No. V-2-4 Name of Dam Chatikubo

Location	District	Masvingo		Communal Land	Mtilikwe
	Map Ref.	2031A3		Coordinates	UN065396
Geology	Granitic gneiss, shearing and weathering.				
Hydrology	River	Chihobvu		Hydrological Zone	E-UT2
	Catchment Area	20.5	sq.km	M.A. Rainfall	800 mm
	M.A. Runoff	102	mm	Sediment	230 tonnes km^2/yr.
Reservoir	Effective Capacity	1.680	MCM	1/10 Yr. Yield	0.732 MCM
	Dead Capacity	0.070	MCM	D.W.S.	681 m
	Total Capacity	1.750	MCM	N.W.S.	691 m
Dam	Height	18	m	Length	360 m
	Embankment Volume	90 000	cu.m	Spillway	108 m
Agriculture	Natural Region	IV		Soil	SL
	Potential Irrigable Area				100 ha
	Proposed Cropping Pattern			B	
Irrigation	Net Irrigable Area 43.1ha		Dist. 1.8 km by Pump, H=19.0 m		
	Topography	Area	Slightly sloping		
		Conveyance	Undulated		
Rural Water Supply	Population	2 337	person		47 cu.m/day
	Livestock	960	unit		43 cu.m/day

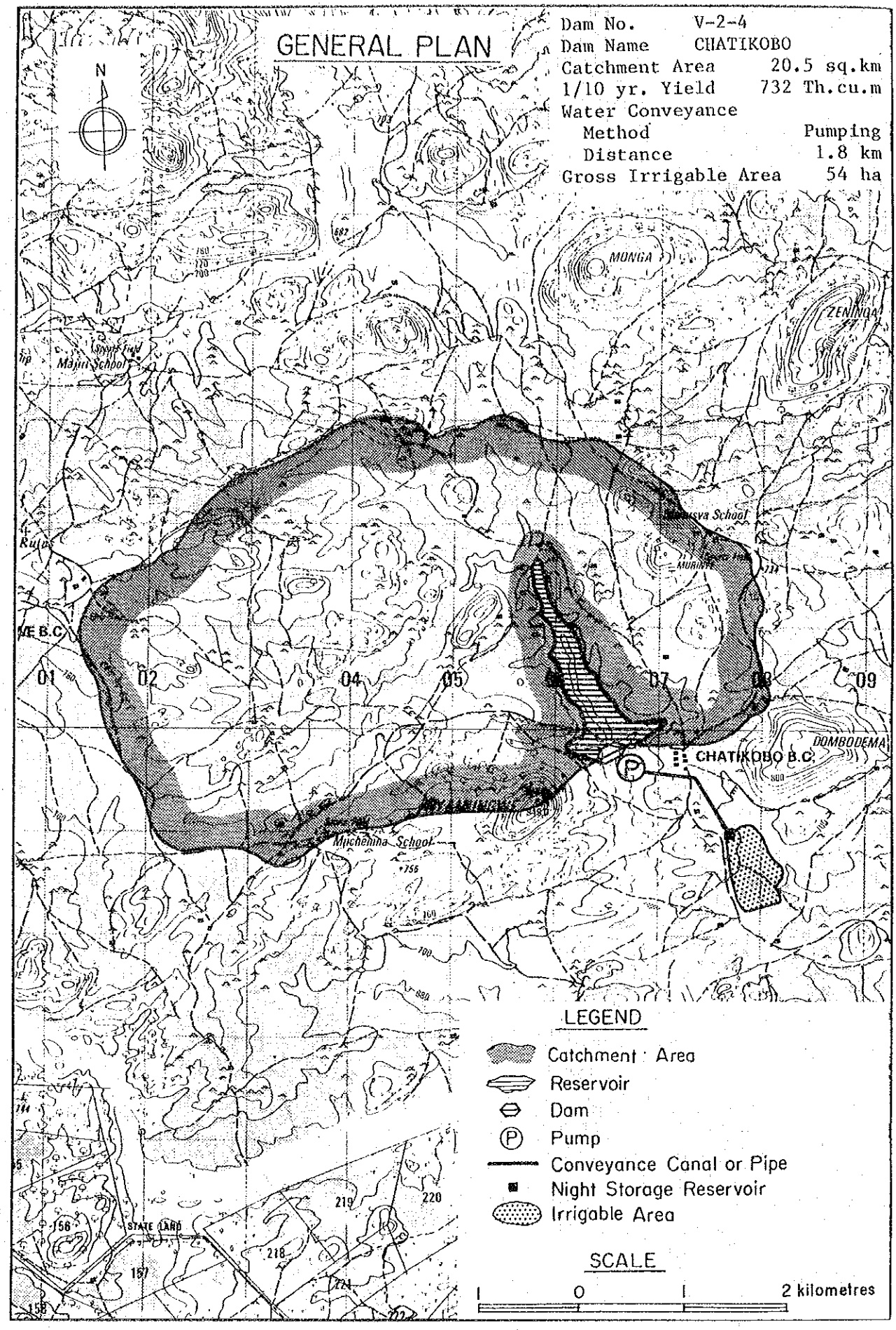
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 911 000	Z$ 1 886 000	Z$ 2 797 000	A
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 104 630/year	Z$ 1 216 000	5.7 per cent	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

Remarks	Water right ... 3.0 km (No. 12412)

Present Condition on the Ward

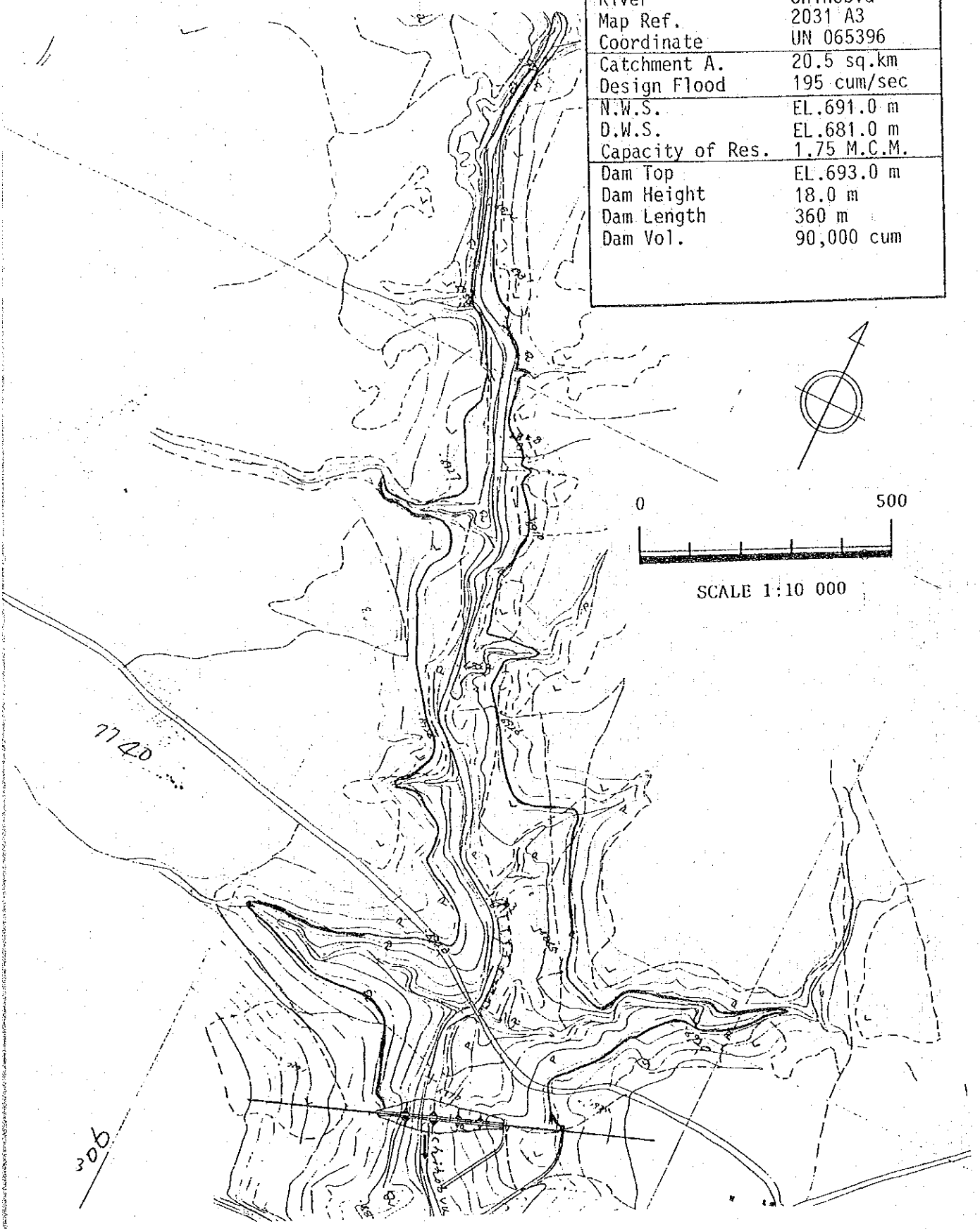
Ward Name	Chatikubo			Area	8 481 ha
Demography	Population Density			77.9	persons/sq.km
	Family Size			4.9	Persons/household
Agriculture	Arable Area	6 160 ha		Grazing Area	2 321 ha
	Maize	1.5	ha/household	11	bags/ha
	Sorghum	0.1	ha/household	18	bags/ha
	Livestock	3.0	LSUs/household	48.0	LSUs/sq.km
Rural Water Supply	Borehole	0.06	units/sq.km	1 322	persons/unit
	Well	0.24	units/sq.km	331	persons/unit


GENERAL PLAN
Dam No. V-2-4
Dam Name CHATIKOBO
Catchment Area 20.5 sq.km
1/10 yr. Yield 732 Th.cu.m
Water Conveyance
Method Pumping
Distance 1.8 km
Gross Irrigable Area 54 ha
N
MONGA
ZENINGA
Sports Field
Majini School
Rujo
ME B.C
01
02
04
05
07
09
CHATIKOBO B.C
DOMBODEMA
Michemma School
STATE LAND
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
2 kilometres

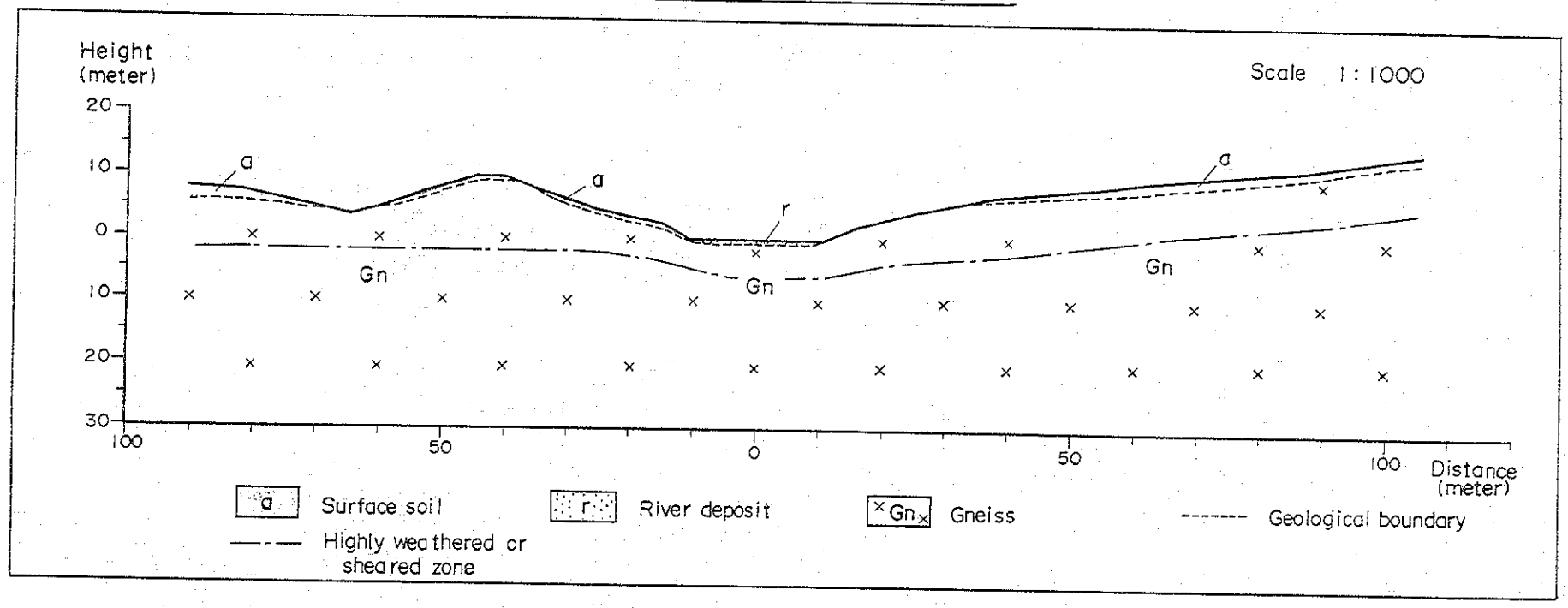
CHATIKUBO

PLAN OF DAM

Dam No.	V - 2 - 4
District	Masvingo
Communal L.	Mtilikwe
River	Chihobvu
Map Ref.	2031 A3
Coordinate	UN 065396
Catchment A.	20.5 sq.km
Design Flood	195 cum/sec
N.W.S.	EL.691.0 m
D.W.S.	EL.681.0 m
Capacity of Res.	1.75 M.C.M.
Dam Top	EL.693.0 m
Dam Height	18.0 m
Dam Length	360 m
Dam Vol.	90,000 cum



V-2-4 Chatikubo

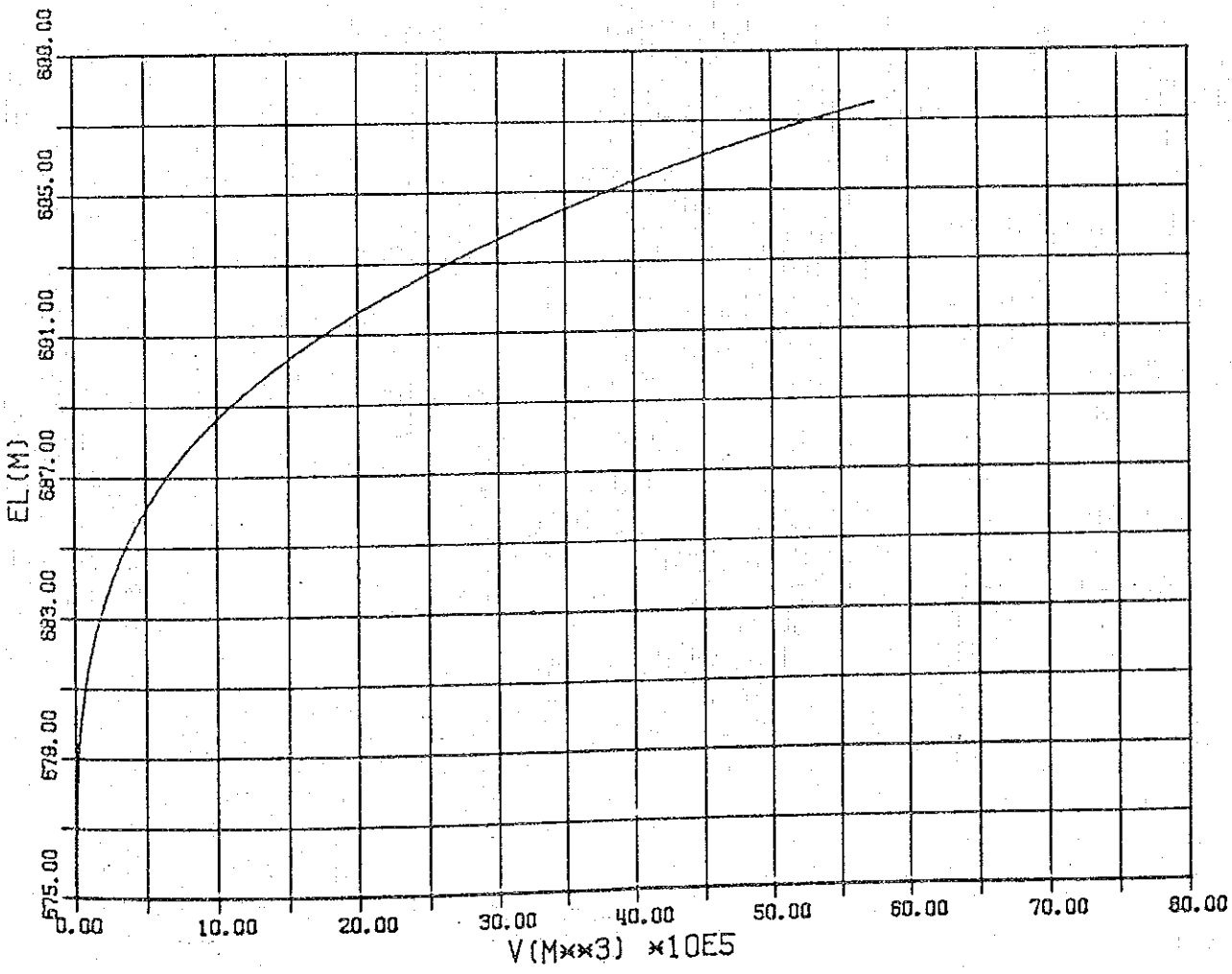


The bedrock consists of granite gneiss. All rock at the surface is very soft, and opened joints at intervals of 50 to 5 centimeters trending in N60°E direction are very well developed by shearing. A small dyke of dolerite and abundant small quartz veins exist around the damsite. Many photo-lineaments trending in N60°E and N30°W direction are recognized around the damsite. The soft and jointful layer seems to be considerably deep. It seems that leakage through the bedrock is great and bearing strength in the foundation strata is small. The estimated thickness of unconsolidated deposits is maximum 1 meter in the riverbed and maximum 2 meters at both banks.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-2-4	2031A3	UN	065	396

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
675.5	0.0	0	0	0	0.00	
677.5	2.0	5000	2500	5000	5.00	
680.0	2.5	21500	13250	33125	38.12	
682.5	2.5	60000	40750	101875	140.00	
685.0	2.5	112000	86000	215000	355.00	
687.5	2.5	194500	153250	383125	738.12	
690.0	2.5	331000	262750	656875	1395.00	
692.5	2.5	473500	402250	1005625	2400.62	
695.0	2.5	657000	565250	1413125	3813.75	
697.5	2.5	892000	774500	193624	5750.00	



No. V-3-1 Name of Dam Maramwidzi

Location	District Masvingo			Communal Land Nyajena	
	Map Ref. 2031C1			Coordinates TN981184	
Geology	Granite, hard to very hard, however, surface changed into boulders by weathering.				
Hydrology	River Mutetenu			Hydrological Zone E-UT2	
	Catchment Area	15.0	sq.km	M.A. Rainfall	830 mm
	M.A. Runoff	103	mm	Sediment	230 tonnes km^2/yr.
Reservoir	Effective Capacity	1.350	MCM	1/10 Yr. Yield	0.556 MCM
	Dead Capacity	0.050	MCM	D.W.S.	739 m
	Total Capacity	1.400	MCM	N.W.S.	749 m
Dam	Height	18	m	Length	370 m
	Embankment Volume	120 000	cu.m	Spillway	87 m
Agriculture	Natural Region V			Soil -	
	Potential Irrigable Area				- ha
	Proposed Cropping Pattern -				
Irrigation	Net Irrigable Area - ha			Dist. - km by -	
	Topography	Area		-	
		Conveyance		-	
Rural Water Supply	Population	1 590	person		32 cu.m/day
	Livestock	3 280	unit		148 cu.m/day

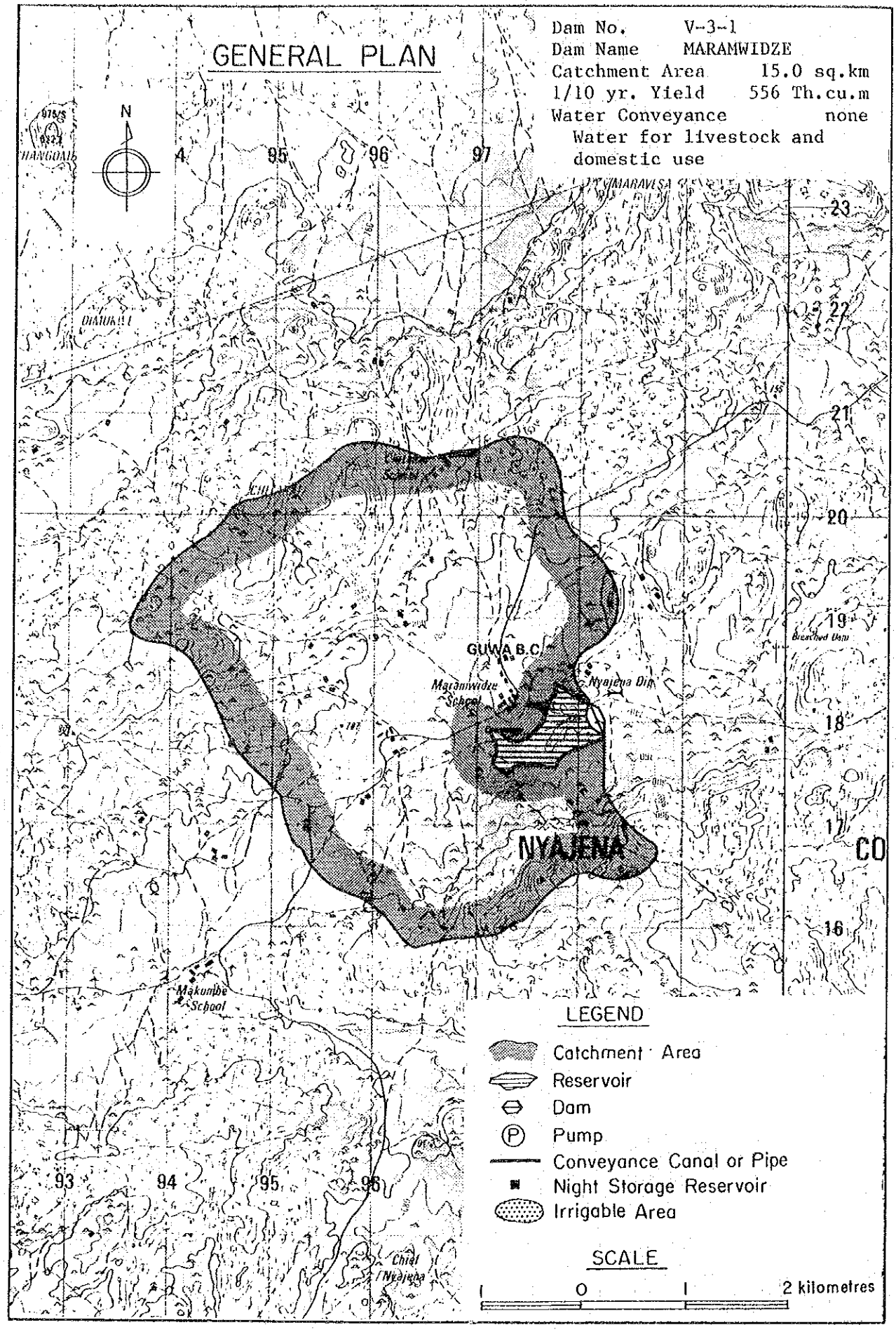
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 1 203 000	-	Z$ 1 203 000	B
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 18 274 /year	Z$ 212 000	1.2 per cent	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

