub> 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
RR	R <sub>R2</sub> 4. Nyatsime River	0	1,845	1,845	30%	121,200	553	4.57
RR3	R <sub>R3</sub> 5. Manyame R. (Downstream)	687	2,322	3,009	35%	165,000	1,053	6.38
RR4	RR. 6. Mukuvisi River	0	5,344	5,344	20%	267,800	1.069	3.99
C <sub>k2</sub> •	7. Manyame R. (Downstream)	2,122	1	2,122	100%	432,800	2,122	4.90
RRS	R <sub>Rs</sub> 8. Marimba River	0	2,278	2,278	30%	93,800	683	7.29
C <sub>t.2</sub>	9. Lake Chivero	2,805	225	3,031	3%	16,000	87	5.46
R <sub>R</sub> s	10. Muzururu River	0	163	163	10%	20.000	16	0.82
RR7	RR, 11. Gwebi River	0	359	359	20%	50,200	72	1.43
C <sub>C</sub> 3	12. Lake Manyame	176	1,250	1,426	25%	211,000	351	1.66

Note: 1. Cr2; 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.

8

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

Volume of Dams:		12,406,000		m3
Inflow Water Vo	lume:	192,100		m3/day
Rivers:	Manyame;		102,000	m3/day
	Ruwa;		44,200	m3/day
Direct Infl	ow;		25,000	m3/day
Rainfall;			7,400	m3/đay
Evaporation	n & Others;		13,500	m3/day
Outflow Water V		192,100		m3/day
to Manyan	ne 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) x V) + DCOD where; N: Concentration of I

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		

## $DCOD = a(N) \times T - N \times 17.73$

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

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)
DCO	$D = a(N) \times T \cdot N \times 17.73 = 10.64$				

<sup>\*;</sup> 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	<b>:</b>	257,181,000		m3
Inflow Water Ve	olume:	520,700		m3/day
Rivers;	Manyame;		271,000	m3/day
	Mukuvisi;		298,400	m3/đay
	Marimba;		158,800	m3/day
Direct Inf	low;		51,900	m3/đay
Rainfall;			58,900	m3/day
Evaporati	on & Others;	(318,300)		m3/day
Outflow Water	Volume:	520,700	•	m3/day
to Lake M	lanyame;		45,000	m3/day
Morton Ja	offray WTW;		475,700	m3/đay
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)

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

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

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

•		, ,		
ere;	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 take (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
	<b>V</b> :	Volume of lake (m3)	=	257,181,000
	DCOD:	Secondary production COD		

## $DCOD = a(N) \times T-N \times 17.73$

where;	a(N);	Conversion rate of Nitrogen to DCOD	=	1.0024
	17.72.	The restinal COD (accounted to be 000% of TC	boouters and the	

Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity

T-N =	$L(N)/((rw+sN) \times V) =$	0.77	(mg/l)		
$T \cdot P =$	$L(P)/((rw+sP) \times V) =$	0.46	(nɪg/lj)		
COD ≃	$L(COD)/((rw+sCOD) \times V) + DCOD =$	38.65	(mg/l) =	4.76	equiv. BOD *(mg/l)
DCO	$D = a(N) \times T - N \times 17.73 = 13.67$				

<sup>\*;</sup> 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)

100

Volume of Lake:		480,236,000		m3
Inflow Water Vo		264,100		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
,	Muzururu		67,000	m3/day
	Gwebi		166,200	m3/day
Direct Infl	low:		110,000	m3/day
Rainfall;	,		182,000	m3/day
	on & Others;		(306,100)	m3/day
Outflow Water V		264,100	•	m3/day
to Manyame River;			154,000	m3/day
	ffray WTW;		110,100	m3/day

Pollution Load Inflow: (kg/day)

Detention Time of Lake:

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

1,818

# 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)	=	4,275,000
-	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)	<b>=</b>	480,236,000
	DCOD:	Secondary production COD		

days

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

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

T-N = T-P =	$L(N) / ((rw+sN) \times V) =$ $L(P) / ((rw+sP) \times V) =$	0.74 0.04	(mg/l) (mg/l)		
	$L(COD)/((rw+sCOD) \times V) + DCOD = 0 = a(N) \times T-N \times 17.73 = 5.61$	20.30	(mg/l) =	1.54	equiv. BOD *(mg/l)

<sup>\*;</sup> 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		n13
Inflow Water Vo		195,400		m3/day
Rivers;	Manyame;		102,000	m3/day
•	Ruwa;		47,500	กา3/day
Direct Inf	low;		25,000	m3/day
Rainfall;	•		7,400	m3/day
Evaporation & Others;			13,500	m3/day
Outflow Water Volume:		195,400		m3/day
to Manyai	me River;		170,000	m3/day
•	ward WTW;		25,400	m3/day
Detection Time	at Dam Lakai	63.5		dave

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: (Voilenweider Model)

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

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

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

•	, ((	2 (11 (10)		
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		

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

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

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)
DCO	$D = a(N) \times T - N \times 17.73 = 12.14$				

