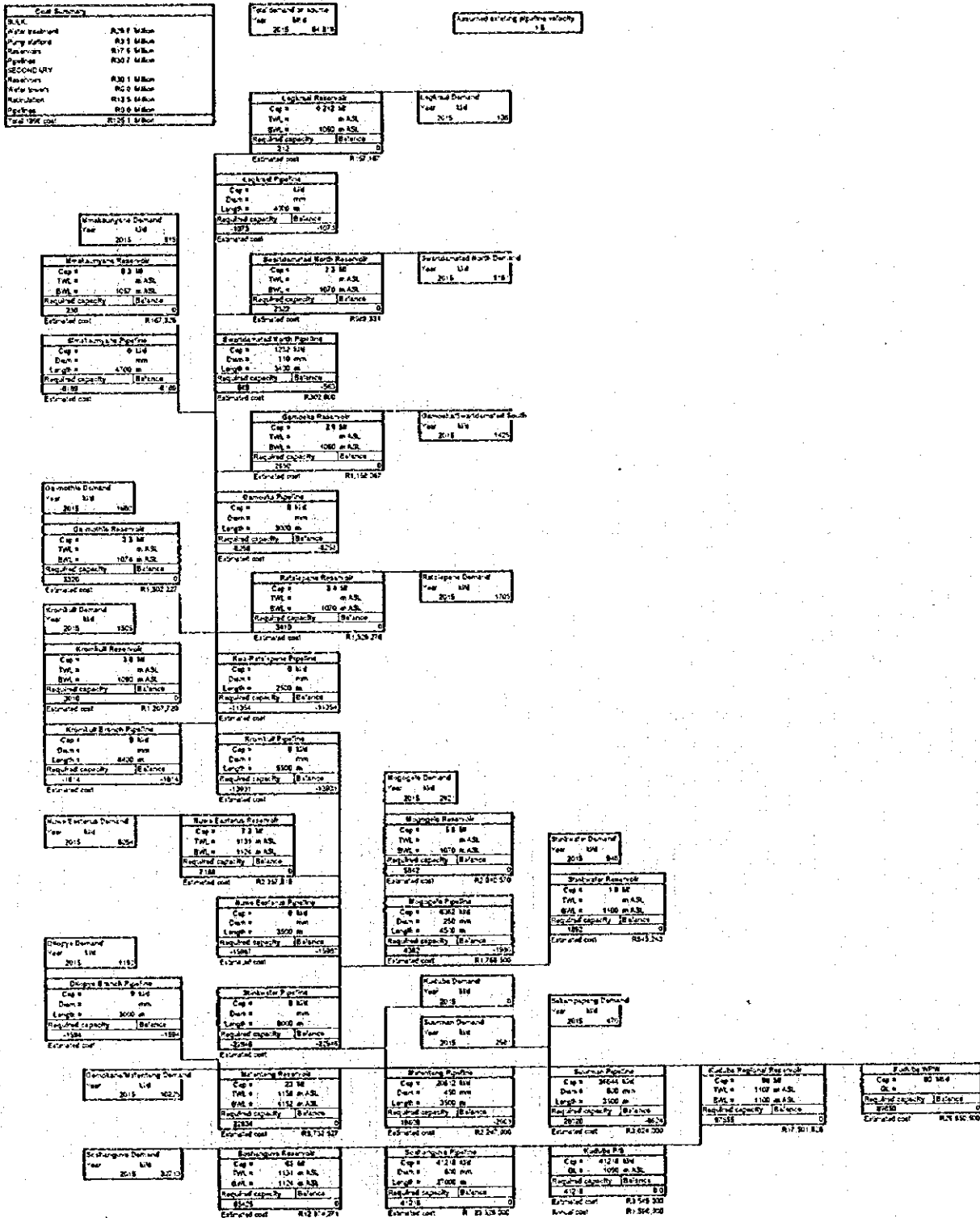


Kuduba South (Note: Seshanguva SR partly supplied from Kuduba WTW (Proposed planning to meet 2015 demand))

10 Nov 06  
E:\NS125



Warmbad and Nylstroom (Proposed planning to meet 2015 demand)

08-Nov-96

EVN0118

Cost Summary	
<b>BULK:</b>	
Water treatment	R7.213 Million (addition to Kudube/Temba)
Pump stations	Million
Reservoirs	R4.059 Million
Pipelines	Million
<b>SECONDARY:</b>	
Reservoirs	Million
Water towers	Million
Reticulation	Million
Pipelines	Million
<b>Total 1996 cost</b>	<b>R11.271 Million</b>
Pumping cost	R0.000 Million

Total demand on source	
Year	Mld
2015	14571

Belabela	
Year	k/d
2015	2621

Warmbaths	
Year	k/d
2015	6677

Warmbaths Reservoir	
Cap = ?	Ml
TWL =	m ASL
BWL =	1105 m ASL
Required capacity	Balance
?	?
Estimated cost	

Nylstroom	
Year	k/d
2015	4077

Phagameng	
Year	k/d
2015	1153

Nylstroom Reservoir	
Cap = ?	Ml
TWL =	m ASL
BWL =	1105 m ASL
Required capacity	Balance
?	?
Estimated cost	

Pump line from Warmbaths	
Cap =	0 k/d
Diam =	0 mm
Length =	26000 m
Required capacity	Balance
-4609	-4609
Estimated cost	

Pienaars River	
Year	k/d
2015	33

Pump line from Temba/Kudube	
Cap =	0 k/d
Diam =	0 mm
Length =	53000 m
Required capacity	Balance
1245	1245
Estimated cost	

Temba/Kudube CW Pumping Station	
Cap = ?	k/d
GL =	1105 m ASL
Required capacity	Balance
?	?
Estimated cost	

Temba/Kudube Regional Reservoir	
Cap =	15 Ml
TWL =	m ASL
BWL =	1105 m ASL
Required capacity	Balance
14571	0
Estimated cost	R4,058,603

Temba/Kudube W/PW	
Cap =	21 8565 M/d
GL =	1105
Required Capacity	Balance
21857	0
Estimated cost	R7,212,645

# WELTEVREDEN SUPPLY AREA

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### **EXISTING INFRASTRUCTURE**

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### **NEW INFRASTRUCTURE**

<b>SUPPLY AREA SUMMARY.....</b>	<b>E-17</b>
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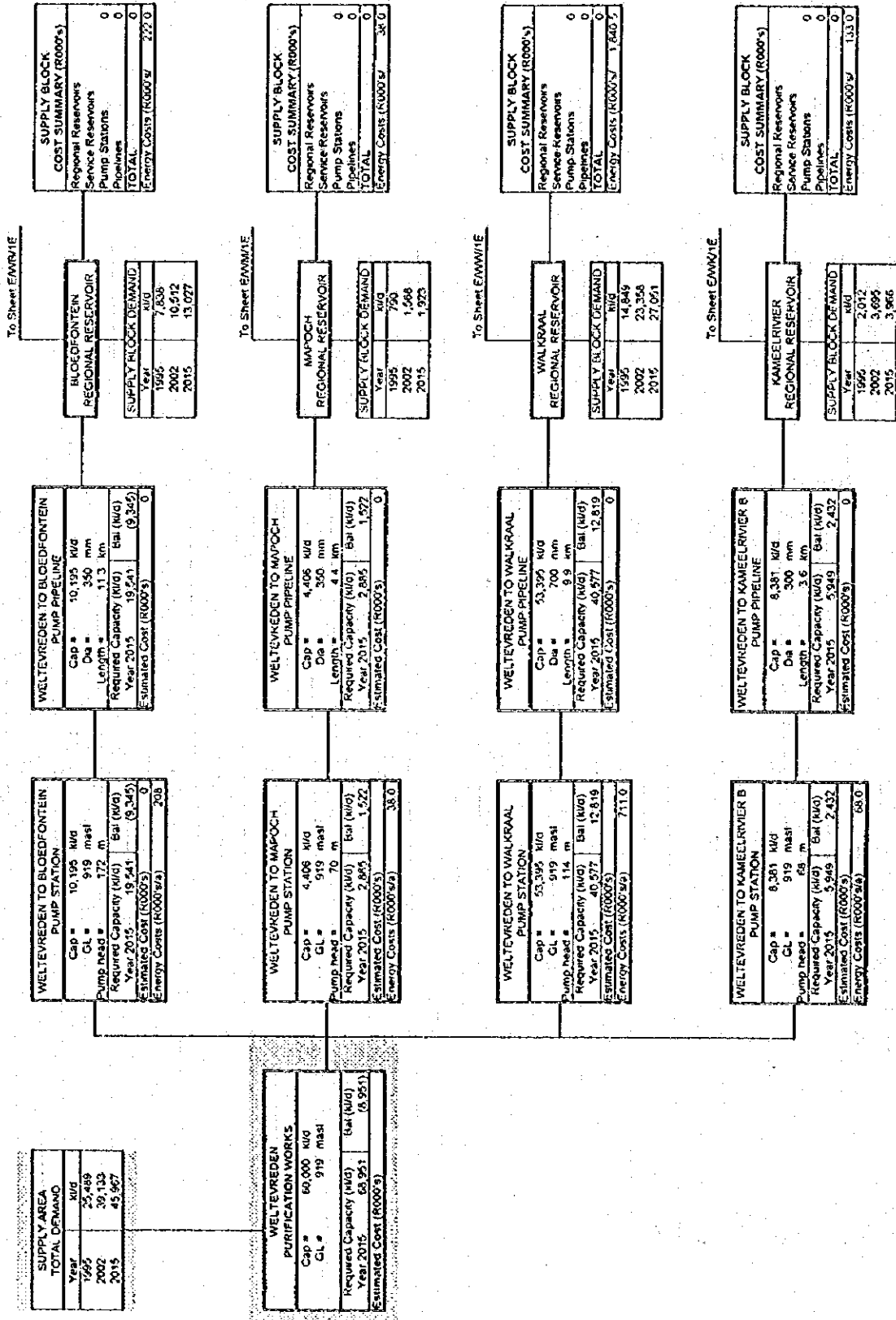
## COST SUMMARY FOR INFRASTRUCTURE

NAME OF SUPPLY AREA :		WELTEVREDEN SUPPLY AREA	
INCLUDING SUPPLY BLOCKS :	1. Waalkraal Supply Block	3. Mapoch Supply Block	
	2. Kameelrivier Supply Block	4. Bloedfontein Supply Block	
POPULATION SERVED (2015) :	631,276		
AADD in mcm/a (2015) :	19.01		
<b>BULK COST :</b>	<b>QUANTITY</b>	<b>COST (R million)</b>	
<b>Water Purification Works</b>	<b>Kl/d (SDD)</b>		
1. Weltevrede WTW	9,000	2.984	
<b>Pump Stations</b>	<b>Kl/d (SDD)</b>		
<b>A : Capital Cost</b>			
1. Weltevrede (Bloedfontein) CWPS	9,345	1.007	
2. Leuwfontein PS	575	0.053	
3. Matshipe A	362	0.059	
4. Spitspunt BPS	8,848	0.382	
5. Tshikanossi BPS	284	0.007	
6. Mmakola BPS	323	0.020	
7. Radijoko BPS	270	0.007	
8. Bamokgoko PS	1,616	0.206	
9. Phake B	1,277	0.148	
10. Ga Ramantshane (Kalkfontein)	908	0.094	
11. Ramantsho	33	0.006	
12. Lefifi	2,523	0.183	
13. Ga Ramantshane (Lefifi)	4,221	0.412	
	<b>Sub-Total</b>	<b>2.584</b>	
<b>B : Annual Energy Cost (Not Incl'd with Total)</b>			
1. Weltevrede (Bloedfontein) CWPS	-	0.255	
2. Leuwfontein PS	-	0.058	
3. Matshipe A	-	0.006	
4. Spitspunt BPS	-	0.070	
5. Tshikanossi BPS	-	0.002	
6. Mmakola BPS	-	0.003	
7. Radijoko BPS	-	0.002	
8. Bamokgoko PS	-	0.029	
9. Phake B	-	0.019	
10. Ga Ramantshane	-	0.011	
11. Ramantsho	-	0.002	
12. Lefifi	-	0.025	
13. Ga Ramantshane (Lefifi)	-	0.074	
	<b>Sub-Total</b>	<b>0.556</b>	
<b>Reservoirs (Regional)</b>	<b>MI</b>		
1. Spitspunt Reservoir	4.7 MI	1.605	
2. Ga-Ramantshane	4.5 MI	1.553	
<b>Pipelines (Bulk)</b>	<b>km</b>		
1. 110 PVC	68.8	6.300	
2. 125 PVC	10.2	1.300	
3. 140 PVC	10.8	1.800	
4. 160 PVC	26.3	5.200	
5. 200 PVC	40.1	11.100	
6. 250 PVC	11.3	4.700	
7. 315 PVC	3.6	2.329	
8. 350 ST			
9. 400 ST	7	5.700	
10. 450 ST	27.5	27.500	
	<b>Sub-Total</b>	<b>65.929</b>	

Sub Total Construction Cost		74.655
Engineering Fees (15 %)		11.198
VAT (14 %)		12.019
Project Contingency (20%)		19.575
TOTAL : Bulk Cost		117.447
Bulk Cost per Capita (Rands)		186
<b>SECONDARY COST :</b>	<b>QUANTITY</b>	<b>COST (R million)</b>
Reservoirs (Service)	MI	
1. Bloedfontein Supply Block	14.53 (34 No)	8.368
2. Waalkraal Supply Block	10.17 (25 No)	5.812
3. Kameelrivier Supply Block	0.92 (2 No)	0.523
4. Mapoch Supply Block	0	0.000
	Sub-Total	14.703
Water Towers	MI	
N/A	NIL	NIL
Pump Stations (Secondary)	Kl/d	
A : Capital Cost		
N/A	NIL	NIL
B : Annual Energy Cost (Not Inc'd with Total)		
N/A	NIL	NIL
Pipelines (Secondary)	km	
	NIL	NIL
Reticulation	km	
1. Bloedfontein Supply Block		99.837
2. Waalkraal Supply Block		95.056
3. Kameelrivier Supply Block		12.356
4. Mapoch Supply Block		6.851
	Sub-Total	214.100
Sub Total Construction Cost		228.803
Engineering Fees (15 %)		34.320
VAT (14 %)		36.837
Project Contingency (20%)		59.992
TOTAL : Secondary Cost		359.953
Secondary Cost per Capita (Rands)		570
<b>GRAND TOTAL COST</b>		<b>477.400</b>
Grand Total Cost per Capita (R)		758

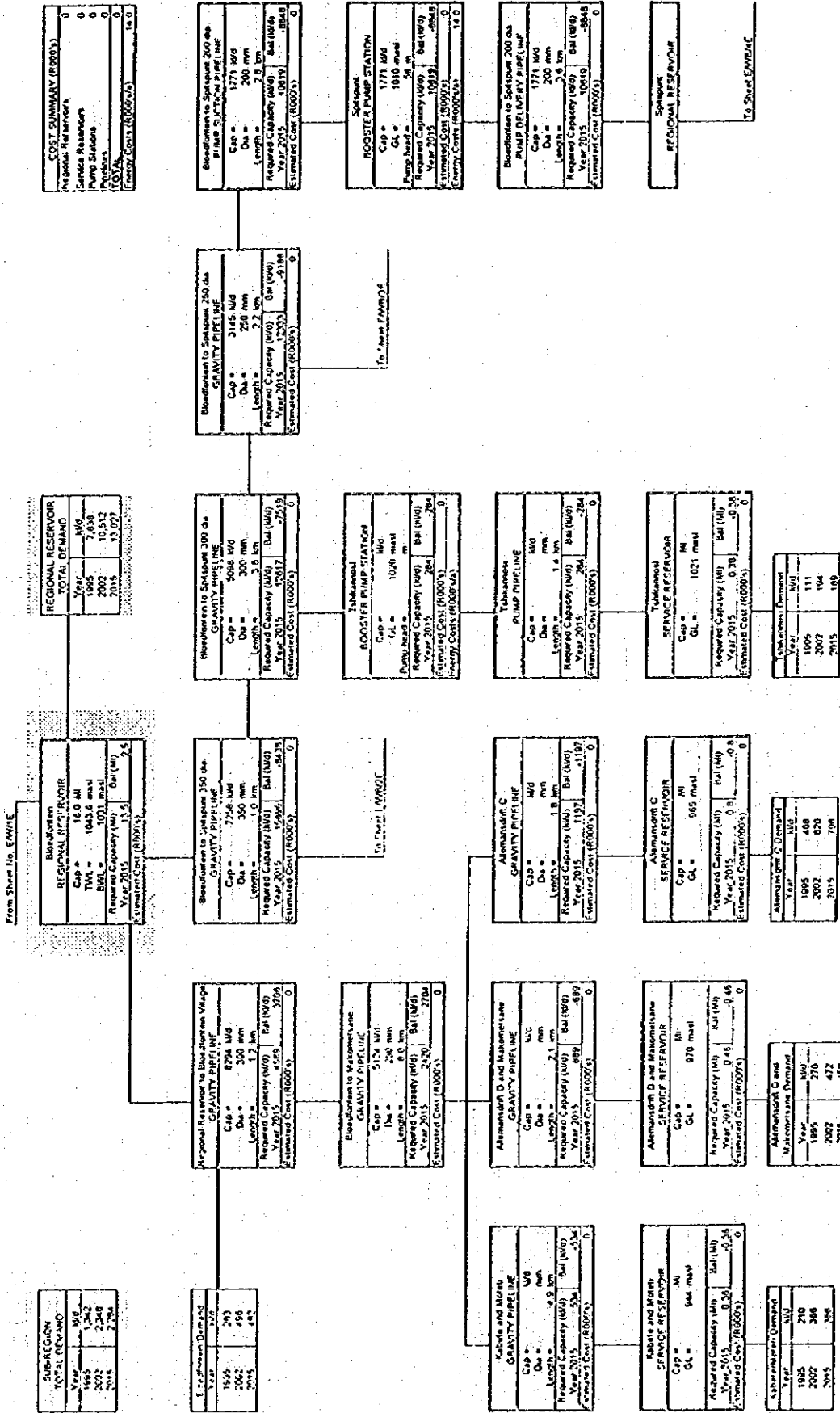
# EASTERN ZONE : WELTEVREDEN SUPPLY AREA : EXISTING INFRASTRUCTURE (EAW1E)

ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)



# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : EXISTING INFRASTRUCTURE (Sheet No. EWB/1E)

## BLOEDFONTEIN TO SPITSPUNT : ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)



COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
PIPELINES	0
TOTAL	0
Energy Costs (R000's)	14.0

REGIONAL RESERVOIR TOTAL DEMAND	
Year	Ml
1995	7.639
2002	10.512
2015	13.027

Bloedfontein REGIONAL RESERVOIR	
Cap	16.0 ML
TKWL	1043.6 m³
HWL	1071.0 m
Required Capacity (Ml)	7.5
Year 2015	13.5
Estimated Cost (R000's)	0

Bloedfontein to Spitspunt 200 dia GRAVITY PIPELINE	
Cap	1771 MGD
Di	200 mm
Length	2.2 km
Required Capacity (Ml)	7.5
Year 2015	10.512
Estimated Cost (R000's)	0

Bloedfontein to Spitspunt 350 dia GRAVITY PIPELINE	
Cap	5084 MGD
Di	300 mm
Length	2.8 km
Required Capacity (Ml)	7.5
Year 2015	13.027
Estimated Cost (R000's)	0

ROOSTER PUMP STATION	
Cap	1771 MGD
GL	1010 masl
Pump head	38 m
Required Capacity (Ml)	7.5
Year 2015	10.512
Estimated Cost (R000's)	14.0

Tshameles ROOSTER PUMP STATION	
Cap	1079 masl
GL	1079 masl
Pump head	0 m
Required Capacity (Ml)	7.5
Year 2015	7.5
Estimated Cost (R000's)	0

Bloedfontein to Spitspunt 200 dia PUMP DELIVERY PIPELINE	
Cap	1771 MGD
Di	200 mm
Length	2.6 km
Required Capacity (Ml)	7.5
Year 2015	10.512
Estimated Cost (R000's)	0

Spitspunt REGIONAL RESERVOIR	
Cap	16.0 ML
TKWL	1043.6 m³
HWL	1071.0 m
Required Capacity (Ml)	7.5
Year 2015	13.027
Estimated Cost (R000's)	0

Sub-Region Demand	
Year	Ml
1995	243
2002	456
2015	485

Regional Reservoir to Bloedfontein Village GRAVITY PIPELINE	
Cap	8724 MGD
Di	300 mm
Length	1.7 km
Required Capacity (Ml)	7.5
Year 2015	13.027
Estimated Cost (R000's)	0

Bloedfontein to Macrodonne GRAVITY PIPELINE	
Cap	5174 MGD
Di	200 mm
Length	8.0 km
Required Capacity (Ml)	7.5
Year 2015	2.570
Estimated Cost (R000's)	0

Almshoek C GRAVITY PIPELINE	
Cap	1100 MGD
Di	180 mm
Length	1.8 km
Required Capacity (Ml)	7.5
Year 2015	11.771
Estimated Cost (R000's)	0

Almshoek C SERVICE RESERVOIR	
Cap	905 masl
GL	905 masl
Required Capacity (Ml)	7.5
Year 2015	0.39
Estimated Cost (R000's)	0

Almshoek C Demand	
Year	Ml
1995	488
2002	820
2015	704

Kasta and Moris GRAVITY PIPELINE	
Cap	1100 MGD
Di	180 mm
Length	2.5 km
Required Capacity (Ml)	7.5
Year 2015	5.34
Estimated Cost (R000's)	0

Almshoek D and Macrodonne GRAVITY PIPELINE	
Cap	1100 MGD
Di	180 mm
Length	2.5 km
Required Capacity (Ml)	7.5
Year 2015	4.89
Estimated Cost (R000's)	0

Almshoek D and Macrodonne SERVICE RESERVOIR	
Cap	970 masl
GL	970 masl
Required Capacity (Ml)	7.5
Year 2015	0.45
Estimated Cost (R000's)	0

Almshoek D and Macrodonne Demand	
Year	Ml
1995	270
2002	472
2015	459

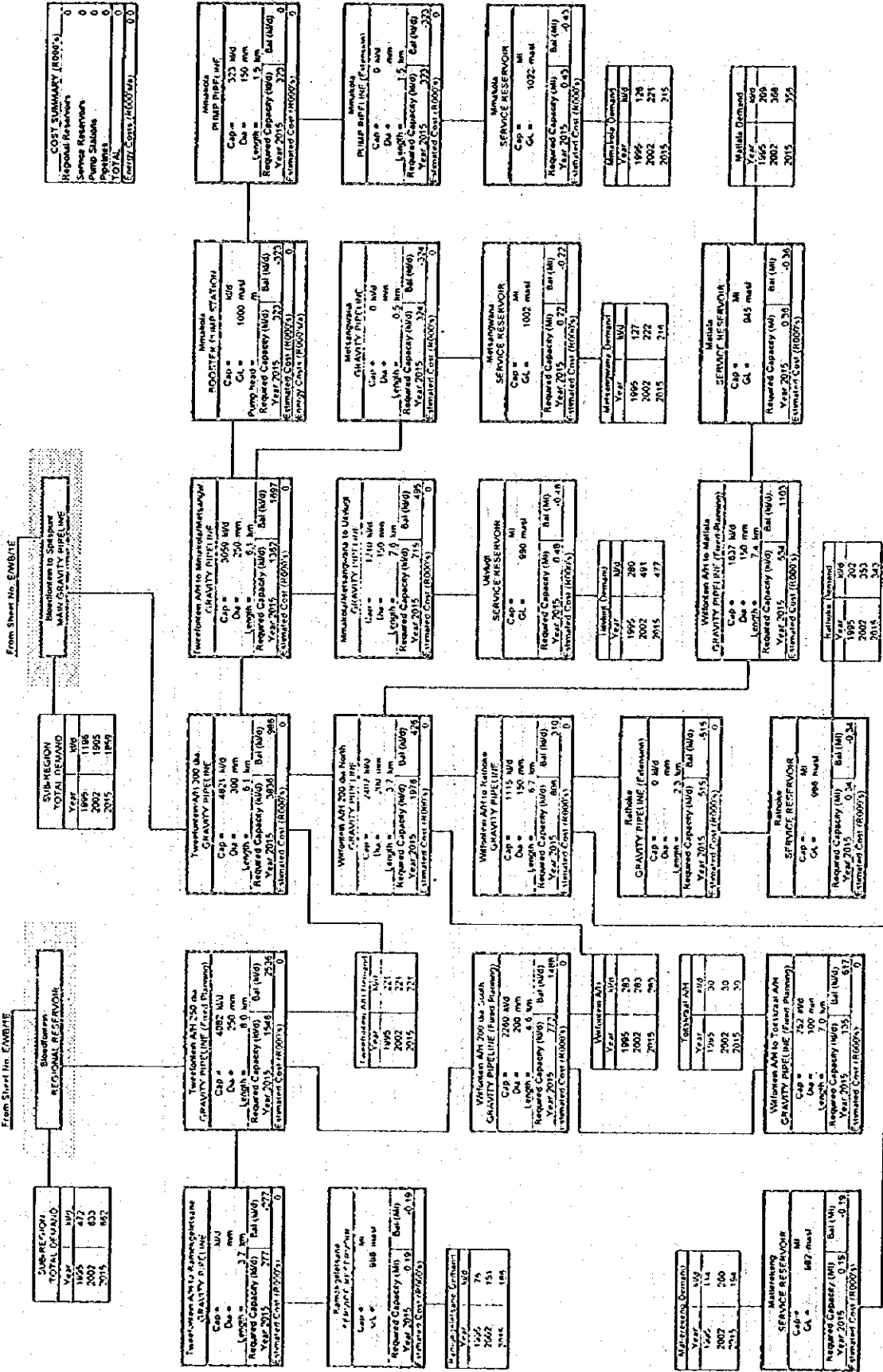
Kasta and Moris SERVICE RESERVOIR	
Cap	644 masl
GL	644 masl
Required Capacity (Ml)	7.5
Year 2015	0.26
Estimated Cost (R000's)	0

Kastebom Demand	
Year	Ml
1995	210
2002	348
2015	336

Note: Pumping energy costs for main pump stations assume 1/2 cent per kWh and 1/2 due to Energy (KWh), to the actual cost is 50% of that calculated for compression pumping for a PFA factor is 1.5 (ie. 100% per day).

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : EXISTING INFRASTRUCTURE (Sheet No. EWB/2E)

BLOEDFONTEIN TO UITVLUGT, RATHOKE AND MATLALA : ALTERNATIVES 1,2 or 3 (Moretele 2 supplied from Weltevreden Purification Works and/or Tamba Purification Works or Rust De Winter Dam)

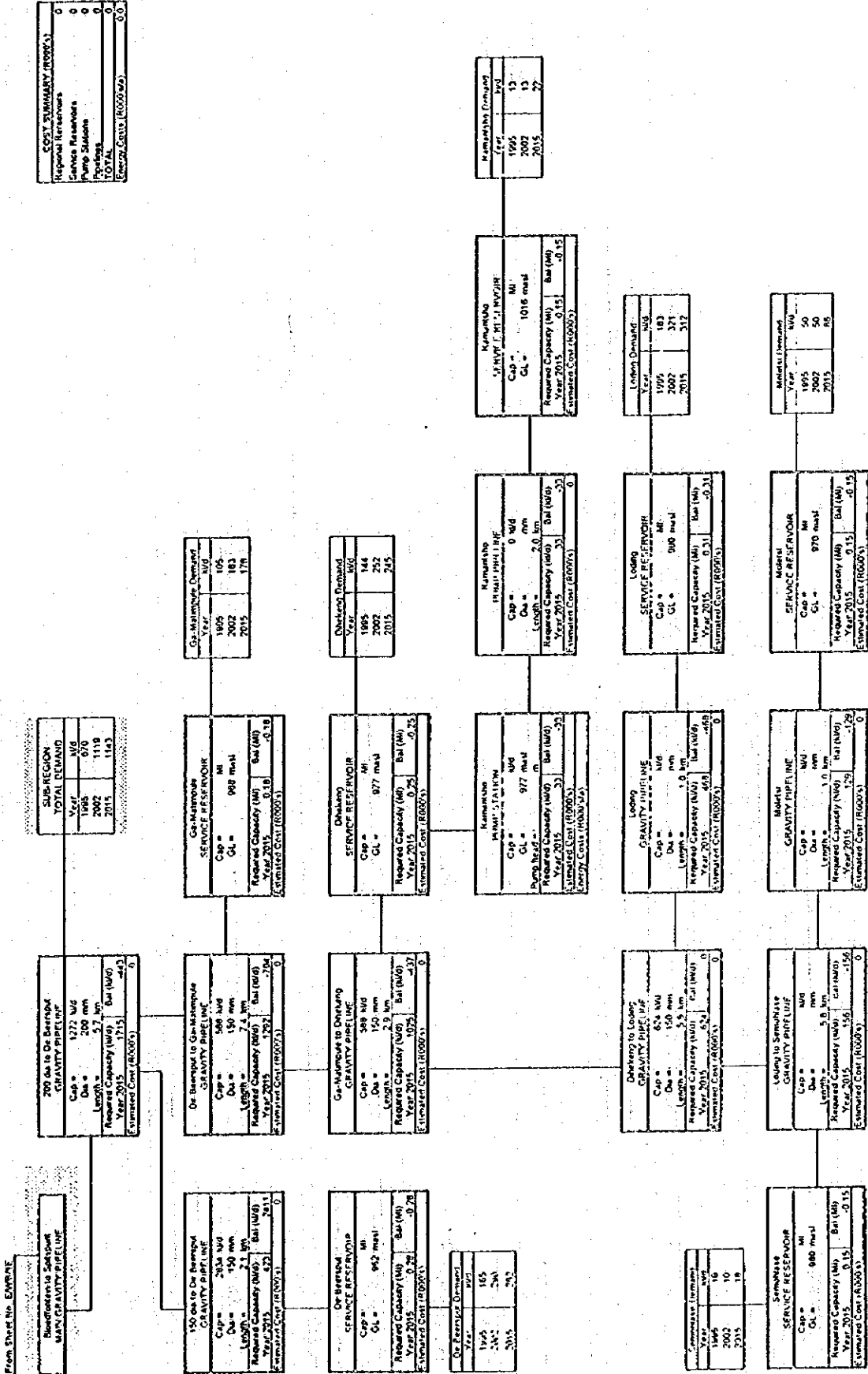


Note: Pumping energy costs for main pump stations assume 1/2 cost due to Pump (NVA) and 1/2 due to Energy (RWH), so that actual cost is 5/8 of that calculated for continuous pumping for a Peak factor = 1.5 (see 10hrs per day).



# EASTERN ZONE: WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : EXISTING INFRASTRUCTURE (Sheet No. EAWB/3E)

FROM BLOEDFONTEIN/SPITSPUNT PIPELINE TO SEMOHLASE : ALTERNATIVES 1, 2 or 3 (Moretele 2 supplied from Weltevreden Purification Works and/or Temba Purification Works or Rust De Winter Dam)



Note: Pumping energy costs for main pump stations assume 12 cent due to Power (kVA) and 12 due to Energy (kWh), so that actual cost is 50¢ that calculated for continuous pumping for a Peak Factor = 1.5 (i.e. 16hrs per day).

COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
Pipelines	0
<b>TOTAL</b>	<b>0</b>
Energy Costs (R000's/yr)	0.0

Gwa-Matshope Demand	
Year	MGD
1995	106
2002	183
2015	176

Overberg Demand	
Year	MGD
1995	144
2002	252
2015	245

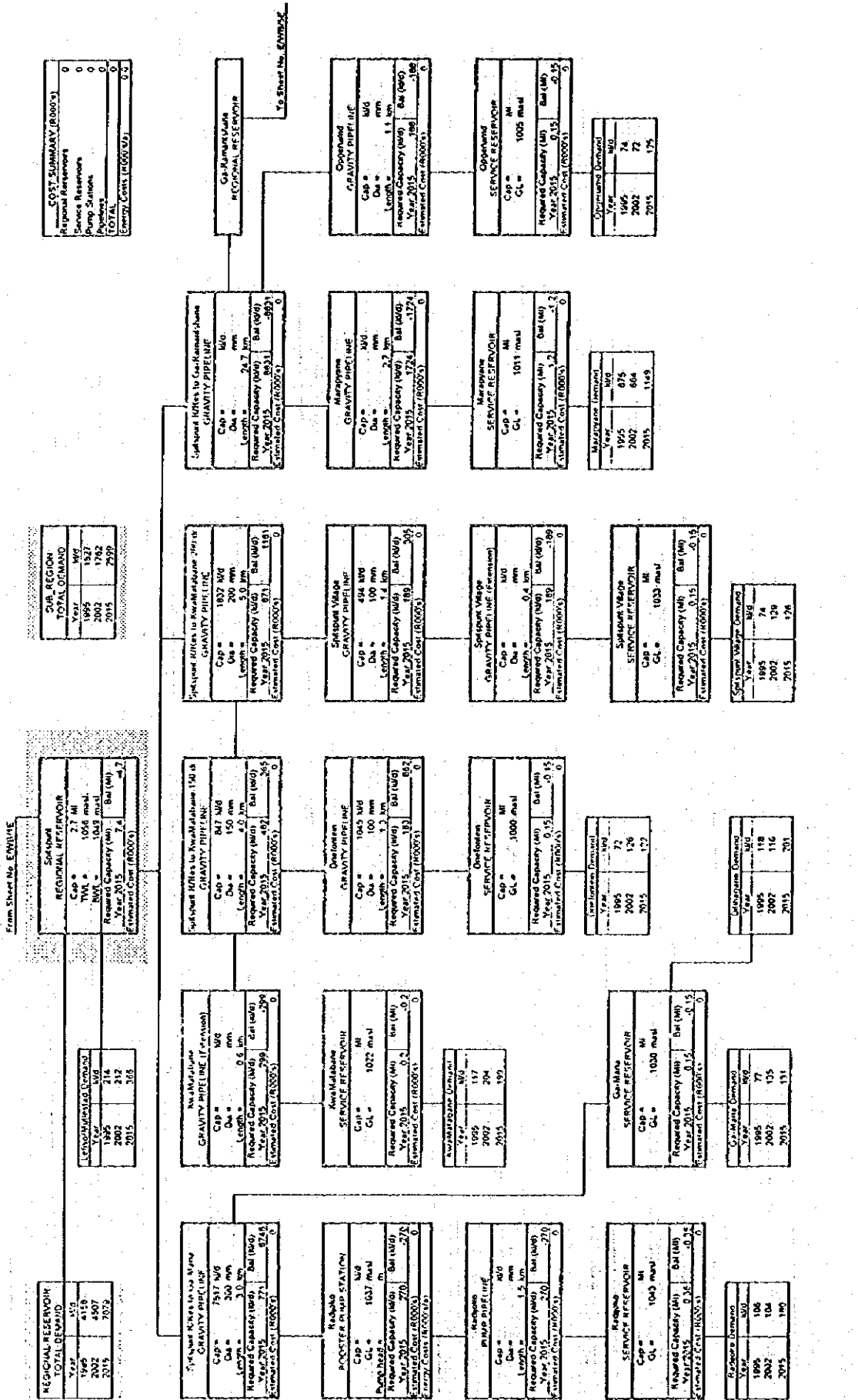
Kamathaba Demand	
Year	MGD
1995	13
2002	13
2015	27