Remarks

Present Condition on the Ward

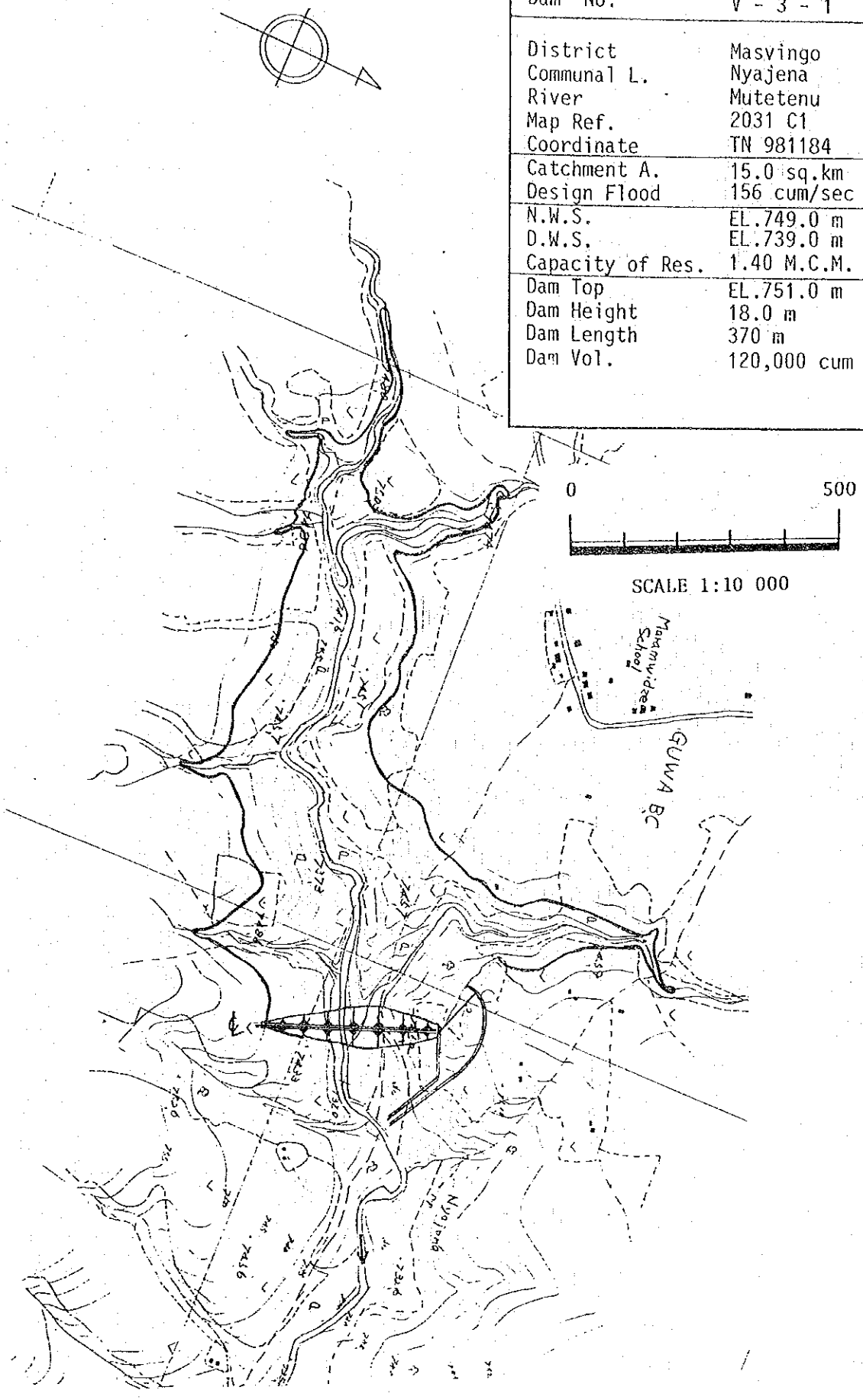
Ward Name	Guwa, Nyajena 3			Area (8 180+17 220) ha	
Demography	Population Density			53.0	persons/sq.km
	Family Size			8.6	Persons/household
Agriculture	Arable Area	N.A ha		Grazing Area	N.A ha
	Maize	1.2	ha/household	10	bags/ha
	Sorghum	0.4	ha/household	8	bags/ha
	Livestock	6.0	LSUs/household	32.8	LSUs/sq.km
Rural Water Supply	Borehole	0.06	units/sq.km	1 359	persons/unit
	Well	0.15	units/sq.km	366	persons/unit


GENERAL PLAN
Dam No. V-3-1
Dam Name MARAMWIDZE
Catchment Area 15.0 sq.km
1/10 yr. Yield 556 Th.cu.m
Water Conveyance none
Water for livestock and domestic use
N
95
96
97
23
22
21
20
19
18
17
16
93
94
95
96
GUWA B.C.
Maramwidze School
Nyajena Dip
NYAJENA
Makumbe School
Chief Nyajena
Branched Dam
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres

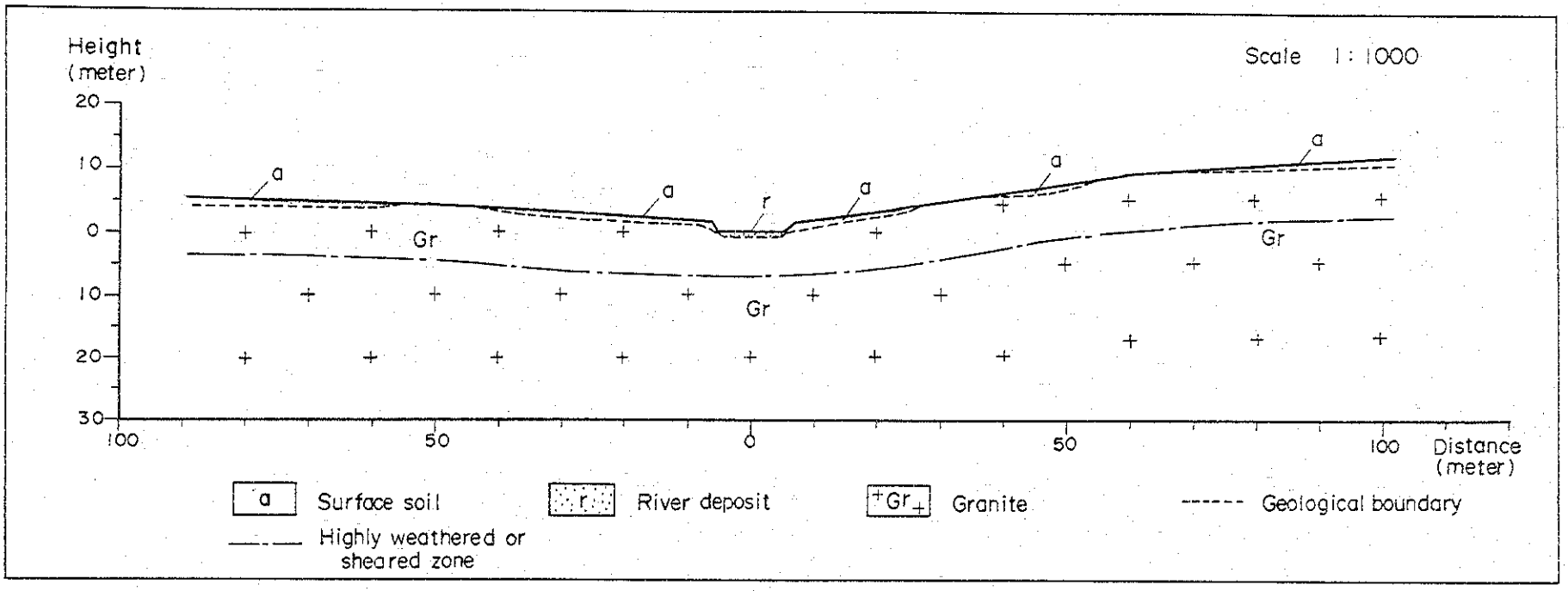
PLAN OF DAM

MARAMWIDZE

Dam No.	V - 3 - 1
District	Masvingo
Communal L.	Nyajena
River	Mutetenu
Map Ref.	2031 C1
Coordinate	TN 981184
Catchment A.	15.0 sq.km
Design Flood	156 cum/sec
N.W.S.	EL.749.0 m
D.W.S.	EL.739.0 m
Capacity of Res.	1.40 M.C.M.
Dam Top	EL.751.0 m
Dam Height	18.0 m
Dam Length	370 m
Dam Vol.	120,000 cum



V-3-1 Maramwidze



The bedrock consists of granite and it is very hard, however it is well jointed and has been changed into boulders.

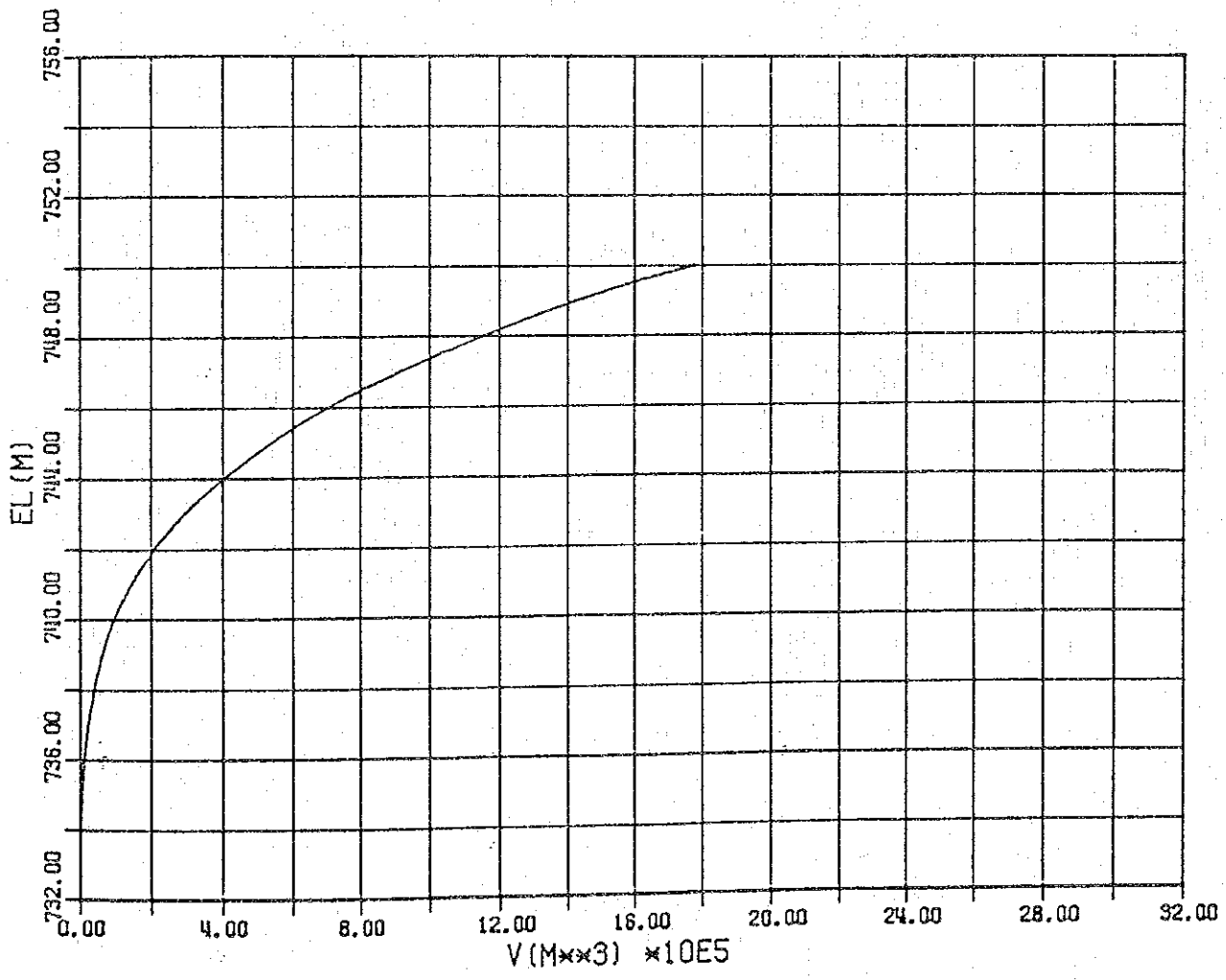
It seems that leakage through the bedrock and the cost of foundation treatments is great, therefore the bedrock in this area is less suitable for dam foundations from the geological point of view.

The thickness of unconsolidated deposits is less than 1 meter.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-3-1	2031C1	TN	981	181

EL.(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
732.8	0.0	0	0	0	0.00	
735.0	2.2	4800	2400	5280	5.28	
737.5	2.5	15516	10158	25395	30.67	
740.0	2.5	36169	25843	64606	95.28	
742.5	2.5	84726	60448	151119	246.40	
745.0	2.5	146091	115409	288521	534.92	
747.5	2.5	247228	19665	491649	1026.57	
750.0	2.5	352904	300066	750165	1776.73	



No. V-3-2 Name of Dam Fusira

Location	District	Masvingo		Communal Land	Nyajena
	Map Ref.	2031C1		Coordinates	UN041091
Geology	Granite and diorite, highly weathering and fracturing, changed into boulders.				
Hydrology	River	Mubagwashe		Hydrological Zone	E-UT2
	Catchment Area	30.8 sq.km		M.A. Rainfall	790 mm
	M.A. Runoff	99 mm		Sediment	230 tonnes km^2/yr.
Reservoir	Effective Capacity	2.890 MCM		1/10 Yr. Yield	1.128 MCM
	Dead Capacity	0.110 MCM		D.W.S.	563 m
	Total Capacity	3.000 MCM		N.W.S.	572 m
Dam	Height	18 m		Length	600 m
	Embankment Volume	152 000 cu.m		Spillway	138 m
Agriculture	Natural Region	V		Soil	SL
	Potential Irrigable Area				140 ha
	Proposed Cropping Pattern		B		
Irrigation	Net Irrigable Area 66.4ha		Dist. 1.2 km by Pump, H=7.0 m		
	Topography	Area	Steep slope and undulated		
		Conveyance	Gently sloping		
Rural Water Supply	Population	2 493 person			50 cu.m/day
	Livestock	2 430 unit			109 cu.m/day

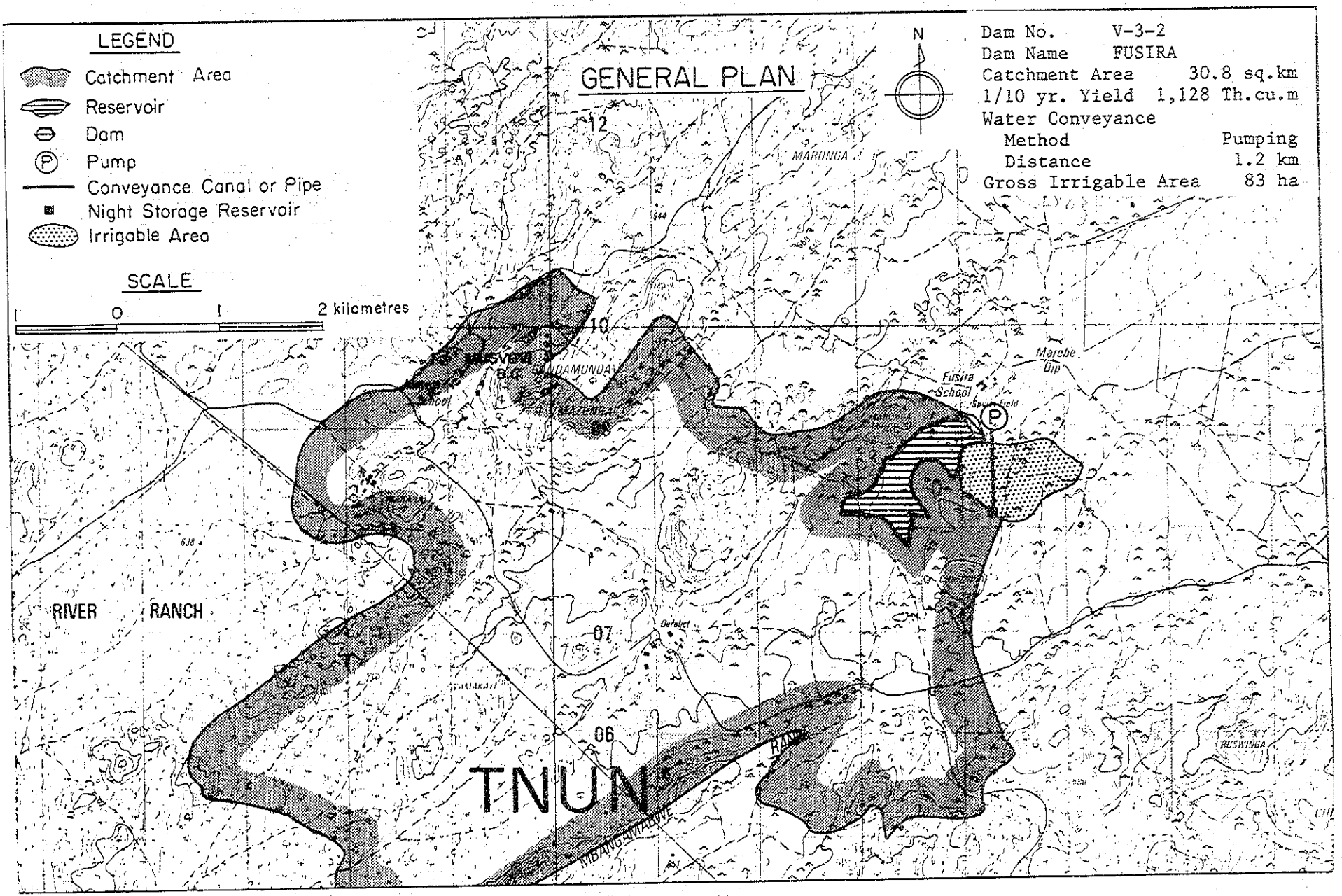
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 2 212 000	Z$ 1 981 000	Z$ 4 193 000	A
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 139 124/year	Z$ 1 617 000	5.0 per cent	

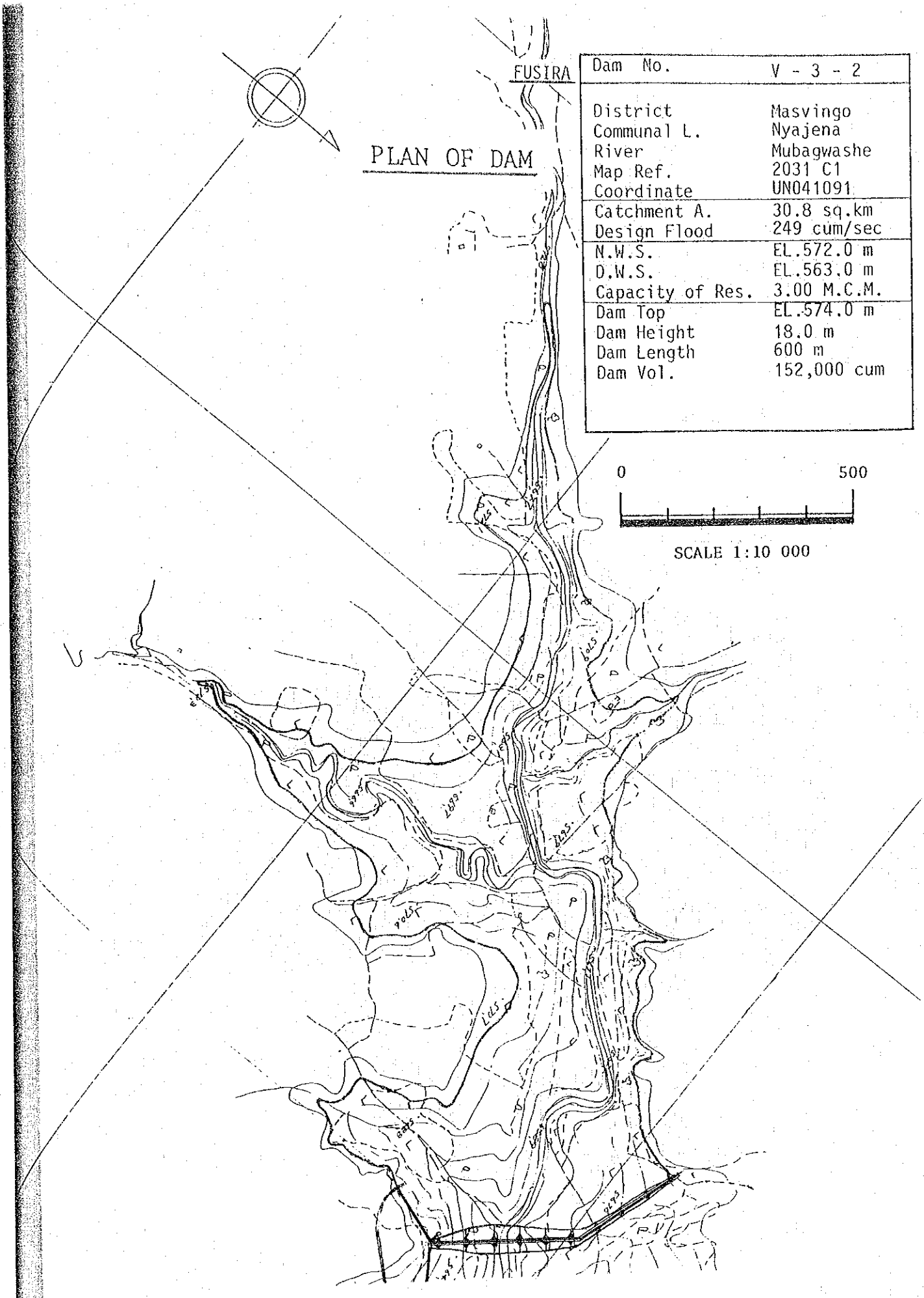
Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

