DIVISION-4

THE STUDY

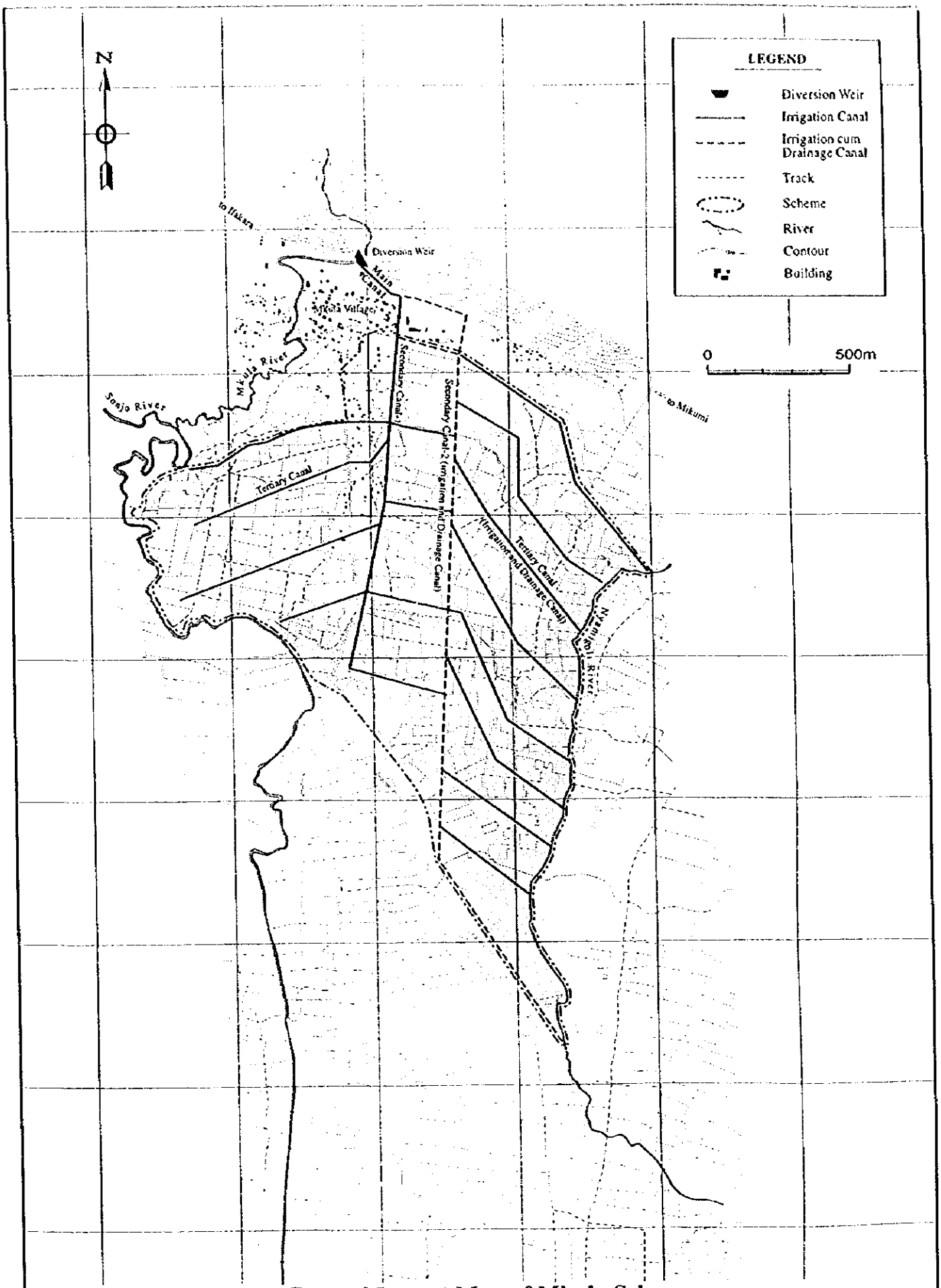
ON

THE SMALLHOLDER IRRIGATION PROJECTS

IN

CENTRAL WAMI RIVER BASIN

FEASIBILITY STUDY
ON
MKULA SCHEME



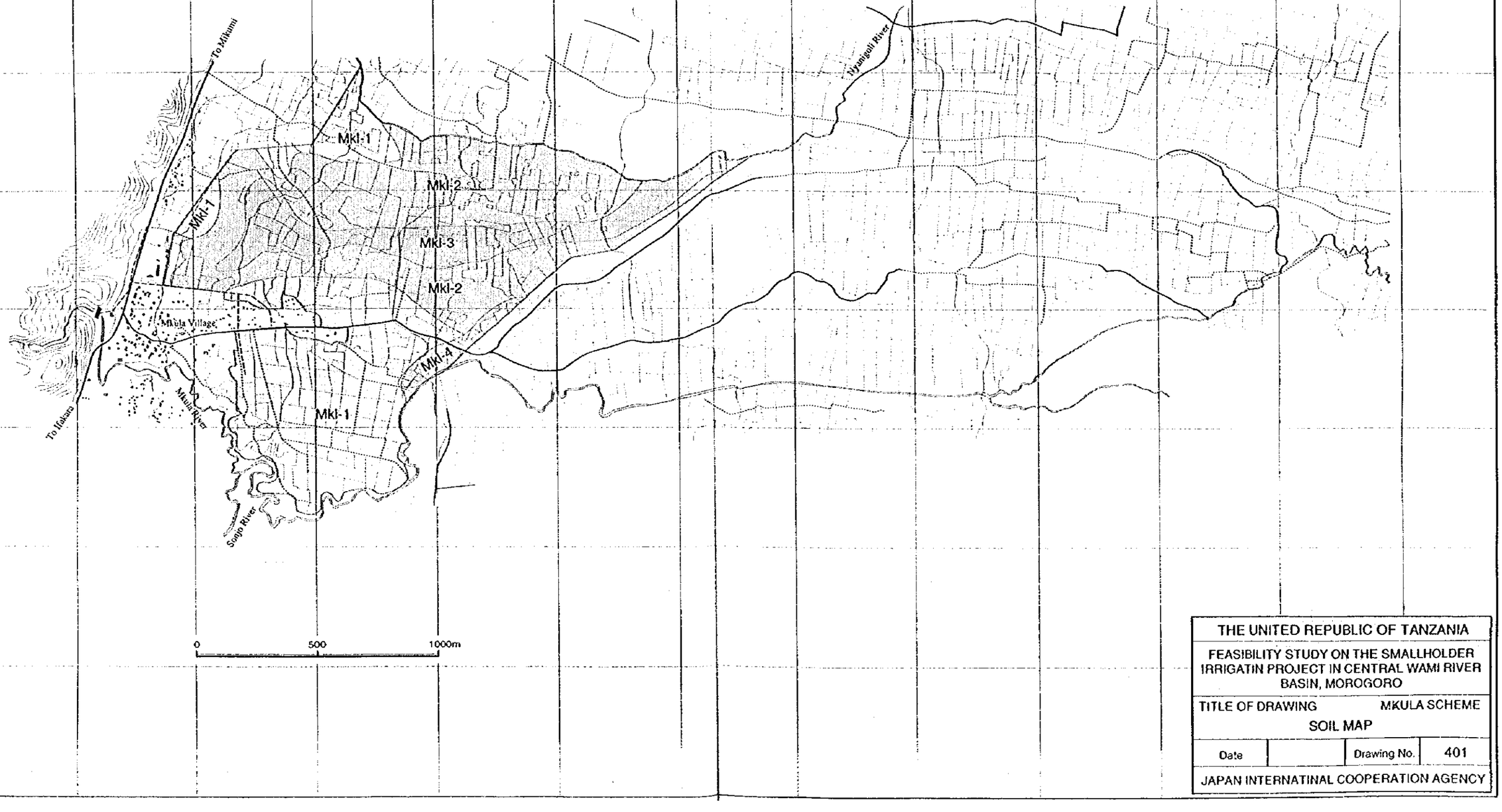
General Layout Map of Mkula Scheme

PLATE NO. 53

LEGEND

- Intake
- Canal
- Track
- Road
- River
- Farm Land
- Contour
- House/Building

Mapping Unit	Area (ha)	Soil unit	Land Form	Drainability	Soil Texture
MkI-1	70	CMe	Fan	Mod. well	CL/L-CL
MkI-2	75	FLe	Fan	Imperfect	CL/SiCL-CL
MkI-3	27	GLe	Fan	Poor	CL/SCL
MkI-4	3	FLe	Natural levee	Excessive	SL/LS
Total	175				



