

3.7 ACTION PLAN STAFFING & ORGANIZATION

The organisational & institutional structure of YCDC will be subject to revision within the scope of the Master Plan. The integrated plan for this is the subject of a separate chapter in this report.

Certain parts of the Water supply Department will be implicated in UFW control and reduction. This section provides a short description of the personnel involved in these activities. The tasks and scope of works for stage 1 of phase 1 are described above in section 3.5.

Estimates of the staff needs for the various functions have been prepared for the master plan period. These are summarised in Table 3.7.1 at the end of this section.

For the initial stages of the project, during stage 1, some description of the staffing and organisation is given below.

For details of the calculations resulting in the staff summary given, please refer to the relevant table in section 3.8 cost estimates.

3.7.1 UFW Control Team

(1) UFW Control Unit (UCU)

The UFW control Unit must be set up immediately on starting the programme. It should be considered as a permanent unit, not a time limited, temporary one; though ultimately many or all of its functions may be included within the operations of mainstream departments, such as distribution, finance, or customer services.

During the first twelve months of operation, the UFW control unit will be set up, trained, developed and become firmly established. Within this period, it is expected that the first half will be principally occupied with setting up, preparing and training and the latter half will be practice and implementation.

For this first stage, the team will be kept relatively small and exclusive, so that it remains manageable and all its members can be properly trained. This is a relatively long lead-in time, because YCDC is starting from zero and a sea change in approach is needed.

At the end of this period, a review will be carried out to determine the future direction of efforts and reinforcement of the team that is needed, along with the additional resources required. The role of the original core team will then be modified to include training and supervising additional staff brought in to cope with the expanded work programme.

(2) UFW Control Unit (UCU) Team

The proposed initial structure of the UCU team is as follows.

UFW Project Manager

To ensure that effective action is taken a well-qualified project manager responsible for UFW should be appointed. The project manager must be allocated sufficiently experienced staff to develop a separate UFW team and should be given suitable assistance to undertake special studies. Additionally, the project manager should be assisted by one or more consultants or other technical assistance.

UFW Control Unit (UCU)

The typical titles of each of the members of the team is described below: The proposed UFW team structure is shown in Figure xx

Project Manager/Team Leader : combined function - see above

Data Control Engineer: Co-ordinates with team for data collection and analysis

Non-Physical Loss (NPL) Team

NPL Controller:	1 Engineer	manages the NPL team,
Technical Controller :	1 Technician	Specialised in Water Meters
Administrative Controller:	1 Technician	specialised in consumer issues

Physical Loss (PL) Team

Leakage Controller :	1 Engineer	manages the PL team.
Draughtsman		prepares network drawings for work and updates,
Network Preparation Team :	2 Technicians	Specialised in Pipework
Leak Detection Teams :	4 Technicians	Specialised in Leak Detection, divided in 2 teams

Note: the number of staff will remain constant for some years except the leak detection teams which will increase as experience is gained and the area covered is expanded.

The proposed structure of the UCU is shown in figure 3.7.1

Passive leakage control (repair of visible leaks and operations upon request of consumers) remains the "maintenance and repair" tasks of the township staff.

The UCU will be trained and supported by a technical assistance programme for the first 3 years.

3.7.2 Network survey

Staffing for the network and customer survey is divided into two categories/ office based and field work. The staff for these functions are estimated as follows:

(1) Office

For Managing and supporting the survey work, an office-based team will be required, whose duties include:

- Daily route planning & preparation of maps, customer lists etc.
- Record keeping / progress checking
- Receipt and processing of marked up drawings
- Supervision & management

The estimate of staff requirements is:

- | | |
|----------------------|---|
| - Engineer in charge | 1 |
| - Technicians | 2 |
| - Assistants | 2 |

(2) Field Work

Field work of surveying the network & connections will be carried out as follows:

- Each team will consist of 2 trained personnel, equipped as required to carry out their duties
- There will be separate teams for the network and for the connections
- Work plan will schedule one of each type of team together in the same area each day

The estimate of requirements is:

- | | |
|--|---|
| - Pipe locating Teams (2 person/team) | 4 |
| - Customer checking teams (2person/team) | 4 |

3.7.3 Repair Teams

A properly resourced repair section should also be set up and equipped at the same time as the UFW control section. Though probably part of the distribution department, the repair section will have close ties with the UFW team, mainly physical loss group, and work co-operatively.

The same principles apply to this repair section as to the UFW control team. That is to develop a small, strong competent core then review the full scale of the requirements to reduce UFW levels according to a timetable and finally provide the resources and staffing accordingly.

The size of these first stage teams should be limited to around 16 persons, though later many more staff will be involved in one way or another. The size of the repair teams does not include unskilled labour.

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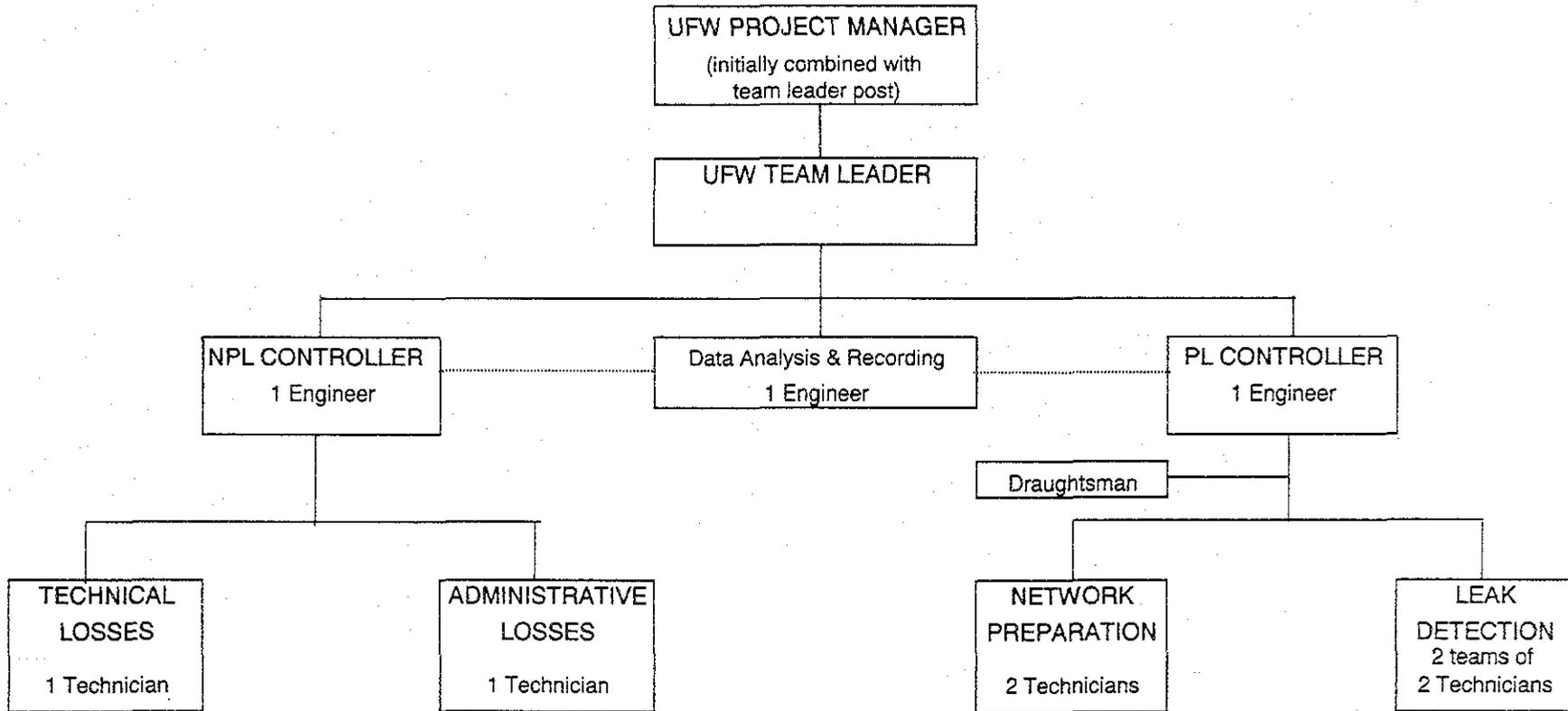