Remarks

Present Condition on the Ward

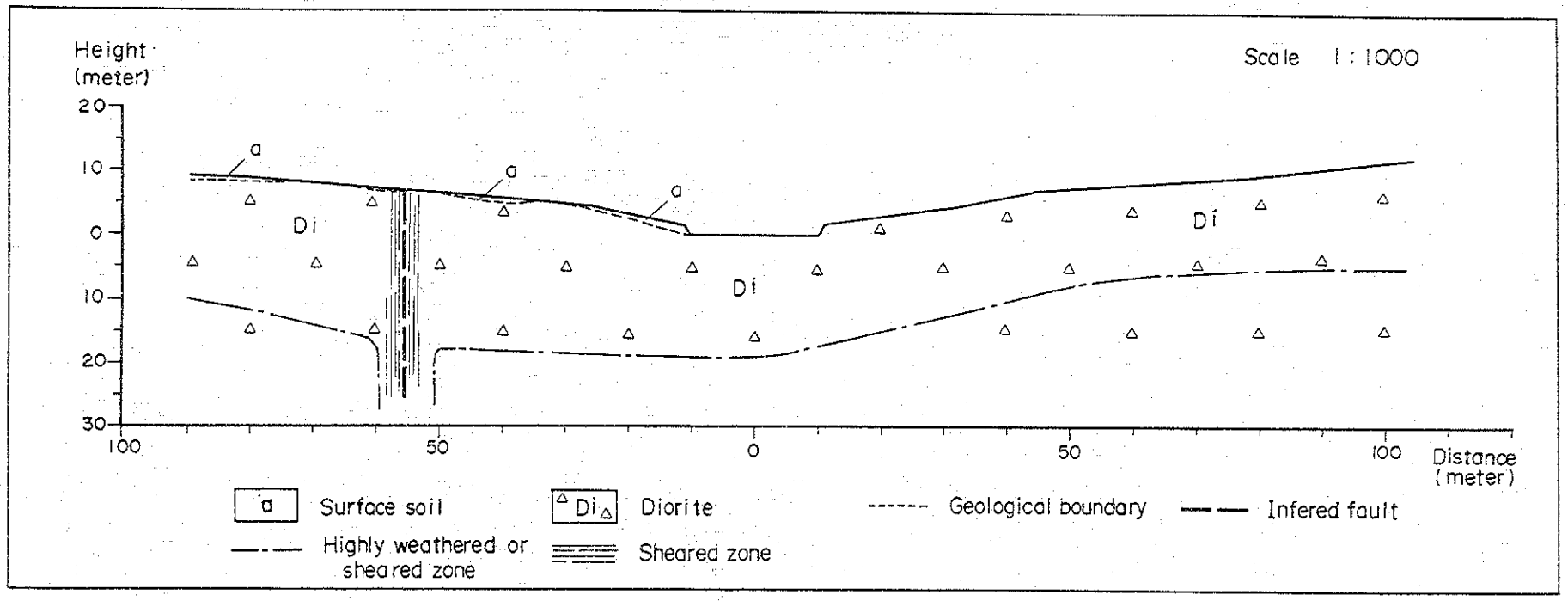
Ward Name	Maregere 4			Area	5 860 ha
Demography	Population Density			83.1	persons/sq.km
	Family Size			7.6	Persons/household
Agriculture	Arable Area	N.A ha		Grazing Area	N.A ha
	Maize	1.1 ha/household		8	bags/ha
	Sorghum	0. ha/household		6	bags/ha
	Livestock	2.2 LSUs/household		24.3	LSUs/sq.km
Rural Water Supply	Borehole	0.03 units/sq.km		2 436	persons/unit
	Well	N.A. units/sq.km		N.A	persons/unit


LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres
GENERAL PLAN
N
Dam No. V-3-2
Dam Name FUSIRA
Catchment Area 30.8 sq.km
1/10 yr. Yield 1,128 Th.cu.m
Water Conveyance
Method Pumping
Distance 1.2 km
Gross Irrigable Area 83 ha
12
10
08
07
06
MARONGA
MAKUNGA
Fusira School
Marobe Dip
RIVER
RANCH
TNUM
MBANGAMWABWE
RUSWINGA



Dam No.	V - 3 - 2
District	Masvingo
Communal L.	Nyajena
River	Mubagwashe
Map Ref.	2031 C1
Coordinate	UN041091
Catchment A.	30.8 sq.km
Design Flood	249 cum/sec
N.W.S.	EL.572.0 m
D.W.S.	EL.563.0 m
Capacity of Res.	3.00 M.C.M.
Dam Top	EL.574.0 m
Dam Height	18.0 m
Dam Length	600 m
Dam Vol.	152,000 cum

V-3-2 Fusira



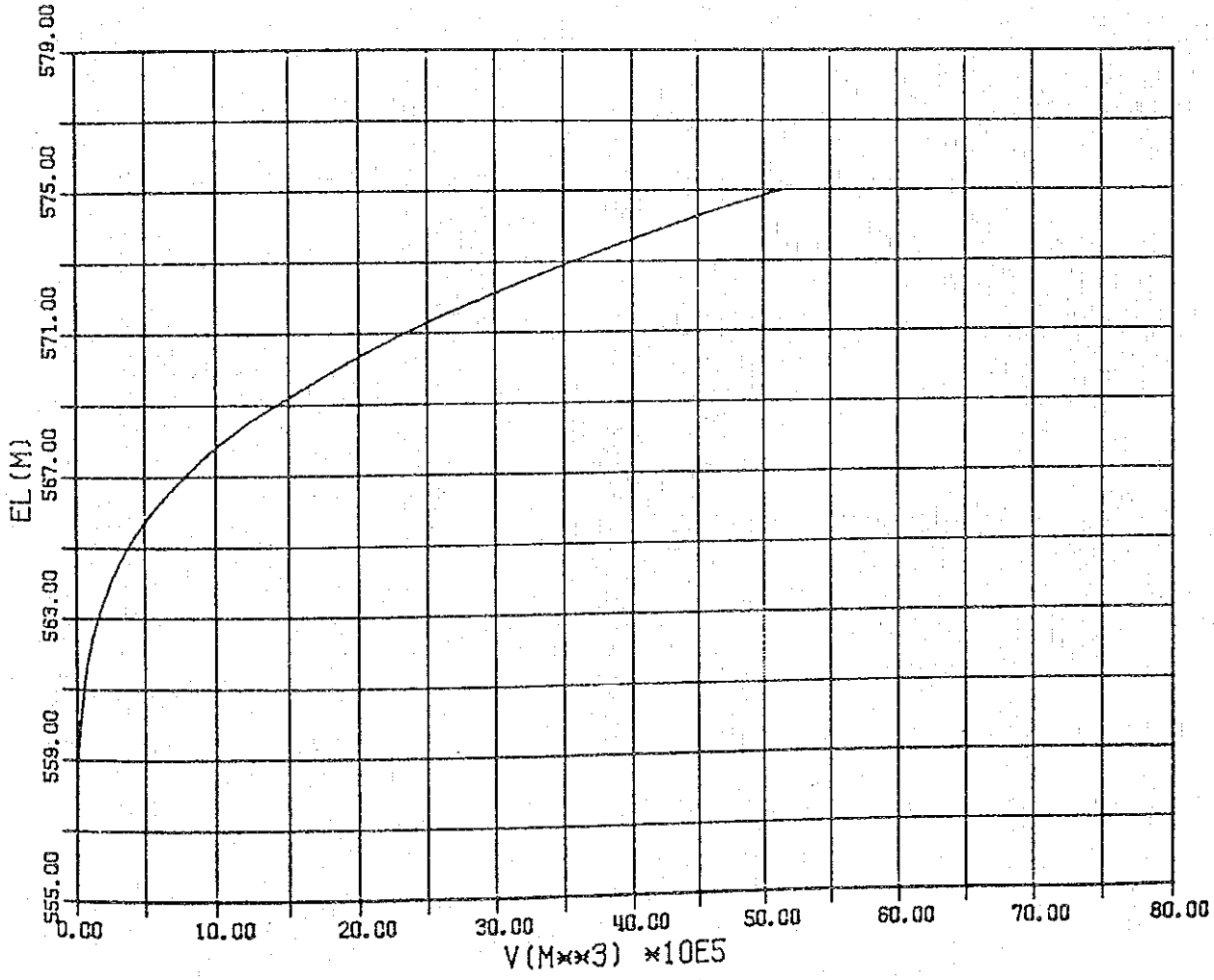
The bedrock consists of granite and diorite, however the latter is distributed only around the damsite, and it is fine grained and very hard, however, well jointed, and all rock at the surface has been changed into boulders. Because the joints look to be considerably deep, it seems that leakage through the bedrock is very large and cost of foundation treatments is great.

The thickness of unconsolidated deposits seems to be less than 1 meter.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-3-2	2031C1	UN	041	091

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
555.7	0.0	0	0	0	0.00	
557.5	1.8	2452	1226	2207	2.21	
560.0	2.5	18065	10259	25646	27.85	
562.5	2.5	56472	37269	93171	121.02	
565.0	2.5	145735	101104	252759	373.78	
567.5	2.5	280252	212994	532484	906.27	
570.0	2.5	460869	370561	926401	1832.67	
572.5	2.5	656993	558931	1397327	3229.99	
575.0	2.5	859559	758276	189568	5125.68	



No. V-3-3 Name of Dam Magudu

Location	District Masvingo		Communal Land Nyajena	
	Map Ref. 2031C3		Coordinates UN078021	
Geology	Granitic gneiss, shearing and weathering.			
Hydrology	River (T) Mwedzi		Hydrological Zone E-UT2	
	Catchment Area 41.9 sq.km		M.A. Rainfall 710 mm	
	M.A. Runoff 69 mm		Sediment 230 tonnes km^2/yr.	
Reservoir	Effective Capacity 5.630 MCM		1/10 Yr. Yield 0.954 MCM	
	Dead Capacity 0.150 MCM		D.W.S. 519 m	
	Total Capacity 5.780 MCM		N.W.S. 529 m	
Dam	Height 17 m		Length 450 m	
	Embankment Volume 129 000 cu.m		Spillway 171 m	
Agriculture	Natural Region V		Soil SCL	
	Potential Irrigable Area 70 ha			
	Proposed Cropping Pattern A			
Irrigation	Net Irrigable Area 56.1ha	Dist. 6.0 km by Gravity		
	Topography	Area	Flat	
		Conveyance	Gently sloping, two river crossings	
Rural Water Supply	Population 3 775 person		75 cu.m/day	
	Livestock 3 240 unit		146 cu.m/day	

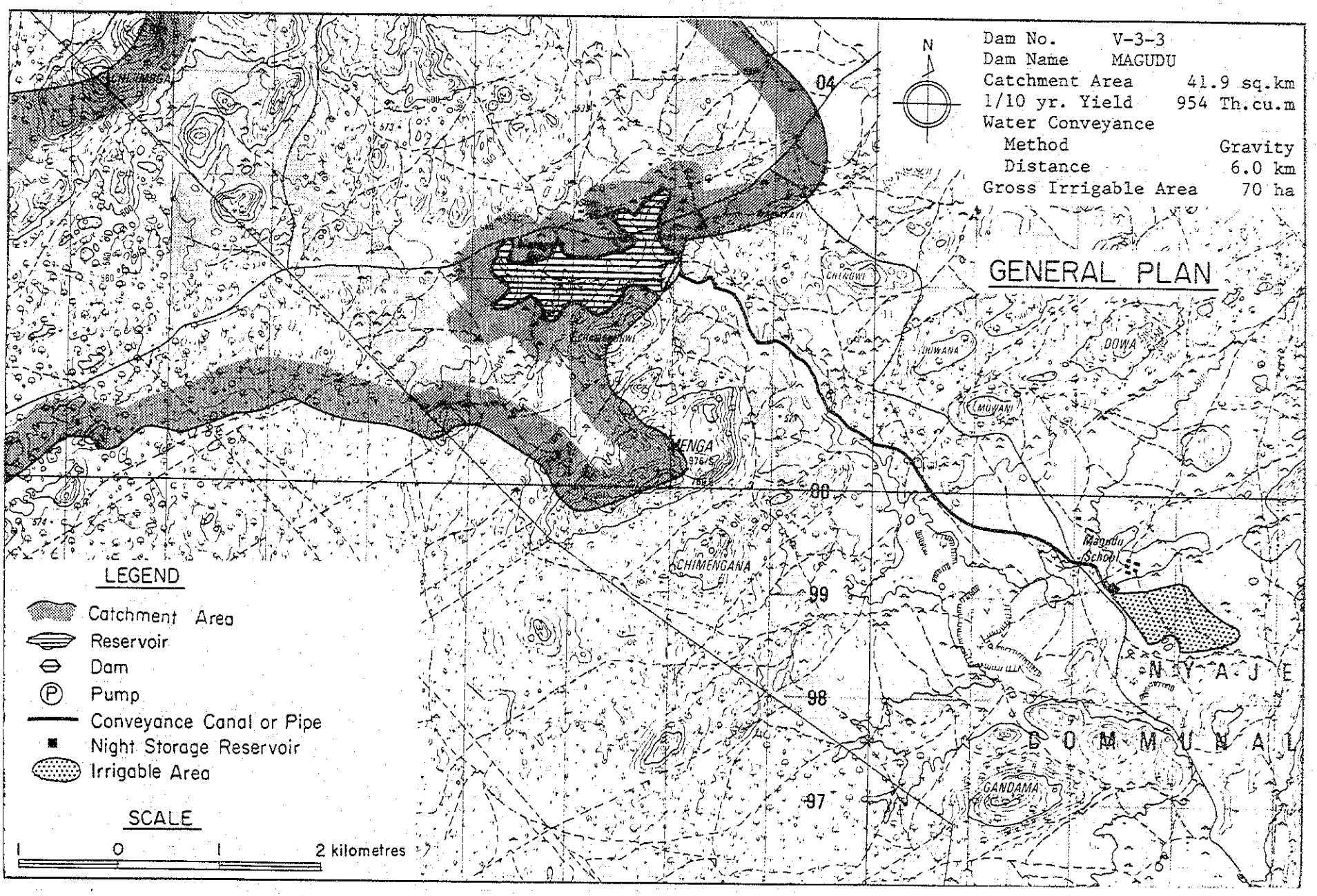
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 1 330 000	Z$ 1 672 000	Z$ 3 002 000	A
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$204 949 /year	Z$ 2 383 000	12.6 per cent	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

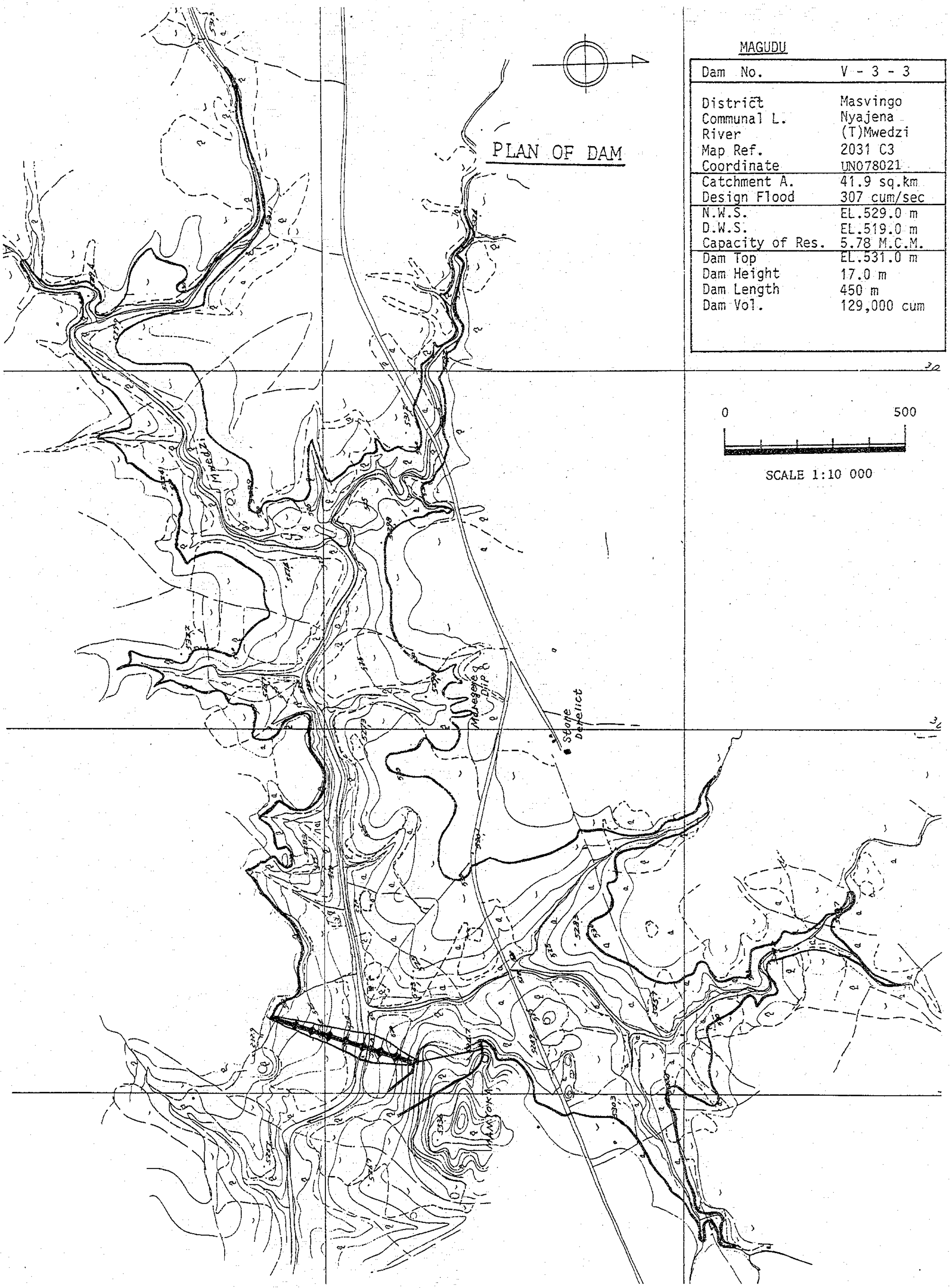
Remarks

Present Condition on the Ward

Ward Name	Dowa 6			Area	6 150 ha
Demography	Population Density			74.7	persons/sq.km
	Family Size			7.5	Persons/household
Agriculture	Arable Area	N.A ha	Grazing Area		N.A ha
	Maize	0.7 ha/household		12	bags/ha
	Sorghum	0.1 ha/household		8	bags/ha
	Livestock	3.2 LSUs/household		32.4	LSUs/sq.km
Rural Water Supply	Borehole	0.02 units/sq.km		4 592	persons/unit
	Well	0.02 units/sq.km		4 592	persons/unit


Dam No. V-3-3
Dam Name MAGUDU
Catchment Area 41.9 sq.km
1/10 yr. Yield 954 Th.cu.m
Water Conveyance
Method Gravity
Distance 6.0 km
Gross Irrigable Area 70 ha
N
GENERAL PLAN
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
1 0 1 2 kilometres
CHIMENGANA
CHIRAGWI
DOWA
MUYANI
Magudu School
GANDAMA
N Y A J E
C O M M U N A L
04
00
99
98
97