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



Volume of Dams:		257,181,000		m3
Inflow Water Vo	lume:	646,900		m3/day
Rivers;	Manyame;		304,800	m3/day
•	Mukuvisi;		360,000	m3/day
	Marimoa;		189,600	m3/day
Direct Inf	low;		51,900	m3/day
Rainfall;	-		58,900	m3/day
Evaporation & Others; Ontflow Water Volume:			(318,300)	m3/day
		646,900	•	m3/day
to Lake M	lanyame;		45,000	m3/đay
Morton Ja	iffray 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)

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

where;

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

, ((····-	/··/·		
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)	=	83,539,000
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		

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

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

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

<sup>\*;</sup> 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)

days

Volume of Lake:		480,236,000		m3
Inflow Water Vo	lume:	266,600		m3/day
Rivers;	Lake Chivero;		45,000	m3/day
	Muzuroru		67,000	m3/day
	Gwebi		166,400	m3/day
Direct Infl	low;		112,300	m3/day
Rainfall;			182,000	m3/day
Evaporation	on & Others;		(306,100)	m3/day
Outflow Water V	/olume:	266,600		m3/day
to Manyar	ne River;		254,500	m3/day
-	ffray WTW;		12,100	m3/day

## Pollution Load Inflow: (kg/day)

Detention Time of Lake:

-	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

1,801

#### Formula for Pollution Analysis: (Vollenweider Model)

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

where;

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

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	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)	22	480,236,000	
DCOD:	Secondary production COD			
L(COD): rw: sN: sP: sCOD: V:	Quantity of inflow COD to lake (g/day) Rate of change of water (1/day) Self-purification (reduction) coefficient for Nitrogen Self-purification (reduction) coefficient for Phosphorus Self-purification (reduction) coefficient for inflow COD Volume of lake (m3)	= = =	37,319,00 0.0005: 0.011. 0.027. 0.004	00 55 51 69 40

#### $DCOD = a(N) \times T-N \times 17.73$

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

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)
DCO	$D = a(N) \times T - N \times 17.73 = 5.76$				

<sup>\*;</sup> 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:	<b>!</b>	12,406,000		m3		
Inflow Water Vo		191,400		m3/day		
Rivers;	Manyame;		102,000	m3/day		
·· ·	Ruwa;		43,500	m3/day		
Direct Infl			25,000	m3/day		
Rainfall;	•		7,400	m3/day		
Evaporation	on & Others;		13,500	m3/day		
Outflow Water V		191,400		m3/day		
to Manyar	ne River;		170,000	m3/day		
Prince Ed	ward WTW;		21,400	m3/day		
Detention Time (	of Dam Lake:	64.8		days		
Pollution Load I	nflow: (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 Poli	ution Analysis:	(Vollenweider Mo	odel)			
N = L(N)	) / ((rw+sN) x V)	l				
	/ ((rw+sP) x V)					
COD = L	(COD) / ((rw+sC	OD) x V) + DCOD	)			
where		Concentration of	Nitrogen of	lake (g/m3)		
	P:	Concentration of	Phosphorus	of lake (g/m3)		
	COD:	Concentration of	COD of lake	e (g/m3)		4 000 000
	L(N):	Quantity of inflo	w Nitrogen to	o lake (g/day)	=	1,789,000
	L(P):	Quantity of inflo	w Phosphoru	is to lake (g/day)	=	216,000
	L(COD):	Quantity of inflo			=	12,970,000 0.015428
	rw:	Rate of change o	f water (1/da	y)	==	
	sN:	Self-purification	(reduction) o	coefficient for Nitrogen	=	0.18797
	sP:	Self-purification	(reduction) o	coefficient for Phosphorus	<b>:</b> =	0.20574
	sCOD:			coefficient for inflow COI		<i>0.07551</i> 12,406,000
	V:	Volume of lake (			==	12,400,000
	DCOD:	Secondary produ	oed COD			
	DCOD =	a(N) x T-N x 17.73				0.0344
	_	(5.1)	3	GOOD at account Military	_	0.8246

## Computation of Water Quality:

T-N = T-P =	$L(N) / ((rw+sN) \times V) =$ $L(P) / ((rw+sP) \times V) =$	0.71 0.08	(mg/l) (mg/l)		
	L(COD) / ((rw+sCOD) x V) + DCOD = D = a(N) x T-N x 17.73 = 10.37	21.86	(n/g/l) =	3.81	equiv. BOD *(mg/l)

Conversion rate of Nitrogen to DCOD

by phytoplankton from unit nitrogen quantity

Theoretical COD (assumed to be 90% of TOD) quantity produced

0.8246

a(N);

17.73;

where;

T.