Fig: 3.7.1
UFW Team Organization

- 1 large meter workshop

Each Workshop has the following staff:

Engineer in charge	1	
Workshop Supervisor	1	
Meter test technicians	6	(2 per small meter test bench & 2 for large meters)
Clerical & stores staff	3	

At first when there is only one meter workshop, The engineer and supervisor role will be combined.

Installation & Replacement of Meters

The detailed calculations of the number of people required to install and later replace meters are in the relevant table in section 3.9 Cost Estimates. These are summarised here.

- Small Meters 40 to 60 teams (fitter & assistant) in stage 1, then 78 teams until 2010
- Large meters 8 teams (fitter & assistant) for stage 1, then 2 teams until 2010

The details of the customer metering estimates are shown in table 3.7.2

3.7.5 Other Proposed Sections

(1) Planning & design Unit

In the master plan a large programme of new works for both distribution mains and secondary mains is included. This will require detailed design and also construction supervision.

It is probable that

- All installation work is done by contractors
- Detailed design and construction supervision will be contracted to Engineering Consultants

Therefore, it is proposed that some YCDC staff are assigned to work on the new works programme, in co-operation with the consultants:

These staff would:

- Be involved in work planning to ensure co-ordination with the operations department for line stops, transfer of service lines, traffic control etc.
- Ensure that work was to a high standard to prevent leaks forming
- Be trained on planning, design, construction supervision

Table 3.7.2 Metering Programme Staffing

Item	Description	Year																					
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Base Data																							
	Service Population																						
	From Master plan	1,443,450					2,201,500				2,973,000					3,601,650					4,311,300		
	Linear extrapolation	1,443,450	1,595,060	1,746,670	1,898,280	2,049,890	2,201,500	2,355,800	2,510,100	2,664,400	2,818,700	2,973,000	3,098,730	3,224,460	3,350,190	3,475,920	3,601,650	3,743,580	3,885,510	4,027,440	4,169,370	4,311,300	
	Estimated no of connections																						
	@ 7 person per connection	7	206,207	227,866	249,524	271,183	292,841	314,500	336,543	358,586	380,629	402,671	424,714	442,676	460,637	478,599	496,560	514,521	534,797	555,073	575,349	595,624	615,900
	@ 6 person per connection	6	240,575	265,843	291,112	316,380	341,648	366,917	392,633	418,350	444,067	469,783	495,500	516,455	537,410	558,365	579,320	600,275	623,930	647,585	671,240	694,895	718,550
	@ 5 person per connection	5	288,690	319,012	349,334	379,656	409,978	440,300	471,160	502,020	532,880	563,740	594,600	619,746	644,892	670,038	695,184	720,330	748,716	777,102	805,488	833,874	862,260
	Estimated number of Non-domestic	5%	12,029	13,292	14,556	15,819	17,082	18,346	19,632	20,918	22,203	23,489	24,775	25,823	26,871	27,918	28,966	30,014	31,197	32,379	33,562	34,745	35,928
	Estimated number of Large users	10%	1,203	1,329	1,456	1,582	1,708	1,835	1,963	2,092	2,220	2,349	2,478	2,582	2,687	2,792	2,897	3,001	3,120	3,238	3,356	3,474	3,593
	Total number of small meters		251,401	277,806	304,212	330,617	357,023	383,428	410,302	437,176	464,050	490,924	517,798	539,695	561,593	583,491	605,389	627,287	652,007	676,726	701,446	726,165	750,885
Small Meter Programme																							
Quantities																							
	Small meters installation					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Quantity per year					40,000	60,000	78,000	78,000	78,000	78,000	78,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	
	Cumulative total					40,000	100,000	178,000	256,000	334,000	412,000	490,000	516,000	542,000	568,000	594,000	620,000	646,000	672,000	698,000	724,000	750,000	
	Assumed number of connections (rounded up from 6/connections)					360,000	390,000	420,000	440,000	470,000	500,000	520,000	540,000	570,000	590,000	610,000	630,000	660,000	680,000	710,000	730,000	760,000	
	Proportion of connections with meters fitted					11%	26%	42%	58%	71%	82%	94%	96%	95%	96%	97%	98%	98%	99%	98%	99%	99%	
	Replacement Programme					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Replacement Cycle (years)					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Quantity per year					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
	1st time replacement					0	0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	78,000	
	2nd time replacement					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40,000	60,000	78,000
	Total Annual quantity					0	0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	78,000	118,000	138,000	156,000
	Proportion tested as reusable	33%				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Installation Manpower																							
	Rate of Installation	(2 man tes)	1,000	per year																			
	Rate of Replacement	(2 man tes)	4,000	per year																			
	No of Teams required																						
	Installation					40	60	78	78	78	78	78	26	26	26	26	26	26	26	26	26	26	
	Replacement					0	0	0	0	0	0	0	10	15	20	20	20	20	20	17	22	26	
	Total					40	60	78	78	78	78	78	36	41	46	46	46	46	46	43	48	52	
	Permanent teams YCDC					20	40	46	46	46	46	46	46	46	46	46	46	46	46	46	46	46	
	Contract teams					20	20	32	32	32	32	32	-10	-5	-1	-1	-1	-1	-1	-4	2	6	
Installation & replacement Programme Staff																							
	Field Supervision	1	engineer per	10 teams		4	6	8	8	8	8	8	4	4	5	5	5	5	5	4	5	5	
	Programme manager	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
	Clerical staff	2	staff per	10 teams		8	12	16	16	16	16	16	7	8	9	9	9	9	9	9	10	10	
	Technicians	2	staff per	10 teams		8	12	16	16	16	16	16	7	8	9	9	9	9	9	9	10	10	
	Meter installation technicians	2	staff per	1 teams		80	120	156	156	156	156	156	72	82	91	91	91	91	91	85	95	104	
Repair workshops																							
	No of meters to test & check (replacement meters)					0	0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	66,000	86,000	104,000	
	No of meters per test bench		30 per day																				
	No of Benches per Workshop		7,500 per year			0	0	0	0	0	0	0	5	8	10	10	10	10	10	9	11	14	
	No of Workshops required		2 per w/shop			0	0	0	0	0	0	0	3	4	5	5	5	5	5	4	6	7	