PLAN OF DAM



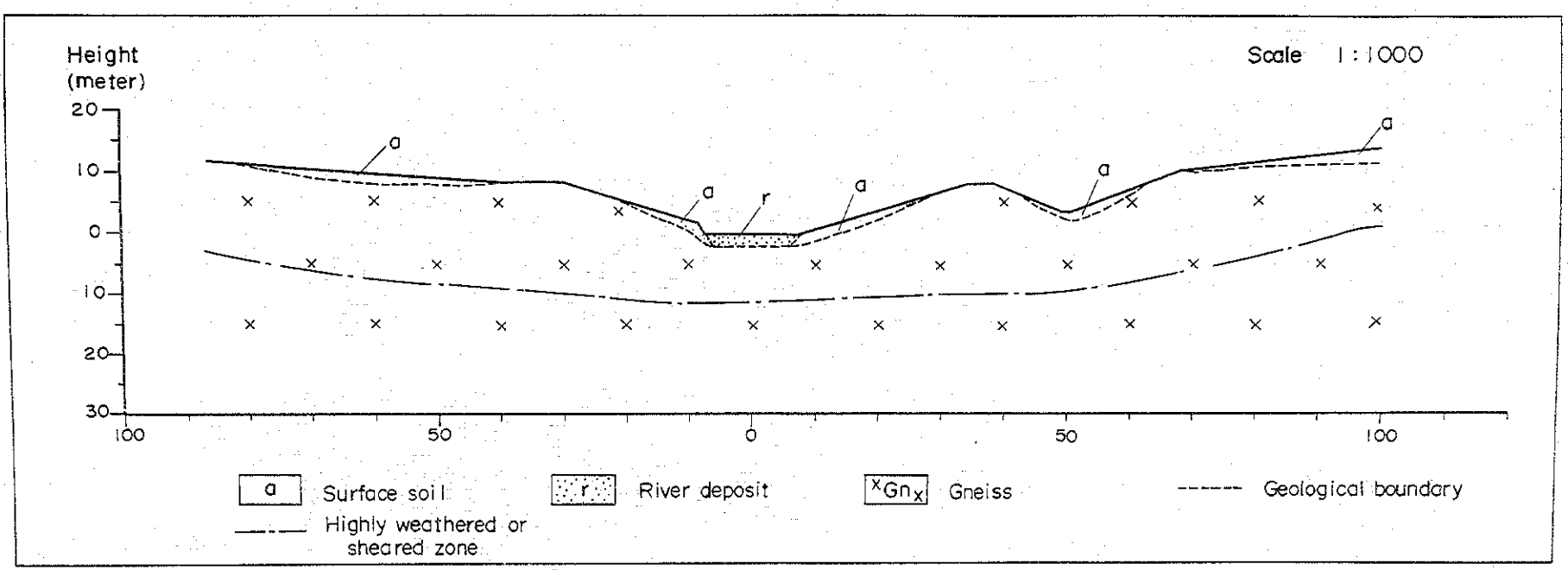
MAGUDU

Dam No.	V - 3 - 3
District	Masvingo
Communal L.	Nyajena
River	(T)Mwedzi
Map Ref.	2031 C3
Coordinate	UN078021
Catchment A.	41.9 sq.km
Design Flood	307 cum/sec
N.W.S.	EL.529.0 m
D.W.S.	EL.519.0 m
Capacity of Res.	5.78 M.C.M.
Dam Top	EL.531.0 m
Dam Height	17.0 m
Dam Length	450 m
Dam Vol.	129,000 cum

0 500

SCALE 1:10 000

V-3-3 Magudu



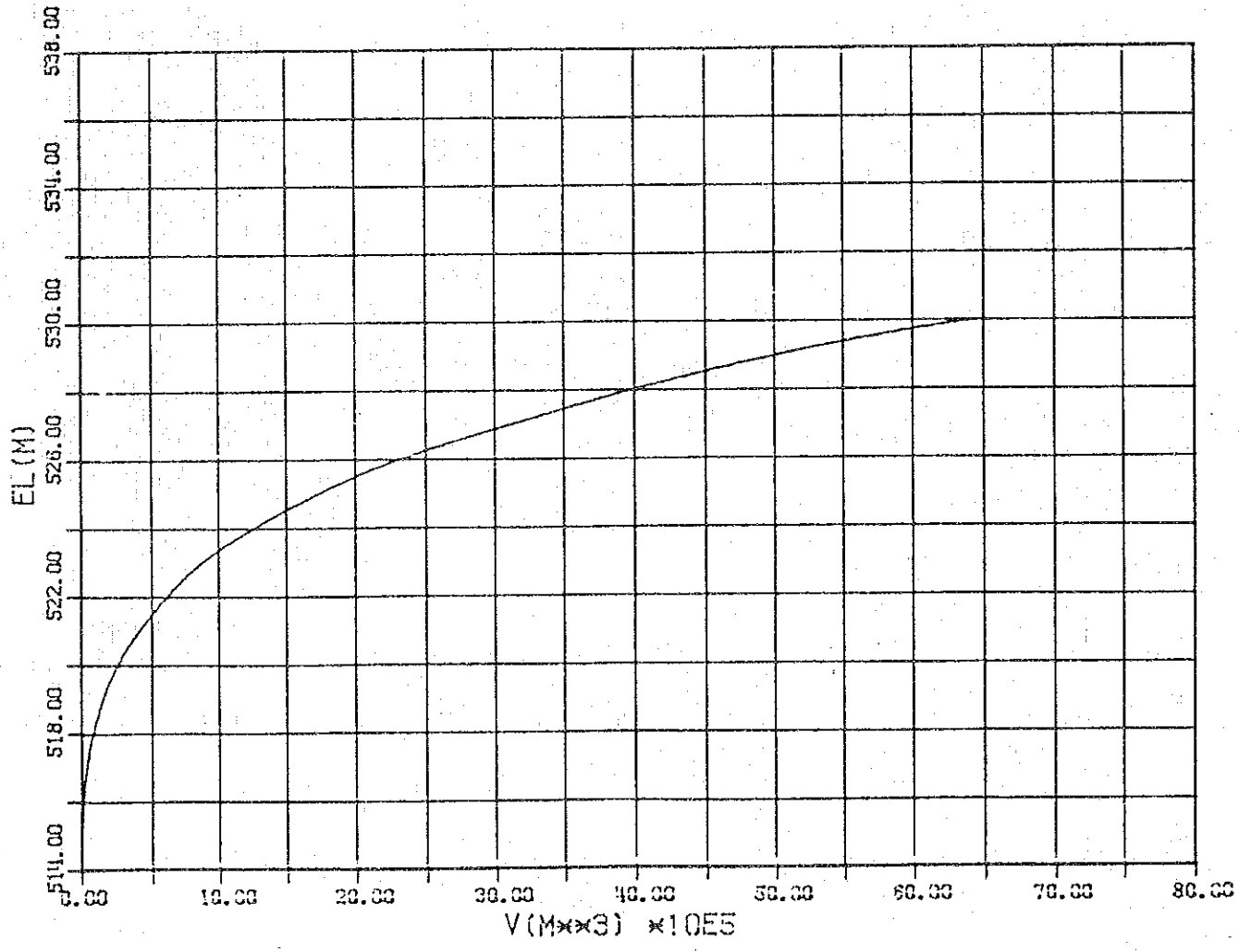
The bedrock consists of granite gneiss, and around damsite it is very soft by shearing. The sheared layer seems to be considerably deep. It seems that leakage through the bedrock is large and bearing strength in foundation strata is small.

The thickness of unconsolidated deposits is maximum 3 meters in the river bed and maximum 5 meters at the both banks.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-3-3	2031C3	UN	143	006

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
514.0	0.0	0	0	0	0.00	
515.0	1.0	8500	4250	4250	4.25	
517.5	2.5	34500	21500	53750	58.00	
520.0	2.5	120300	77400	193500	251.50	
522.5	2.5	264700	192500	481250	732.75	
525.0	2.5	530800	397750	994375	1727.12	
527.5	2.5	910600	720700	180174	3528.87	
530.0	2.5	1405300	115794	2894875	6423.75	



No. V-4-1 Name of Dam Marongera

Location	District Masvingo		Communal Land Zimutu	
	Map Ref. 1930D2		Coordinates 74	
Geology	Granite, it seems to be soft and well jointed, and the surface soil is very deep from the airphoto-reading.			
Hydrology	River Matiringardi		Hydrological Zone E-UT2	
	Catchment Area 11.4 sq.km		M.A. Rainfall 690 mm	
	M.A. Runoff 62 mm		Sediment 60 tonnes km^2/yr.	
Reservoir	Effective Capacity 1.400 MCM		1/10 Yr. Yield 0.170 MCM	
	Dead Capacity 0.010 MCM		D.W.S. 1.258 m	
	Total Capacity 1.410 MCM		N.W.S. 1.266 m	
Dam	Height 13 m		Length 550 m	
	Embankment Volume 101 000 cu.m		Spillway 71 m	
Agriculture	Natural Region IV		Soil LS-SL	
	Potential Irrigable Area 150 ha			
	Proposed Cropping Pattern B			
Irrigation	Net Irrigable Area 10.0ha	Dist. 1.5 km by Pump, H=37.0 m		
	Topography	Area	Slightly sloping	
		Conveyance	Gently sloping	
Rural Water Supply	Population 1 917 person		38 cu.m/day	
	Livestock 1 275 unit		57 cu.m/day	

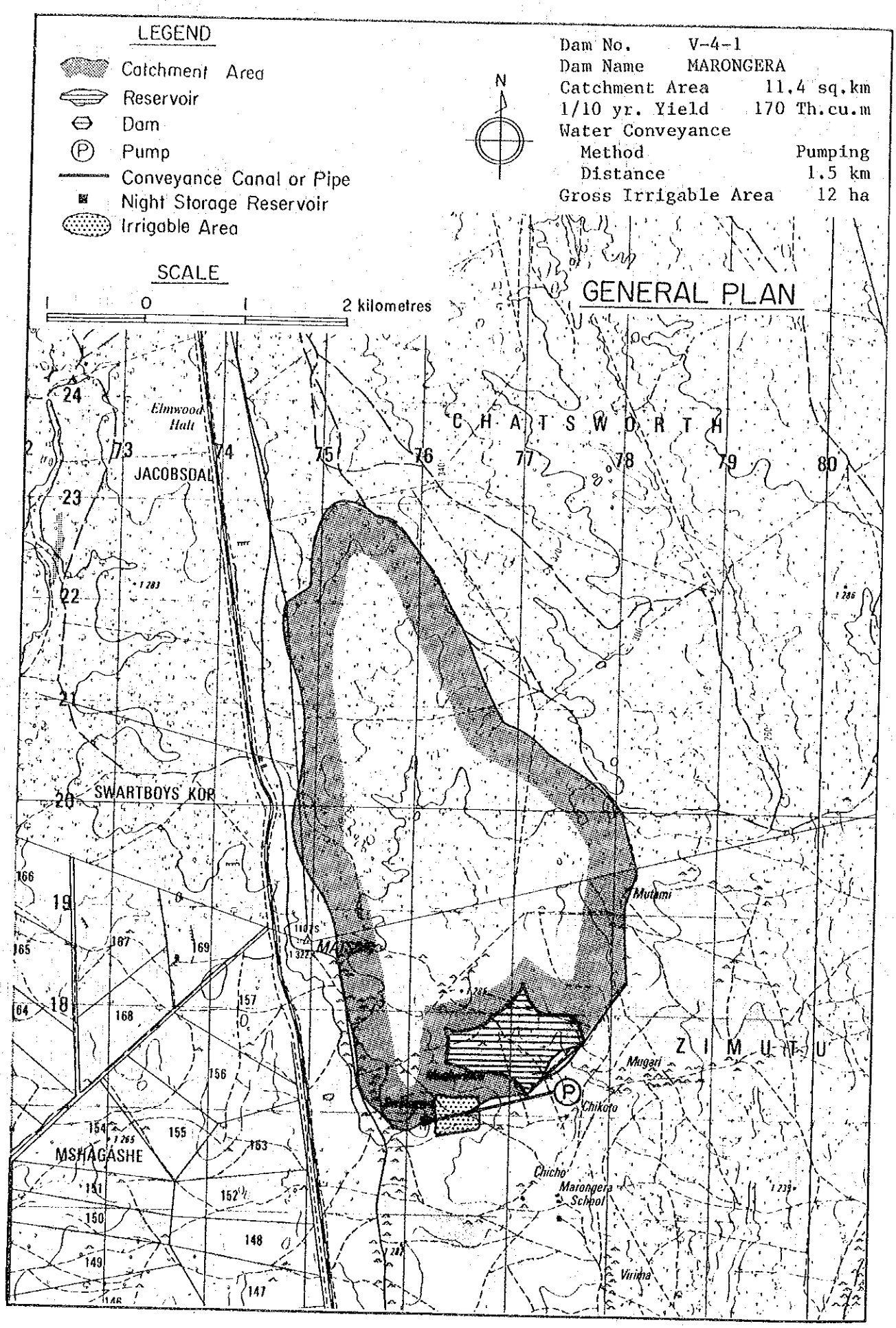
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 1 075 000	Z$ 889 000	Z$ 1 964 000	C
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 22 421 /year	Z$ 261 000	—	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	N	Y	Y	Y

Remarks	Water Control Area

Present Condition on the Ward

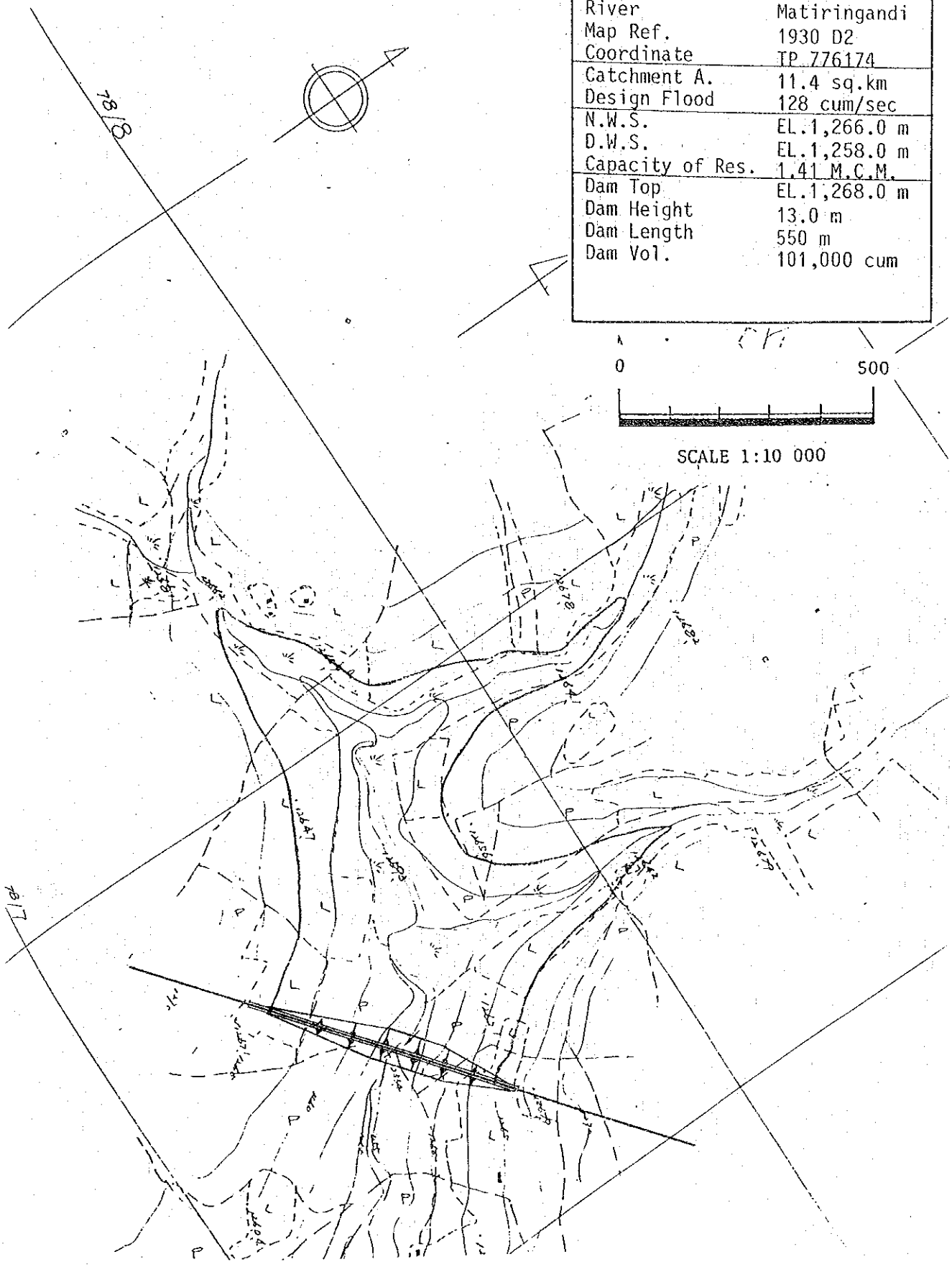
Ward Name	Mushavhi			Area	7 890 ha
Demography	Population Density			63.9	persons/sq.km
	Family Size			5.6	Persons/household
Agriculture	Arable Area	N.A ha		Grazing Area	N.A ha
	Maize	0.7 ha/household		15	bags/ha
	Sorghum	- ha/household		-	bags/ha
	Livestock	2.2 LSUs/household		25.5	LSUs/sq.km
Rural Water Supply	Borehole	0.04 units/sq.km		1 680	persons/unit
	Well	0.11 units/sq.km		560	persons/unit


LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
N
Dam No. V-4-1
Dam Name MARONGERA
Catchment Area 11.4 sq.km
1/10 yr. Yield 170 Th.cu.m
Water Conveyance
Method Pumping
Distance 1.5 km
Gross Irrigable Area 12 ha
SCALE
1 0 1 2 kilometres
GENERAL PLAN
CHATSWORTH
JACOBSDAL
SWARTBOYS' KOP
MSHAGASHE
ZIMUTU
Elmwood Halt
Mutami
Mugari
Chikoro
Chicho
Marongera School
Vimima

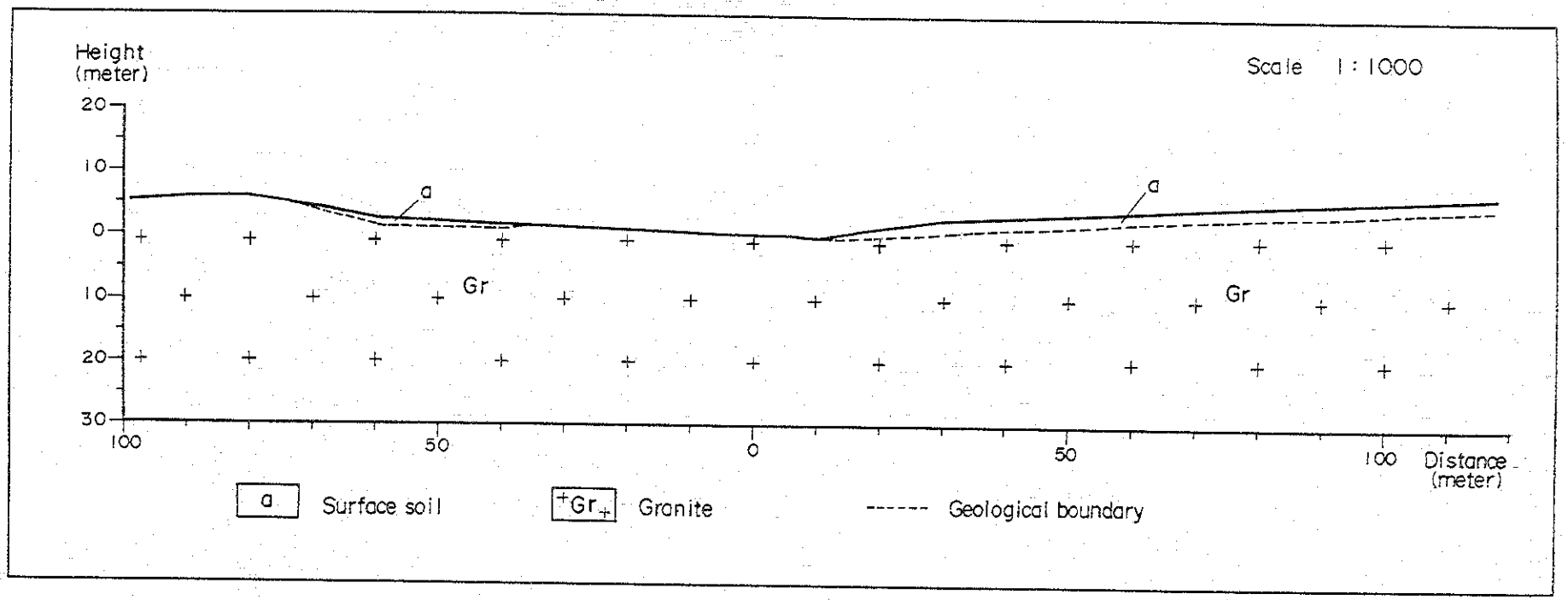
MARONGERA

PLAN OF DAM

Dam No.	V - 4 - 1
District	Masvingo
Communal L.	Zimutu
River	Matiringandi
Map Ref.	1930 D2
Coordinate	TP 776174
Catchment A.	11.4 sq.km
Design Flood	128 cum/sec
N.W.S.	EL.1,266.0 m
D.W.S.	EL.1,258.0 m
Capacity of Res.	1.41 M.C.M.
Dam Top	EL.1,268.0 m
Dam Height	13.0 m
Dam Length	550 m
Dam Vol.	101,000 cum



V-4-1 Marongera



The ground survey was not carried out in this area, therefore the geographical and the geological conditions were studied from existing data.