Kamathaba Demand	
Year	MGD
1995	183
2002	371
2015	312

Semohlase Demand	
Year	MGD
1995	50
2002	50
2015	85

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : EXISTING INFRASTRUCTURE (Sheet No. EWB/4E)

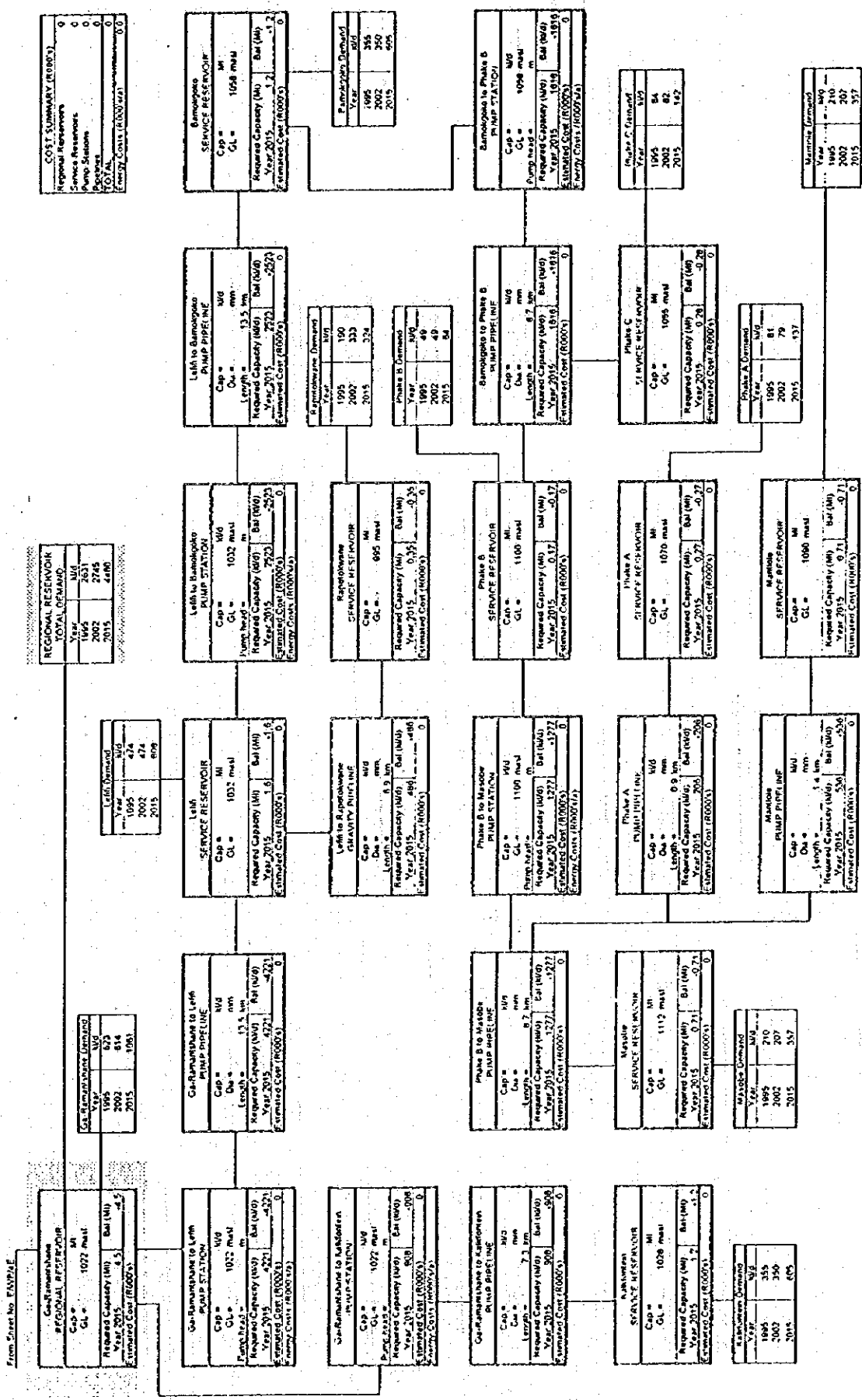
SPTSIPUNT TO KWAMATABANE AND GA-RAMANTSHANE : ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)



Note : Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWh).  
 \* that actual cost is 5/8 of that calculated for continuous pumping for a Peak Factor = 1.5 (hrs per day).

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : EXISTING INFRASTRUCTURE (Sheet No. EWB/5E)

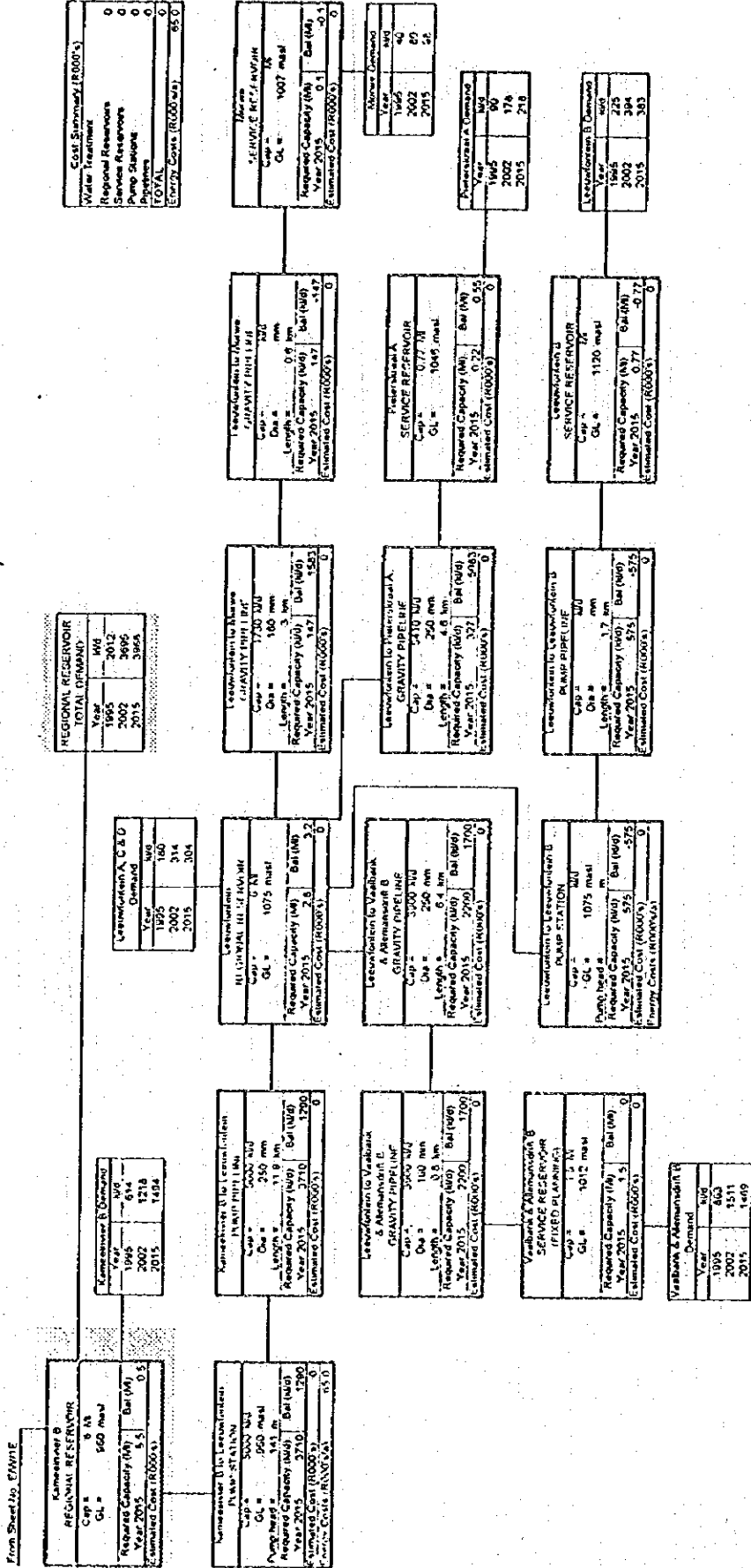
GA-RAMAMTSHANE TO MASOBE : ALTERNATIVE 1 (Moretele 2, supplied from Weltevrede Purification Works only)



Note : Pumped energy costs for main pump stations assume 1/2 unit due to Power (KW) and 1/2 due to Energy (kWh), so that total cost is 50% of that calculated for continuous pumping for a Peak Factor = 1.5 (ie. 4hrs per day).

# WELTEVREDEN - KAMEELRIVIER SUPPLY BLOCK : EXISTING INFRASTRUCTURE

KAMEELRIVIER B TO VAALBANK (Sheet No. EWK/1E)



Note: Pumping energy costs for main-line stations assume 1/2 cost due to Power (PWA) and 1/2 due to Energy (NWT).  
 so that actual cost is 3/8 of that calculated for continuous pumping for a Peak Factor = 1.5 (i.e. 10hrs per day)

# WELTEVREDEN - MAPOCH SUPPLY BLOCK : EXISTING INFRASTRUCTURE

MAPOCH TO THABANA (Sheet No. EWM/1E)

From Sheet No. EWM/1E

Mapoch REGIONAL RESERVOIR	
Cap =	6 MI
GL =	975 masl
Required Capacity (Ml)	Bal (Ml)
Year 2015	3.5
Year 2015	2.5
Estimated Cost (R000's)	0

Mapoch Demand	
Year	kl/d
1995	652
2002	1295
2015	1580

REGIONAL RESERVOIR TOTAL DEMAND	
Year	kl/d
1995	790
2002	1568
2015	1923

Mapoch to Thabana GRAVITY PIPELINE	
Cap =	372 kl/d
Dia =	100 mm
Length =	5 km
Required Capacity (kl/d)	Bal (kl/d)
Year 2015	503
Year 2015	-131
Estimated Cost (R000's)	0

Thabana SERVICE RESERVOIR	
Cap =	0.77 MI
GL =	956 masl
Required Capacity (Ml)	Bal (Ml)
Year 2015	0.34
Year 2015	0.43
Estimated Cost (R000's)	0

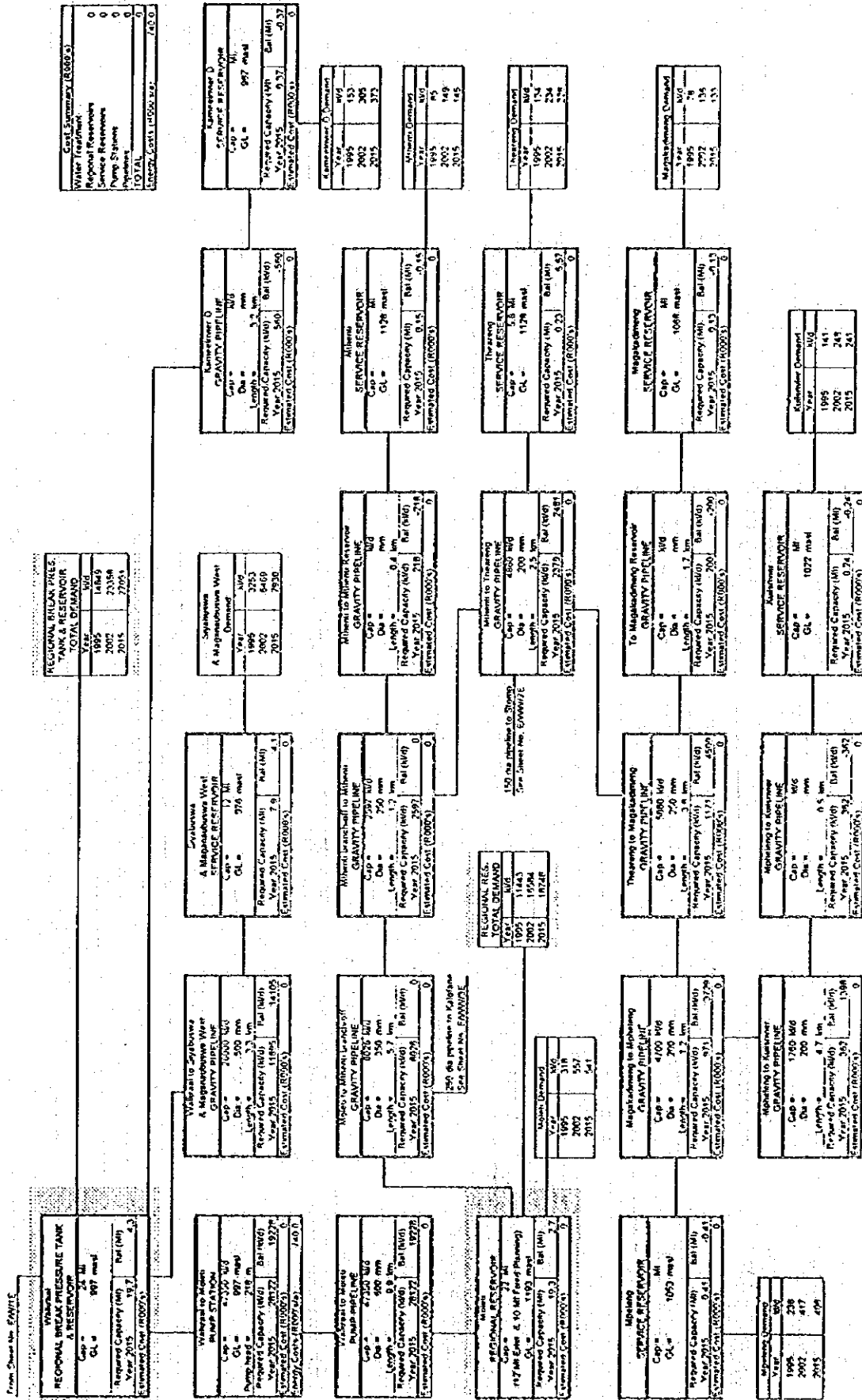
Thabana Demand	
Year	kl/d
1995	138
2002	273
2015	335

Cost Summary (R000's)	
Water Treatment	0
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
Pipelines	0
TOTAL	0
Energy Costs (R000's/d)	
	0.0

Note : Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWhr), so that actual cost is 5/6 of that calculated for continuous pumping for a Peak Factor = 1.5 (ie. 16hrs per day).

# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : EXISTING INFRASTRUCTURE

## WALKRAAL TO KUILSRIVIER (Sheet No. EMMW/1E)

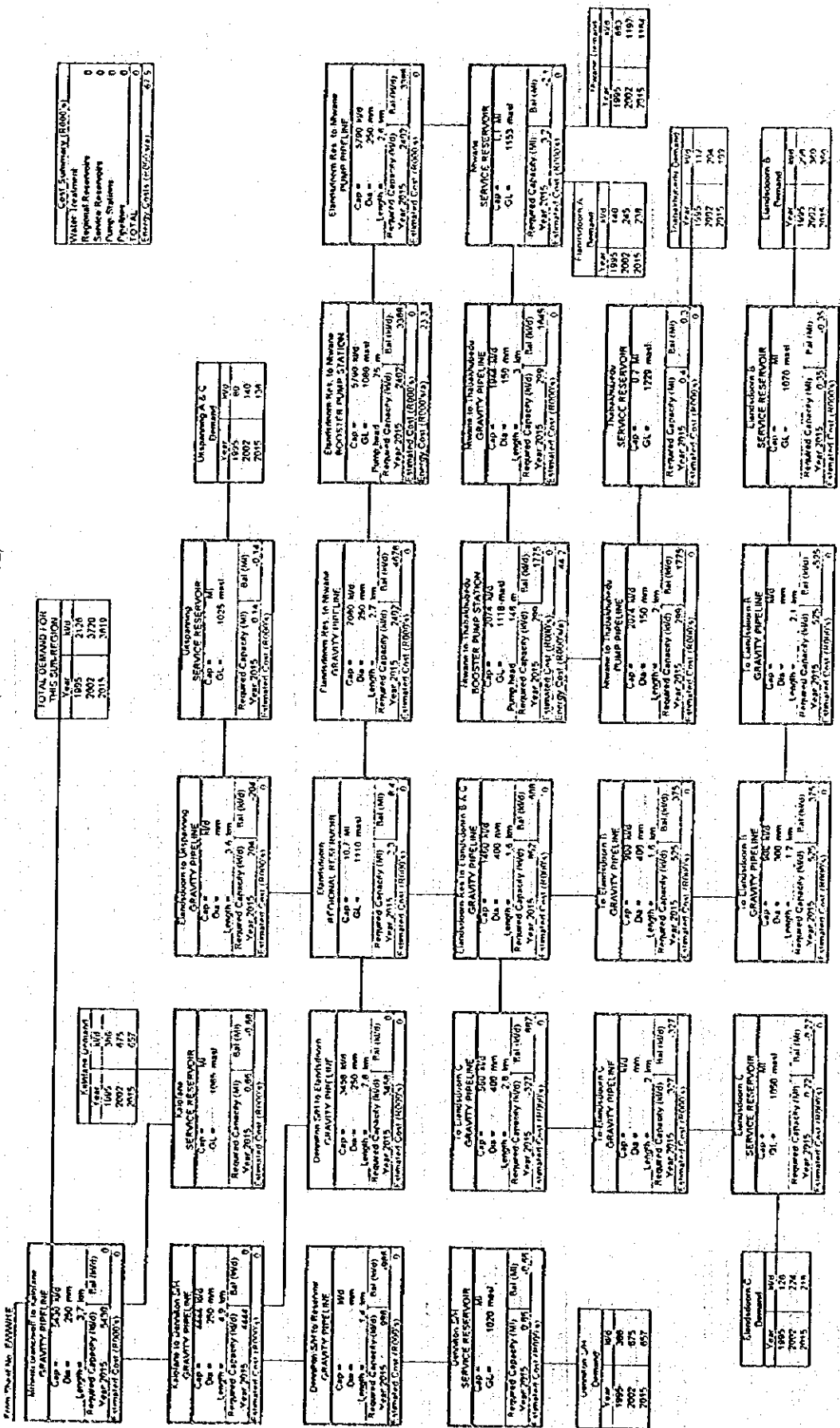


Note : Pumping energy costs for main pump stations assume 12 cent/kWh and 12¢ due to empty (EMW), so that actual cost is 58¢ that calculated for continuous pumping for a Peak Factor = 1.5 (ie. 16hrs per day).



# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : EXISTING INFRASTRUCTURE

KALOFANE TO THABAKHUBEDU (Sheet No. E/MW/BE)



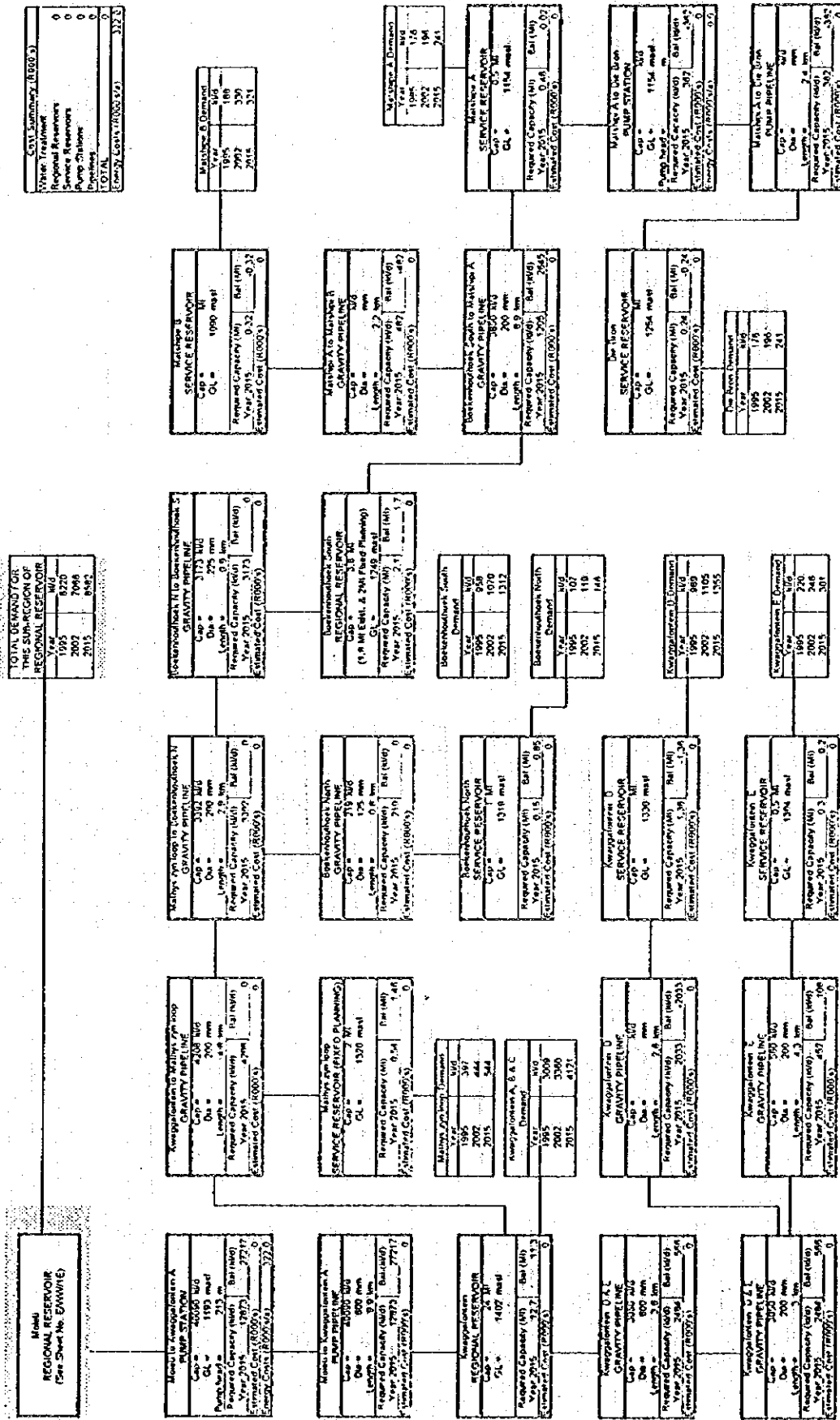
Note: Pumping energy costs for main pump stations assume 12 cent/kwh in Power (PVA) and 12 due to Energy (EMW), so that actual cost is 50% of that calculated for continuous pumping for a Peak Factor = 1.5 (i.e. 10hrs per day).





# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : EXISTING INFRASTRUCTURE

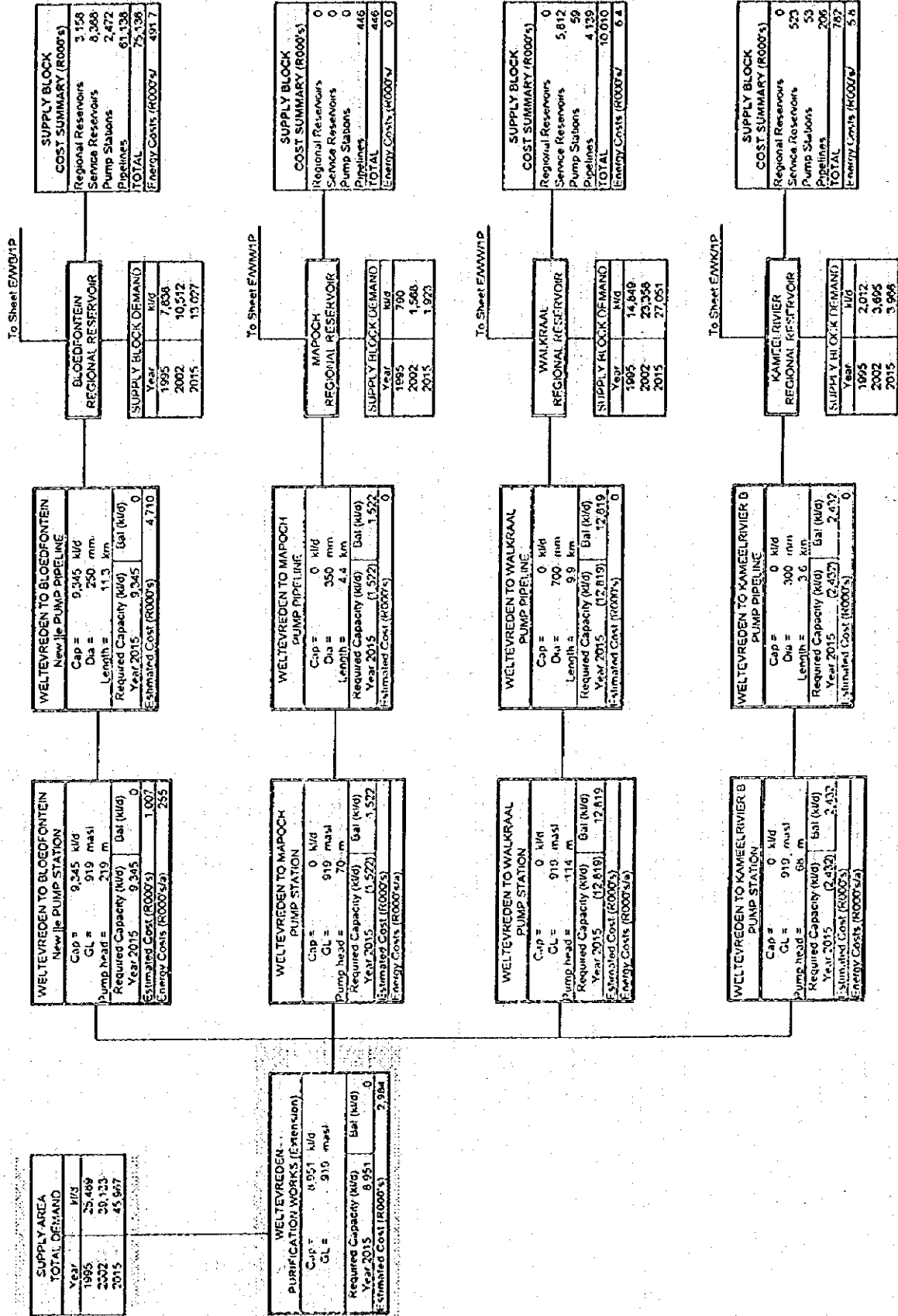
MOLETTI TO DIE BRON (Sheet No. EMMW/SE)



Note: Pumping energy costs for each pump station assume 1/2 cost due to Power (PVA) and 1/2 due to Energy (EMW), as the actual cost is 3/5 of that calculated for continuous pumping for a Peak Factor = 1.5 (i.e. 10hrs per day).

# EASTERN ZONE : WELTEVREDEN SUPPLY AREA : PROPOSED INFRASTRUCTURE (EW/W1P)

ALTERNATIVE 1 (Moretele 1 supplied from Weltevrede Purification Works only)



SUPPLY AREA TOTAL DEMAND	
Year	m³/s
1995	25,489
2002	39,123
2015	45,867

WELTEVREDEN PURIFICATION WORKS (Extension)	
Cap =	0,951 kld
GL =	919 masl
Required Capacity (kld)	Gal (kld)
Year 2015	8,951
Estimated Cost (R000's)	2,394

WELTEVREDEN TO BLOEDFONTEIN New 1/2 PUMP STATION	
Cap =	9,345 kld
GL =	919 masl
Pump head =	219 m
Required Capacity (kld)	Gal (kld)
Year 2015	9,345
Estimated Cost (R000's)	1,097
Energy Costs (R000's/a)	255

WELTEVREDEN TO BLOEDFONTEIN New 1/2 PUMP PIPELINE	
Cap =	9,345 kld
Dia =	250 mm
Length =	11.3 km
Required Capacity (kld)	Gal (kld)
Year 2015	9,345
Estimated Cost (R000's)	4,710

WELTEVREDEN TO MAPOCH PUMP STATION	
Cap =	0 kld
GL =	919 masl
Pump head =	70 m
Required Capacity (kld)	Gal (kld)
Year 2015	1,522
Estimated Cost (R000's)	1,522
Energy Costs (R000's/a)	0

WELTEVREDEN TO MAPOCH PUMP PIPELINE	
Cap =	0 kld
Dia =	300 mm
Length =	4.4 km
Required Capacity (kld)	Gal (kld)
Year 2015	1,522
Estimated Cost (R000's)	0

WELTEVREDEN TO WALKRAAL PUMP STATION	
Cap =	0 kld
GL =	910 masl
Pump head =	114 m
Required Capacity (kld)	Gal (kld)
Year 2015	12,819
Estimated Cost (R000's)	12,819
Energy Costs (R000's/a)	0

WELTEVREDEN TO WALKRAAL PUMP PIPELINE	
Cap =	0 kld
Dia =	700 mm
Length =	9.9 km
Required Capacity (kld)	Gal (kld)
Year 2015	12,819
Estimated Cost (R000's)	0

WELTEVREDEN TO KAMEELRIVIER B PUMP STATION	
Cap =	0 kld
GL =	919 masl
Pump head =	68 m
Required Capacity (kld)	Gal (kld)
Year 2015	2,432
Estimated Cost (R000's)	2,432
Energy Costs (R000's/a)	0

WELTEVREDEN TO KAMEELRIVIER D PUMP PIPELINE	
Cap =	0 kld
Dia =	300 mm
Length =	3.6 km
Required Capacity (kld)	Gal (kld)
Year 2015	2,432
Estimated Cost (R000's)	0

BLOEDFONTEIN REGIONAL RESERVOIR	
Year	kld
1995	7,638
2002	10,512
2015	13,027

SUPPLY BLOCK DEMAND	
Year	kld
1995	7,638
2002	10,512
2015	13,027

MAPOCH REGIONAL RESERVOIR	
Year	kld
1995	760
2002	1,568
2015	1,923

SUPPLY BLOCK DEMAND	
Year	kld
1995	760
2002	1,568
2015	1,923

WALKRAAL REGIONAL RESERVOIR	
Year	kld
1995	14,840
2002	20,358
2015	27,051

SUPPLY BLOCK DEMAND	
Year	kld
1995	14,840
2002	20,358
2015	27,051

KAMEELRIVIER REGIONAL RESERVOIR	
Year	kld
1995	2,012
2002	3,865
2015	3,995

SUPPLY BLOCK DEMAND	
Year	kld
1995	2,012
2002	3,865
2015	3,995

SUPPLY BLOCK COST SUMMARY (R000's)	
Regional Reservoirs	3,158
Service Reservoirs	8,368
Pump Stations	2,472
Pipelines	61,138
TOTAL	75,136
Energy Costs (R000's/a)	491.7

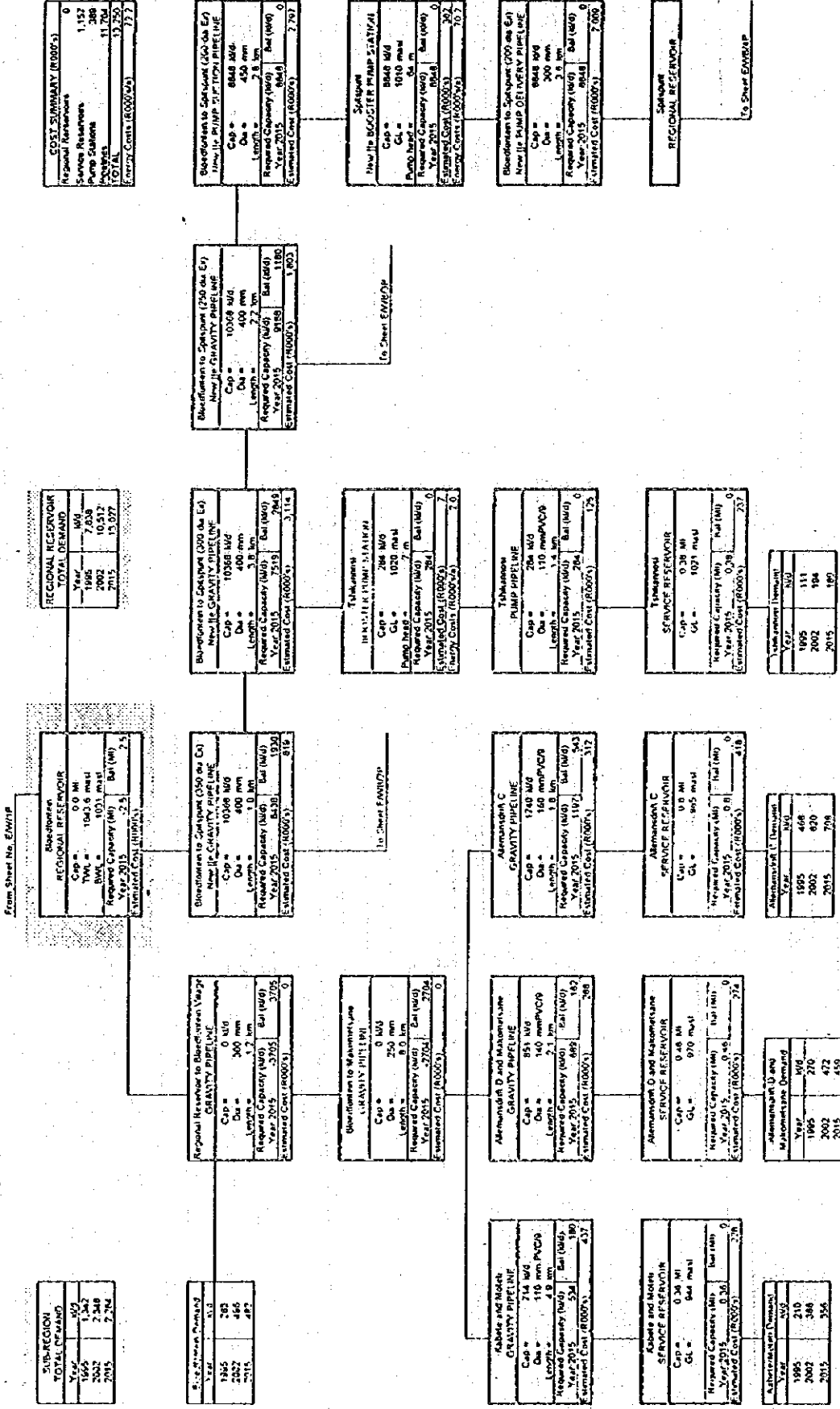
SUPPLY BLOCK COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
Pipelines	446
TOTAL	446
Energy Costs (R000's/a)	0.0