Table 3.7.2 Metering Programme Staffing

Item	Description	Year																				
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	No of workshops assumed					1	1	1	1	1	1	1	4	4	5	5	5	5	5	5	6	7
	No of test benches					2	2	2	2	2	2	2	8	8	10	10	10	10	10	10	12	14
	No of additional test benches					2	0	0	0	0	0	0	6	0	2	0	0	0	0	0	2	2
Workshop staffing																						
	Meter repair manager	1	engineer			1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Workshop supervision	1	supervisor	1	workshop	1	1	1	1	1	1	1	4	4	5	5	5	5	5	5	6	7
	Meter repair technicians	2	technicians	1	bench	4	4	4	4	4	4	4	16	16	20	20	20	20	20	20	24	28
	Clerical & stores/driver	3	staff	1	workshop	3	3	3	3	3	3	3	12	12	15	15	15	15	15	15	18	21
Large Meter Programme																						
	No of large meters	1,300	1,400	1,500	1,600	1,800	1,900	2,000	2,100	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,100	3,200	3,300	3,400	3,500	3,600
	No of additional meters	1,300	100	100	100	200	100	100	100	200	100	100	100	100	100	100	200	100	100	100	100	100
Quantities																						
	Large meters installation					400	800	800	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	Quantity per year	0	0	0	0	400	800	800	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	Cumulative total	0	0	0	0	400	1,200	2,000	2,120	2,240	2,360	2,480	2,600	2,720	2,840	2,960	3,080	3,200	3,320	3,440	3,560	3,680
	Proportion of connections with meters fitted	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Replacement Programme	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Replacement Cycle (years)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Quantity per year	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	1st cycle	0	0	0	0	0	0	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
	2nd cycle	0	0	0	0	0	0	0	0	0	0	0	0	120	120	120	120	120	120	120	120	120
	3rd cycle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	120	120	120	120
	Total Annual quantity	0	0	0	0	0	0	500	500	500	500	500	500	620	620	620	620	620	740	740	740	740
	Proportion tested as reusable	50%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Installation Manpower																						
	Rate of installation	(2 man tes	100	per year																		
	Rate of Replacement	(2 man tes	400	per year																		
	No of Teams required																					
	Installation					4	8	8	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Replacement					0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	2	2
	Total					4	8	8	2	2	2	2	2	3	3	3	3	3	3	3	3	3
	Permanent teams YCDC					2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3
	Contract teams					2	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Installation & replacement Programme Staff																						
	Field Supervision	1	engineer per	4	teams	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Programme manager	1				1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Clerical staff	2	staff per	4	teams	2	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2
	Technicians	1	staff per	4	teams	1	2	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Meter installation technicians	2	staff per	1	teams	8	16	16	5	5	5	5	5	6	6	6	6	6	7	7	7	7
Repair workshops																						
	No of meters to test & check (replacement meters)					0	0	0	500	500	500	500	500	620	620	620	620	620	740	740	740	740
	No of meters per test bench		4 per day						1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No of Benches per Workshop		1,000 per year																			
	No of Workshops required		1 per w/shop			0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No of workshops assumed					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No of test benches					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	No of additional test benches					1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 3.7.2 Metering Programme Staffing

Item	Description	Year																			
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Workshop staffing																					
Meter repair manager	1 engineer					1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Workshop supervision	1 supervisor			1 workshop		1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Meter repair technicians	2 technicians			1 bench		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Clerical & stores/driver	2 staff			1 workshop		2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2

NOTES:

- 1 Based on 7 year replacement period for meters
- 2 Allowance for re-use of meters not outside calibration limits 33% (i.e. 67% discarded)
- 3 Accessories cost includes a filter to prevent damage from sediment
- 4 Installation is concentrated on areas that have been rehabilitated
- 5 Meters are to be installed as soon as possible after rehabilitation
- 6 Non-domestic consumers add 5% to the total of connections
- 7 Large users represent 5% of the total of non-domestic consumers
- 8 Small meters are assumed all to be 19mm diameter
- 9 Large meters are assumed to be 80 mm diameter average for costing
- 10 Some large meter installation teams can be kept on for network meter installation later

Item	Description	Year																				
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Meter reading programme																						
Estimated number of Non-domestic	5%	12,029	13,292	14,556	15,819	17,082	18,346	19,632	20,918	22,203	23,489	24,775	25,823	26,871	27,918	28,966	30,014	31,197	32,379	33,562	34,745	35,928
Estimated number of Large users	10%	1,203	1,329	1,456	1,582	1,708	1,835	1,963	2,092	2,220	2,349	2,478	2,582	2,687	2,792	2,897	3,001	3,120	3,238	3,356	3,474	3,593
Total number of small meters		251,401	277,806	304,212	330,617	357,023	383,428	410,302	437,176	464,050	490,924	517,798	539,695	561,593	583,491	605,389	627,287	652,007	676,726	701,446	726,165	750,885
Meter readings																						
Small meters																						
Number of readings																						
1 month interval		3016811	3333675	3650540	3967405	4284270	4601135	4923622	5246109	5568596	5891083	6215570	6476346	6739121	7001897	7264673	7527449	7824082	8120716	8417350	8713983	9010617
3 month interval		1005604	1111225	1216847	1322468	1428090	1533712	1641207	1748703	1856199	1963694	2071190	2158782	2346374	2333966	2421558	2509150	2608027	2706905	2805783	2904661	3003539
Large meters																						
1 month interval		14435	15951	17467	18983	20499	22015	23538	25101	26644	28187	29730	30987	32245	33502	34759	36017	37436	38855	40274	41694	43113
Meter readers																						
Number of Meter readers																						
Readings at 1 month interval		152	167	183	199	215	231	247	264	280	296	312	325	339	352	365	378	393	408	423	438	453
Readings at 3month small meters																						
Readings at 1 month large meters		51	56	62	67	72	78	83	89	94	100	105	109	114	118	123	127	132	137	142	147	152

Note:

- 1 Number of readings per day 80 per day
20000 per year

3.8 ACTION PLAN PROJECT COST ESTIMATES

The period for the master plan is up to 2020, for which this UFW Control Plan has been prepared. Additionally, this study is to further investigate and develop pre-feasibility assessments for those immediate priorities that have been identified as being:

- In the initial 2 to 3 year project period (stage 1)
- Requiring substantial inputs of materials and/or personnel by outside agencies

These are summarised as follows:

- UFW Control comprising
 - Set up UFW Control team and ALC teams
 - Activities Undertaken by the above
 - Network Bulk Metering
 - Network & Customer Survey
- Repair Teams with equipment & Material
- Customer Metering
- Technical Assistance

For each of these categories, cost estimates have been made for the whole project period to 2020, based on reasonable continuation or expansion of the assessment of immediate requirements.

3.8.1 Summary Cost Estimates

The overall costs during stage 1 are summarised in the Table 3.8.0 below. These do not include staffing costs for YCDC.

Table 3.8.0 Summary of Cost Estimate

Category	2003	2004	2005
UFW Control	522,000	313,000	225,000
Customer Metering	0	1,450,000	2,300,000
Network Repairs	545,000	444,150	567,000
Technical Assistance	756,000	1,312,000	608,000
Total	1,823,000	3,520,000	3,700,000

All prices are given in US dollars. For costs in Myanmar, an exchange rate of 500 Kyats to 1 dollar has been used.

The totals of the costs for each category through to 2020 is summarised in Table 3.8.1 TO illustrate the relative scale of the different elements , the costs are shown as a graph in Figure 3.8.1.

3.8.2 Equipment Cost estimates

(1) UFW Control Costs

The totals of the costs for this category through to 2020 is summarised in Table 3.8.2 for UFW Control Equipment and Table 3.8.3 for Network Bulk Metering.

(2) Network Repairs

The totals of the costs for this category through to 2020 is summarised in Table 3.8.4.