<sup>\*;</sup> 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 Vo	lume:	440,600	m3/da	
Rivers;	Manyame;		289,100	m3/day
	Mukuvisi;		255,600	m3/day
	Marimba;		103,400	m3/day
Direct Infl	ow;		51,900	m3/day
Rainfall;			58,900	m3/day
Evaporation	on & Others;		(318,300)	m3/day
Outflow Water V	olume:	440,600		m3/day
to Lake M	anyame;		45,000	m3/day
Morton Ja	ffray WTW;		395,600	m3/day
Detention Time of	f 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 Poliution Analysis: (Vollenweider Model)

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

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

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 take (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	=	0.00863
	sCOD:	Self-purification (reduction) coefficient for inflow COD	=	0.00908
	V:	Volume of lake (m3)	=	257,181,000
	DCOD:	Secondary production COD		

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

where; a(N); Conversion rate of Nitrogen to DCOD = 1.0024 17.73; Theoretical COD (assumed to be 90% of TOD) quantity produced

Theoretical COD (assumed to be 90% of TOD) quantity produced by phytoplankton from unit nitrogen quantity

T-N =	$L(N)/((rw+sN) \times V) =$	0.66	(mg/i)		
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)
DCO	$D = a(N) \times T - N \times 17.73 = 11.79$				

<sup>\*;</sup> 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	
Rive	s; Lak	e Chivero;		45,000	m3/day
	Mua	oruru -		67,000	m3/day
	Gw	ebi		166,200	m3/day
Dire	t Inflow:			109,600	m3/day
Rain	fall;			182,000	m3/day
Evap	oration & C	thers;		(306,100)	m3/day
Outflow Wa			263,700		m3/day
to M	anyame Riv	er:		154,000	m3/day
	on Jaffray \	-		109,700	m3/day
Detention T	ime of Lak	e:	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)

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

where;

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

פריינו)) יונטט	CODIX III BEOD		
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		

## $DCOD = a(N) \times T-N \times 17.73$

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

T-N =	$L(N)/((rw+sN) \times V) =$	0.73	(mg/l)		
<b>T-P</b> =	$L(P)/((rw+sP) \times V) =$	0.04	(mg/l)		
COD =	$L(COD)/((rw+sCOD) \times V) + DCOD =$	19.92	(mg/l) =	1.47	equiv. BOD *(mg/l)
DCO	$DD = a(N) \times T \cdot N \times 17.73 = 5.52$				

<sup>\*;</sup> 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 Vo	lume:	194,300		m3/day
Rivers;	Manyame;		102,000	m3/day
·	Ruwa;		46,400	m3/day
Direct Inf	low;		25,000	m3/day
Rainfall;	-		7,400	m3/day
•	on & Others;		13,500	m3/day
Outflow Water V		194,300		m3/day
to Manyai	ne River;		170,000	m3/day
Prince Ed	ward WFW;		24,300	m3/day
Detention Time	of Dam Lake:	63.8		đays
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
N = L(N P = L(P)	lution Analysis: (' ) / ((rw+sN) x V) / ((rw+sP) x V) (COD) / ((rw+sCO			
COD = F	(COD) \ ((IM+8CC	אלחו + לא צלחו	•	

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
	rv:	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		
		<b>7</b> •		

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

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:

<sup>\*;</sup> 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	<b>.</b>	257,181,000		m3	
Inflow Water Vo	-	594,300		m3/day	
Rivers;	Manyame;	•	338,700	m3/day	
2.4,	Mokuvisi:		328,200	m3/day	
	Marimba;		134,900	m3/day	
Direct Infl			51,900	m3/day	
Rainfall:	•		58,900	m3/day	
Evaporation	on & Others;		(318,300)	m3/day	
Outflow Water V		594,300		m3/day	
to Lake M			45,000	m3/day	
	ffray WTW;		549,300	m3/day	
Detention Time	of Lake:	433		days	
Poliution Load I	nílow: (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 Pol	ution Analysis	s: (Vollenweider Mo	odel)		
	/((rw+sN) x \				
	/ ((rw+sP) x V)				
		COD) x V) + DCOD	•		
where		Concentration of ?		ke (g/m3)	
	P: Concentration of Phosphorus of lake (g/m3)				

Concentration of Nitrogen of lake (g/m3)		
Concentration of Phosphorus of lake (g/m3)		
Concentration of COD of lake (g/m3)		
Quantity of inflow Nitrogen to lake (g/day)	=	9,963,000
Quantity of inflow Phosphorus to lake (g/day)	=	1,454,000
Quantity of inflow COD to lake (g/day)	=	80,248,000
	=	0.002311
	=	0.04270
	=	0.00868
	=	0.00908
•	=	257,181,000
Secondary production COD		
	Concentration of Phosphorus of lake (g/m3) Concentration of COD of lake (g/m3) Quantity of inflow Nitrogen to lake (g/day) Quantity of inflow Phosphorus to lake (g/day) Quantity of inflow COD to lake (g/day) Rate of change of water (1/day) Self-purification (reduction) coefficient for Nitrogen Self-purification (reduction) coefficient for Phosphorus Self-purification (reduction) coefficient for inflow COD Volume of lake (m3)	Concentration of Phosphorus of lake (g/m3)  Concentration of COD of lake (g/m3)  Quantity of inflow Nitrogen to lake (g/day)  Quantity of inflow Phosphorus to lake (g/day)  Quantity of inflow COD to lake (g/day)  Rate of change of water (1/day)  Self-purification (reduction) coefficient for Nitrogen  Self-purification (reduction) coefficient for Phosphorus  Self-purification (reduction) coefficient for inflow COD  Volume of lake (m3)

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

where; a(N);

Conversion rate of Nitrogen to DCOD

1.0024

1771.