SUPPLY BLOCK COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	5,812
Pump Stations	59
Pipelines	4,129
TOTAL	10,010
Energy Costs (R000's/a)	6.4

SUPPLY BLOCK COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	523
Pump Stations	53
Pipelines	206
TOTAL	782
Energy Costs (R000's/a)	5.6

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE (Sheet No. EWB/1P)

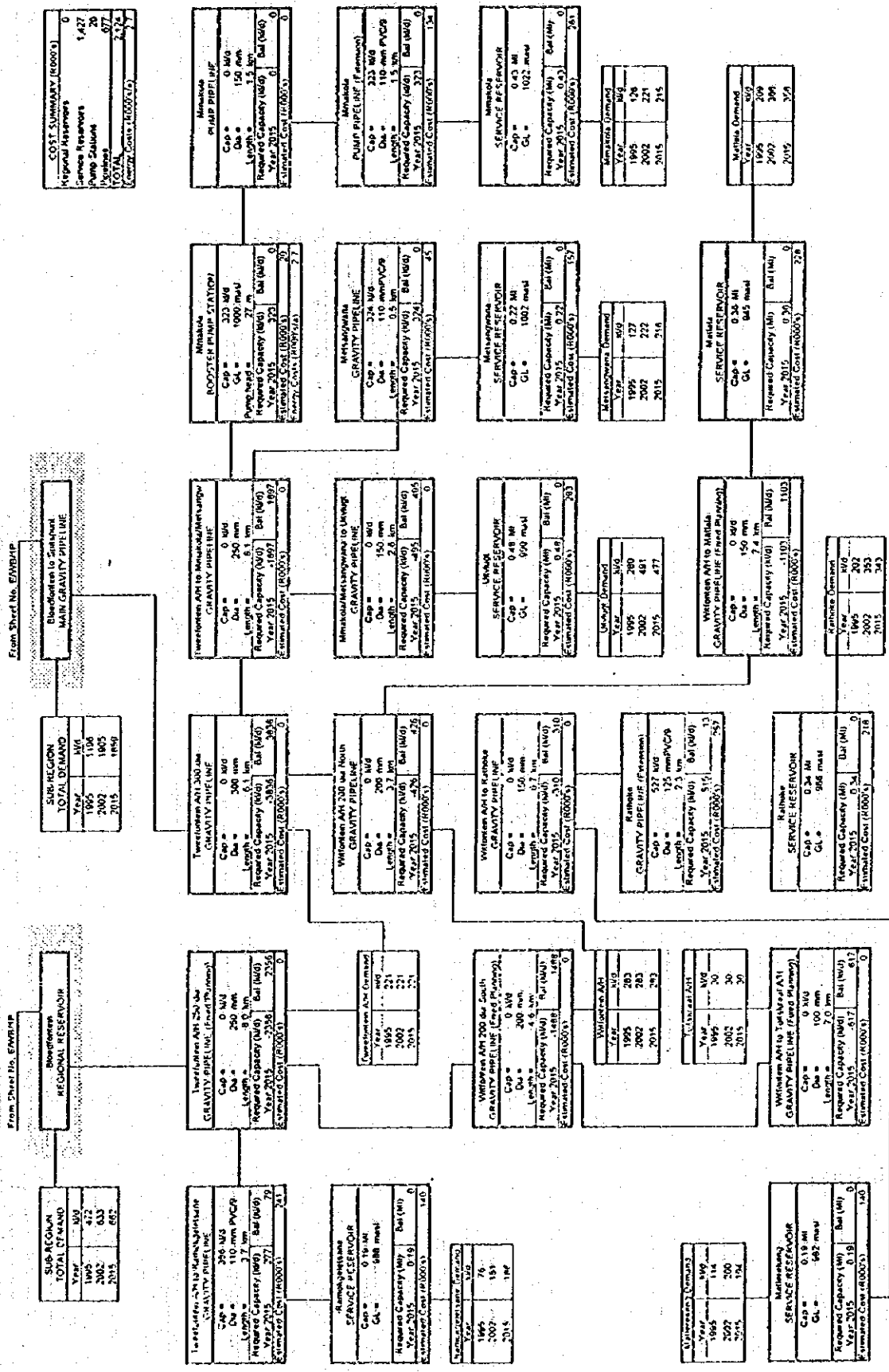
BLOEDFONTEIN TO SPITSPUNT : ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)



Note: Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWh), as the actual cost is 50% of that calculated for common pumping for a Peak Factor = 1.5 (ie. 10hrs per day).

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE (Sheet No. E/WB/2P)

BLOEDFONTEIN TO UTUYLGT, RATHOKE AND MATLALA : ALTERNATIVES 1, 2 or 3 (Moretele 2 supplied from Weltevreden Purification Works and/or Tembisa Purification Works or Rust De Winter Dam)



**COST SUMMARY (R000's)**

Regional Reservoirs	0
Service Reservoirs	1427
Pump Stations	20
Hydrants	677
<b>TOTAL</b>	<b>2124</b>
Contingency (10%)	212

**Bloubaai to Sinterklaar MAIN GRAVITY PIPELINE**

Year	1995	2002	2015	1995
Cap	0 MGD	240 mm	240 mm	240 mm
Length	0.00 km	0.00 km	0.00 km	0.00 km
Required Capacity (MG)	0	0	0	0
Year 2015	0	0	0	0
Estimated Cost (R000's)	0	0	0	0

**Bloubaai to Sinterklaar MAIN GRAVITY PIPELINE**

Year	1995	2002	2015	1995
Cap	0 MGD	240 mm	240 mm	240 mm
Length	0.00 km	0.00 km	0.00 km	0.00 km
Required Capacity (MG)	0	0	0	0
Year 2015	0	0	0	0
Estimated Cost (R000's)	0	0	0	0

**Bloubaai to Sinterklaar MAIN GRAVITY PIPELINE**

Year	1995	2002	2015	1995
Cap	0 MGD	240 mm	240 mm	240 mm
Length	0.00 km	0.00 km	0.00 km	0.00 km
Required Capacity (MG)	0	0	0	0
Year 2015	0	0	0	0
Estimated Cost (R000's)	0	0	0	0

**Bloubaai to Sinterklaar MAIN GRAVITY PIPELINE**

Year	1995	2002	2015	1995
Cap	0 MGD	240 mm	240 mm	240 mm
Length	0.00 km	0.00 km	0.00 km	0.00 km
Required Capacity (MG)	0	0	0	0
Year 2015	0	0	0	0
Estimated Cost (R000's)	0	0	0	0

**Bloubaai to Sinterklaar MAIN GRAVITY PIPELINE**

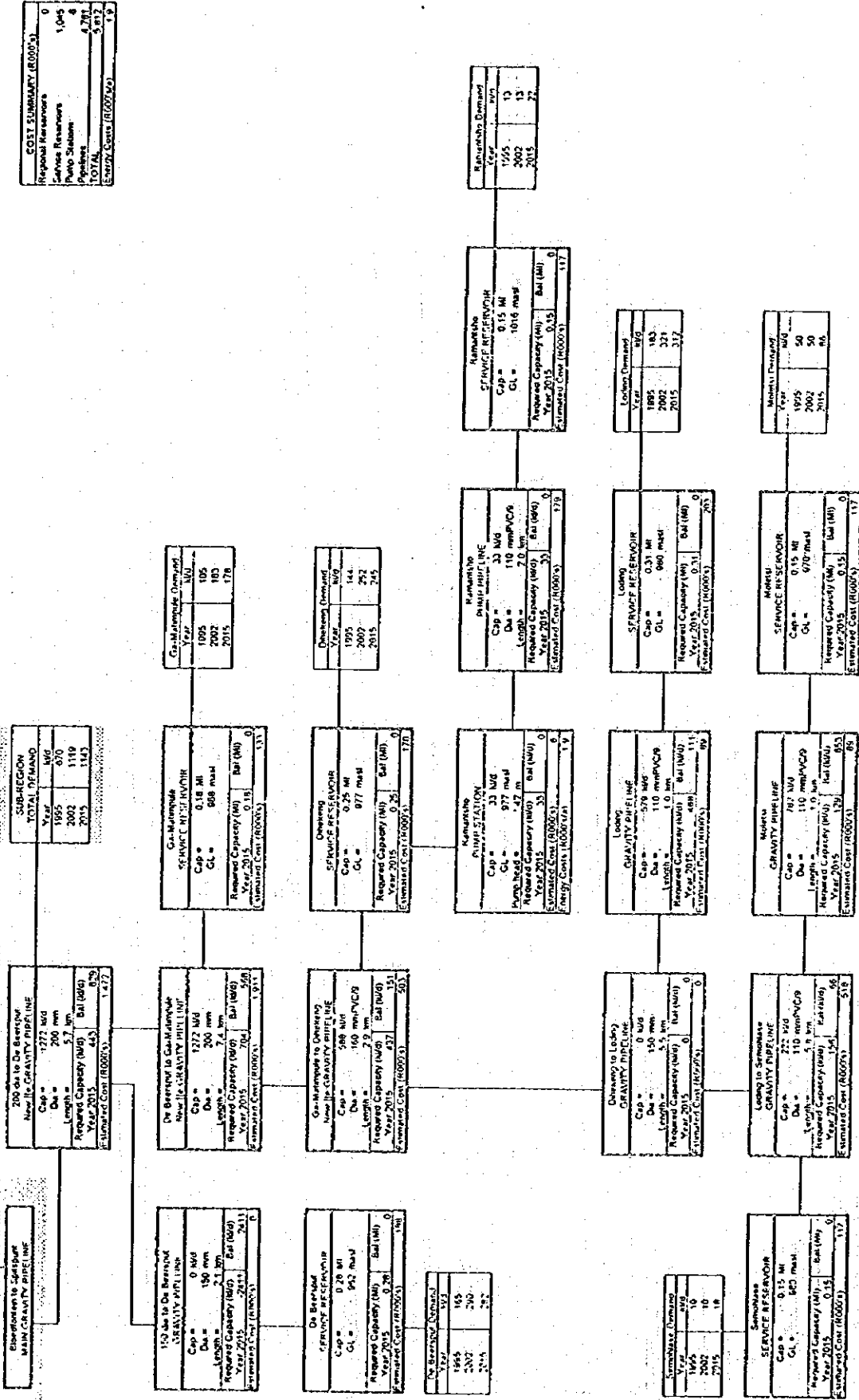
Year	1995	2002	2015	1995
Cap	0 MGD	240 mm	240 mm	240 mm
Length	0.00 km	0.00 km	0.00 km	0.00 km
Required Capacity (MG)	0	0	0	0
Year 2015	0	0	0	0
Estimated Cost (R000's)	0	0	0	0

Note : Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWh), so the actual cost is 5/8 of that calculated for continuous pumping for a Peak Factor = 1.5 (ie 100% per day)

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE (Sheet No. EW/B/3P)

FROM BLOEDFONTEIN/SPTS/PUNT PIPELINE TO SEMOHLASE : ALTERNATIVES 1, 2 or 3 (Moretele 2 supplied from Weltevreden Purification Works and/or Tomba Purification Works or Rust De Winter Dam)

From Sheet No. EW/B/2P



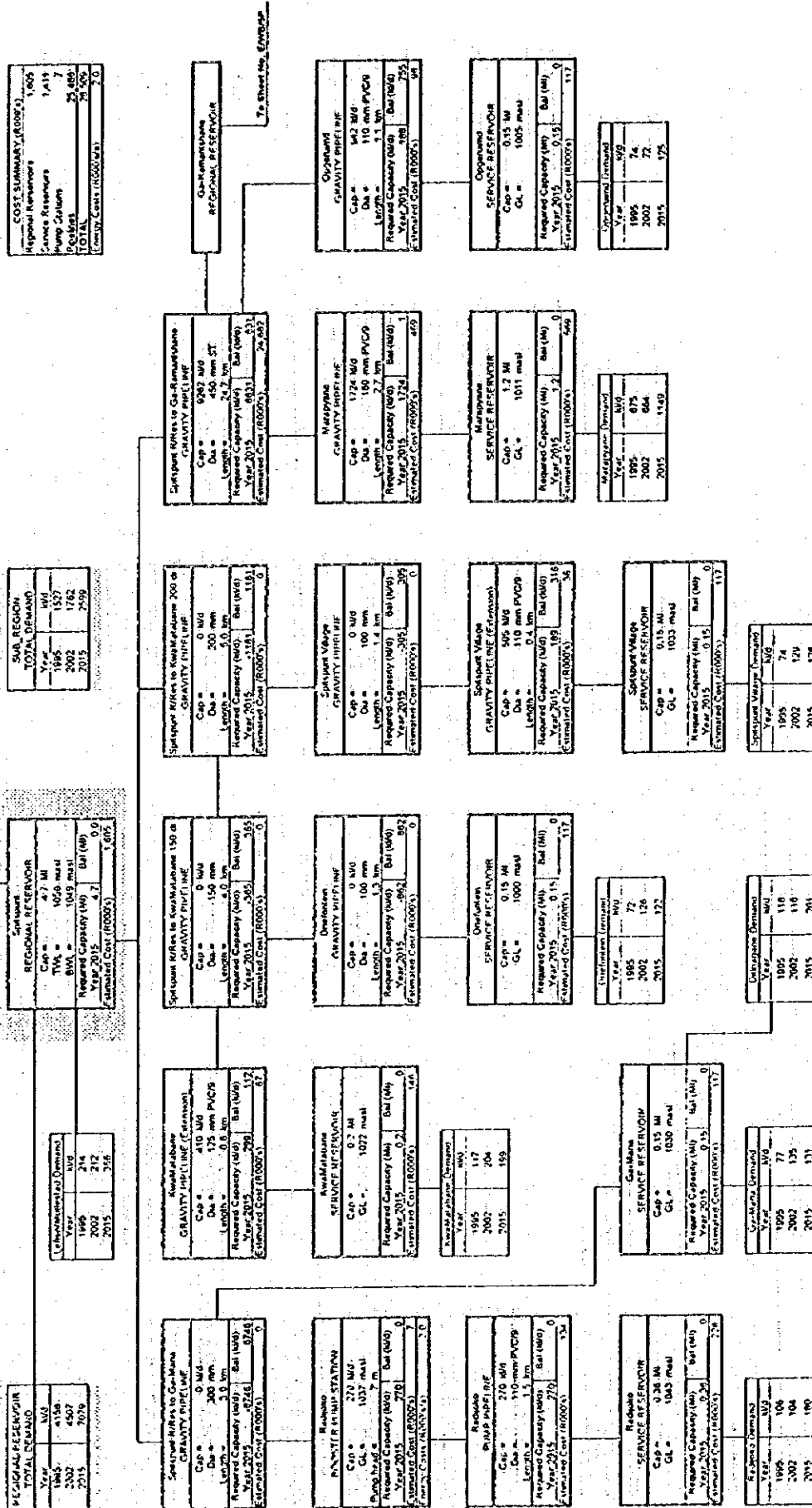
COST SUMMARY (R000's)	
Regional Reservoirs	0
Service Reservoirs	1,045
Pump Station	4,281
Pipelines	5,912
<b>TOTAL</b>	<b>11,248</b>
ESTIMATED COST (R000's)	
	11,248

Note : Pumping energy costs for main pump stations assume 1/2 cost due to Power (kWh) and 1/2 due to Energy (kWh), so that actual cost is 50% of that calculated for conversion pumping for a Peak Factor = 1.5 (ie. 16hrs per day).

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE (Sheet No. EWB/4P)

## SPLITSPUNT TO KWAMATABANE AND GA-RAMANTSHANE : ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)

From Sheet No. EWB/1P

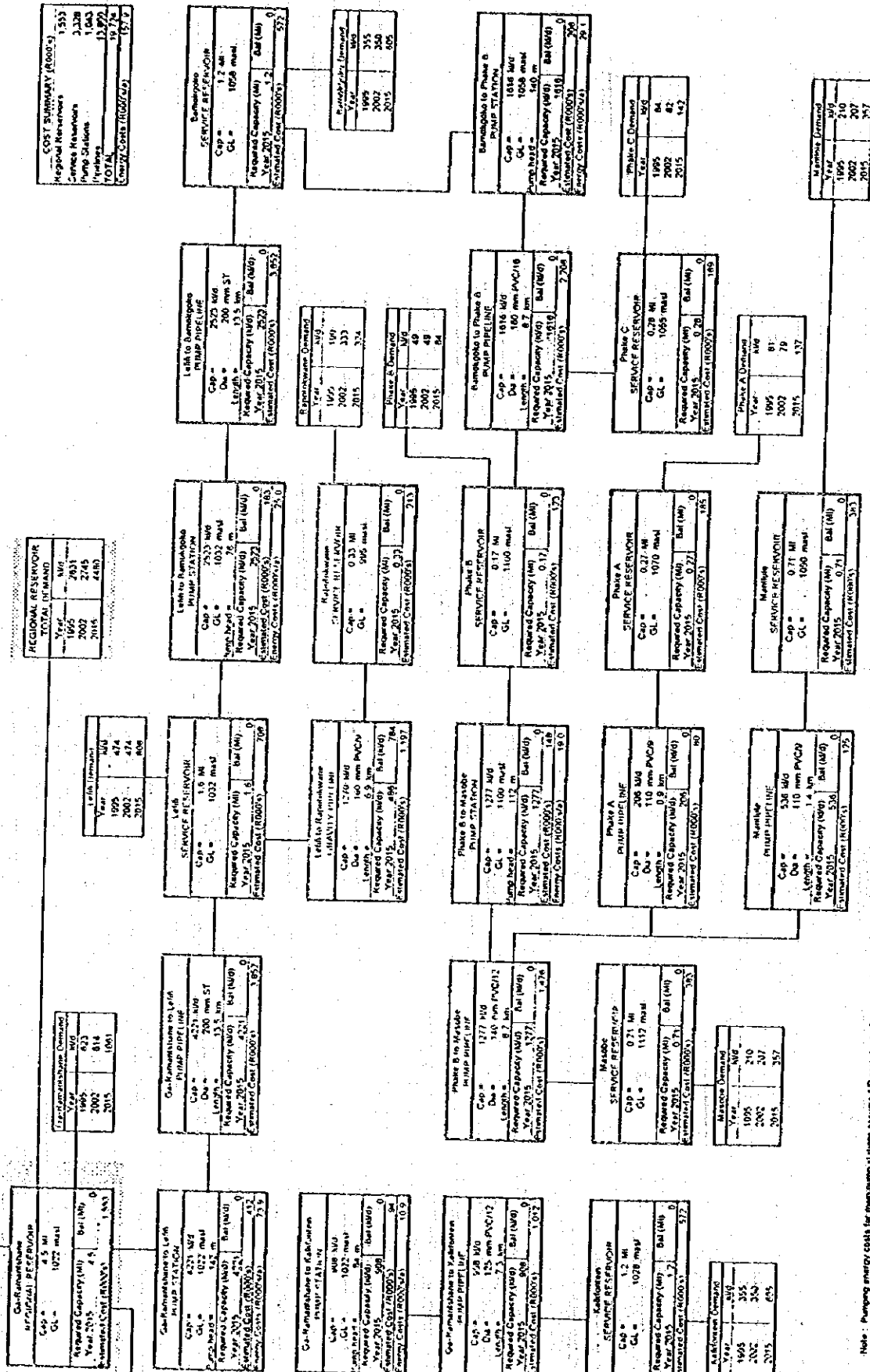


Note : Pumping energy costs for main pump stations assume 12 cent per kWh and 1/2 due to Energy (kWh), so that actual cost is 50% of that calculated for compression pumping for a Peak Factor = 1.5 (per 10hrs per day).