(3) Customer Metering

The totals of the costs for this category through to 2020 is summarised in Table 3.8.5 and Figure 3.8.2.

3.8.3 Technical Assistance Cost Estimates

The totals of the costs for this category through to 2020 is summarised in Table 3.8.6.

3.8.4 Staffing Cost Estimates

The totals of the costs for this category through to 2020 is summarised in Table 3.8.7.

Table 3.8.1 Task Cost Estimates - Summary of Costs

Item	Task	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Remarks	
		\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	\$	
	Equipment	967,103	2,123,208	3,071,855	3,678,478	3,467,515	3,979,128	3,906,678	3,938,703	3,765,385	4,002,415	4,793,065	4,497,490	4,872,340	4,885,465	5,241,040	5,014,765	5,482,015	5,881,540		
	UFW Control	384,983	39,113	169,838	82,688	93,188	276,938	126,263	169,838	467,670	121,800	403,200	165,375	306,600	316,050	208,950	403,200	263,025	296,100		
	Bulk Metering	37,170	189,945	35,280	78,015	78,015	139,440	139,440	139,440	143,115	143,115	146,790	146,790	146,790	150,465	150,465	154,140	154,140	154,140		
	Customer Metering		1,450,000	2,300,000	2,840,000	2,507,500	2,507,500	2,507,500	2,507,500	1,787,500	2,229,700	2,607,700	2,607,700	2,607,700	2,607,700	2,629,900	2,377,900	2,797,900	3,175,900		
	Repairs	544,950	444,150	566,738	677,775	788,813	1,055,250	1,133,475	1,121,925	1,367,100	1,507,800	1,635,375	1,577,625	1,811,250	1,811,250	2,251,725	2,079,525	2,266,950	2,255,400		
	Training & TA	756,000	1,312,000	608,000	132,000																
	Long term	396,000	792,000	528,000	132,000																
	Short term	360,000	520,000	80,000																	
	Policy Advisers		40,000	80,000																	
	Customer metering	40,000	40,000																		
	Network Repairs	20,000	100,000																		
	Staffing	29,640	29,640	36,924	44,916	44,424	45,432	47,448	51,278	38,484	40,284	45,552	45,552	47,760	47,760	49,776	49,776	54,312	54,312		
	UFW Control	5,724	5,724	3,552	3,888	4,224	4,560	5,232	5,232	6,096	6,096	6,768	6,768	7,440	7,440	8,112	8,112	8,784	8,784		
	Planning & Design Unit	1,176	1,176	1,176	1,176	1,176	1,176	1,176	1,176	1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668	1,668		
	Customer Metering	3,312	3,312	3,984	4,656	5,328	6,000	7,344	7,344	9,312	9,312	10,656	10,656	12,192	12,192	13,536	13,536	14,880	14,880		
	Repairs	19,428	19,428	28,212	35,196	33,696	33,696	33,696	37,476	21,408	23,208	26,460	26,460	26,460	26,460	26,460	26,460	28,980	28,980		
	UFW Only Total	1,123,877	1,366,782	736,670	296,591	175,427	420,938	270,935	314,510	616,881	271,011	556,758	318,933	460,830	473,955	367,527	565,452	425,949	459,024		
	Combined total	1,752,743	3,464,848	3,716,779	3,855,394	3,511,939	4,024,560	3,954,126	3,989,931	3,903,869	4,042,699	4,838,617	4,543,042	4,920,100	4,933,225	5,290,816	5,064,541	5,536,327	5,935,852		