Theoretical COD (assumed to be 90% of TOD) quantity produced

by phytoplankton from unit nitrogen quantity

Difficult of	4. m. m				
T-N =	$L(N)/((rw+sN) \times V) =$	0.86	(mg/i)		
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)
DCO	$D = a(N) \times T - N \times 17.73 = 15.30$				

e; 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
-	Muzoruru		67,000	m3/day
	Gwebi		166,200	m3/day
Direct Inflow;			111,100	m3/day
Rainfall;	•		182,000	m3/day
Evaporati	on & Others;		(306,100)	m3/day
Outflow Water		265,200	•	m3/day
to Manyame River;			200,500	m3/day
•	iffray 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) x V)

where;

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

, ((	**= <b>,</b>		
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		

## $DCOD = a(N) \times T-N \times 17.73$

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

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)
DCO:	$D = a(N) \times T - N \times 17.73 = 5.60$				

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

SECTION 11 STUDY ON POLLUTION LOAD REDUCTION

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

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

8

1

Sub-basis         Upstream         Upstream         Upstream         Origin         Origin           0.0         132.8         0.0         12.4         0.0         13.3           0.0         13.4         0.0         0.0         13.3           0.0         13.7         0.5         0.0         13.3           0.0         0.0         0.0         0.0         11.4         0.0         13.3           0.0         0.0         0.0         0.0         0.0         11.4         0.0         11.3           0.0         0.0         0.0         0.0         0.0         0.0         11.3         0.0	Pollution Load Remaining Ratio BOX	BOD Load	Concentrated Load of	Inflow BOD to Section Run-off Load from	Run-off Load from	Sub-basin	WOCP Run- Upstream	WQCP Run-off BOD Load Upstream Upstream	Total	Composition of Run-off	of Run-off
Operatory         Operatory <t< th=""><th>8</th><th>Source Category</th><th>Sub-basin</th><th>Upstream</th><th>Upstream WOCP (CR)</th><th>Origin</th><th>Origin</th><th>WOCP Origin</th><th></th><th>300 T</th><th>(%) peo</th></t<>	8	Source Category	Sub-basin	Upstream	Upstream WOCP (CR)	Origin	Origin	WOCP Origin		300 T	(%) peo
0.00         132.8         2.6         0.0         132.8           0.00         0.01         0.0         0.0         11.4         0.0         0.0         11.4         0.0         0.0         11.4         0.0 <td< th=""><th></th><th>•</th><th>(kg/day)</th><th>(kg/dav)</th><th>(kg/dav)</th><th>(kg/day)</th><th>(kg/dav)</th><th>(kg/day)</th><th>(kg/day)</th><th>Total</th><th>Sub-basin</th></td<>		•	(kg/day)	(kg/dav)	(kg/dav)	(kg/day)	(kg/dav)	(kg/day)	(kg/day)	Total	Sub-basin
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ñ	Domestic	0.0	132.8	2.6	0.0	132.8	2.6	135.4	74.44%	80.28%
0.0		ad (Unamerated)	0.0	11.4	0.0	0.0	11.4	0.0	11.4	6.28%	6.91%
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0		Livestock	0.0	88.3	4.1	0.0	203	4.1	21.6	11.90%	12.25%
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		Natural	0.0	11.7	8.0	0.0	11.7	8.0	12.5	6.87%	1
0.0	:3	Solid Waste	0.0	0.0	0'0	0.0	0.0	0.0	0:0	00.0 %	%000
2590 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0	<b>3</b>	×ι×	0.0	6'0	0.0	0.0	6.0	0.0	6.0	0.52%	0.57%
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	-18	Total	0.0	177.1	x 6	0.0	17/77	000	176.2	S. 46%	200.30
6.5		mesar	200	2 6	3 6	1	6	2 6	5	3000	2000
13.7   0.0	. :	T intercool	2 0	000	200	2.5	200	2 6	6	1.18%	23.6%
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		National	2 2	200	200	1 19	000	0.0	4	2,26%	
0.0         0.0 <th></th> <th>Solid Waste</th> <th>00</th> <th>0.0</th> <th>00</th> <th>00</th> <th>00</th> <th>00</th> <th>0.0</th> <th>8000</th> <th>2000</th>		Solid Waste	00	0.0	00	00	00	00	0.0	8000	2000
\$79.5         0.0         0.0         182.7         0.0           924.0         176.2         135.4         26.8         5.1           10.0         0.0         0.0         0.0         0.0           10.1         4.3         12.5         0.5         0.0           0.0         0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0         0.0         0.0           48.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0         0.0           99.2         0.0 </th <th>. &gt;</th> <th>M.M</th> <th>00</th> <th>0.0</th> <th>0.0</th> <th>0.0</th> <th>00</th> <th>9</th> <th>0.0</th> <th>0.00%</th> <th>0.00%</th>	. >	M.M	00	0.0	0.0	0.0	00	9	0.0	0.00%	0.00%
924.0         176.2         135.4         26.8         5.1           0.0         0.0         0.0         0.0         0.0           16.2         4.3         11.5         0.8         0.1           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0           0.0         0.0         0.0		Total	5,678	0.0	000	182.7	00	0.0	1 82.7	100.00%	100.00%
28.1 2.2 21.6 0.8 0.1 1.1.4 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	19	Domestic	924.0	176.2	135.4	26.8	5.1	3.9	35.8	92.70%	97.32%
28.1 2.2 21.6 0.8 0.1 16.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	٠.	(Manward)	0.0	0.0	11.4	0:0	0.0	63	6.0	0.86%	2000
16.2 4.3 12.5 0.5 0.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	_	Livestock	28.1	7,7	21.6	8:0	0.1	9.0	1.5	3.90%	2.68%