THE UNITED REPUBLIC OF TANZANIA

FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO

TITLE OF DRAWING MKULA SCHEME

SOIL MAP

Date		Drawing No.	401

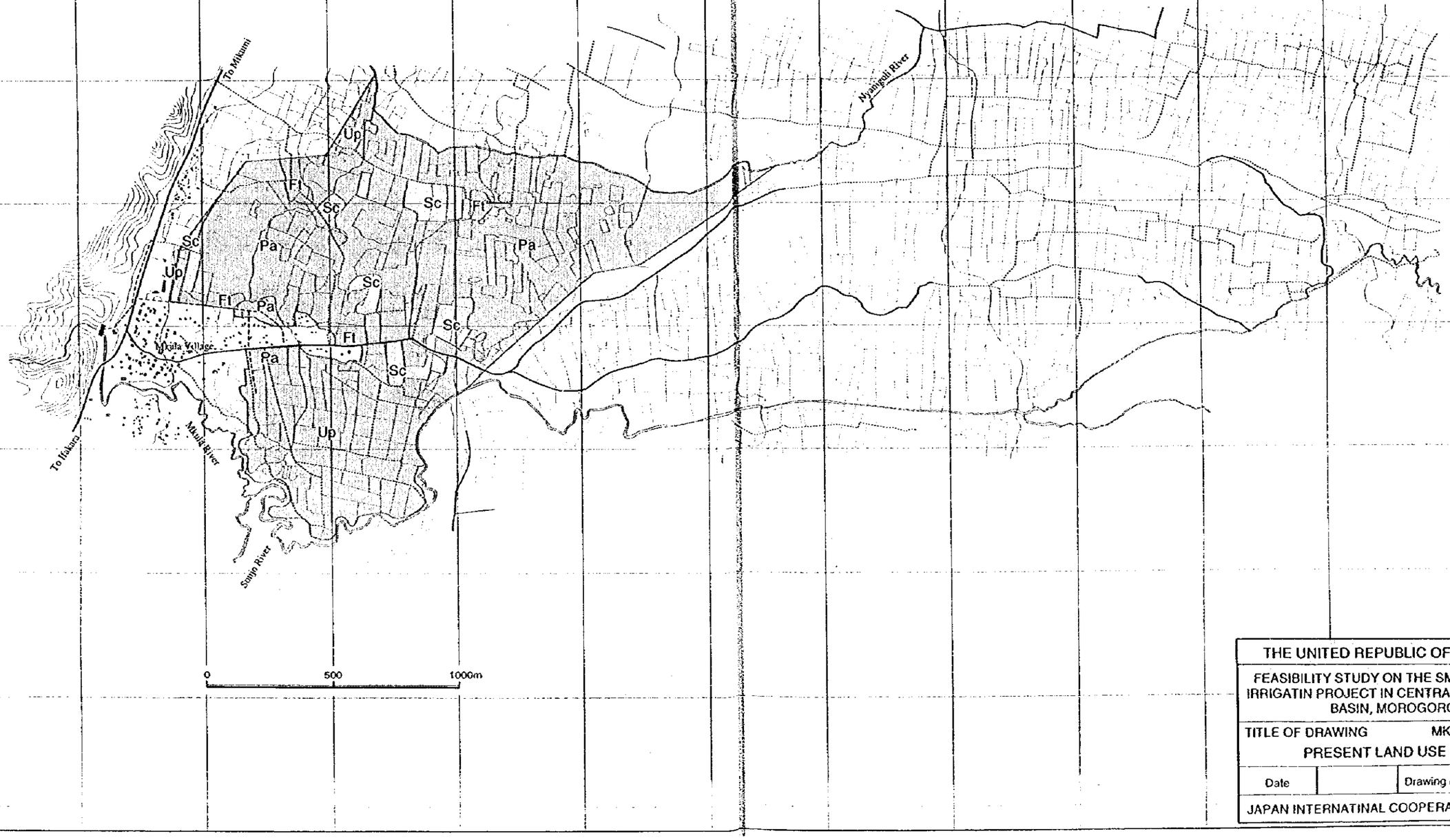
JAPAN INTERNATINAL COOPERATION AGENCY

PLATE NO. 54

LEGEND

- Intake
- Canal
- Track
- Road
- River
- Farm Land
- Contour
- House/Building

Symbol	Land Use	Area (ha)
Pa	Paddy Land	108
Up	Upland Crops	42
Sc	Sugarcane	11
Ft	Forest and Tree Crops	10
	Settlement/Right of Ways	4
	Total	175