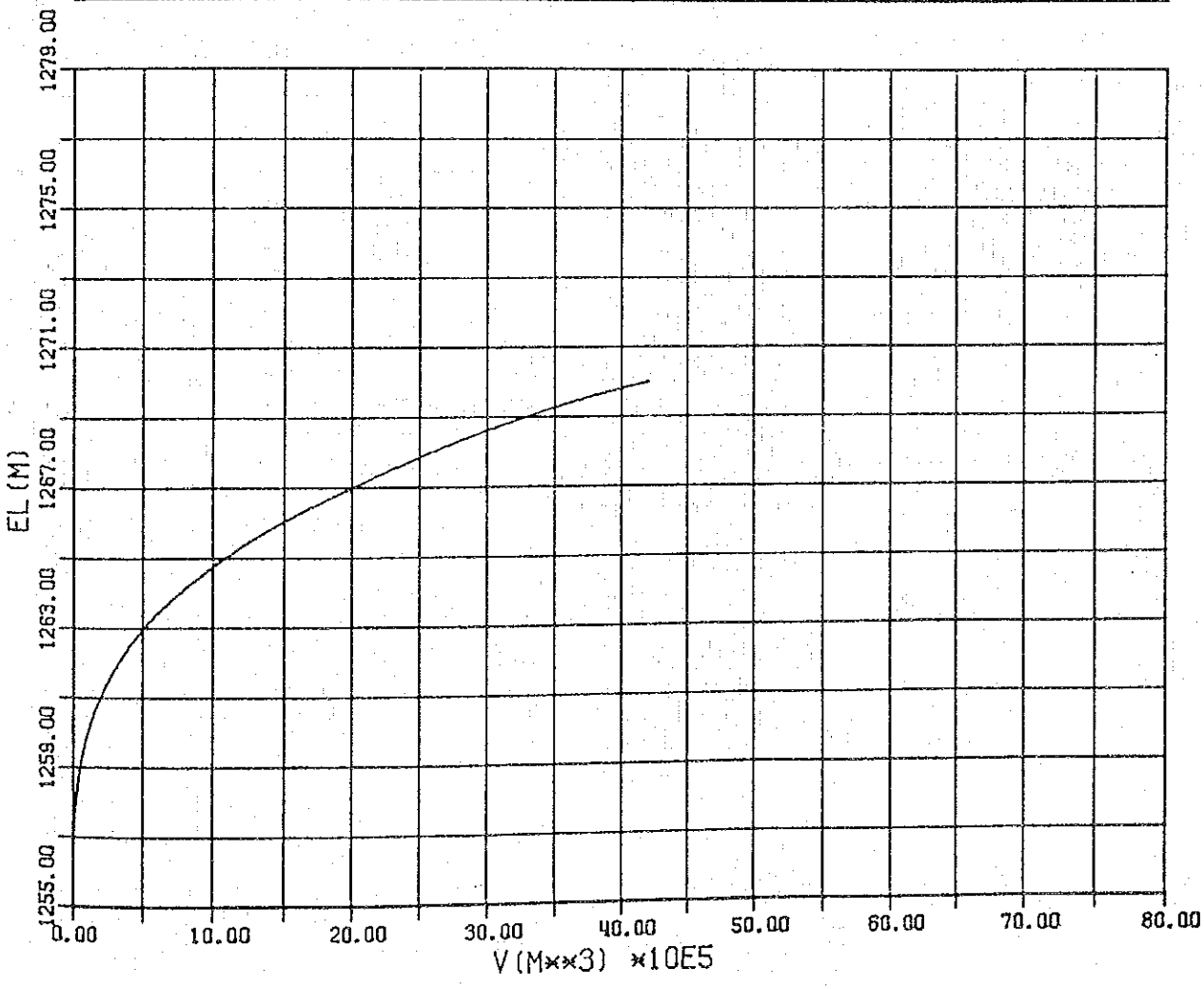
The area is flat land, and slopes gently towards the Matiringandi River. The river forms shallow and relatively wide valley.

The bedrock consists of granite and the surface soil is thick. Because outcrops is a few and the bedrock seems to be soft, it is difficult to find a good damsite.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-4-1	193002	UP	776	174

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
1255.4	0.0	0	0	0	0.00	
1257.5	2.1	9733	4867	10220	10.22	
1260.0	2.5	67192	38463	96156	106.38	
1262.5	2.5	174997	121095	302736	409.11	
1265.0	2.5	362742	26886	672174	1081.29	
1267.5	2.5	599410	481076	120268	2283.98	
1270.0	2.5	933970	766690	1916725	4200.70	



No. V-4-2 Name of Dam Macheka

Location	District Masvingo			Communal Land Zimutu	
	Map Ref. 1930D4			Coordinates TP850143	
Geology	Granite, it has been changed into boulders and leakage is great from the airphoto-reading the surface soil is thin.				
Hydrology	River Macheka			Hydrological Zone E-UT4	
	Catchment Area	29.2	sq.km	M.A. Rainfall	690 mm
	M.A. Runoff	62	mm	Sediment	60 tonnes km^2/yr.
Reservoir	Effective Capacity	1.180	MCM	1/10 Yr. Yield	0.326 MCM
	Dead Capacity	0.030	MCM	D.W.S.	1 219 m
	Total Capacity	1.210	MCM	N.W.S.	1 225 m
Dam	Height	10	m	Length	500 m
	Embankment Volume	42 000	cu.m	Spillway	133 m
Agriculture	Natural Region IV			Soil SL	
	Potential Irrigable Area				150 ha
	Proposed Cropping Pattern			B	
Irrigation	Net Irrigable Area 19.2 ha			Dist. 2.4 km by Gravity	
	Topography	Area		Flat	
		Conveyance		Gently sloping	
Rural Water Supply	Population	1 848	person		37 cu.m/day
	Livestock	1 955	unit		90 cu.m/day

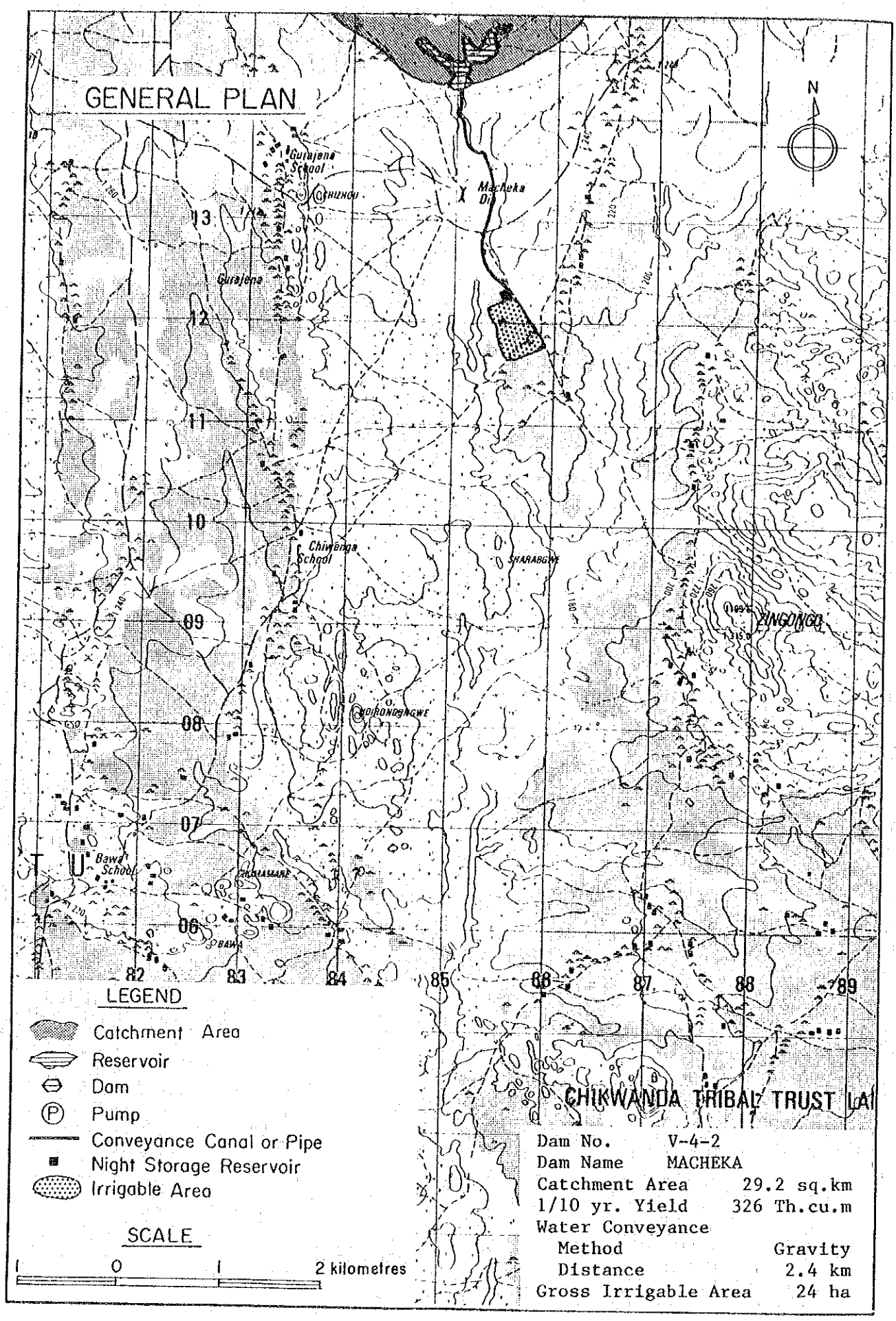
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 1 185 000	Z$ 585 000	Z$ 1 770 000	B
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 31 453 /year	Z$ 366 000	1.8 per cent	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	N	Y	N	N

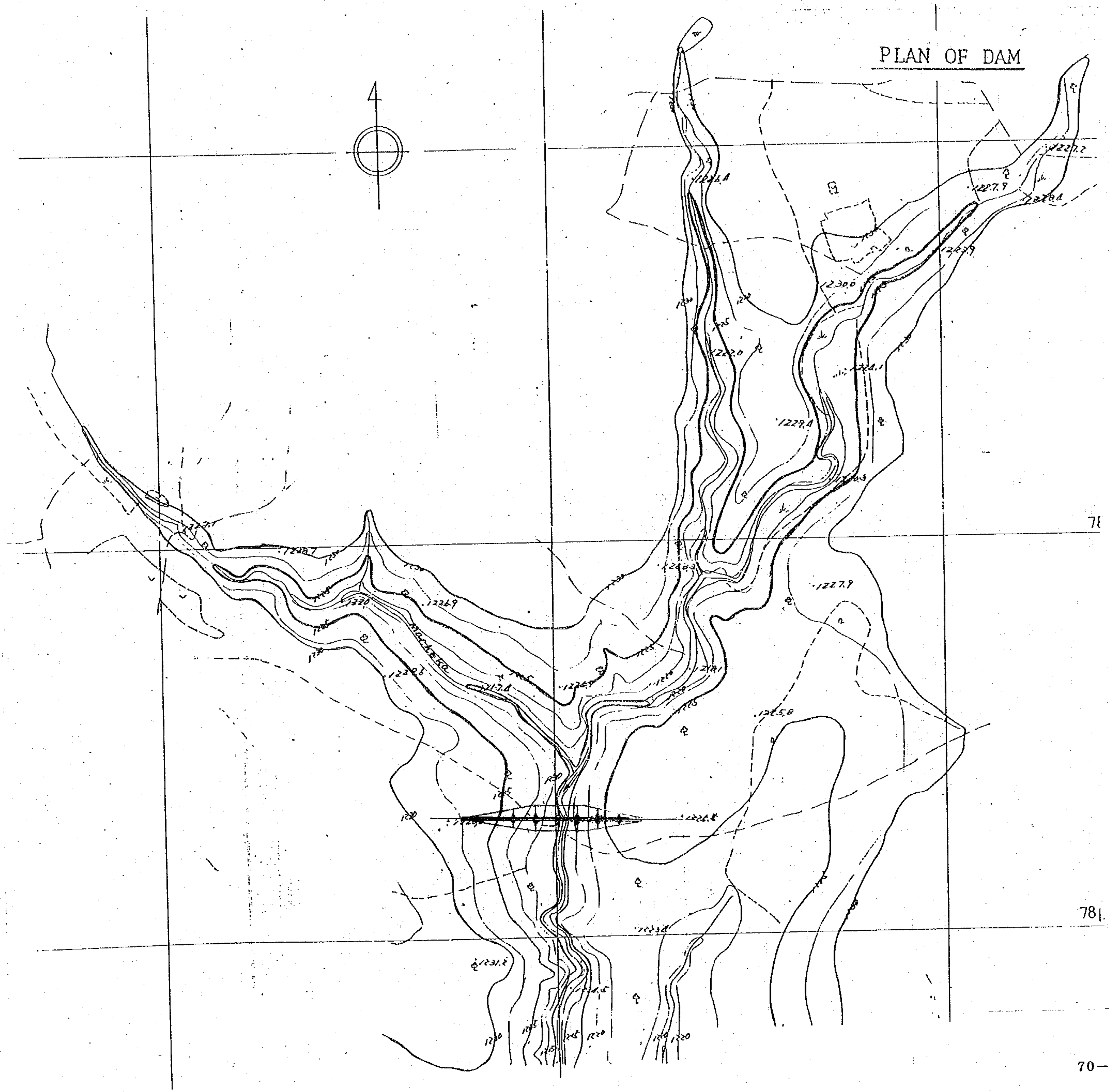
Remarks	Water Control Area

Present Condition on the Ward

Ward Name	Gurajena			Area	6 820 ha
Demography	Population Density			61.6	persons/sq.km
	Family Size			4.2	Persons/household
Agriculture	Arable Area	N.A	ha	Grazing Area	N.A ha
	Maize	0.9	ha/household	15	bags/ha
	Sorghum	0.	ha/household	5	bags/ha
	Livestock	2.7	LSUs/household	39.1	LSUs/sq.km
Rural Water Supply	Borehole	0.12	units/sq.km	525	persons/unit
	Well	0.15	units/sq.km	420	persons/unit


GENERAL PLAN
N
Gurajena School
CHIUNGU
Macheka Dam
Gurajena
Chiwenga School
SHARABGWE
ZINGONGO
CHIKWANDA TRIBAL TRUST LAND
Bawa School
BAWA
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres
Dam No. V-4-2
Dam Name MACHEKA
Catchment Area 29.2 sq.km
1/10 yr. Yield 326 Th.cu.m
Water Conveyance
Method Gravity
Distance 2.4 km
Gross Irrigable Area 24 ha

PLAN OF DAM



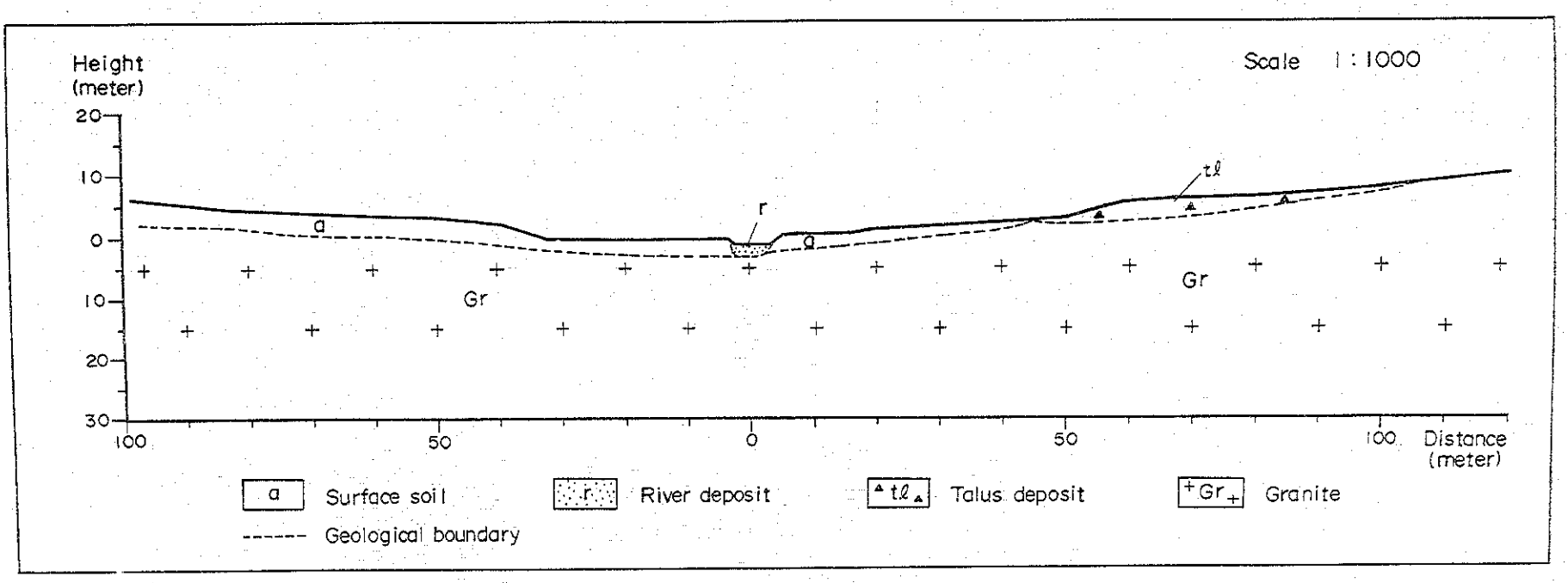
MACHEKA

Dam No.	V - 4 - 2
District	Masvingo
Communal L.	Zimutu
River	Macheka
Map Ref.	1930 D4
Coordinate	TP 850143
Catchment A.	29.2 sq.km
Design Flood	239 cum/sec
N.W.S.	EL.1,225.0 m
D.W.S.	EL.1,219.0 m
Capacity of Res.	1.21 M.C.M.
Dam Top	EL.1,227.0 m
Dam Height	10.0 m
Dam Length	500 m
Dam Vol.	42,000 cum

0 500

SCALE 1:10 000

V-4-2 Macheka



The ground survey was not carried out in this area, therefore the geographical and the geological conditions were studied from existing data.

The area is flat land and slopes gently towards the Macheka River which forms a narrow and shallow valley.

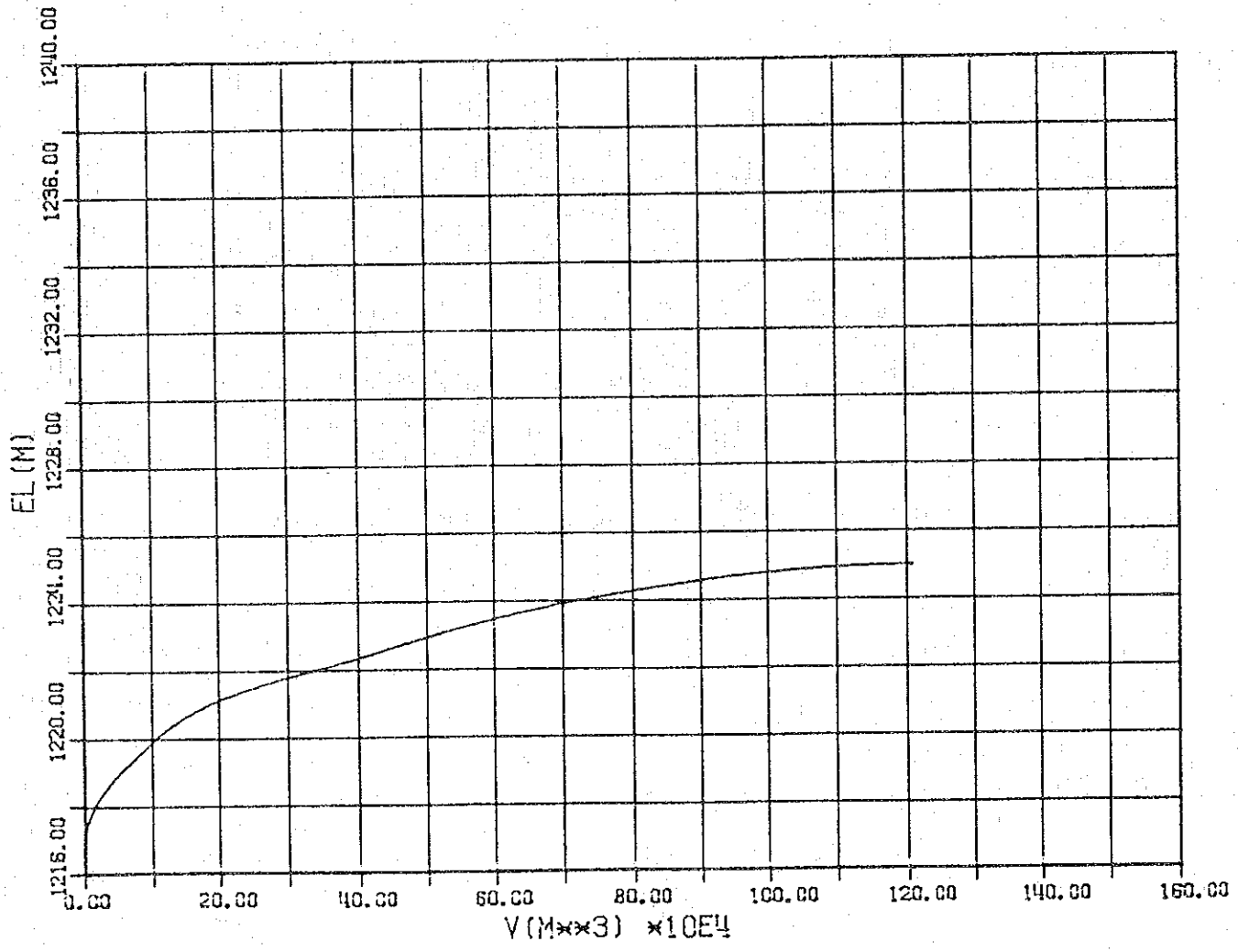
The bedrock consists of granite, and the surface soil is thin.