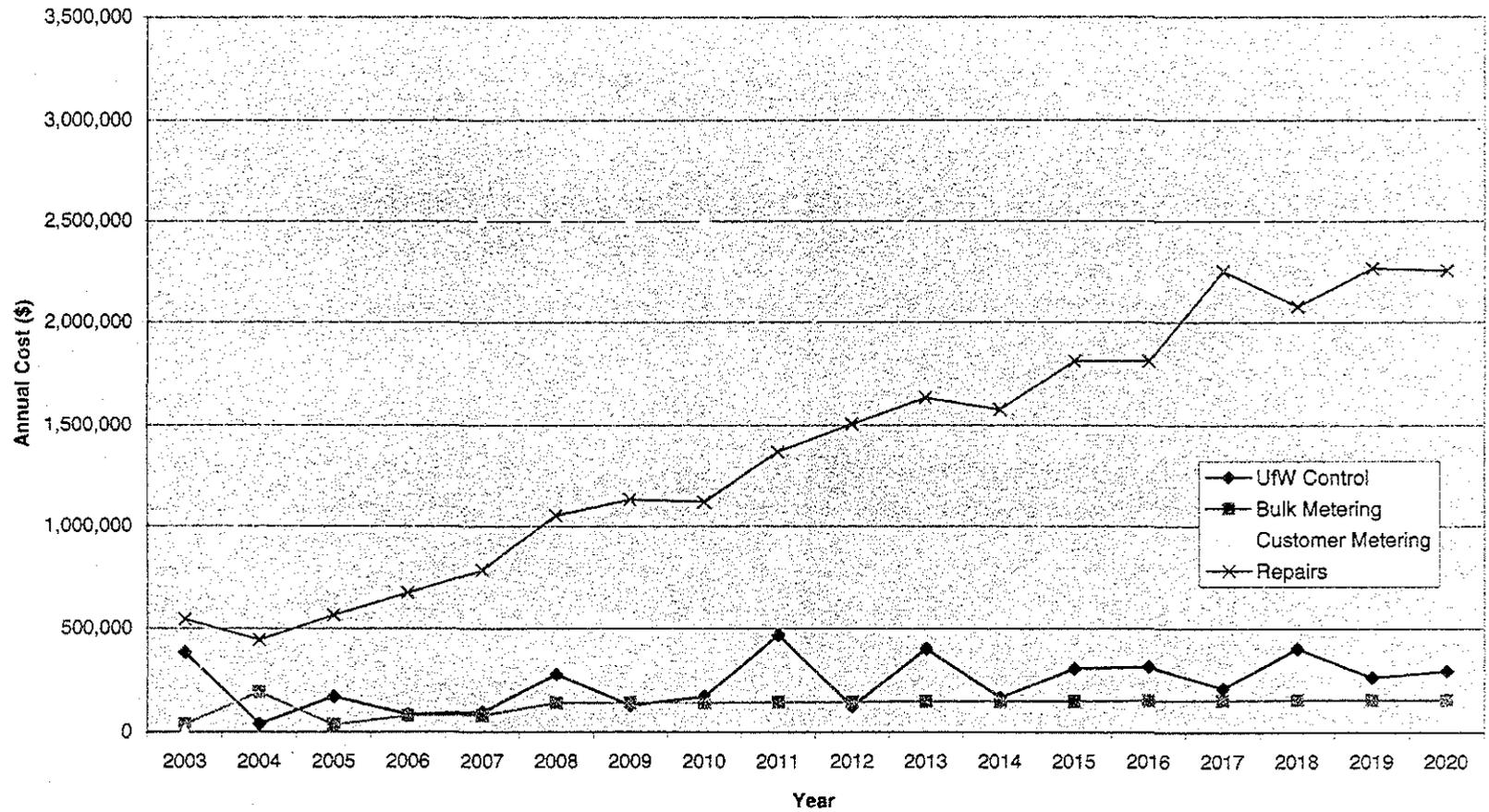


Figure 3.8.1 Chart of UFW & Other Related Work Material Costs

Table 3.8.2 Task Cost Estimates - UFW Control Tasks

Item	Description	Year																				
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Base Data																						
	No of UFW Teams (non-leakage)				1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	
	Additional no of UFW teams				1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	
	No of Leakage teams				2	2	3	6	7	8	10	10	12	12	14	14	16	16	18	18	20	
	Additional no of Leakage teams				2	0	3	1	1	1	2	0	2	0	2	0	2	0	2	0	2	
UFW Control Unit																						
	Office Setup	5000	\$ for office							5,000							5,000				5,000	
	UFW General Equipment	21000	\$ per set							21,000							21,000				21,000	
UFW Monitoring																						
	UFW Monitoring	12000	\$ per set							12,000							12,000				12,000	
	Pressure monitoring	12000	\$ per set							12,000							12,000				12,000	
Measurement Campaign																						
	Measurement Equipment	57000	\$ per set							57,000							57,000				57,000	
	Measurement Materials	37250	\$ per set							37,250							37,250				37,250	
Leak Detection																						
	Leak detection equipment	41500								83,000							83,000				83,000	
				cycle 1	83,000	0	124,500	41,500	41,500	41,500	83,000	0	83,000	0	83,000	0	83,000	0	83,000	0	83,000	
				cycle 2						83,000	0	124,500	41,500	41,500	83,000	0	83,000	0	83,000	0	83,000	
				cycle 3													83,000	0	124,500	41,500	41,500	
				cycle 4															83,000	0	124,500	
UFW Control Costs Total																						
	Sub-total UFW control Unit				26,000	0	0	0	5,000	21,000	0	0	26,000	0	21,000	0	5,000	21,000	0	21,000	5,000	0
	Sub-total UFW monitoring				24,000	0	0	0	0	24,000	0	0	24,000	0	24,000	0	0	24,000	0	24,000	0	0
	Sub-total Measurement campaign				94,250	37,250	37,250	37,250	37,250	94,250	37,250	37,250	131,500	74,500	131,500	74,500	74,500	131,500	74,500	131,500	74,500	74,500
	Sub-total Leak detection				83,000	0	124,500	41,500	41,500	124,500	83,000	124,500	124,500	41,500	207,500	83,000	207,500	124,500	124,500	207,500	166,000	207,500
	TOTAL UFW EQUIPMENT COSTS				227,250	37,250	161,750	78,750	83,750	263,750	120,250	161,750	306,000	116,000	384,000	157,500	287,000	301,000	199,000	384,000	245,500	282,000
Network Survey																						
	Office	5000	\$ per set							5,000							5,000				5,000	
	Mobile equipment for each team	33600	\$ per team														134,400				134,400	
	TOTAL NETWORK SURVEY COSTS				139,400	0	0	0	5,000	0	0	0	139,400	0	0	0	5,000	0	0	0	5,000	0
	TOTAL EQUIPMENT COSTS				366,650	37,250	161,750	78,750	88,750	263,750	120,250	161,750	445,400	116,000	384,000	157,500	292,000	301,000	199,000	384,000	250,500	282,000
	Contingency, spares etc	5%			18,333	1,863	8,088	3,938	4,438	13,188	6,013	8,088	22,270	5,800	19,200	7,875	14,600	15,050	9,950	19,200	12,525	14,100
	Grand total UFW Control Equipment				384,983	39,113	169,838	82,688	93,188	276,938	126,263	169,838	467,670	121,800	403,200	165,375	306,600	316,050	208,950	403,200	263,025	296,100

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Notes:

- 1 Equipment is renewed each 5 years
- 2 Repair teams of 1 per leakage team
- 3 Office equipment renewed each 4 years
- 4 Survey equipment renewed every 10 years
- 5 After first intensive survey, equipment is redeployed to UFW unit & others

Table 3.8.3 Task Cost Estimates - Network Bulk Metering

Item	Description	Year																					
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Base Data																							
Service Population							2,201,500				2,973,000						3,601,650				4,311,300		
From Master plan		1,443,450																					
Linear extrapolation		1,443,450	1,595,060	1,746,670	1,898,280	2,049,890	2,201,500	2,355,800	2,510,100	2,664,400	2,818,700	2,973,000	3,098,730	3,224,460	3,350,190	3,475,920	3,601,650	3,743,580	3,885,510	4,027,440	4,169,370	4,311,300	
Estimated no of connections																							
@ 7 person per connection	7	206,207	227,866	249,524	271,183	292,841	314,500	336,543	358,586	380,629	402,671	424,714	442,676	460,637	478,599	496,560	514,521	534,797	555,073	575,349	595,624	615,900	
@ 6 person per connection	6	240,575	265,843	291,112	316,380	341,648	366,917	392,633	418,350	444,067	469,783	495,500	516,455	537,410	558,365	579,320	600,275	623,930	647,585	671,240	694,895	718,550	
@ 5 person per connection	5	288,690	319,012	349,334	379,656	409,978	440,300	471,160	502,020	532,880	563,740	594,600	619,746	644,892	670,038	695,184	720,330	748,716	777,102	805,488	833,874	862,260	
Estimated number of Non-domestic	5%	12,029	13,292	14,556	15,819	17,082	18,346	19,632	20,918	22,203	23,489	24,775	25,823	26,871	27,918	28,966	30,014	31,197	32,379	33,562	34,745	35,928	
Total number of Connections		252,694	279,136	305,667	332,199	358,731	385,263	412,265	439,268	466,270	493,273	520,275	542,278	564,281	586,283	608,286	630,289	655,127	679,964	704,802	729,640	754,478	
No of Water Supply Areas (WSA)	connections/ WSA	10000	25	28	31	33	36	39	41	44	47	49	52	54	56	59	61	63	66	68	70	73	75
No of District meter Areas (DMA)	connections/D MA	2500	101	112	122	133	143	154	165	176	187	197	208	217	226	235	243	252	262	272	282	292	302
Bulk Metering Stage 1																							
<i>(Existing Production, service reservoirs, pump station etc.)</i>																							
Estimated Quantities																							
Full bore meters	\$/installation				1	8	2																
Insertion Probe meters	\$/installation				2	5																	
Cost Estimates																							
Full bore meters		16800			16,800	134,400	33,600																
Insertion Probe meters		9300			18,600	46,500	0																
Sub-total for Stage1 network metering	\$				35,400	180,900	33,600																
Bulk Metering Stage 2																							
Estimated Quantities																							
Sectors					0	0	0	5	5	10	10	10	10	10	10	10	10	10	10	10	10	10	
WSA					0	0	0	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	
DMA					0	0	0	4	4	8	8	8	8	8	8	8	8	8	8	8	8	8	
Cumulative total	WSA				0	0	0	1	2	4	6	8	10	12	14	16	18	20	22	24	26	28	
	DMA				0	0	0	4	8	16	24	32	40	48	56	64	72	80	88	96	104	112	
Cost Estimates																							
WSA meters installation Set	10300	\$/WSA meter set			0	0	10,300	10,300	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	20,600	
WSA sectorisation valves etc	17000	\$/WSA valves set			0	0	17,000	17,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	34,000	
WSA meter only (replacement unit)	1500	\$/WSA meter			0	0	0	0	0	0	0	0	1,500	1,500	3,000	3,000	3,000	4,500	4,500	6,000	6,000	6,000	
													1,500	1,500	3,000	3,000	3,000	4,500	4,500	6,000	6,000	6,000	
																	1,500	1,500	3,000	3,000	3,000	3,000	
DMA meters installation Set	3300	\$/DMA meter set			0	0	13,200	13,200	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	26,400	
DMA sectorisation valves etc	4500	\$/DMA valves set			0	0	18,000	18,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	36,000	
DMA meter only (replacement unit)	500	\$/DMA meter			0	0	0	0	0	0	0	0	2,000	2,000	4,000	4,000	4,000	6,000	6,000	8,000	8,000	8,000	
													2,000	2,000	4,000	4,000	4,000	6,000	6,000	8,000	8,000	8,000	
																	2,000	2,000	4,000	4,000	4,000	4,000	
Sub-total for Stage 2 network metering	WSA	\$			0	0	27,300	27,300	54,600	54,600	54,600	56,100	56,100	57,600	57,600	57,600	59,100	59,100	60,600	60,600	60,600	60,600	
	DMA	\$			0	0	31,200	31,200	62,400	62,400	62,400	64,400	64,400	64,400	66,400	66,400	66,400	68,400	68,400	70,400	70,400	70,400	