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	•	Natural	16.2	4.3	12.5	0.5	0.1	9.4	1.0	2,48%	•
0.0         0.0         0.9         0.0         0.0           48.0         0.0         0.0         0.0         0.0         0.0           48.0         0.0         0.0         0.0         0.0         0.0         0.0           99.2         0.0	-3	Solid Wage	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	%00.0
48.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0		wiw	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.07%	%00.0
48.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	•	Total	968.4	182.7	181.9	28.1	5.3	5.3	38.6	100.00%	100.00%
99.2 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	ι Σ	Domestic	48.0	0.0	0.0	5.9	0.0	0.0	2.9	28.76%	32.61%
99.2 0.0 0.0 5.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	₹	(nd.(Unacwerd)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
19.7 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	2.	Livestock	99.2	0.0	0.0	5.9	0.0	0.0	5.9	59.43%	67.39%
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z.	Natural	19.7	0.0	0.0	17	0.0	0.0	걲	11.81%	,
166.9 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	3.	Solid Wash	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
166.9 0.0 0.0 0.0 10.0 0.0 10.0 0.0 10.0 0.0	•	W.T.W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.00%	9.00%
122.0         0.0         0.0         26.5         0.0           0.0         0.0         0.0         0.0         0.0           198.5         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           0.0         0.0         0.0         0.0         0.0           350.4         0.0         0.0         0.0         0.0           44.2         50.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           628.0         0.0         0.0         0.0         0.0           50.0         0.0         0.0         0.0         0.0           60.0         0.0         0.0         0.0         0.0           60.0         0.0         0.0         0.0         0.0           60.0 <t< th=""><th>•</th><th>Total</th><th>166.9</th><th>0.0</th><th>0.0</th><th>10,0</th><th>0.0</th><th>0.0</th><th>10.0</th><th>\$00.00%</th><th>100.00%</th></t<>	•	Total	166.9	0.0	0.0	10,0	0.0	0.0	10.0	\$00.00%	100.00%
198.5 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	ដ	Domestic	122.0	0'0	0.0	26.5	0.0	0.0	26.5	33.02%	38.07%
1985 0.0 0.0 45.1 0.0 45.1 0.0 45.1 0.0 45.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Ŧ	(ad.(Unacweed)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	0.00%
49.0 0.0 0.0 10.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	3	Livestock	198.5	0.0	0.0	43.1	0.0	000	43.1	53.72%	61.93%
0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	Z	Natural	49.0	0.0	0.0	10.6	0.0	0.0	30.6	13.26%	,
0.0         0.0         0.0         0.0         0.0           3604         0.0         0.0         0.0         0.0           176.0         61.3         3.9         57.1         19.9           44.2         50.0         0.4         15.2         4.0           37.5         12.4         0.0         0.0         0.0           20.0         0.0         0.0         0.0         0.0           20.0         0.0         0.0         84.4         0.0           20.0         0.0         0.0         0.0         0.0	₹.	Solid Waste	00	0:0	0.0	0.0	0.0	0.0	0.0	0.00%	%00.0
369.4         0.0         0.0         80.3         0.0           176.0         61.3         3.9         57.1         19.9           628.0         0.0         0.3         203.7         0.0           44.2         50.0         0.6         14.3         16.2           37.5         11.4         0.4         12.2         4.0           0.0         0.0         0.0         0.0         0.0           260.2         0.0         0.0         84.4         0.0	_	M.I.W	0:0	0.0	0.0	0.0	0.0	0.0	0.0	2000	%00.0
176.0         61.3         3.9         57.1         19.9           628.0         0.0         0.3         203.7         0.0           44.2         50.0         0.6         14.3         16.2           37.5         12.4         0.4         12.2         4.0           0.0         0.0         0.0         0.0         0.0           260.2         0.0         0.0         84.4         0.0	- 1	Total	369.4	0'0	0.0	80.3	0,0	0.0	×0.3	100.00%	100.00%
628.0 0.0 0.3 203.7 0.0 44.2 50.0 0.0 0.6 14.3 16.2 4.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	្តត	Domestic	176.0	61.3	3.9	57.1	19.9	1.3	78.2	18.92%	19.46%
44.2     50.0     0.6     14.3     16.2       37.5     12.4     0.4     12.2     4.0       0.0     0.0     0.0     0.0     0.0       260.2     0.0     0.0     84.4     0.0       0.0     0.0     0.0     0.0       0.0     0.0     0.0     0.0	Į	(Charmons)	628.0	0.0	03	203.7	0.0	0.1	203.8	49.28%	51.49%
37.5 12.4 0.4 12.2 4.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	ij	Livestock	4.2	50.0	9.0	14.3	16.2	0.2	30.7	7.43%	7.72%
260.2 0.0 0.0 0.0 0.0	Z.	Natural	37.5	12.4	9.0	12.2	7.0	0.1	16.3	3.95%	•
6.00 0.00	S	Solid Weste	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3:00:0	2000
7,20	-	≱I.≱	260.2	0.0	0.0	25	0.0	00	<b>X</b>	20.41%	21.24%
0.07	- 1	Total	1,145.9	123.7	5.3	37).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)