# EASTERN ZONE : WELTEVREDEN - BLOEDFONTEIN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE (Sheet No. EWB/ISP)

GA-RAMANTSHANE TO MASOBE : ALTERNATIVE 1 (Moretele 2 supplied from Weltevreden Purification Works only)

From Sheet No. EWB/ISP



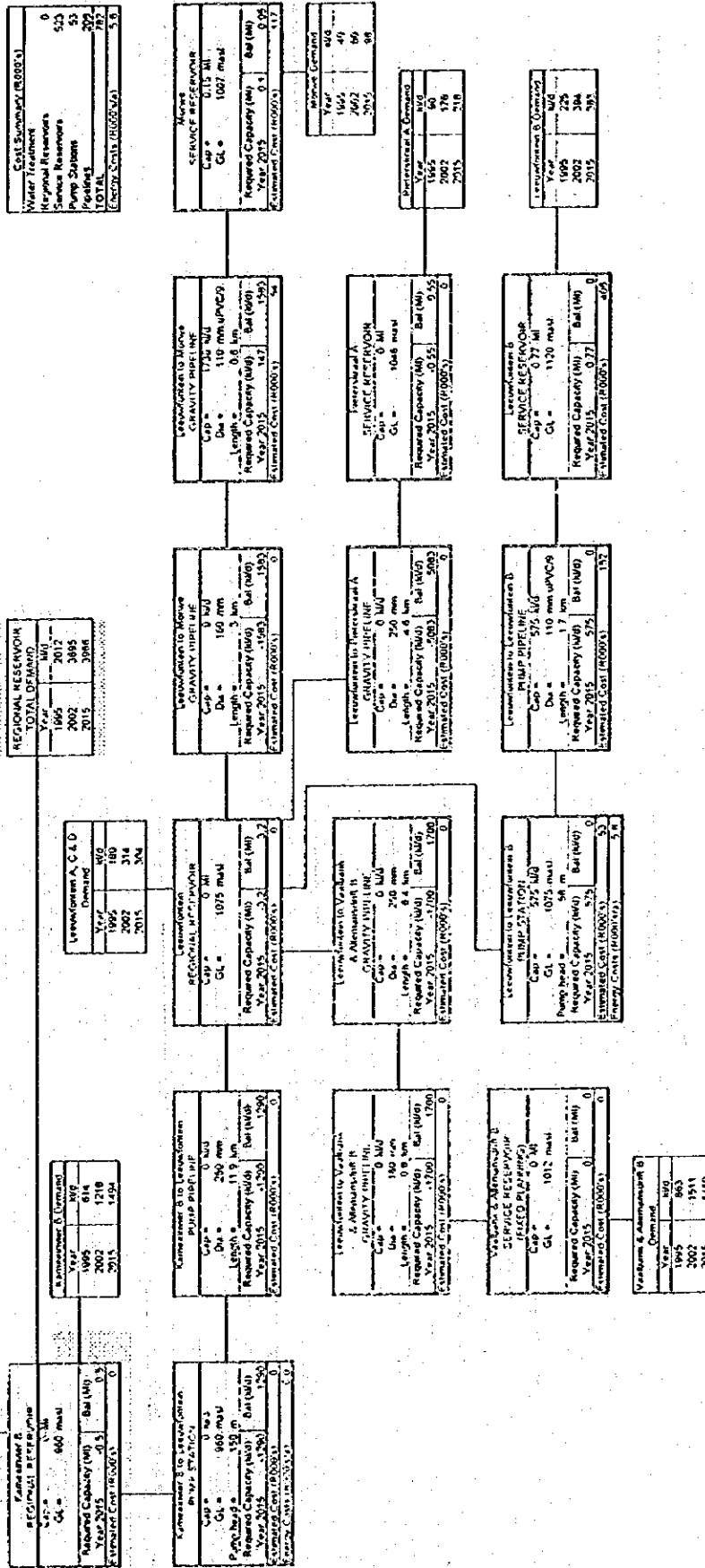
Note: Pumping energy costs for main pump stations assume 172 cost due to Power (kWh) and 172 due to Energy (kWh), so their actual cost is 5/6 of that calculated for stations pumping for a peak factor = 1.5 (ie. 10hrs per day)



# WELTEVREDEN - KAMEELRIVIER SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

KAMEELRIVIER B TO VAALBANK (Sheet No. EAWK1/P)

From Division: EAWK1/P



Note: Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWh), so that actual cost is 5/6 of that calculated for continuous pumping for a Peak Factor = 1.5 (ie 16hrs per day).

# WELTEVREDEN - MAPOCH SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

MAPOCH TO THABANA (Sheet No. E/WM/1P)

From Sheet No. E/W/1P

Mapoch	
REGIONAL RESERVOIR	
Cap =	0 MI
GL =	975 masl
Required Capacity (MI)	Bal (MI)
Year 2015	-2.5
Estimated Cost (R000's)	0

Mapoch Demand	
Year	kl/d
1995	790
2002	1568
2015	1923

REGIONAL RESERVOIR	
TOTAL DEMAND	
Year	kl/d
1995	790
2002	1568
2015	1923

Mapoch to Thabana	
GRAVITY PIPELINE PAR. TO EXIST.	
Cap =	387 kl/d
Dia =	110 mm UPVC/9
Length =	5 km
Required Capacity (kl/d)	Bal (kl/d)
Year 2015	131
Estimated Cost (R000's)	446

Thabana	
SERVICE RESERVOIR	
Cap =	0 MI
GL =	956 masl
Required Capacity (MI)	Bal (MI)
Year 2015	-0.43
Estimated Cost (R000's)	0.43

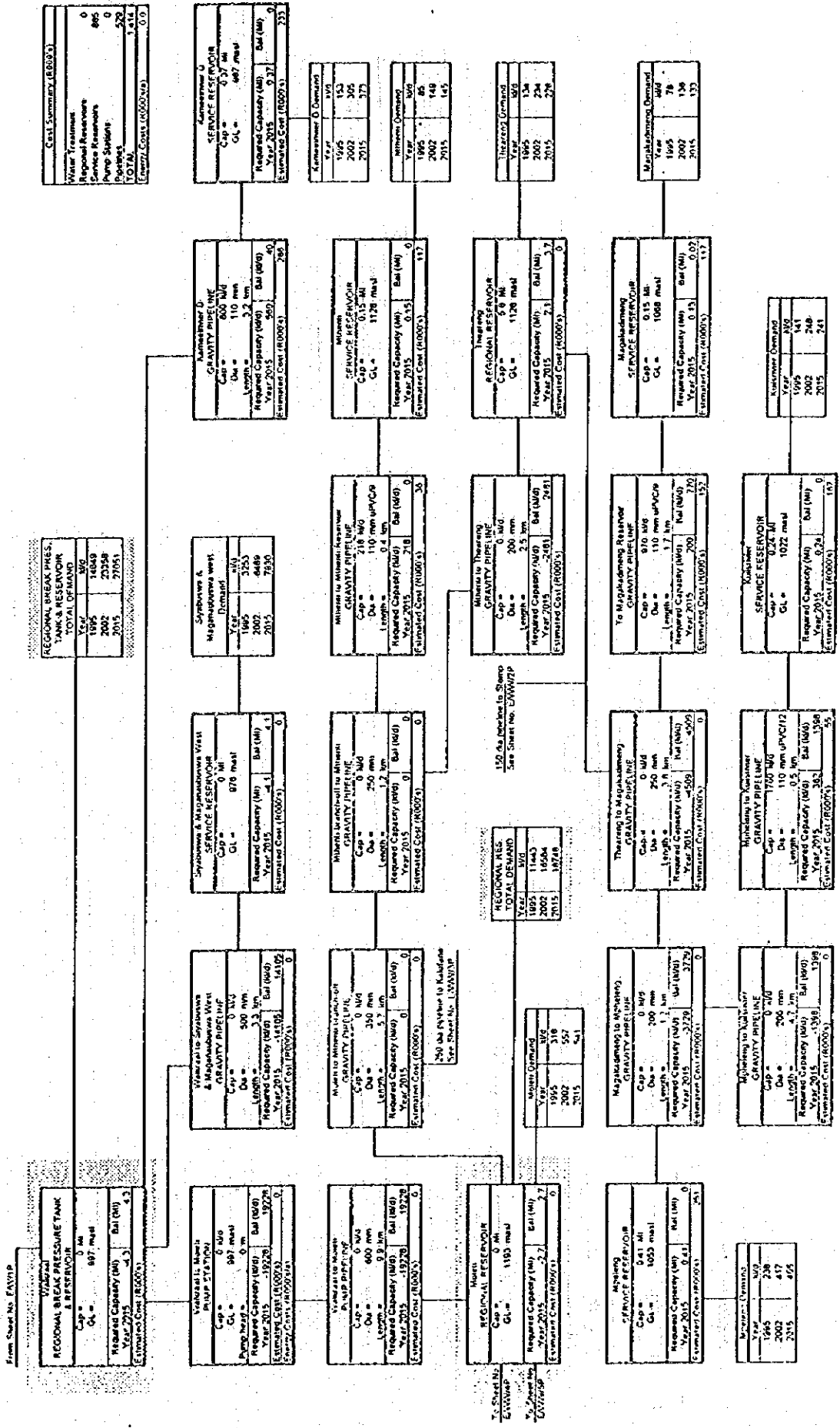
Thabana Demand	
Year	kl/d
1995	138
2002	273
2015	305

Cost Summary (R000's)	
Water Treatment	0
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
Pipelines	446
TOTAL	446
Energy Costs (R000's/a)	0.0

Note : Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWhr), so that actual cost is 5/6 of that calculated for continuous pumping for a Peak Factor = 1.5 (ie. 16hrs per day).

# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

WALKRAAL TO KUILSRIVIER (Sheet No. EMWW/1P)



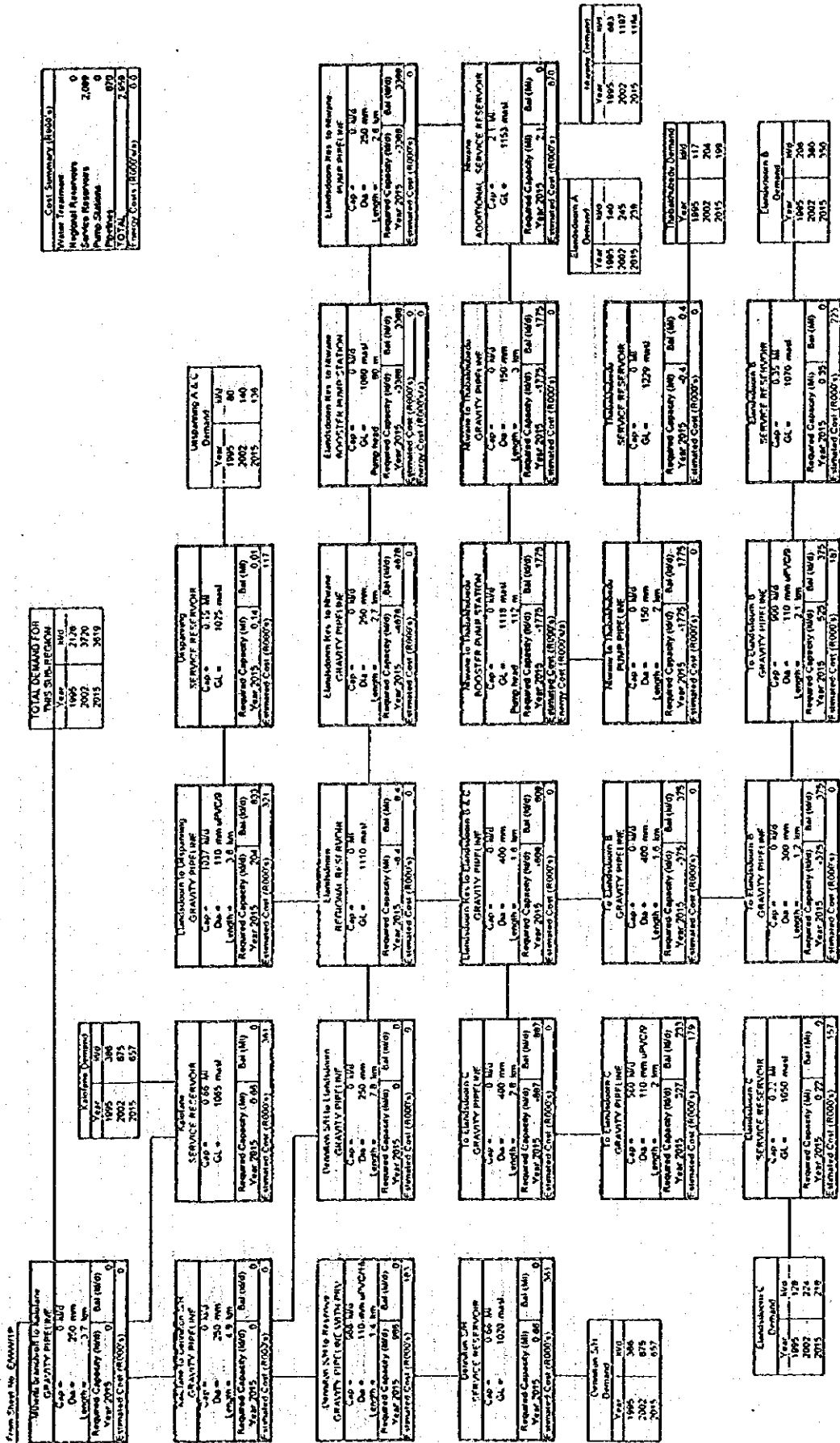
Note: Pumping energy costs for main pipe losses, assume 17 cent/kWh for Power (NVA) and 17 cent/kWh for Energy (W&E), as the actual cost is 50% of that calculated for courtesies pumping for a TPA Factor = 1.5 (for 100% per day).



# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

KALOFANE TO THABAKHUBEDU (Sheet No. EMMW/SP)

22-51-51 Stage 2 - Pre-Feasibility

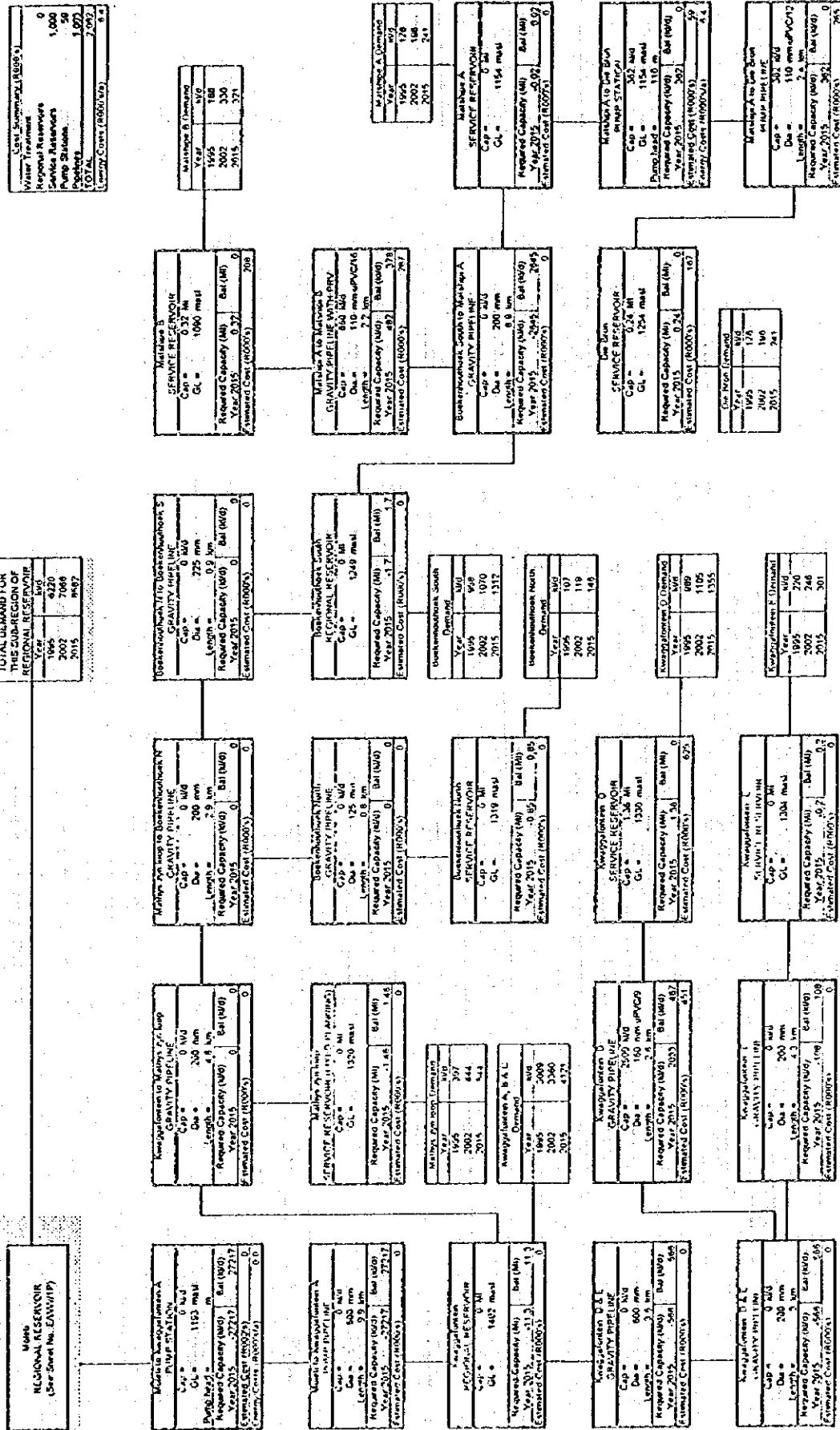


Note: Pumping energy costs for pump stations assume 17 cent due to Power (kVA) and 1/2 due to Energy (kWh), so that actual cost is 50% of that calculated for continuous pumping for a Peak factor = 1.5 (i.e. 10hrs per day).



# WELTEVREDEN - WALKRAAL SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

MOLETTI TO DIE BRON (Sheet No. EMM/SP)



Note: Pumping energy costs for main pump stations assume 1/2 cost due to Power (kVA) and 1/2 due to Energy (kWh), so that annual cost is 3/4 of that calculated for continuous pumping for a Peak Factor = 1.5 (i.e. 10h's per day).

# **BRONKHORSTSPRUIT SUPPLY AREA**

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**COST SUMMARY FOR INFRASTRUCTURE.....E-27**

### **EXISTING INFRASTRUCTURE**

**BRONKHORSTSPRUIT SUPPLY BLOCK..... E-29**  
**CULLINAN SUPPLY BLOCK..... E-32**

### **NEW INFRASTRUCTURE**

**BRONKHORSTSPRUIT SUPPLY BLOCK..... E-33**  
**CULLINAN SUPPLY BLOCK..... E-36**

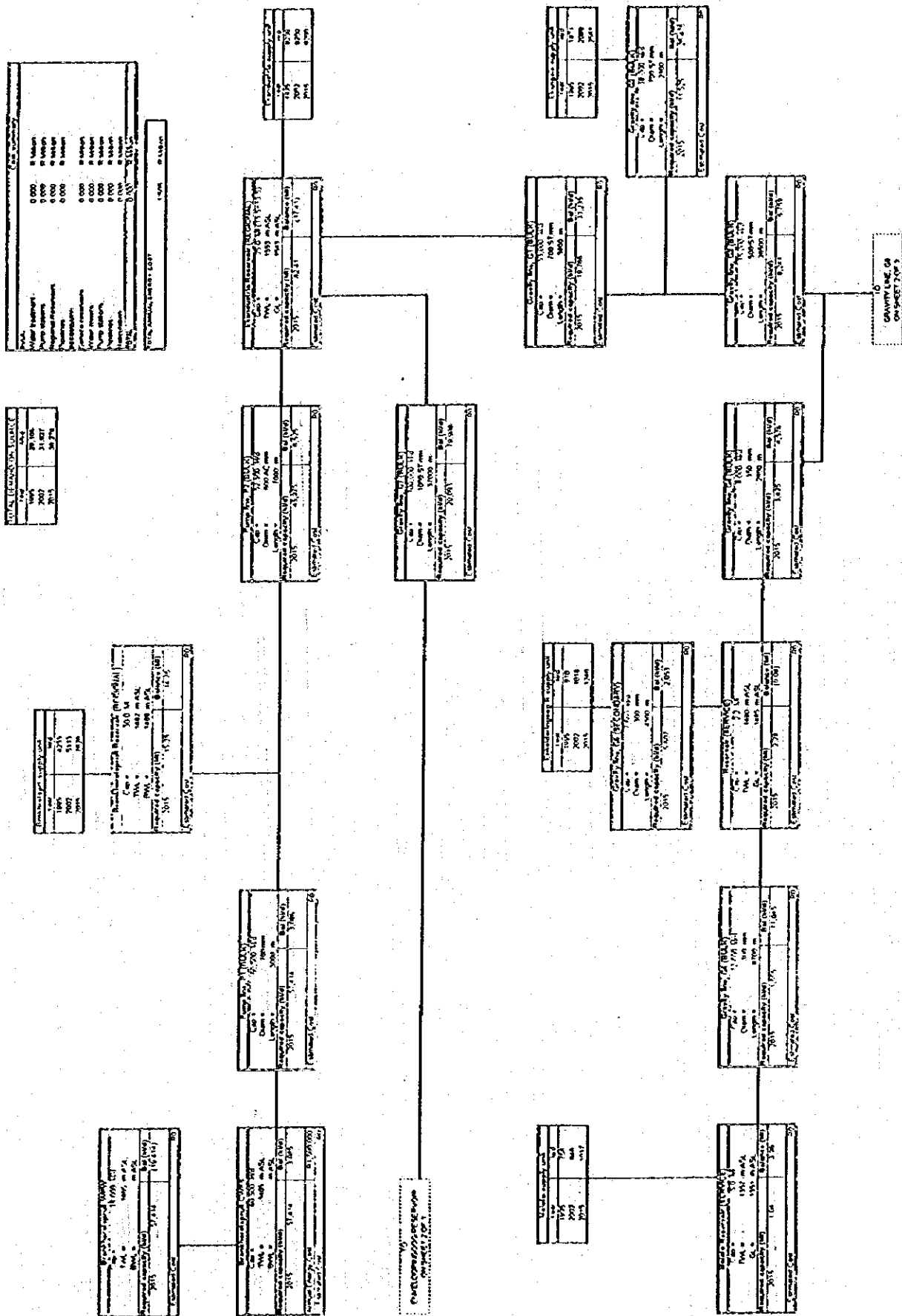


<b>COST SUMMARY FOR INFRASTRUCTURE</b>		
<b>NAME OF SUPPLY AREA :</b>	<b>BRONKHORSTSPRUIT SUPPLY AREA</b>	
<b>INCLUDING SUPPLY BLOCKS :</b>	1. Bronkhorstspuit Supply Block 2. Cullinan Supply Block	
<b>POPULATION SERVED (2015) :</b>	375,843	
<b>AADD in mcm/a (2015) :</b>	18.41	
<b>BULK COST :</b>	<b>QUANTITY</b>	<b>COST (R million)</b>
<b>Water Purification Works</b>	<b>Kl/d (SDD)</b>	
1. Bronkhorstspuit WTW	19,400	6.471
<b>Pump Stations</b>	<b>Kl/d (SDD)</b>	
<b>A: Capital Cost</b>	NIL	NIL
<b>B: Annual Energy Cost (Not Inc'd with Total)</b>	NIL	NIL
<b>Reservoirs (Regional)</b>	<b>MI</b>	
1. Ekandustria Reservoir	20 MI (2 x 10 MI)	10.355
2. Cullinan Reservoirs	0.8 MI	0.418
<b>Pipelines (Bulk)</b>	<b>km</b>	
1. 110 PVC	3.5	1.265
2. 125 PVC		
3. 140 PVC		
4. 160 PVC		
5. 200 PVC		
6. 250 PVC	3.1	1.190
7. 315 PVC		
8. 350 ST		
9. 400 ST		
10. 450 ST		
	<b>Sub-Total</b>	<b>2.455</b>
<b>Sub Total Construction Cost</b>		<b>19.699</b>
<b>Engineering Fees (15 %)</b>		<b>2.955</b>
<b>VAT (14 %)</b>		<b>3.172</b>
<b>Project Contingency (20%)</b>		<b>5.165</b>
<b>TOTAL : Bulk Cost</b>		<b>30.990</b>
<b>Bulk Cost per Capita (Rands)</b>		<b>49</b>

SECONDARY COST :	QUANTITY	COST (R million)
Reservoirs (Service)	MI	
1. Klipfontein	0.5	0.304
2. Tweefontein M	1	0.516
3. Enkeldoringoog A	1.5	0.707
4. Refitwe	0.7	0.377
5. Elandria & Proteem	1.3	0.604
6. Rayton	0.9	0.457
	<b>Sub-Total</b>	<b>2.965</b>
Water Towers	MI	
N/A	NIL	NIL
Pump Stations (Secondary)	KV/d	
A : Capital Cost		
N/A	NIL	NIL
B : Annual Energy Cost (Not Inc'd with Total)		
N/A	NIL	NIL
Pipelines (Secondary)	km	
	NIL	NIL
Reticulation	km	
1. Bronkhorstspuit Supply Block		
2. Cullinan Supply Block		
	<b>Sub-Total</b>	<b>77.500</b>
<b>Sub Total Construction Cost</b>		<b>80.465</b>
Engineering Fees (15 %)		12.070
VAT (14 %)		12.955
Project Contingency (20%)		21.098
<b>TOTAL : Secondary Cost</b>		<b>126.588</b>
Secondary Cost per Capita (Rands)		201
<b>GRAND TOTAL COST</b>		<b>157.578</b>
<b>Grand Total Cost per Capita (R)</b>		<b>250</b>