Table 3.8.3 Task Cost Estimates - Network Bulk Metering

Item	Description	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Tubewell Metering																							
Estimated Quantities																							
Tubewell meters	Qty per year				0	0	0	20	20	20	20	20											
Cost Estimates																							
Tubewell Meters installation set	790 \$/meter set				0	0	0	15,800	15,800	15,800	15,800	15,800	0	0	0	0	0	0	0	0	0	0	
Tubewell Meters (replacement unit)	450 \$/meter				0	0	0	0	0	0	0	0	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	
				cycle 1									15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	
				cycle 2									0	0	0	0	0	0	15,800	15,800	15,800	15,800	
Sub-total for Tubewell metering	\$				0	0	0	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	
Bulk Metering Costs Total																							
Sub-total Bulk Metering Stage 1					35,400	180,000	33,600	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Sub-total Bulk Metering Stage 2					0	0	0	58,500	58,500	117,000	117,000	117,000	120,500	120,500	124,000	124,000	124,000	124,000	127,500	127,500	131,000	131,000	132,000
Sub-total Tubewell metering					0	0	0	25,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	15,800	
TOTAL REPAIR COSTS					35,400	180,000	33,600	74,300	74,300	132,800	132,800	132,800	136,300	136,300	139,800	139,800	139,800	139,800	143,300	143,300	146,800	146,800	
Contingency, spares etc 5%					1,770	9,045	1,680	3,715	3,715	6,640	6,640	6,640	6,815	6,815	6,990	6,990	6,990	6,990	7,165	7,165	7,340	7,340	
Grand total Repair Equipment & Materials					37,170	189,045	35,280	78,015	78,015	139,440	139,440	139,440	143,115	143,115	146,790	146,790	146,790	146,790	150,465	150,465	154,140	154,140	

Notes:

- 1 DMA & WSA Meters are renewed each 5 years
- 2 Installation is done by repair teams or large meter teams
- 3 Bulk meters are installed in rehab areas as part of new works programme
- 4 Meters included here are only for non-rehab network areas with supply & pressure
- 5 WSA meters are assumed to be average size of 10 inch
- 6 DMA meters are assumed to be average size of 4 inch
- 7 10 valves for sectorisation are estimated on average
- 8 Valves are the same size as the meters for WSA & DMA respectively
- 9 Tubewell Meters are renewed each 5 years
- 10 Insertion probe meters are redeployed to UFW Control Unit when facilities are taken out of service

Table 3.8.4 Task Cost Estimates - Leak Repair Equipment & Material

Item	Description	Year																					
		2008	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	
Base Data																							
	No of Repairs				400	400	500	600	700	800	1,000	1,000	1,200	1,200	1,400	1,400	1,600	1,600	1,800	1,800	2,000	2,000	
	No of repair teams				4	4	5	6	7	8	10	10	12	12	14	14	16	16	18	18	20	20	
	Additional no of repair teams				4	0	1	1	1	1	2	0	2	0	2	0	2	0	2	0	2	0	
Repair Materials																							
	No of Repair Kits	20	repairs per kit		20	20	25	30	35	40	50	50	60	60	70	70	80	80	90	90	100	100	
	Cost of repair materials	21150	\$ per kit		423,000	423,000	528,750	634,500	740,250	846,000	1,057,500	1,057,500	1,269,000	1,269,000	1,480,500	1,480,500	1,692,000	1,692,000	1,903,500	1,903,500	2,115,000	2,115,000	
Repair Equipment																							
	Major Equipment held centrally	52000	\$ per set		52,000					104,000				156,000					208,000				
	Mobile equipment for each team	11000	\$ per team		44,000	0	11,000	11,000	11,000	55,000	22,000	11,000	33,000	11,000	77,000	22,000	33,000	33,000	33,000	33,000	77,000	44,000	33,000
				Cycle 1:	44,000	0	11,000	11,000	11,000	11,000	22,000	0	22,000	0	22,000	0	22,000	0	22,000	0	22,000	0	22,000
				Cycle 2:						44,000	0	11,000	11,000		11,000	22,000	0	22,000	0	22,000	0	22,000	
				Cycle 3:										44,000	0	11,000	11,000	11,000	11,000	11,000	22,000	0	
				Cycle 4:																44,000	0	11,000	
Repair Costs Total																							
	Sub-total Material				423,000	423,000	528,750	634,500	740,250	846,000	1,057,500	1,057,500	1,269,000	1,269,000	1,480,500	1,480,500	1,692,000	1,692,000	1,903,500	1,903,500	2,115,000	2,115,000	
	Sub-total equipment				96,000	0	11,000	11,000	11,000	159,000	22,000	11,000	33,000	167,000	77,000	22,000	33,000	33,000	241,000	77,000	44,000	33,000	
	TOTAL REPAIR COSTS				519,000	423,000	539,750	645,500	751,250	1,005,000	1,079,500	1,068,500	1,302,000	1,436,000	1,557,500	1,502,500	1,725,000	1,725,000	2,144,500	1,980,500	2,159,000	2,148,000	
	Contingency, spares etc 5%				25,950	21,150	26,988	32,275	37,563	50,250	53,975	53,425	65,100	71,800	77,875	75,125	86,250	86,250	107,225	99,025	107,950	107,400	
	Grand total Repair Equipment & Materials				544,950	444,150	566,738	677,775	788,813	1,055,250	1,133,475	1,121,925	1,367,100	1,507,800	1,635,375	1,577,625	1,811,250	1,811,250	2,251,725	2,079,525	2,266,950	2,255,400	

Notes:

- 1 Equipment is renewed each 5 years
- 2 Repair teams of 1 per leakage team
- 3 Major equipment based on 1 per 4 teams
- 4 Mobile equipment is based on 1 per team
- 5 Repair teams also contribute to network meter & valve installation
- 6 The estimate for repair materials is based on a unit of a mixed set of fittings