11-2-1

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

Water Quality  Calcoling Point  Sub-basin  Sub-basin  Nub-basin  PLRR  O.186  Domestic  Livestock Natural Sold Wase WTW  Total  (Re1)  Ruwa R. 0.174  Domestic  Livestock Natural Sold Wase WTW  Total  (Re2)  Nyatsine R. 0.293  Domestic Livestock Natural Sold Wase WTW  Total Sold Wase WTW  Total Chefton  Confluence  WTW  Total Sold Wase WTW  Total	Concentrated Load of Sub-basin (Keyldav) 100.0 0.0 52.8 30.1 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0	8005	Kun-off Load from Upstream WOCP (CR)	Sub-basin Origia	Upstream	Upstream	Total	Composition of Run-off	of Run-off
Sub-basin Source Category Sub-basin PIRR Manyame R. 0.186 Domestic Livestock Natural Solic Wasse WTW Total Solic Wasse WTW Total Solic Wasse WTW Total Solic Wasse WTW Total Natural Solic Wasse WTW Total Natural Solic Wasse WTW Total Solic Wasse Solic Wasse WTW Total Solic Wasse WTW Total		_	Upstream WOCP (CR)	Origin	Š				
Seke & 0.359  Harava Dams  Nyatsime R. 0.359  Nyatsime R. 0.359  Nyatsime R. 0.359  Manyame R. 0.359  Whukuvisi R. 0.359  Mukuvisi R. 0.359		Costream			<b>a</b>			(%) peor COS	(4) (4)
Manyame R. 0.136  - Upstream  Ruwa R. 0.174  Ruwa R. 0.393  Harava Dams  Seke & 0.393  - Downstream (before confluence w/ Mukuvisi R. 0.186			(kg/day)	(kg/dav)	(kg/day)	(kg/day)	(kg/dav)	Toral	Sub-basin
Nanyame R. 0.174  Ruwa R. 0.174  Seke & 0.393  Harava Dams  Ownstream  Chefore  Confluence  W. Mukuvisi R. 0.186  Mukuvisi R. 0.186		00	0.0	18.6	0.0	0.0	18.6	54.67%	65.46%
Nowa R. 0.174  Rowa R. 0.174  Seke & 0.393  Harava Dams  Madyame R. 0.259  Nyatime R. 0.259  Confluence  w/ Mukuvisi R. 0.186  Mukuvisi R. 0.186		3 6		0.0	0.0	0.0	0.0	20000	%00.0
Seke & 0.393 Harava Dams Harava Dams Nyasime R. 0.293  Mauyame R. 0.359 - Downstream (before confluence w/ Mukuvisi R. 0.186		2 6	200	2	00	00	8.6	28.85%	222
Seke & 0.393 Harava Dams Harava Dams Nyatsime R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		3 6		Y V	0.0	0.0	5,6	16.48%	lest.
Seke & 0.393  Seke & 0.393  Harava Dams  Manyame R. 0.359  Downstream (before confluence w/ Mukuvisi R. 0.186		0.0			00	8	0.0	0,00%	2000
Seke & 0.393 Seke & 0.393 Harava Dams Nyasime R. 0.259 Nyasime R. 0.359 Downstream Chefore confluence w/ Mukuvisi R. 0.186 Mukuvisi R. 0.186		2 6	2 6	3 6	2	8	0.0	0.00%	%00.0
Seke & 0.393 Harava Dams Harava Dams Nyatsime R. 0.293 Nyatsime R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186	-	3 6	3 6	7	00	00	<u>4</u>	100.00%	300 001
Seke & 0.393 Harava Dams Harava Dams Nyasime R. 0.293  Mauyame R. 0.359 - Downstream (before confluence w/ Mukuvisi R. 0.186 Mukuvisi R. 0.186			90	0.77	0.0	0.0	44.9	86.95%	90.74%
Seke & 0.393 Harava Dams Nyatsime R. 0.293 Nyatsime R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		5 6	2 6		0	00	0.0	2,00%	%00'0
Seke & 0.393 Harava Dams Nyatime R. 0.293 Nyatime R. 0.359 Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		9.5		3 4	8 6		4.6	× ×74	0260
Seke & 0.393 Harava Dams Nyasime R. 0.293 Nyasime R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0:0	2:0	) (	9 6	200	) (	4 1945	