The air-photograph indicates that outcrops are well, however, the bedrock has been changed into boulders, therefore leakage seems to be large.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-4-2	1930D4	TP	850	143

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
1216.6	0.0	0	0	0	0.00	
1217.5	0.9	11956	5978	5380	5.38	
1220.0	2.5	67690	39823	99558	104.94	
1222.5	2.5	188400	128045	320113	425.05	
1225.0	2.5	437234	312817	782043	1207.09	



No. V-4-3 Name of Dam Mahoto

Location	District Masvingo			Communal Land Zimutu	
	Map Ref. 1930D4			Coordinates TN768959	
Geology	Granite, the surface soil is deep, the bedrock has been changed into boulders, and leakage is great.				
Hydrology	River Makurumidzi			Hydrological Zone E-UT4	
	Catchment Area	23.4	sq.km	M.A. Rainfall	670 mm
	M.A. Runoff	56	mm	Sediment	60 tonnes km^2/yr.
Reservoir	Effective Capacity	1.260	MCM	1/10 Yr. Yield	0.275 MCM
	Dead Capacity	0.020	MCM	D.W.S.	1 141 m
	Total Capacity	1.280	MCM	N.W.S.	1 148 m
Dam	Height	11	m	Length	1 000 m
	Embankment Volume	121 000	cu.m	Spillway	115 m
Agriculture	Natural Region IV			Soil L-CL	
	Potential Irrigable Area				20 ha
	Proposed Cropping Pattern			A	
Irrigation	Net Irrigable Area 16.2ha			Dist. 5.0 km by Gravity	
	Topography	Area		Undulated	
		Conveyance		Complicated, two river crossings	
Rural Water Supply	Population	2 973	person		60 cu.m/day
	Livestock	1 310	unit		59 cu.m/day

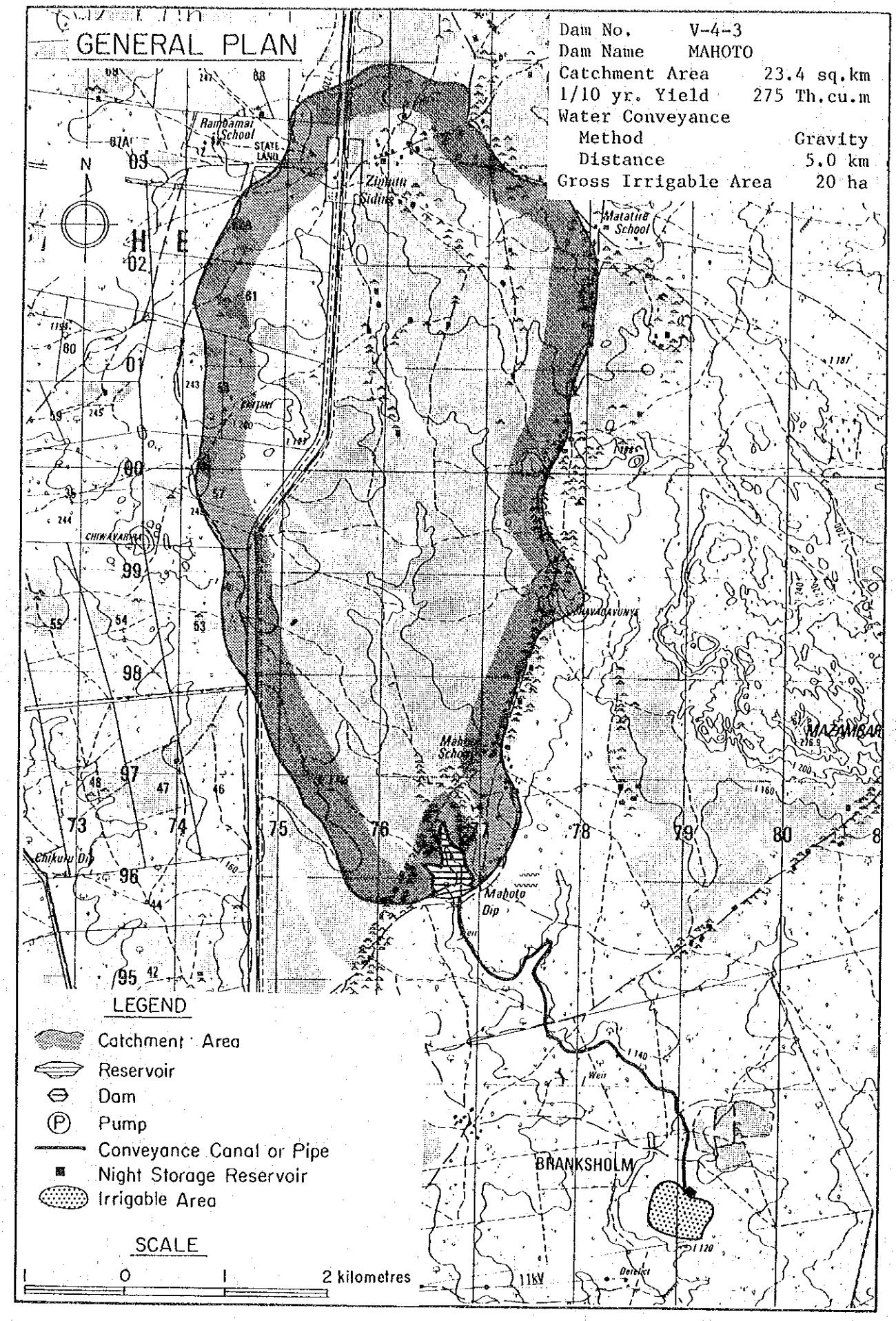
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 1 360 000	Z$ 1 082 000	Z$ 2 442 000	B
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 61 267 /year	Z$ 712 000	3.8 per cent	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	N	N	Y	Y	Y

Remarks	Water Control Area

Present Condition on the Ward

Ward Name	Zimuto			Area	6 360 ha
Demography	Population Density			99.1	persons/sq.km
	Family Size			6.3	Persons/household
Agriculture	Arable Area	N.A	ha	Grazing Area	N.A. ha
	Maize	0.5	ha/household	15	bags/ha
	Sorghum	0.	ha/household	4	bags/ha
	Livestock	1.7	LSUs/household	26.2	LSUs/sq.km
Rural Water Supply	Borehole	0.08	units/sq.km	1 260	persons/unit
	Well	0.09	units/sq.km	1 050	persons/unit

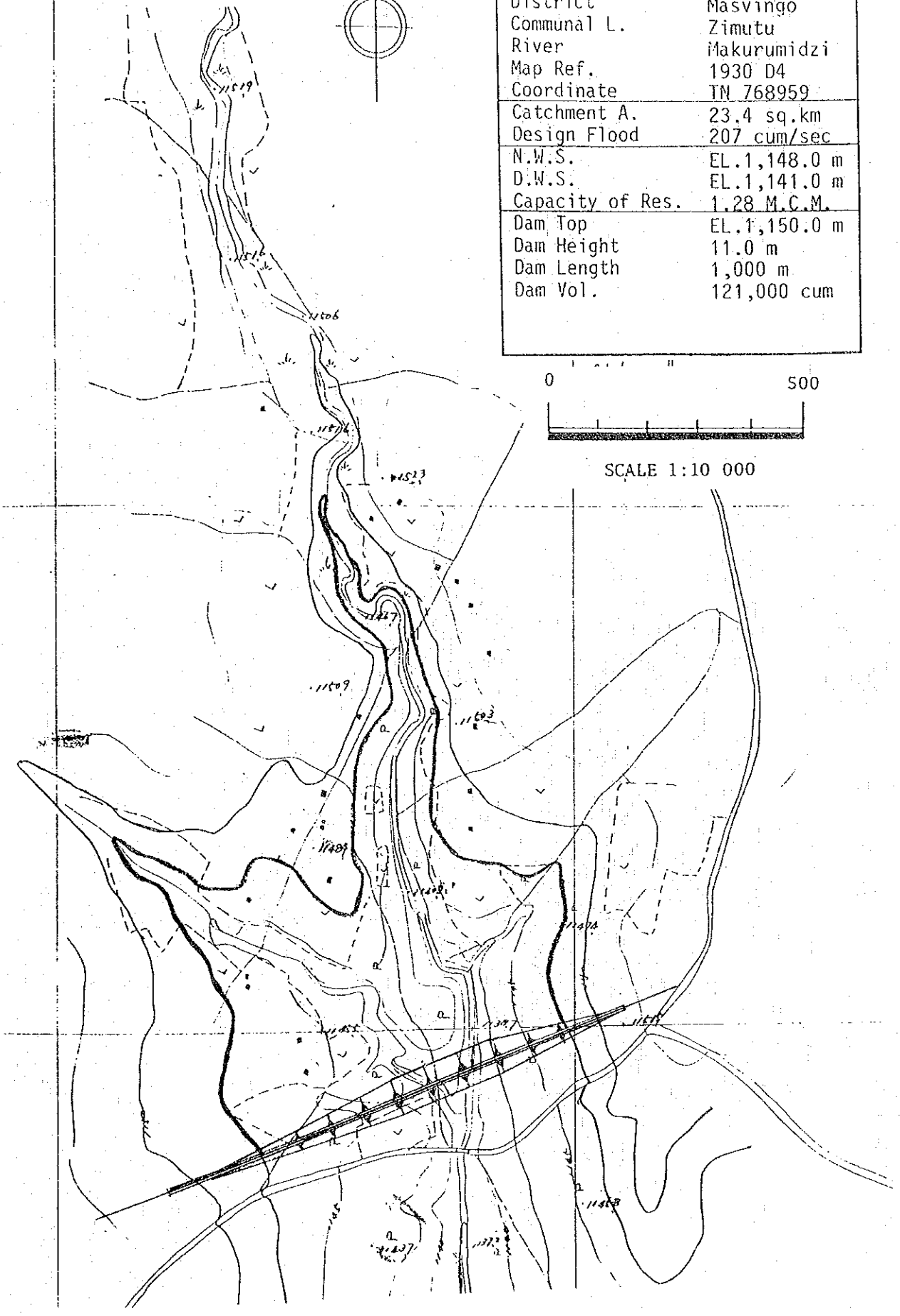

GENERAL PLAN
Dam No. V-4-3
Dam Name MAHOTO
Catchment Area 23.4 sq.km
1/10 yr. Yield 275 Th.cu.m
Water Conveyance
Method Gravity
Distance 5.0 km
Gross Irrigable Area 20 ha
N
Rambamai School
STATE LAND
Zimbuu Siding
Matatire School
Mahoto Dip
Chikuku Dip
BRANKSHOLM
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
2 kilometres
11kV

276.

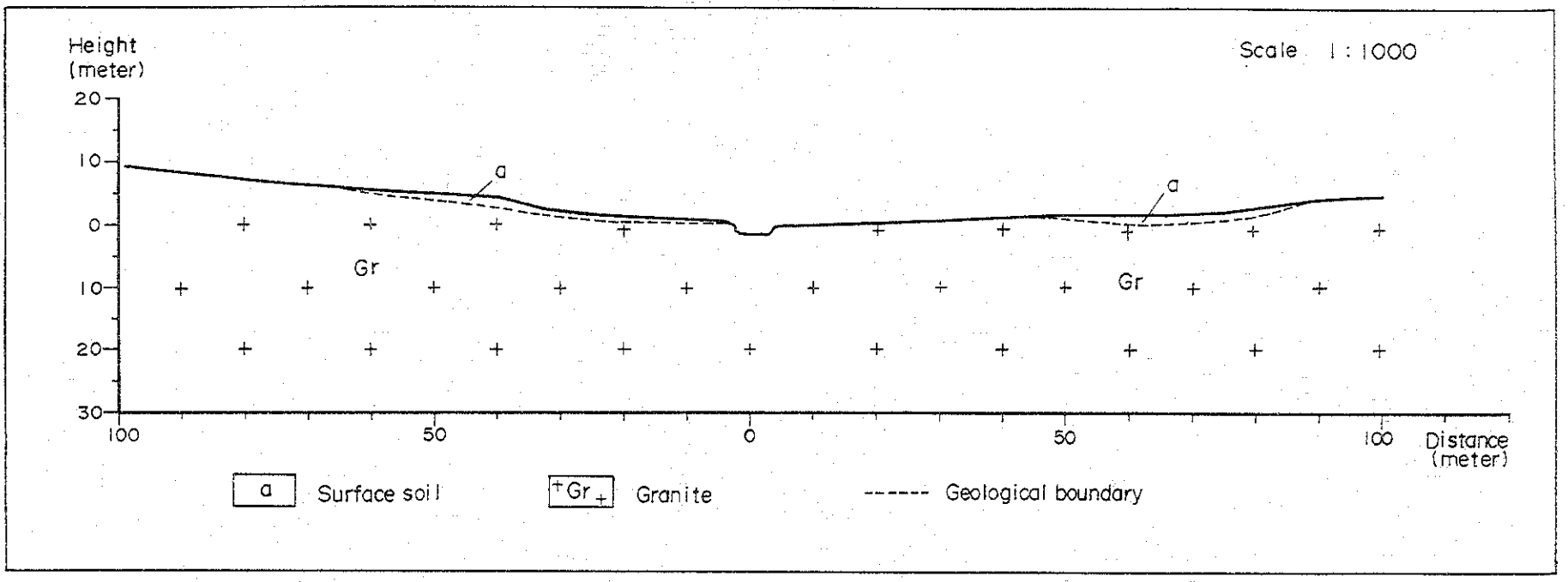
PLAN OF DAM

MAHOTO
7798

Dam No.	V - 4 - 3
District	Masvingo
Communal L.	Zimutu
River	Makurumidzi
Map Ref.	1930 D4
Coordinate	TN 768959
Catchment A.	23.4 sq.km
Design Flood	207 cum/sec
N.W.S.	EL.1,148.0 m
D.W.S.	EL.1,141.0 m
Capacity of Res.	1.28 M.C.M.
Dam Top	EL.1,150.0 m
Dam Height	11.0 m
Dam Length	1,000 m
Dam Vol.	121,000 cum



V-4-3 Mahoto



The ground survey was not carried out in this area, therefore the geographical and the geological conditions were studied from existing data.

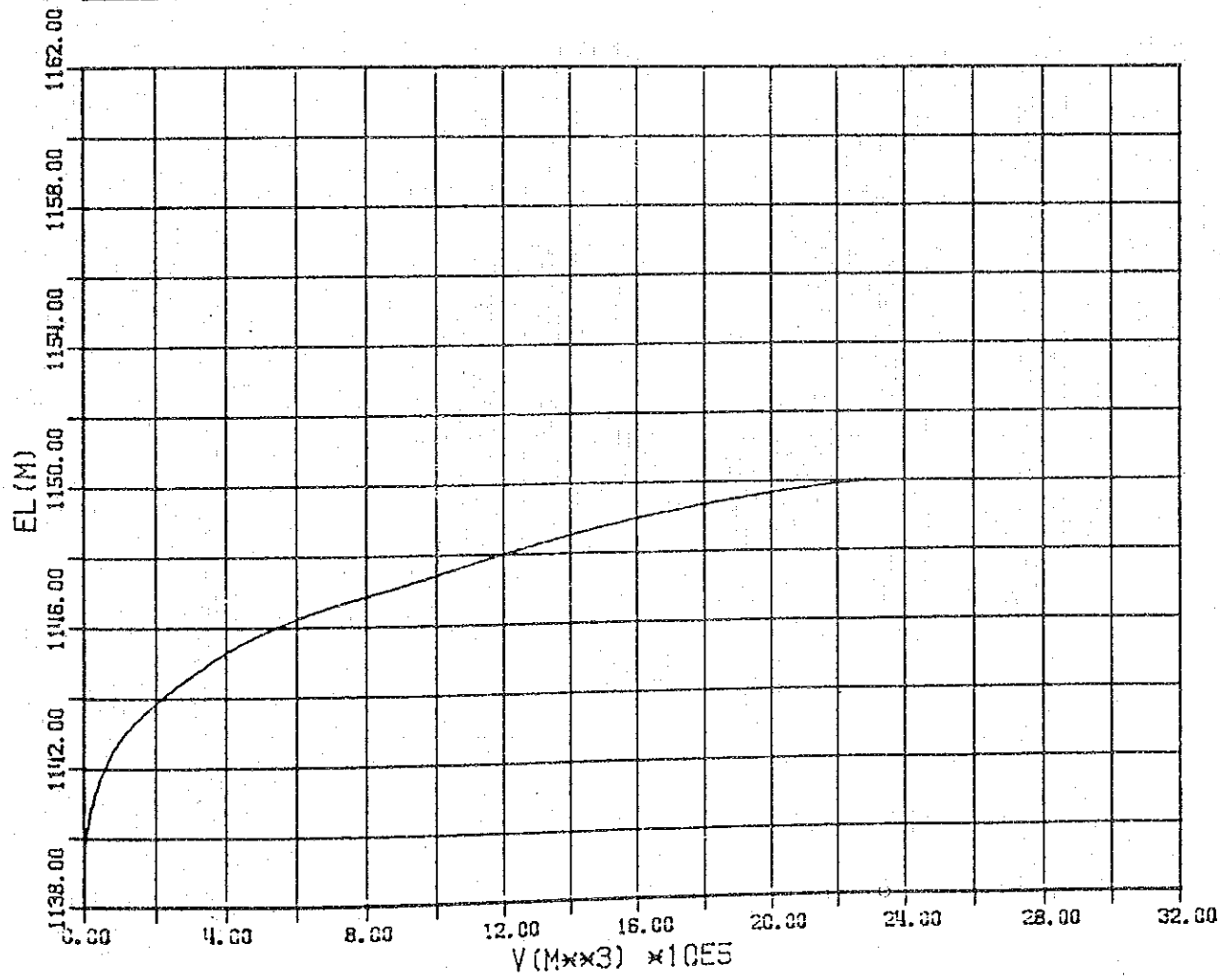
The area is flat land and slopes gently towards the Makurumidzi River which forms shallow and relatively wide flood plane.

The bedrock consists of granite, and the surface soil seems to be thick. Flat landform, a few outcrops and the bedrock that has been changed into boulders indicate that it is difficult to find a good damsite in this area.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
V-4-3	193004	TN	768	959

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
1138.5	0.0	0	0	0	0.00	
1140.0	1.5	8500	4250	6375	6.37	
1142.5	2.5	50500	29500	73750	80.12	
1145.0	2.5	168500	109500	273750	353.87	
1147.5	2.5	369000	268750	671875	1025.75	
1150.0	2.5	637500	503250	1258125	2283.87	



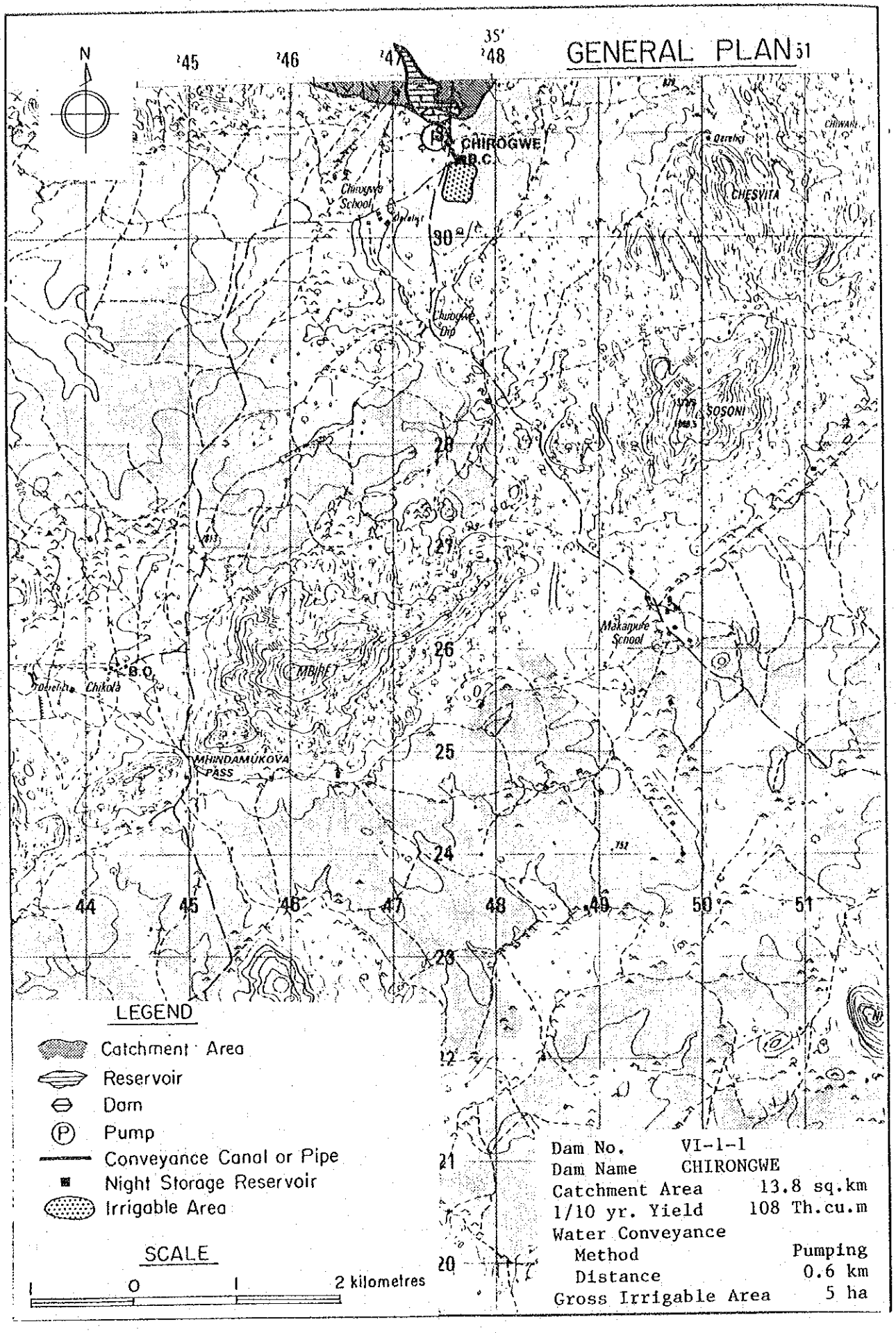
No. VI-1-1 Name of Dam Chirongwe

Location	District Chivi			Communal Land Chivi	
	Map Ref. 2030D1			Coordinates TN473312	
Geology	Gneiss, massive and hard, there is a foult.				
Hydrology	River Save			Hydrological Zone E-L3	
	Catchment Area	13.8	sq.km	M.A. Rainfall	560 mm
	M.A. Runoff	29	mm	Sediment	70 tonnes km^2/yr.
Reservoir	Effective Capacity	0.79	MCM	1/10 Yr. Yield	0.108 MCM
	Dead Capacity	0.01	MCM	D.W.S.	811 m
	Total Capacity	0.80	MCM	N.W.S.	820 m
Dam	Height	14	m	Length	590 m
	Embankment Volume	79 000	cu.m	Spillway	83 m
Agriculture	Natural Region V			Soil SL	
	Potential Irrigable Area				60 ha
	Proposed Cropping Pattern			B	
Irrigation	Net Irrigable Area 3.7 ha			Dist. 0.6 km by Pump, H=9.0 m	
	Topography	Area		Flat	
		Conveyance		Slightly sloping	
Rural Water Supply	Population	2 040	person		41 cu.m/day
	Livestock	1 810	unit		82 cu.m/day
Cost and Benefit	Dam	Irrigation Facilities		Total Cost	Class
	Z$ 847 000	Z$ 385 000		Z$ 1 232 000	C
	Annual Increment Benefit	Net Present Value		Economic Internal Rate of Return	
	Z$ 9 063 /year	Z$ 105 000		—	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y
Remarks					