Table 3.8.5 Task Cost Estimates - Customer Metering Programme

Item	Description	Year																						
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
Base Data																								
Service Population																								
From Master plan		1,443,450					2,201,500				2,973,000					3,601,650					4,311,300			
Linear extrapolation		1,443,450	1,595,060	1,746,670	1,898,280	2,049,890	2,201,500	2,353,100	2,510,100	2,664,400	2,818,700	2,973,000	3,098,730	3,224,460	3,350,190	3,475,920	3,601,650	3,743,580	3,885,510	4,027,440	4,169,370	4,311,300		
Estimated no of connections																								
@ 7 person per connection	7	206,207	227,866	249,524	271,183	292,841	314,500	336,153	358,586	380,629	402,671	424,714	442,676	460,637	478,599	496,560	514,521	534,797	555,073	575,349	595,624	615,900		
@ 6 person per connection	6	240,575	265,843	291,112	316,380	341,648	366,917	392,183	418,350	444,067	469,783	495,500	516,455	537,410	558,365	579,320	600,275	623,950	647,585	671,240	694,895	718,550		
@ 5 person per connection	5	288,690	319,012	349,334	379,656	409,978	440,300	471,160	502,020	532,880	563,740	594,600	619,746	644,892	670,038	695,184	720,330	748,716	777,102	805,488	833,874	862,260		
Estimated number of Non-domestic	5%	12,029	13,292	14,556	15,819	17,082	18,346	19,610	20,918	22,203	23,489	24,775	25,823	26,871	27,918	28,966	30,014	31,197	32,379	33,562	34,745	35,928		
Estimated number of Large users	10%	1,203	1,329	1,456	1,582	1,708	1,835	1,963	2,092	2,220	2,349	2,478	2,582	2,687	2,792	2,897	3,001	3,120	3,238	3,356	3,474	3,593		
Total number of small meters		251,401	277,806	304,212	330,617	357,023	383,428	410,302	437,176	464,050	490,924	517,798	539,695	561,593	583,491	605,389	627,287	652,067	676,726	701,446	726,165	750,885		
Small Meter Programme																								
Quantities																								
Small meters installation																								
Quantity per year							40,000	60,000	78,000	78,000	78,000	78,000	78,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000	26,000		
Cumulative total							40,000	100,000	178,000	256,000	334,000	412,000	490,000	516,000	542,000	568,000	594,000	620,000	646,000	672,000	698,000	724,000	750,000	
Assumed number of connections							360,000	390,000	420,000	440,000	470,000	500,000	520,000	540,000	570,000	590,000	610,000	630,000	660,000	680,000	710,000	730,000	760,000	
(Rounded up from 6/connection)																								
Proportion of connections with meters fitted							11%	26%	42%	58%	71%	82%	94%	96%	95%	96%	97%	98%	98%	99%	98%	99%	99%	
Replacement Programme																								
Replacement Cycle (years)	7																							
Quantity per year																								
1st time replacement							0	0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	26,000	26,000	26,000	
2nd time replacement																					40,000	60,000	78,000	
Total Annual quantity							0	0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	78,000	66,000	86,000	104,000
Proportion tested as reusable	33%																							
Costs																								
Unit Metering Costs																								
Meter	20	\$																						
Accessories & fittings	5	\$																						
Installation	5	\$																						
Replacement	1	\$																						
Installation costs																								
Purchase Costs	25						1,000,000	1,500,000	1,950,000	1,950,000	1,950,000	1,950,000	1,950,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	650,000	
Install costs	5						200,000	300,000	390,000	390,000	390,000	390,000	390,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	130,000	
Total	30						1,200,000	1,800,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	780,000	780,000	780,000	780,000	780,000	780,000	780,000	780,000	780,000	780,000	
Replacement costs																								
Purchase costs	20						0	0	0	0	0	0	0	536,000	804,000	1,045,200	1,045,200	1,045,200	1,045,200	1,045,200	884,400	1,152,400	1,393,600	
Replace costs	1						0	0	0	0	0	0	40,000	60,000	78,000	78,000	78,000	78,000	78,000	78,000	66,000	86,000	104,000	
Total	21						0	0	0	0	0	0	840,000	1,260,000	1,638,000	1,638,000	1,638,000	1,638,000	1,638,000	1,638,000	1,386,000	1,806,000	2,184,000	
Total Purchase costs																								
New & replacement meters							1,000,000	1,500,000	1,950,000	1,950,000	1,950,000	1,950,000	1,950,000	1,186,000	1,454,000	1,695,200	1,695,200	1,695,200	1,695,200	1,695,200	1,534,400	1,802,400	2,043,600	
Installation & replacement costs							200,000	300,000	390,000	390,000	390,000	390,000	390,000	170,000	190,000	208,000	208,000	208,000	208,000	208,000	196,000	216,000	254,000	
total of small Metering costs							1,200,000	1,800,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	1,620,000	2,040,000	2,418,000	2,418,000	2,418,000	2,418,000	2,418,000	2,166,000	2,586,000	2,944,000	
Cost equalisation							1,200,000	1,800,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	2,340,000	

Table 3.8.5 Task Cost Estimates - Customer Metering Programme

Item	Description	Year																				
		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Large Meter Programme																						
	No of large meters	1,300	1,400	1,500	1,600	1,800	1,900	2,000	2,100	2,300	2,400	2,500	2,600	2,700	2,800	2,900	3,100	3,200	3,300	3,400	3,500	3,600
	No of additional meters	1,300	100	100	100	200	100	100	100	200	100	100	100	100	100	100	200	100	100	100	100	100
Quantities																						
	Large meters installation																					
	Quantity per year					400	800	800	120	120	120	120	120	120	120	120	120	120	120	120	120	120
	Cumulative total				0	400	1,200	2,000	2,120	2,240	2,360	2,480	2,600	2,720	2,840	2,960	3,080	3,200	3,320	3,440	3,560	3,680
	Proportion of connections with meters fitted					22%	63%	100%	101%	97%	98%	99%	100%	101%	101%	102%	99%	100%	101%	101%	102%	102%
	Replacement Programme																					
	Replacement Cycle (years)	5																				
	Quantity per year																					
	1st cycle					0	0	0	500	500	500	500	500	500	500	500	500	500	500	500	500	500
	2nd cycle													120	120	120	120	120	120	120	120	120
	3rd cycle																				120	120
	Total Annual quantity					0	0	0	500	500	500	500	500	620	620	620	620	620	620	740	740	740
	Proportion tested as reusable	50%																				
Costs																						
	Unit Metering Costs																					
	Meter		Large meters																			
	Accessories & fittings		350 \$																			
	Installation		175 \$																			
	Replacement		100 \$																			
			20 \$																			
	Installation costs																					
	Purchase Costs	525				210,000	420,000	420,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000	63,000
	Install costs	100				40,000	80,000	80,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000	12,000
	Total	625				250,000	500,000	500,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000	75,000
	Replacement costs																					
	Purchase costs	350				0	0	0	87,500	87,500	87,500	87,500	87,500	108,500	108,500	108,500	108,500	108,500	129,500	129,500	129,500	129,500
	Replace costs	20				0	0	0	5,000	5,000	5,000	5,000	5,000	6,200	6,200	6,200	6,200	6,200	7,400	7,400	7,400	7,400
	Total	370				0	0	0	92,500	92,500	92,500	92,500	92,500	114,700	114,700	114,700	114,700	114,700	136,900	136,900	136,900	136,900
	Total Purchase costs																					
	New & replacement meters					210,000	420,000	420,000	150,500	150,500	150,500	150,500	150,500	171,500	171,500	171,500	171,500	171,500	192,500	192,500	192,500	192,500
	Installation & replacement costs					40,000	80,000	80,000	17,000	17,000	17,000	17,000	17,000	18,200	18,200	18,200	18,200	18,200	19,400	19,400	19,400	19,400
	total of Large Metering costs					250,000	500,000	500,000	167,500	167,500	167,500	167,500	167,500	189,700	189,700	189,700	189,700	189,700	211,900	211,900	211,900	211,900
	Cost equalisation					250,000	500,000	500,000	167,500	167,500	167,500	167,500	167,500	189,700	189,700	189,700	189,700	189,700	211,900	211,900	211,900	211,900
Combined Metering Costs																						
	Total Purchase costs																					
	New & replacement meters					1,210,000	1,920,000	2,370,000	2,100,500	2,100,500	2,100,500	2,100,500	1,336,500	1,625,500	1,866,700	1,866,700	1,866,700	1,866,700	1,887,700	1,726,900	1,994,900	2,236,100
	Installation & replacement costs					240,000	380,000	470,000	407,000	407,000	407,000	407,000	187,000	208,200	226,200	226,200	226,200	226,200	227,400	215,400	235,400	253,400
	total of All Metering costs				0	1,450,000	2,300,000	2,840,000	2,507,500	2,507,500	2,507,500	2,507,500	1,787,500	2,229,700	2,607,700	2,607,700	2,607,700	2,607,700	2,629,900	2,377,900	2,797,900	3,175,900
	Cost equalisation					1,500,000	2,500,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000	2,520,000