Seke & 0.393 Harava Dams Nyasime R. 0.293 Mauyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	0.0	7 6	2 6	3 6	16	3000	2000
Seke & 0.393 Harava Dams Nyatsime R. 0.293 Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0:0	0:0	0.0	9 6	2 6	2 6	8 8	3 8
Seke & 0.393 Harava Dams Nyatsime R. 0.293 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	0.0	o t	3 6	3 6	) Ç	0.00	20000
Sekc & 0.393 Harava Dams Nyasime R. 0.293 Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi R. 0.186	-	0.0	0.0	7.10	200	2,0	147	20 5 405	20 000
Harava Dams Nyatsime R. 0.293 Matlyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		<b>\$</b>	18.6	18.9	17.7	?	45.5	00.04.78	9 77 0
Nyatsime R. 0.293  Manyame R. 0.359  - Downstream (before confluence w/ Mukuvisi)  Mukuvisi R. 0.186	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	900
Nyatsime R. 0.293  Manyame R. 0.359  - Downstream (before confluence w/ Mukuvisi)  Mukuvisi R. 0.186		4.6	9.8	4.8	30; 1.7	3.0	14.1	27.07%	21.38%
Nyatsime R. 0.293  Manyame R. 0.359  Downstream (before confluence w/ Mukuvisi)  Mukuvisi R. 0.186		2.2	5.6	5.9	9.0	52	5.9	9238	1
Nyasime R. 0.293  Manyame R. 0.359  - Downstream (before confluence w/ Mukuvisi)  Mukuvisi R. 0.186		0.0	0.0	0.0	0.0	000	0.0	0.00%	0.00% %00.0
Manyame R. 0.253  Manyame R. 0.359  - Downstram (before confluence w/ Mukuvisi)  Mukuvisi R. 0.186		0.0	0.0	0.0	0.0	0.0	0.0	%00%	2000
Manyame R. 0.259 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		51.7	7.7	30.2	20.3	13.4	63.9	100,00%	100.00%
Manyame R. 0.359 - Downstram (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	000	18.1	0.0	0.0	18.1	25.48%	30.04%
Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	0.0	16.7	0.0	0,0	16.7	23.43%	27.62%
Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186	87.4	0.0	0.0	3. 3.	0.0	0.0	25.6	35.92%	42.34%
Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	0.0	10.8	0.0	0.0	10.8	15.16%	•
Manyame R. 0.359 - Downstram (before confluence w/ Mukuvisi) Mukuvisi R. 0.186		0.0	00	0.0	0.0	0.0	0.0	0.00%	0.00%
Manyame R. 0.359 - Downstram (before confluence w/ Mukuvisi) Mukuvisi R. 0.186	000	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	2000
Manyame R. 0.359 - Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186	_	0.0	0.0	71.2	00	0.0	77.2	100.00%	100.00%
- Downstream (before confluence w/ Mukuvisi) Mukuvisi R. 0.186	-	54.7	7.3	14.7	19.6	2.6	36.9	49.8%	57.06%
(before confluence w/ Mukuvisi)  Mukuvisi R. 0.186		16.7	00	0.0	6.0	0.0	6.0	8.09%	9.95%
confluence w/ Mukavisi) Mukavisi R. 0.186		35.8	3.9	6.1	12.8	1,4	203	27.44%	31.43%
w/ Mukuvisi R. 0.186		14.5	22	3.8	5.2	80	8.6	13.24%	,
Mukuvisi R. 0.186		00	0.0	0.0	0.0	0.0	0.0	0.00%	2000
Mukuvisi R. 0.186	20	0.0	0.0	6.0	0.0	0.0	6.0	127%	1.56%
Mukuvisi R. 0.186	••	121.7	13.4	25.5	43.6	4,8	73.9	400.00%	₹00:00
		0.0	0.0	58.5	0.0	0:0	586	91.18%	82.58
Livestock	_	0.0	0.0	5.4	0.0	99	5. 4.	8.02%	5.17%
		0.0	0.0	1.4	0.0	000	1.4	1.26%	1.30%
Natural		0.0	0.0	2.7	0.0	0.0	દ્ય	2.52%	•
Solid Water		0.0	0.0	0.0	0.0	0.0	0.0	0.00%	2000
N.I.W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00%	%000
Total		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)