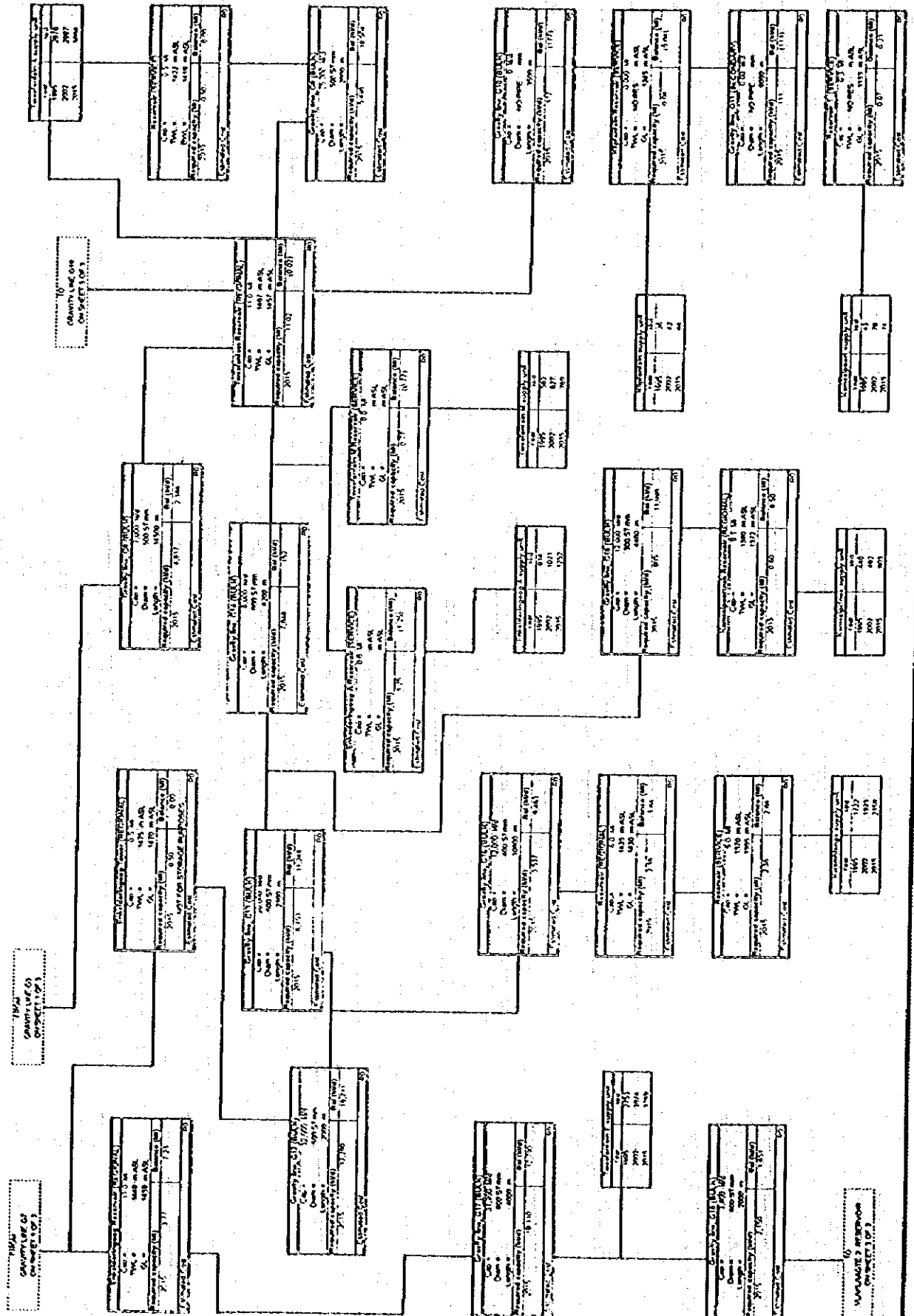
# BRONKHORSTSPRUIT SUPPLY BLOCK : EXISTING INFRASTRUCTURE

( SHEET E/BH/ME ) 1 of 3



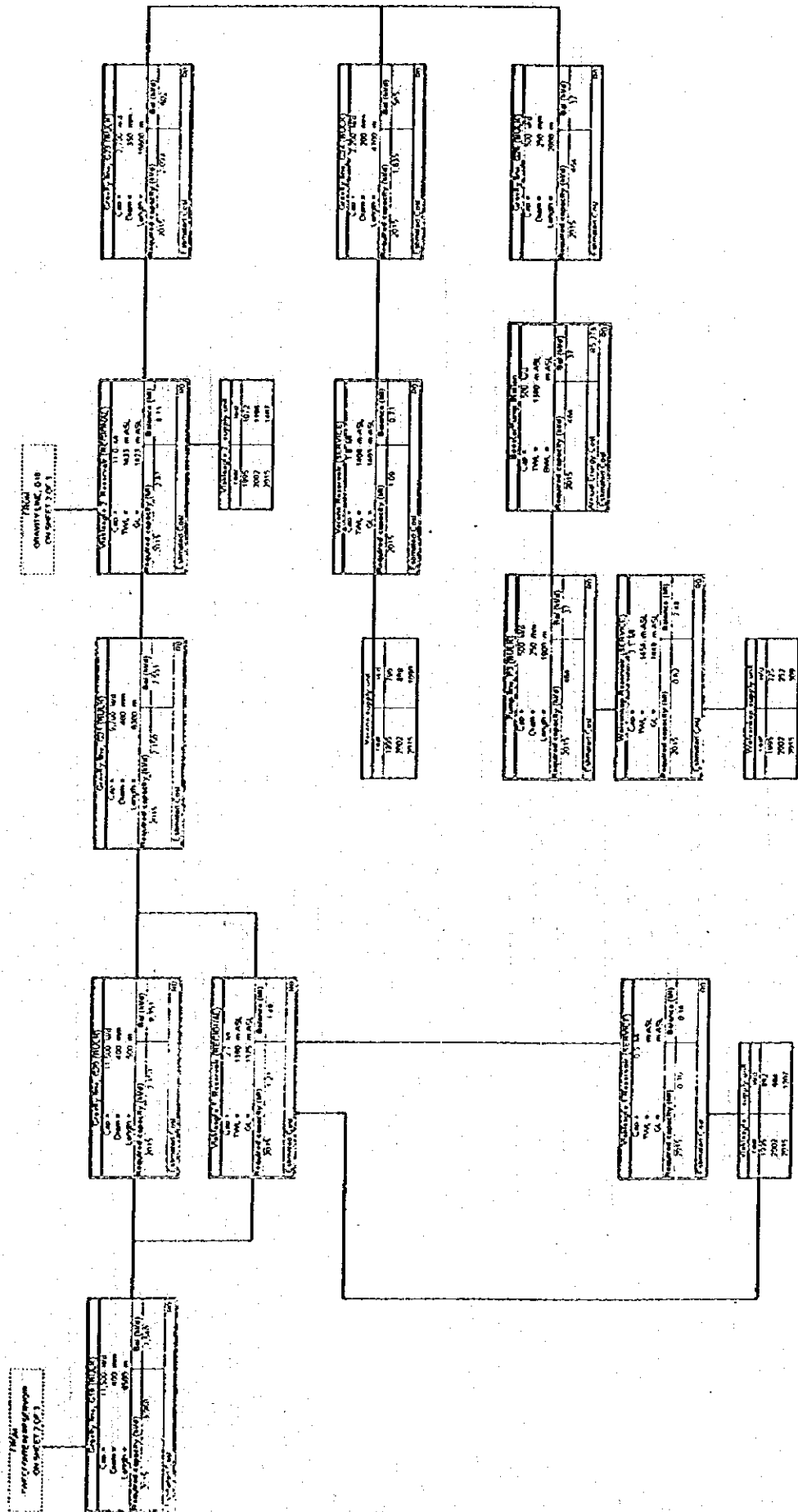
# BRONKHORSTSPR T SUPPLY BLOCK : EXISTING IN. RASTRUCTURE

(SHEET EIBH/2E) 2 of 3



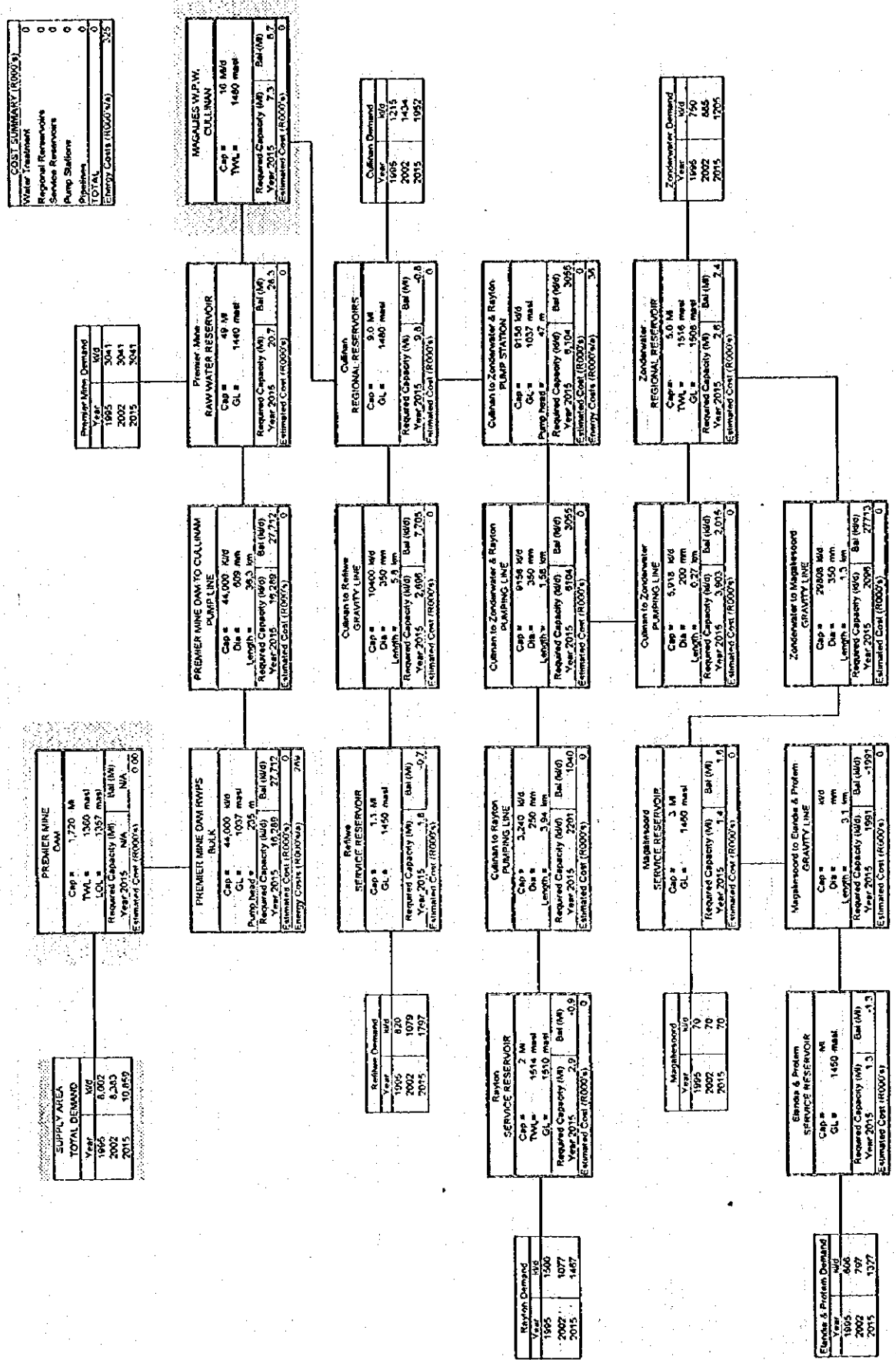
# BRONKHORSTSPRUIT SUPPLY BLOCK : EXISTING INFRASTRUCTURE

( SHEET E/BH/0E ) 3 of 3



# EASTERN ZONE : CULLINAN SUPPLY BLOCK : EXISTING INFRASTRUCTURE

## PREMIER MINE DAM TO CULLINAN (Sheet No. E/PC/1/E)



Water Treatment	0
Regional Reservoirs	0
Service Reservoirs	0
Pump Stations	0
Gravity Lines	0
TOTAL	325
Energy Costs (R000's/a)	325

Year	1995	2002	2015
MGD	5041	5041	5041

Cap	16 MGD
TWL	1480 masl
Required Capacity (MG)	16
Year 2015	16
Estimated Cost (R000's)	0

Year	1995	2002	2015
MGD	1215	1404	1952

Cap	9.0 M
GL	1480 masl
Required Capacity (MG)	9.0
Year 2015	9.0
Estimated Cost (R000's)	0

Cap	9150 MGD
Dia	350 mm
Length	4.7 m
Required Capacity (MG)	9104
Year 2015	9104
Estimated Cost (R000's)	3055

Cap	5.0 M
TWL	1516 masl
GL	1505 masl
Required Capacity (MG)	5.0
Year 2015	5.0
Estimated Cost (R000's)	0

Year	1995	2002	2015
MGD	750	865	1705

Cap	1,720 M
TWL	1360 masl
L.O.L.	1357 masl
Required Capacity (MG)	N/A
Year 2015	N/A
Estimated Cost (R000's)	0.00

Cap	44,000 MGD
GL	1037 masl
Pump Head	295 m
Required Capacity (MG)	44,000
Year 2015	44,000
Estimated Cost (R000's)	27,712

Cap	1.1 M
GL	1450 masl
Required Capacity (MG)	1.1
Year 2015	1.1
Estimated Cost (R000's)	0

Cap	3240 MGD
Dia	250 mm
Length	3.84 km
Required Capacity (MG)	3201
Year 2015	3201
Estimated Cost (R000's)	1040

Cap	3 M
GL	1460 masl
Required Capacity (MG)	3
Year 2015	3
Estimated Cost (R000's)	0

Cap	400 M
Dia	350 mm
Length	3.1 km
Required Capacity (MG)	391
Year 2015	391
Estimated Cost (R000's)	1191

Year	1995	2002	2015
MGD	8,243	8,243	10,859

Year	1995	2002	2015
MGD	820	1079	1757

Cap	2 M
TWL	1514 masl
GL	1510 masl
Required Capacity (MG)	2.0
Year 2015	2.0
Estimated Cost (R000's)	0

Year	1995	2002	2015
MGD	70	70	70

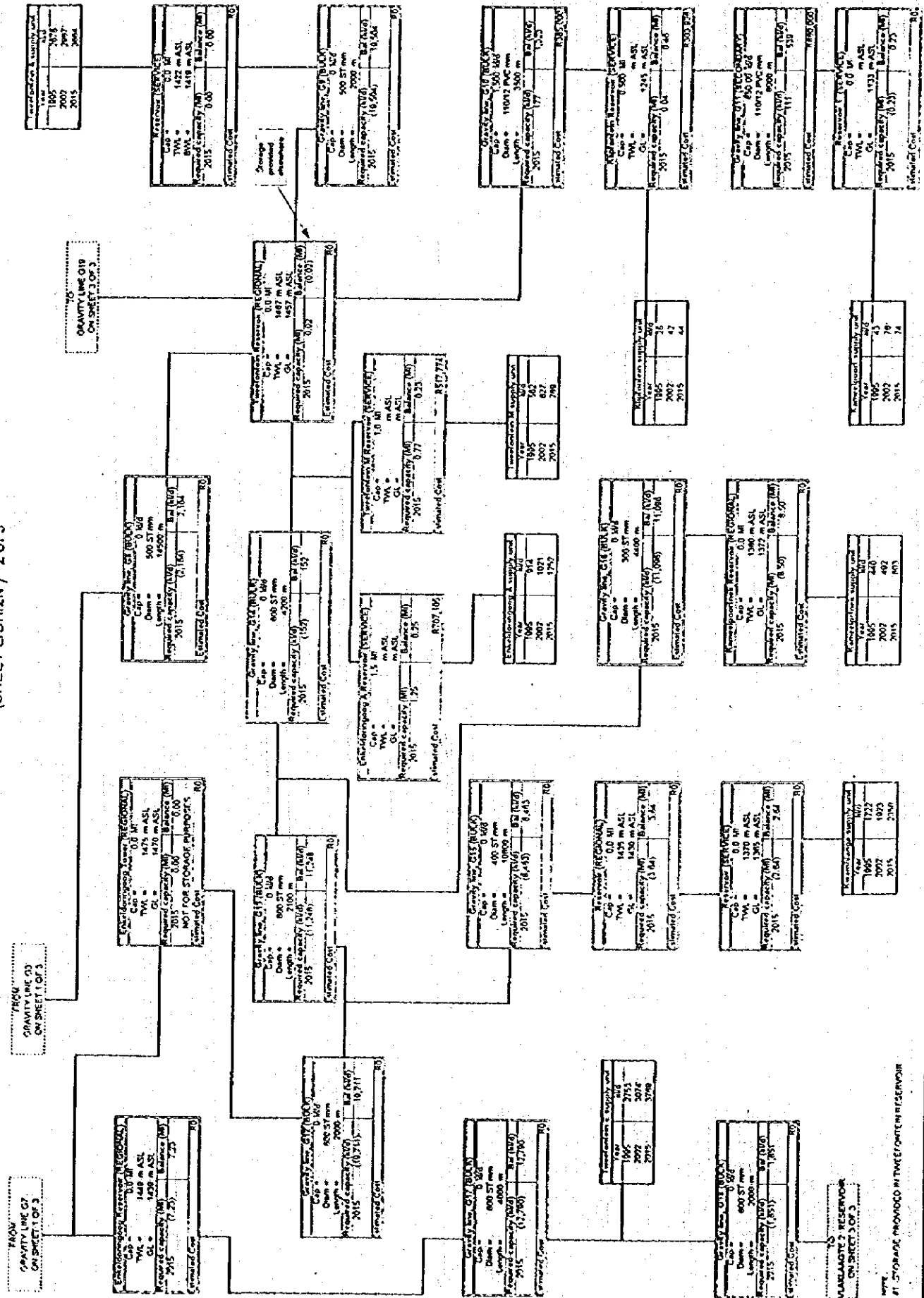
Cap	1460 masl
GL	1460 masl
Required Capacity (MG)	1.3
Year 2015	1.3
Estimated Cost (R000's)	0

Year	1995	2002	2015
MGD	797	797	1377



# BRONKHORSTSPKJIT SUPPLY BLOCK : NEW INFRASTRUCTURE

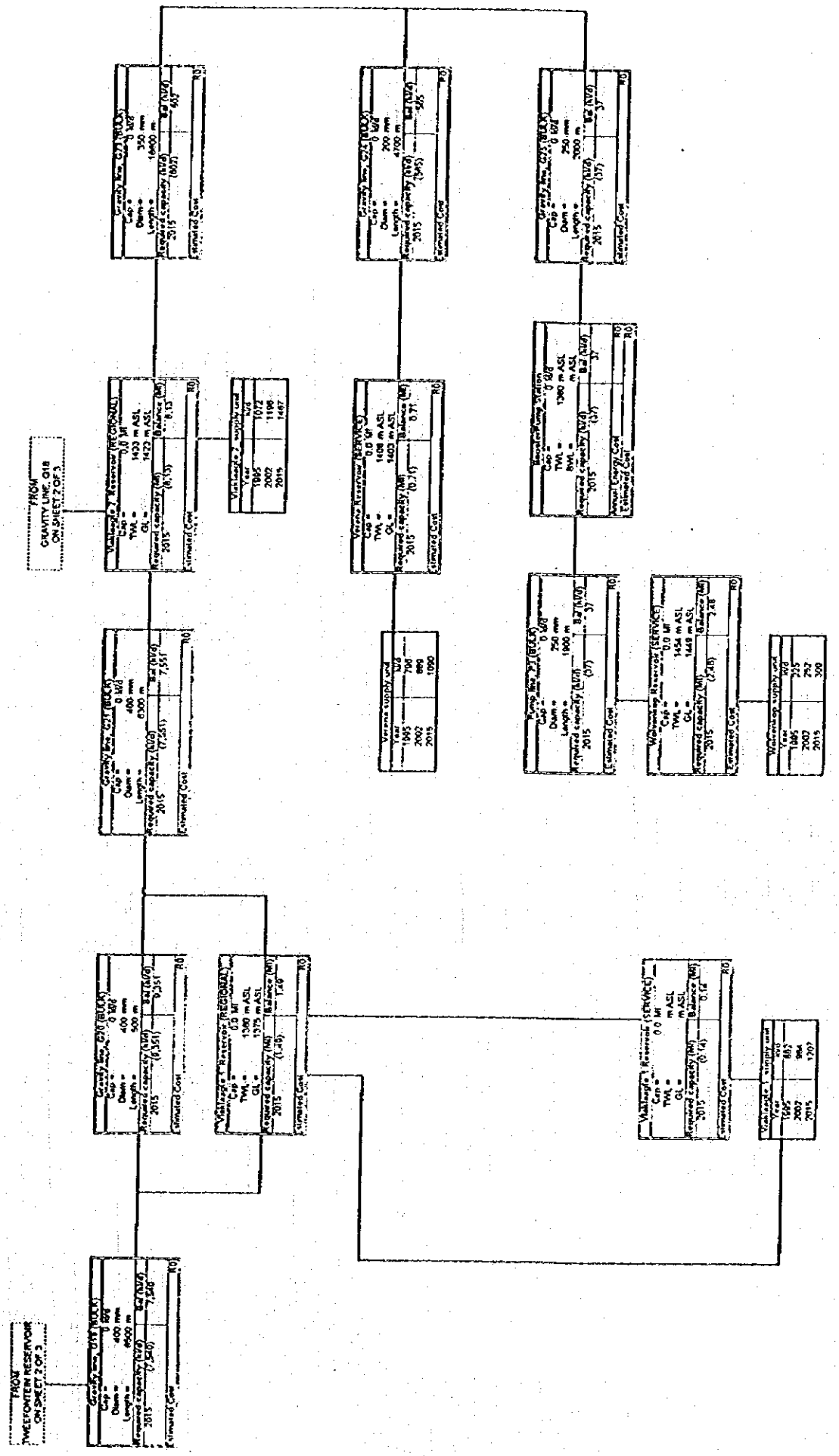
(SHEET E/BH/2N) 2 of 3





# BRONKHORSTSPIJT SUPPLY BLOCK : NEW INFRASTRUCTURE

( SHEET E/BH/3N ) 3 of 3



FROM  
WESTPORTEN RESERVOIR  
ON SHEET 2 OF 3

FROM  
GRAVITY LINE G18  
ON SHEET 2 OF 3

Gravity Line G19 (R003)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	7,540
Estimated Cost	70

Gravity Line G20 (R004)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	6,351
Estimated Cost	70

Gravity Line G21 (R005)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	7,551
Estimated Cost	70

Gravity Line G22 (R006)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	8,13
Estimated Cost	70

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1360 m ASL
OL =	1375 m ASL
Estimated Capacity (M3)	1,240
2015	1,240
Estimated Cost	70

Water supply and	
Year	1995
	1072
Year	2002
	1106
Year	2015
	1467

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1408 m ASL
OL =	1403 m ASL
Estimated Capacity (M3)	7,715
2015	8,771
Estimated Cost	70

Water supply and	
Year	1995
	100
Year	2002
	186
Year	2015
	1090

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1408 m ASL
OL =	1403 m ASL
Estimated Capacity (M3)	7,715
2015	8,771
Estimated Cost	70

Gravity Line G25 (R007)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	8,245
Estimated Cost	70

Gravity Line G26 (R008)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	8,245
Estimated Cost	70

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1380 m ASL
OL =	1380 m ASL
Estimated Capacity (M3)	1,13
2015	1,13
Estimated Cost	70

Gravity Line G27 (R009)	
Cap =	400 mm
Diam =	500 mm
Length =	1000 m
Estimated Capacity (M3)	82 (N/A)
2015	8,245
Estimated Cost	70

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1454 m ASL
OL =	1448 m ASL
Estimated Capacity (M3)	2,218
2015	2,218
Estimated Cost	70

Valve Reservoir (SERVICES)	
Cap =	0.0 M
TWA =	1454 m ASL
OL =	1448 m ASL
Estimated Capacity (M3)	2,218
2015	2,218
Estimated Cost	70

Water supply and	
Year	1995
	800
Year	2002
	255
Year	2015
	292

Water supply and	
Year	1995
	800
Year	2002
	255
Year	2015
	300

# EASTERN ZONE : CULLINAN SUPPLY BLOCK : PROPOSED INFRASTRUCTURE

## PREMIER MINE DAM TO CULLINAN (Sheet No. E/PC/1/P)