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NOTES:

- 1 Based on 7 year replacement period for meters
- 2 Allowance for re-use of meters not outside calibration limits. 33% (i.e. 67% discarded)
- 3 Accessories cost includes a filter to prevent damage from sediment
- 4 Installation is concentrated on areas that have been rehabilitated
- 5 Meters are to be installed as soon as possible after rehabilitation
- 6 Non-domestic consumers add 5% to the total of connections
- 7 Large users represent 5% of the total of non-domestic consumers
- 8 Small meters are assumed all to be 19mm diameter
- 9 Large meters are assumed to be 80 mm diameter average for costing

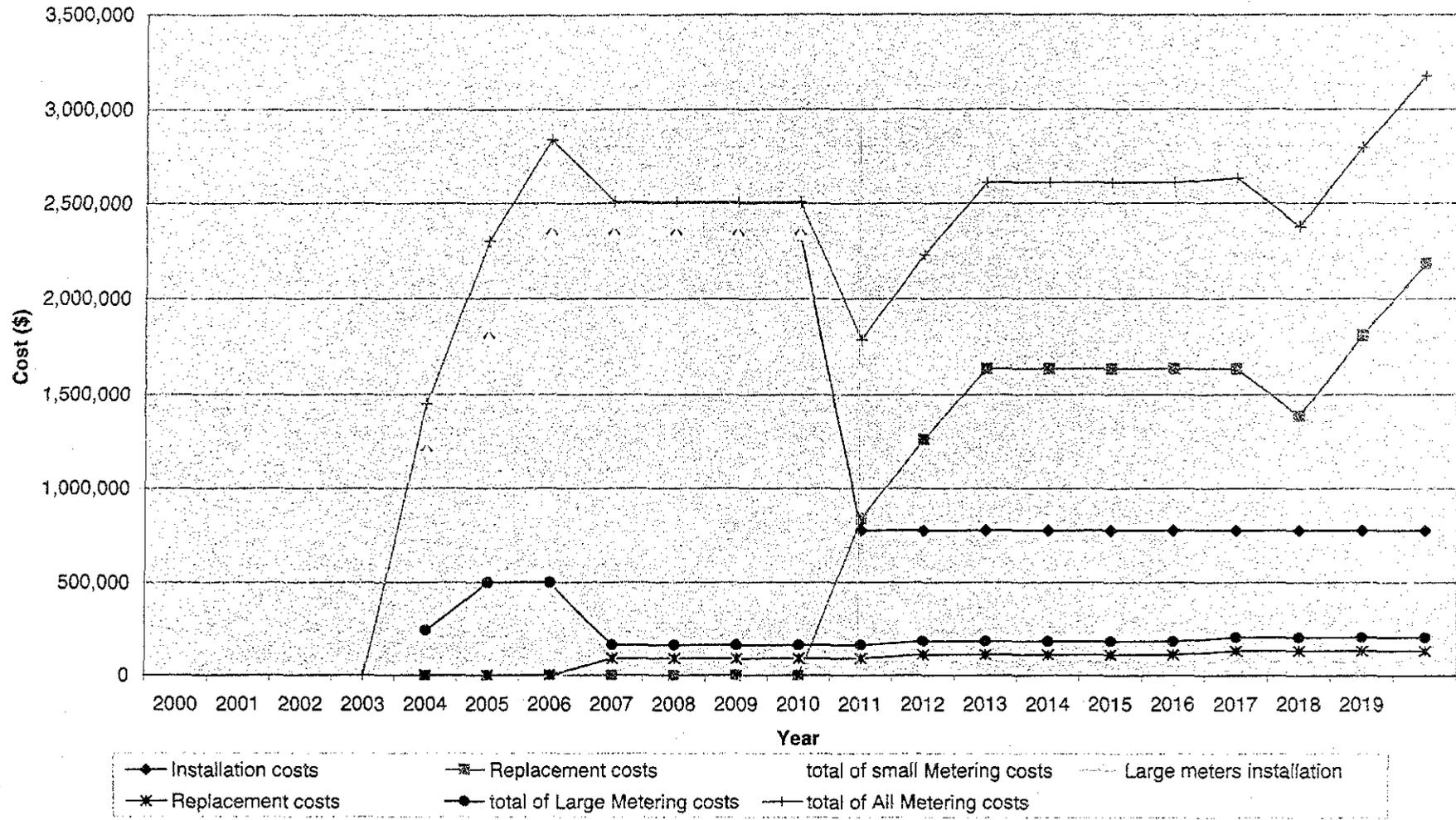


Figure 3.8.2 Customer Metering Costs

Table 3.8.6 Task Cost Estimates Training & Technical Assistance

Training & Technical Assistance Programme Costs

Group	Task	Unit cost \$(2001)		Units	Setup 2003		2004		2005		2006		2007		2008		2009		2010		2011		Remarks
		\$/month			month	\$	month	\$	month	\$	month	\$	month	\$	month	\$	month	\$	month	\$	month	\$	
Long-Term Technical Assistance																							
	UFW Team Leader	22000			6	132000	12	264000	12	264000	6	132000											
	Leakage Engineer	22000			6	132000	12	264000	6	132000													
	Non physical Loss Engineer	22000			6	132000	12	264000	6	132000													
Short-Term Experts																							
						360000		520000		80000													
	UFW Control					300000		340000															
	Network Survey Project engineer	20000			6	120000	12	240000															
	Network Survey Field engineer	20000			3	60000	3	60000															
	Tender Document & Specifications engineer	20000			6	120000	2	40000															
	Policy Advisors							40000		80000													
	Tariff Policy	20000							2	40000													
	Byelaws & Regulations	20000					2	40000	2	40000													
	Customer Metering					40000		40000															
	Customer Metering Planner	20000			2	40000	2	40000															
	Network Repairs					20000		100000															
	Network repair Engineer	20000			1	20000	5	100000															
	Technical Assistance Total					756000		1312000		608000		132000											
UFW Training																							
	Leakage Management	20000	4000	per person	4	96000																	
	Leakage Detection		2000	per person	4	8000																	
	Repair Techniques	20000	2000	per person	2	44000																	

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Technical assistance Consultants

Item	Unit cost	Unit
Foreign Component		
Expert	20000	month
Local Component		
Estimate local costs of 10% of Foreign costs		10%