3

				Inf	Inflow T-N Load to Lake/Dam by Sub-basin	to Lake/Dan	1 by Sub-basir	-1		Composition	Composition of Inflow T-N Load (%)	V Load (%)
						(kg/day)				Total-1	Total-2	excl. Natural
	Sub	Sub-basin	ځ	RR1	J				Total			
Ü	Sckc &	Domestic	25.0	88.0	12.0		:		125.0	7.68%	7.68%	14.63%
<b>i</b>	Harava	Ind.(Unsewered)	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
<b></b>	Dams	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	6.0	0.0				6.0	0.06%	0.06%	0.11%
		WIW	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	Sub-basin	ບິ	RR	RR3	$R_{R4}$	RRs	ဌ	Total			
င်	Lake	Domestic	8.4	2,182.0	10.0	388.0	270.0	267.0	3,125.4	54.40%	55.31%	74.04%
<b>)</b>	Chivero	Ind.(Unsewered)	0.0	2.0	0.0	6.0	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%
	_ <del>.</del>	Natural	52.1	571.9	163.7	226.8	212.0	251.4	1,477.8	25.72%	25.30%	•
	<del></del>	Solid Waste	0.1	3.6	0.0	0.0	13.8	0.0	17.5	0.30%	0.31%	0.41%
		M.I.M	0.0	0.0	7.7	0.0	0.0	0.0	1.1	0.02%	0.02%	0.03%
	:	Total	109.7	3,399.1	298.5	0.699	545.6	723.4	5,745.2	100.00%	100.00%	100.00%
	qnS	Sub-basin	ပ္ပံ	RRA	R <sub>R7</sub>	ည်			Total			
ට් —	Lake	Domestic	12.5	12.0	34.0	30.0			88.5	1.99%	1.72%	2.74%
	Manyame	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			8.4	0.11%	0.11%	0.17%
·		WIW	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:

Share in Total Inflow Pollution Load (incl. PL from upstream WQCP)
Share in Total Inflow Pollution Load (excl. PL from upstream WQCP)
Share in Inflow Pollution Load (excl. PL from upstream WQCP and natural load) Total-1; Total-2;

excl. Natural;

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

				Int	Inflow T-P Load	T-P Load to Lake/Dam by Sub-basin	by Sub-basir	1		Compositi	Composition of Inflow T-P Load (%)	P Load (%)
	. :					(kg/dav)				Total-1	Total-2	excl. Natural
	-qnS	Sub-basin	ؾ	$R_{R1}$	J J				Total			
j	Seke &	Domestic	3.0	11.0	1.0				15.0	7.83%	7.83%	11.78%
	Harava	Ind.(Unsewered)	0.0	0.0	0.0				0.0	0.00%	0.00%	0.00%
	Dams	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%	1
		Solid Waste	0.0	0.0	0.0		•		0.0	0.00%	0.00%	0.00%
		WIW	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%
	-QnS	Sub-basin	ပ	RR2	RRA	R <sub>R4</sub>	RRS	$C_{12}$	Total			
J.	Lake	Domestic	6.0	135.0	1.0	117.0	70.0	49.0	372.9	55.95%	56.82%	69.39%
}	Chivero	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	83	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%	1
		Solid Waste	0.0	0.0	0.0	0.0	0.0	0.0	0:0	0.00%	0.00%	0.00%
		WIW	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	9.999	100.00%	100.00%	100.00%
	-qnS	Sub-basin	C <sub>12</sub>	RRA	RR7	$C_{L3}$		:	Total			
ථ	Lake	Domestic	8.9	1.0	4.0	5.0			16.8	2.80%	1.70%	2.21%
	Manyame	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%	00.0	0.00%
		WIW	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)

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

				Inflow	ow COD Load	COD Load to Lake/Dam by Sub-basin	by Sub-basi	c		Compositio	Composition of Inflow COD Load (%)	D Load (%)
						(kg/day)	•			Total-1	Total-2	excl. Natural
	-qnS	Sub-basin	ؿؖ	R <sub>R1</sub>	Ö				Total			
ـــا تن	Seke &	Domestic	199.0	577.0	97.0				873	6.91%	6.91%	25.75%
	Harava	Ind.(Unsewered)	0.0	0.0	0.0	•			0	0.00%	0.00%	0.00%
	Dams	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	ຸຕ	0				ო	0.03%	0.03%	0.10%
		WIW	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%
l	-qnS	Sub-basin	ဌ	RRZ	RR3	R <sub>R4</sub>	RRS	12	Total			
ب ن	Lake	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%
	Chivero	Ind.(Unsewered)	0.0	136.0	0.0	81.6	0:0	0.0	218	0.52%	0.57%	1.03%
		Livestock	869	2,185	422	184	172	40,	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		13	0	0	20	0	2	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%
	-QnS	Sub-basin	$C_{L_2}$	RRG	R <sub>R7</sub>	ပ်			Total			
<u>ل</u>	Lake	Domestic	475.8	96.0	253.0	386.0			1,211	2.88%	1.80%	3,46%
	Manyame	Ind.(Unsewered)	5.9	0.0	0.0	2,668.7			2,675	6.36%	6.52%	12.56%
	1	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	7	0	10	7			19	0.04%	0.04%	0.08%
		wTw	н	0	0	9,285			9,286	22.07%	22.69%	43.69%
		7.424	1130	3009	14.206	207.00			42.064	10000	10000	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)