Present Condition on the Ward

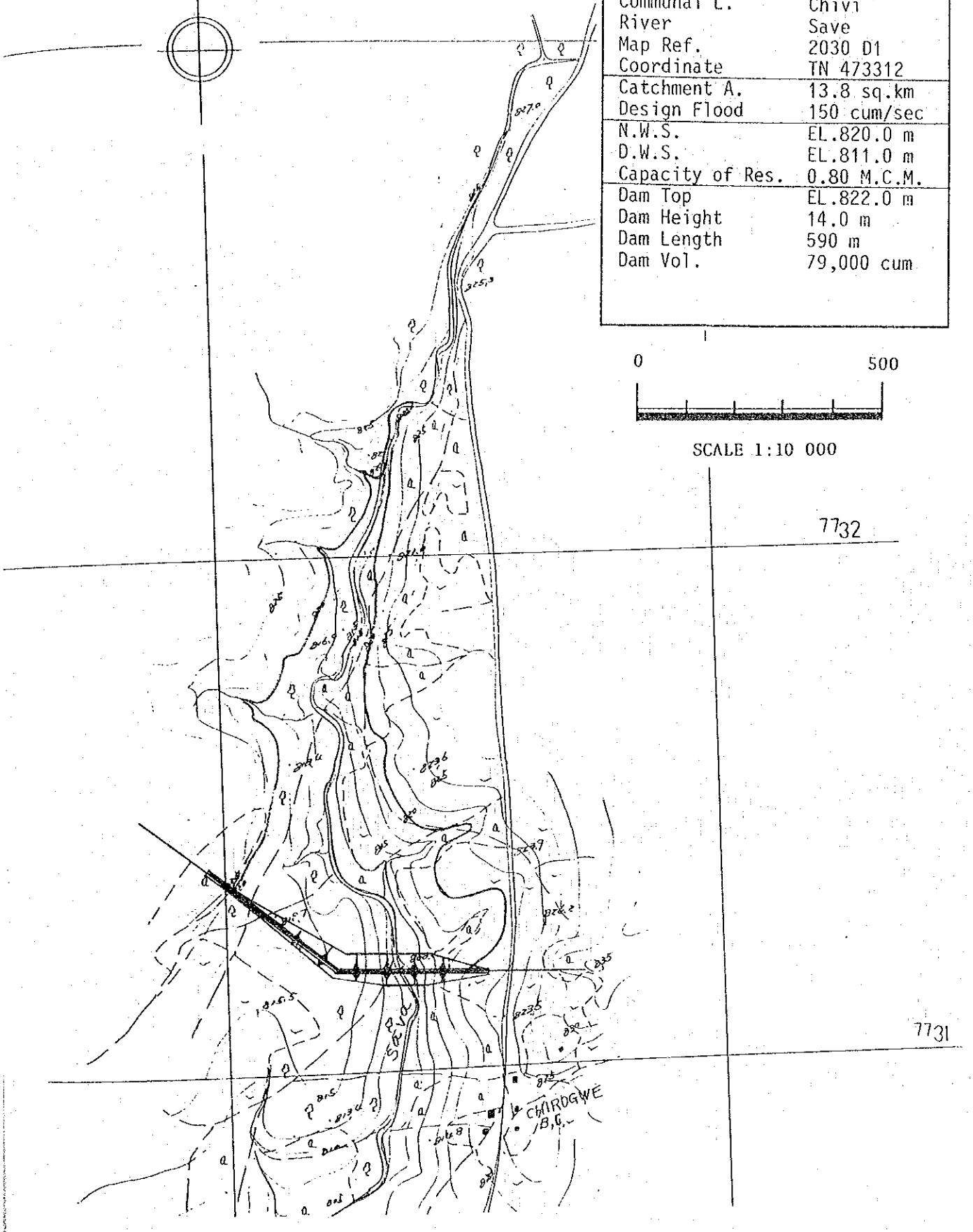
Ward Name	17			Area	14 900 ha
Demography	Population Density			40.8	persons/sq.km
	Family Size			4.8	Persons/household
Agriculture	Arable Area	6 705	ha	Grazing Area	8 195 ha
	Maize	0.5	ha/household	7	bags/ha
	Sorghum	0.5	ha/household	6	bags/ha
	Livestock	2.1	LSUs/household	18.1	LSUs/sq.km
Rural Water Supply	Borehole	0.03	units/sq.km	1 518	persons/unit
	Well	0.04	units/sq.km	1 012	persons/unit


GENERAL PLAN
N
35'
45
46
47
48
51
CHIROGWE
B.C
Chirogwe School
CHESVITA
SOSONI
Chirogwe Dip
Makanjure School
B.C.
Chikola
MBIRET
MHINDAMUKOVA PASS
44
45
46
47
48
49
50
51
30
29
28
27
26
25
24
23
22
21
20
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres
Dam No. VI-1-1
Dam Name CHIRONGWE
Catchment Area 13.8 sq.km
1/10 yr. Yield 108 Th.cu.m
Water Conveyance
Method Pumping
Distance 0.6 km
Gross Irrigable Area 5 ha

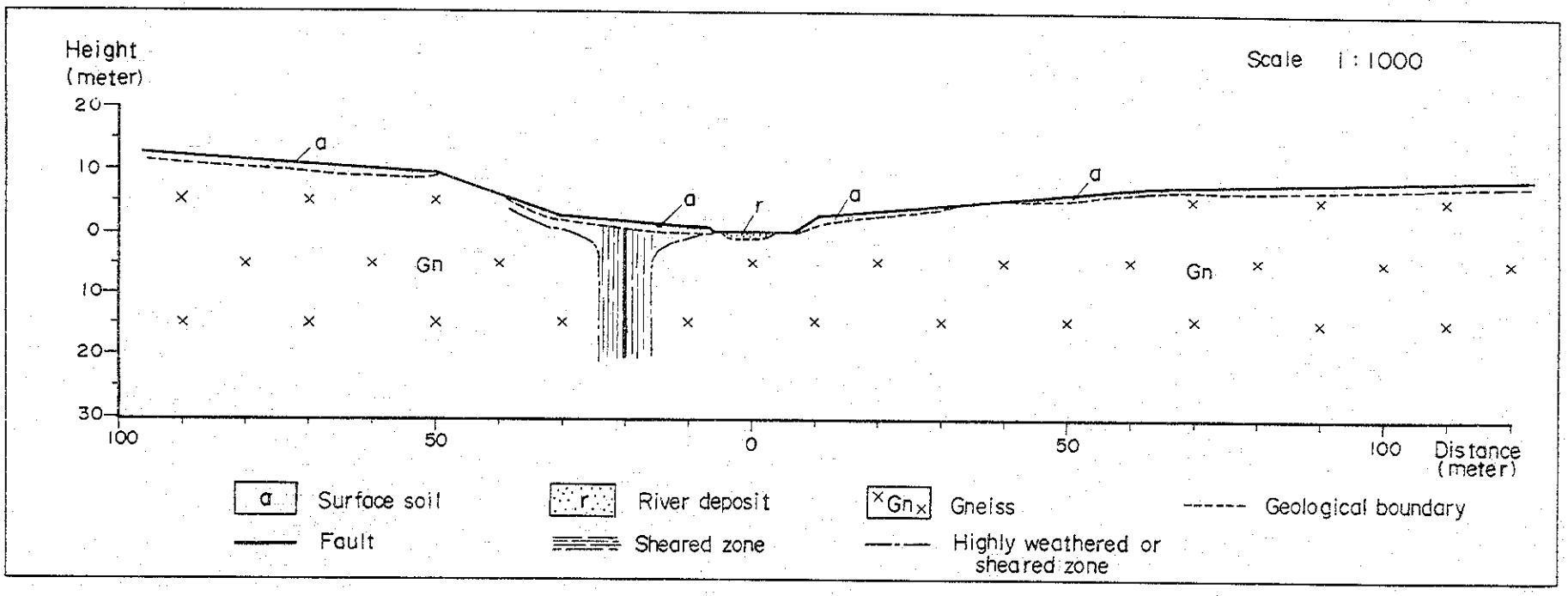
PLAN OF DAM

CHIRONGWE

Dam No.	VI- 1 - 1
District	Chivi
Communal L.	Chivi
River	Save
Map Ref.	2030 D1
Coordinate	TN 473312
Catchment A.	13.8 sq.km
Design Flood	150 cum/sec
N.W.S.	EL.820.0 m
D.W.S.	EL.811.0 m
Capacity of Res.	0.80 M.C.M.
Dam Top	EL.822.0 m
Dam Height	14.0 m
Dam Length	590 m
Dam Vol.	79,000 cum



VI-1-1 Chirongwe

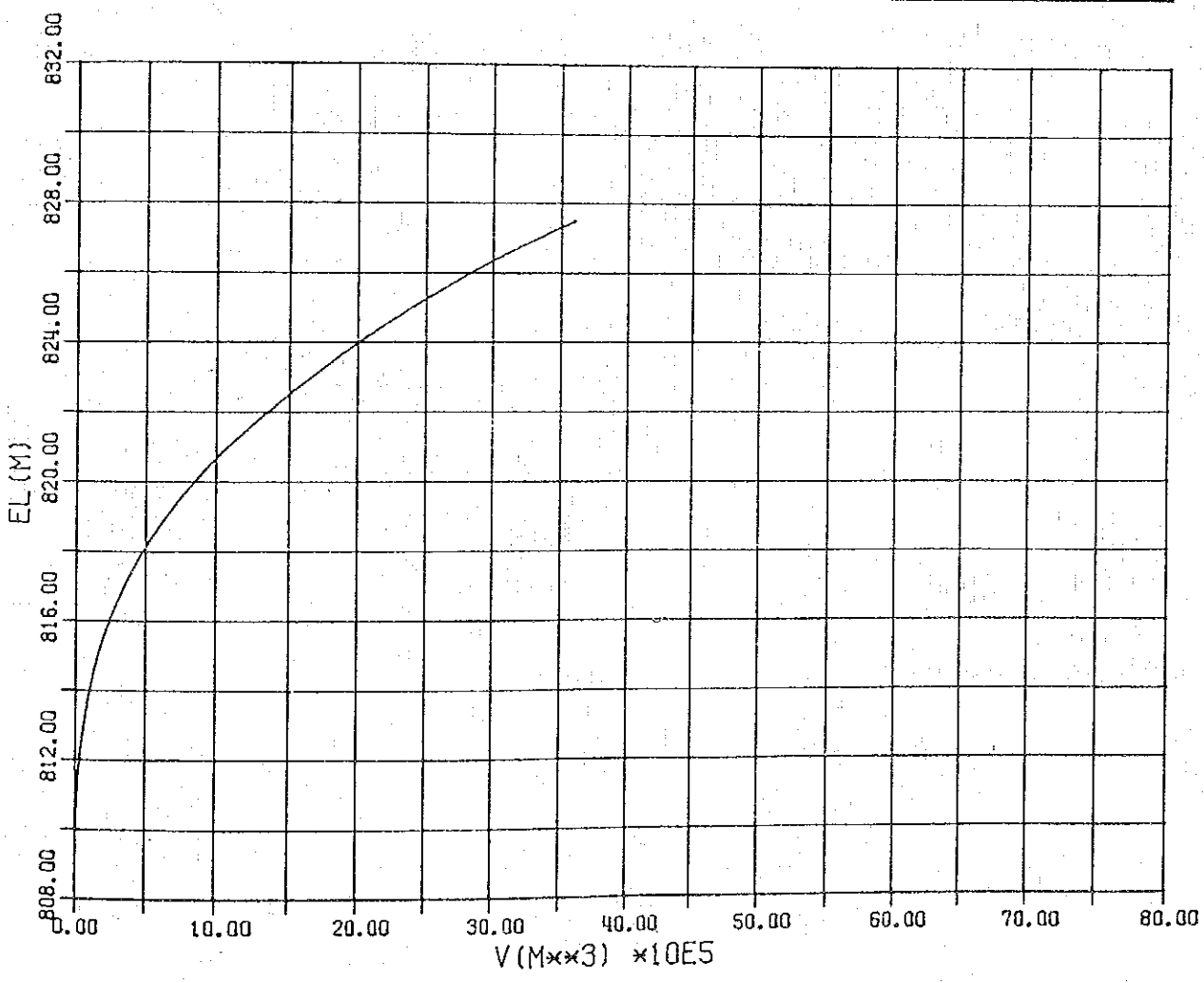


The Save River in the area flows straight and very gently.
The bedrock consists of gneiss, and it is massive and hard. A dyke of dolerite about 3 meters wide is distributed in parallel with the dam axis. A small scale fault trending N40°W direction is distributed at the left abutment. However the dyke and the fault do not affect the safety of the dam embankment.
The unconsolidated deposits are estimated to be 1 to 0.5 meter thick.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
VI-1-1	203001	TN	473	312

EL.(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
808.1	0.0	0	0	0	0.00	
810.0	1.9	5199	259	4939	4.94	
812.5	2.5	24875	15037	37593	42.53	
815.0	2.5	67291	46083	115208	157.74	
817.5	2.5	133292	100292	250729	408.47	
820.0	2.5	216636	174964	437410	845.88	
822.5	2.5	303303	25996	649924	1495.80	
825.0	2.5	416167	359735	899338	2395.14	
827.5	2.5	550632	483400	1208498	3603.64	



No. VI-1-2 Name of Dam Nemavuzhe

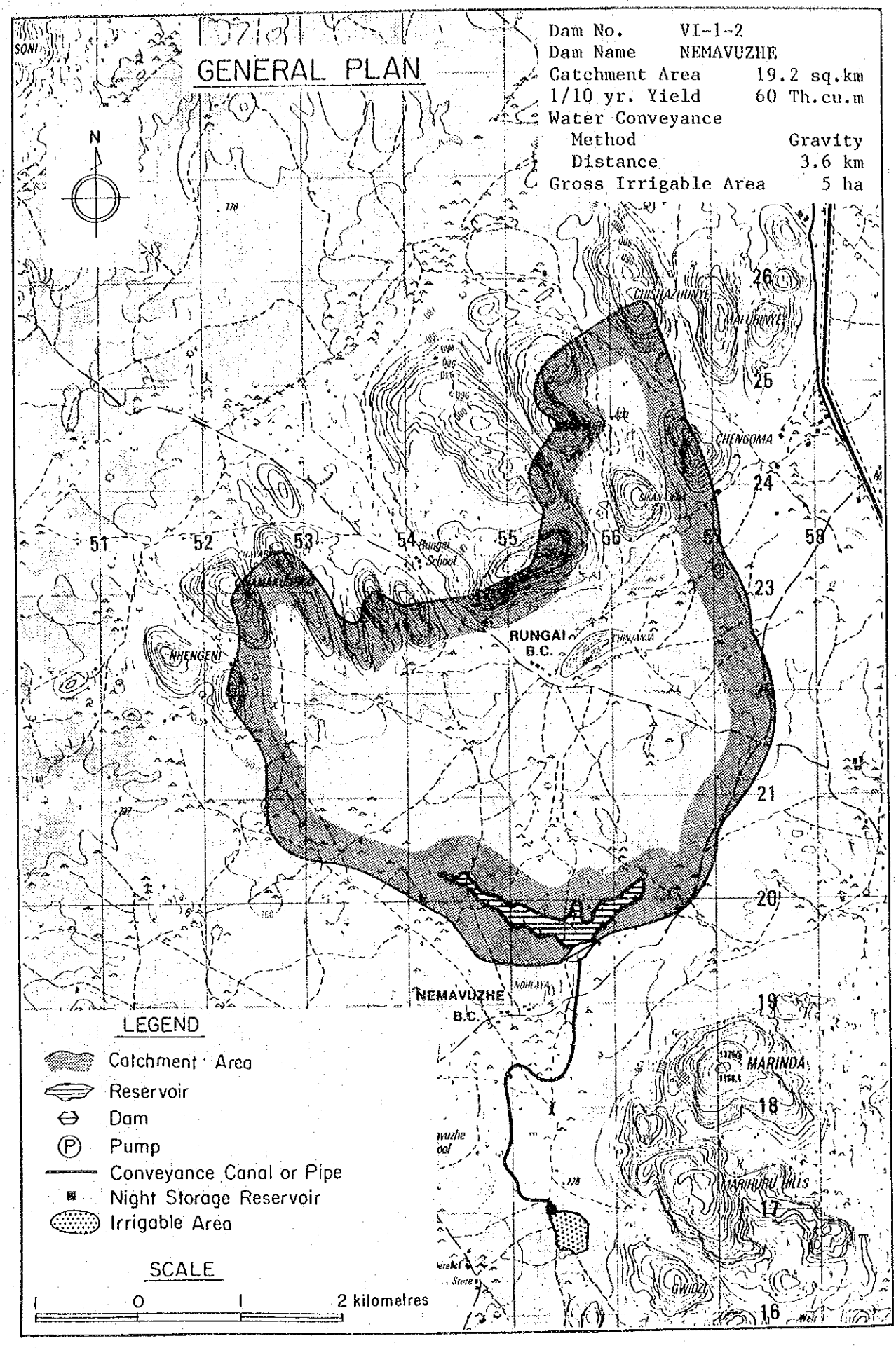
Location	District Chivi		Communal Land Chivi	
	Map Ref. 2030D1		Coordinates TN558195	
Geology	Gneiss, outcrops very few, shearing and weathering, very soft, joint well developed.			
Hydrology	River Tende		Hydrological Zone E-L2	
	Catchment Area 19.2 sq.km		M.A. Rainfall 570 mm	
	M.A. Runoff 31 mm		Sediment 70 tonnes km^2/yr.	
Reservoir	Effective Capacity 0.330 MCM		1/10 Yr. Yield 0.060 MCM	
	Dead Capacity 0.020 MCM		D.W.S. 736 m	
	Total Capacity 0.350 MCM		N.W.S. 740 m	
Dam	Height 7 m		Length 700 m	
	Embankment Volume 36 000 cu.m		Spillway 101 m	
Agriculture	Natural Region IV		Soil SCL	
	Potential Irrigable Area 80 ha			
	Proposed Cropping Pattern A			
Irrigation	Net Irrigable Area 3.5 ha	Dist. 3.6 km by Gravity		
	Topography	Area	Slightly sloping	
		Conveyance	Slightly sloping, one river crossing	
Rural Water Supply	Population 2 225 person		45 cu.m/day	
	Livestock 2 260 unit		102 cu.m/day	
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 509 000	Z$ 719 000	Z$ 1 228 000	C
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$13 942 /year	Z$ 162 000	–	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

Remarks	Water right ... 18 km (No. 6676)

Present Condition on the Ward

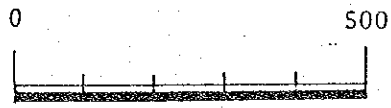
Ward Name	21		Area	13 700 ha
Demography	Population Density		44.5	persons/sq.km
	Family Size		4.5	Persons/household
Agriculture	Arable Area	8 220 ha	Grazing Area	5 480 ha
	Maize	2.2 ha/household	N.A	bags/ha
	Sorghum	0.6 ha/household	N.A	bags/ha
	Livestock	2.3 LSUs/household	22.6	LSUs/sq.km
Rural Water Supply	Borehole	0.06 units/sq.km	762	persons/unit
	Well	– units/sq.km	–	persons/unit


GENERAL PLAN
Dam No. VI-1-2
Dam Name NEMAVUZHE
Catchment Area 19.2 sq.km
1/10 yr. Yield 60 Th.cu.m
Water Conveyance
Method Gravity
Distance 3.6 km
Gross Irrigable Area 5 ha
N
RUNGAI B.C.
NEMAVUZHE B.C.
CHENGOMA
MARINDA
NHENGENI
Rungai School
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres

PLAN OF DAM

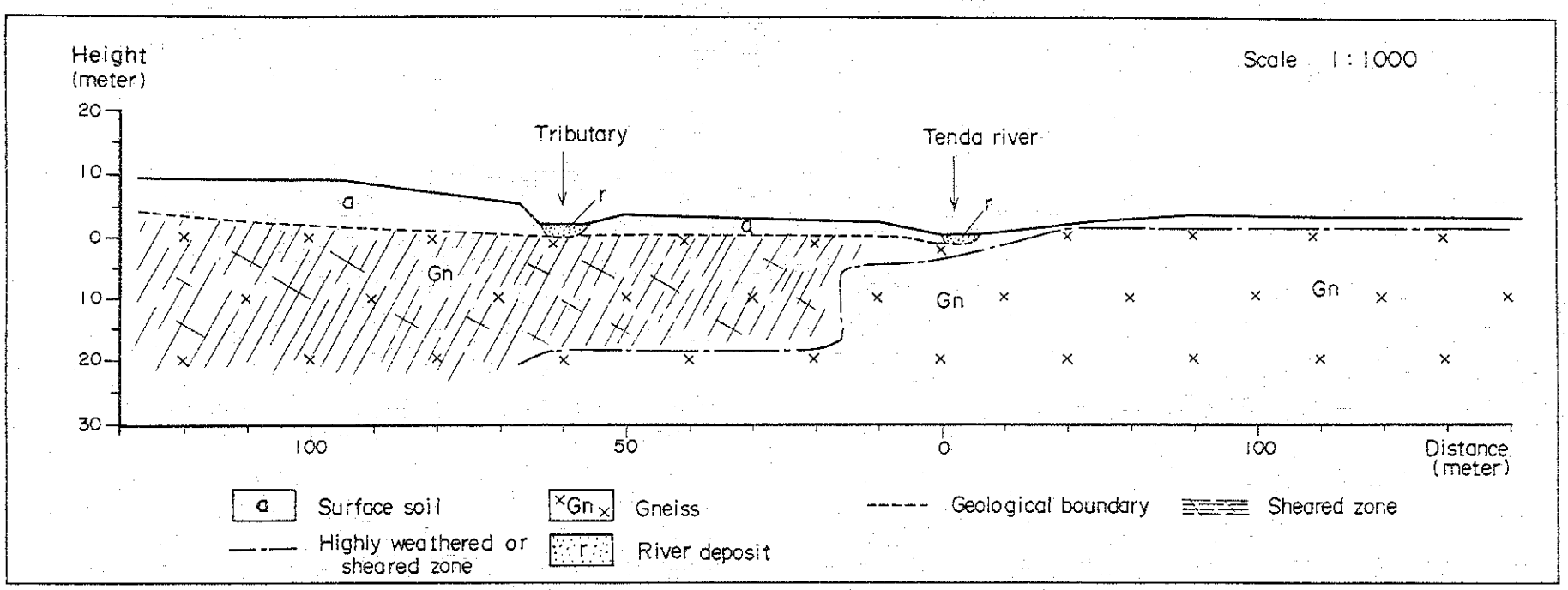
NEMAVUZHE

Dam No.	VI- 1 - 2
District	Chivi
Communal L.	Chivi
River	Tende
Map Ref.	2030 D1
Coordinate	TN 558195
Catchment A.	19.2 sq.km
Design Flood	182 cum/sec
N.W.S.	EL.740.0 m
D.W.S.	EL.736.0 m
Capacity of Res.	0.35 M.C.M.
Dam Top	EL.742.0 m
Dam Height	7.0 m
Dam Length	700 m
Dam Vol.	36,000 cum



SCALE 1:10 000

VI-1-2 Nemavuzhe



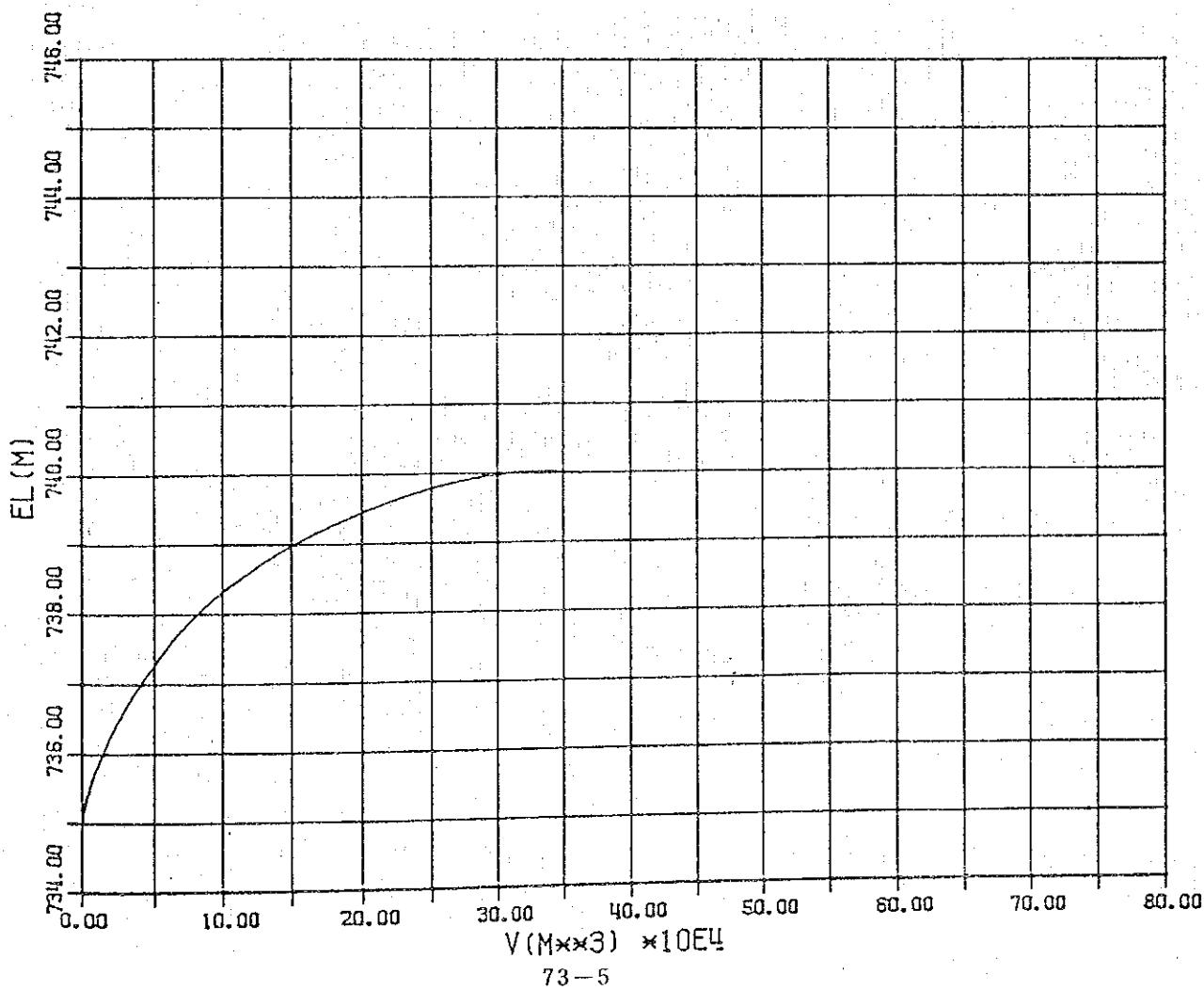
The area forms relatively flat land, and the Tende River forms shallow and narrow valley. Outcrops around the damsite is a few.

The bedrock consists of gneiss and it is sheared widely. The sheared zone is wide and trending E-W direction. The bedrock around the sheared zone has abundant opened joints. It seems that leakage through the bedrock is considerably large and bearing strength in the foundation strata is small. Therefore the bedrock is less suitable for dam foundation from the geological point of view.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
VI-1-2	203001	TN	558	195

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
734.0	0.0	0	0	0	0.00	
735.0	1.0	900	450	450	0.45	
737.5	2.5	45400	23150	57875	58.32	
740.0	2.5	185500	115450	288625	346.95	



No. VI-1-3 Name of Dam Madzivire

Location	District Chivi			Communal Land Chivi	
	Map Ref. 2030D4			Coordinates TM682955	
Geology	Gneiss, generally massive and hard, however sediments are plenty.				
Hydrology	River Chivake			Hydrological Zone E-L2	
	Catchment Area	21.3 sq.km		M.A. Rainfall	690 mm
	M.A. Runoff	62 mm		Sediment	70 tonnes km^2/yr.
Reservoir	Effective Capacity	0.050 MCM		1/10 Yr. Yield	0.013 MCM
	Dead Capacity	0.020 MCM		D.W.S.	609 m
	Total Capacity	0.070 MCM		N.W.S.	611 m
Dam	Height	10 m		Length	280 m
	Embankment Volume	33 000 cu.m		Spillway	108 m
Agriculture	Natural Region IV			Soil L-CL	
	Potential Irrigable Area				50 ha
	Proposed Cropping Pattern		A		
Irrigation	Net Irrigable Area 0.8 ha		Dist. 3.0 km by Gravity		
	Topography	Area	Flat with gullys		
		Conveyance	Gently sloping		
Rural Water Supply	Population	2 260 person			45 cu.m/day
	Livestock	810 unit			37 cu.m/day

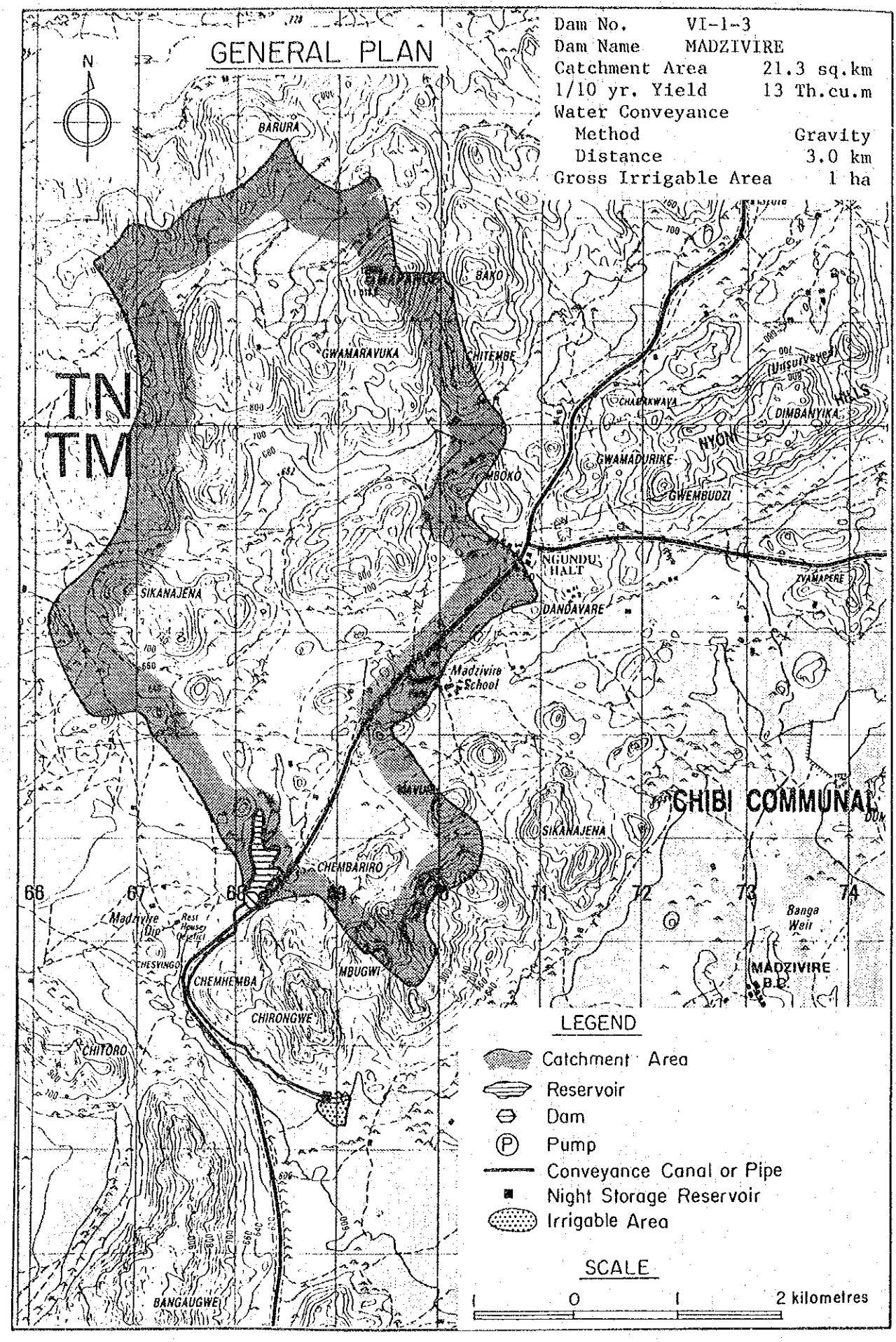
Cost and Benefit	Dam	Irrigation Facilities	Total Cost	Class
	Z$ 392 000	Z$ 518 000	Z$ 910 000	C
	Annual Increment Benefit	Net Present Value	Economic Internal Rate of Return	
	Z$ 4 522 /year	Z$ 53 000	—	

Visit	Dam Engineer	Geologist	Irrigation Engineer	Agronomist	Economist
	Y	Y	Y	Y	Y

Remarks	Storage Ratio < 0.1

Present Condition on the Ward

Ward Name	25			Area	13 600 ha
Demography	Population Density			45.2	persons/sq.km
	Family Size			4.5	Persons/household
Agriculture	Arable Area	3 400 ha		Grazing Area	10 200 ha
	Maize	1.0	ha/household	12	bags/ha
	Sorghum	0.4	ha/household	9	bags/ha
	Livestock	1.6	LSUs/household	16.2	LSUs/sq.km
Rural Water Supply	Borehole	0.03	units/sq.km	1 536	persons/unit
	Well	-	units/sq.km	-	persons/unit


GENERAL PLAN
Dam No. VI-1-3
Dam Name MADZIVIRE
Catchment Area 21.3 sq.km
1/10 yr. Yield 13 Th.cu.m
Water Conveyance
Method Gravity
Distance 3.0 km
Gross Irrigable Area 1 ha
N
TN
TM
BARURA
BAKO
GWAMARAVUKA
CHITEMBE
MBOKO
GWAMADURIKE
GWEMBUDZI
NYONI HILLS
DIMBANYIKA
CHAERKWAVA
NGUNDU HALT
ZVAMAPERE
DANDAVARE
SIKANAJENA
Madzivire School
CHIBI COMMUNAL
CHEMBARIRO
Madzivire Dip
Rest House (Derelict)
CHESVINGO
CHEMHEMBA
MBUGWI
CHIRONGWE
CHITORO
BANGAUGWE
Banga Well
MADZIVIRE B.C.
66
67
68
69
70
71
72
73
74
LEGEND
Catchment Area
Reservoir
Dam
Pump
Conveyance Canal or Pipe
Night Storage Reservoir
Irrigable Area
SCALE
0
1
2 kilometres

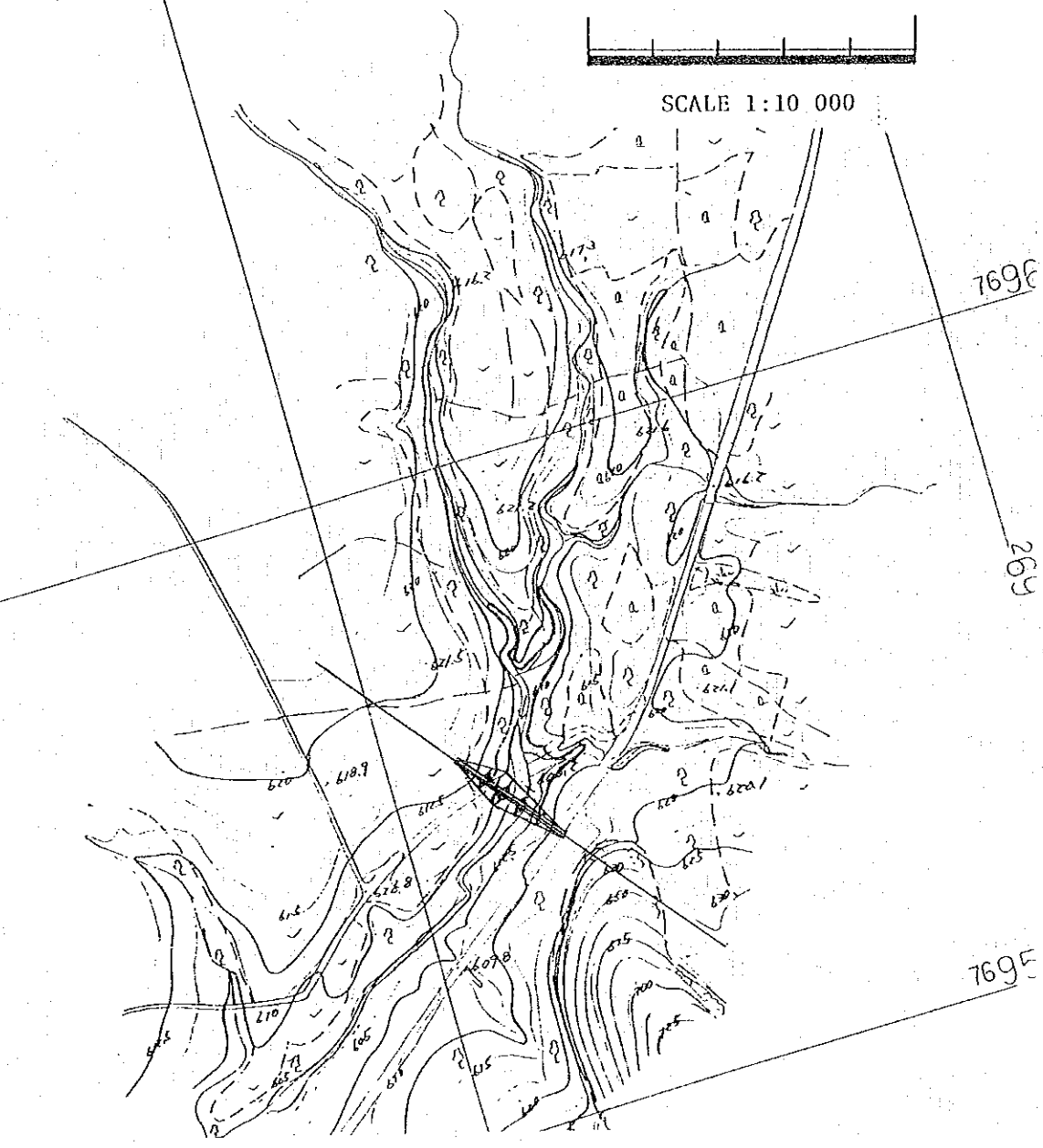
PLAN OF DAM

MADZIVIRE

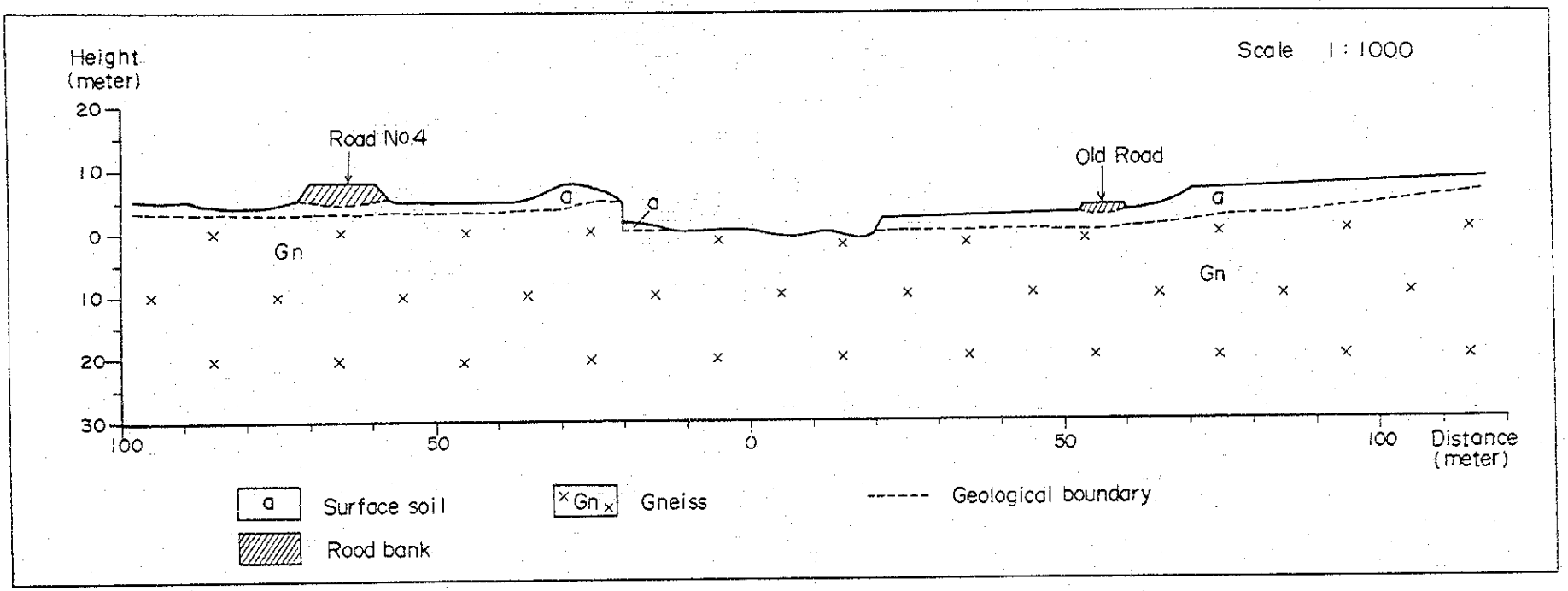
Dam No.	VI- 1 - 3
District	Chivi
Communal L.	Chivi
River	Chivake
Map Ref.	2030 D4
Coordinate	TM 682955
Catchment A.	21.3 sq.km
Design Flood	195 cum/sec
N.W.S.	EL.611.0 m
D.W.S.	EL.609.0 m
Capacity of Res.	0.07 M.C.M.
Dam Top	EL.613.0 m
Dam Height	10.0 m
Dam Length	200 m
Dam Vol.	33,000 cum

0 500

SCALE 1:10 000



VI-1-3 Madzivire



The Chivake River in the area forms relatively wide and deep valley.
The bedrock consists of gneiss, and it is massive and very hard, and very poorly jointed. The estimated thickness of the unconsolidated deposits is less than 3 meters.
Thick sedimentation that consists of cuarse sand is distributed in the upper stream above the old bridge, and the flood of the Chivake River is deepening the sedimentation. Considering the thick deposit, sedimentation after the dam construction will be very fast.

TABLE STORAGE VOLUME OF RESERVOIR

NO	MAP	GRID	VER	HOR
VI-1-3	203004	TM	682	955

EL(M)	ΔH(M)	AREA(M2)	AVE(M2)	VOL(M3)	ΣV(1000M3)	NOTE
602.5	0.0	0	0	0	0.00	
605.0	2.5	1000	500	1250	1.25	
607.5	2.5	5500	3250	8125	9.37	
610.0	2.5	16500	11000	27500	36.87	
612.5	2.5	42000	29250	73125	110.00	
615.0	2.5	87000	64500	161250	271.25	
617.5	2.5	168000	127500	318750	590.00	
620.0	2.5	267000	217500	543750	1133.75	
622.5	2.5	401500	334250	835625	1969.37