THE UNITED REPUBLIC OF TANZANIA

FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO

TITLE OF DRAWING — MKULA SCHEME

PRESENT LAND USE MAP

Date		Drawing No.	402

JAPAN INTERNATINAL COOPERATION AGENCY

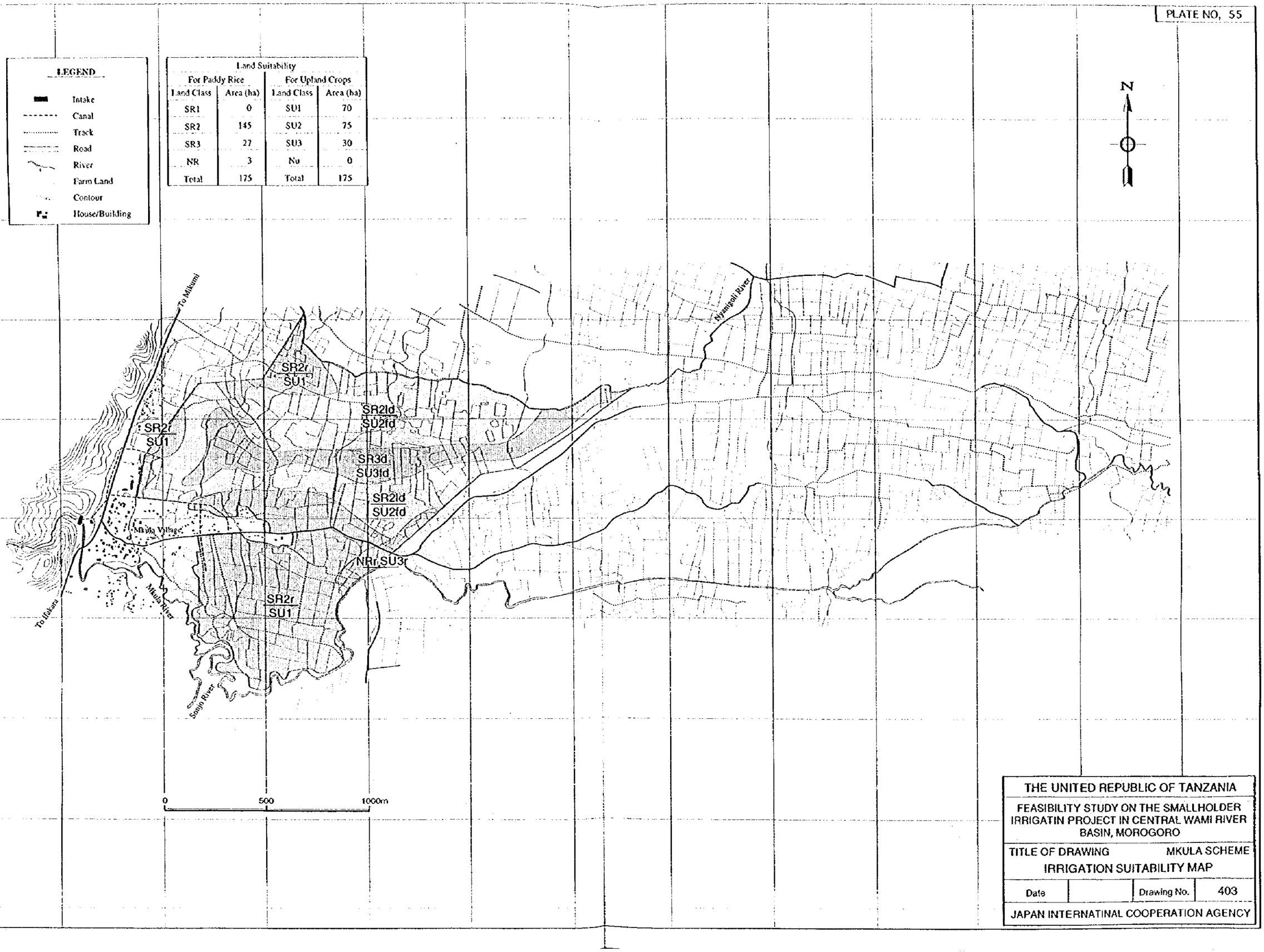
PLATE NO. 55

LEGEND

- Intake
- Canal
- Track
- Road
- River
- Farm Land
- Contour
- House/Building

Land Suitability

For Paddy Rice		For Upland Crops	
Land Class	Area (ha)	Land Class	Area (ha)
SR1	0	SU1	70
SR2	145	SU2	75
SR3	27	SU3	30
NR	3	Nu	0
Total	175	Total	175



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FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO

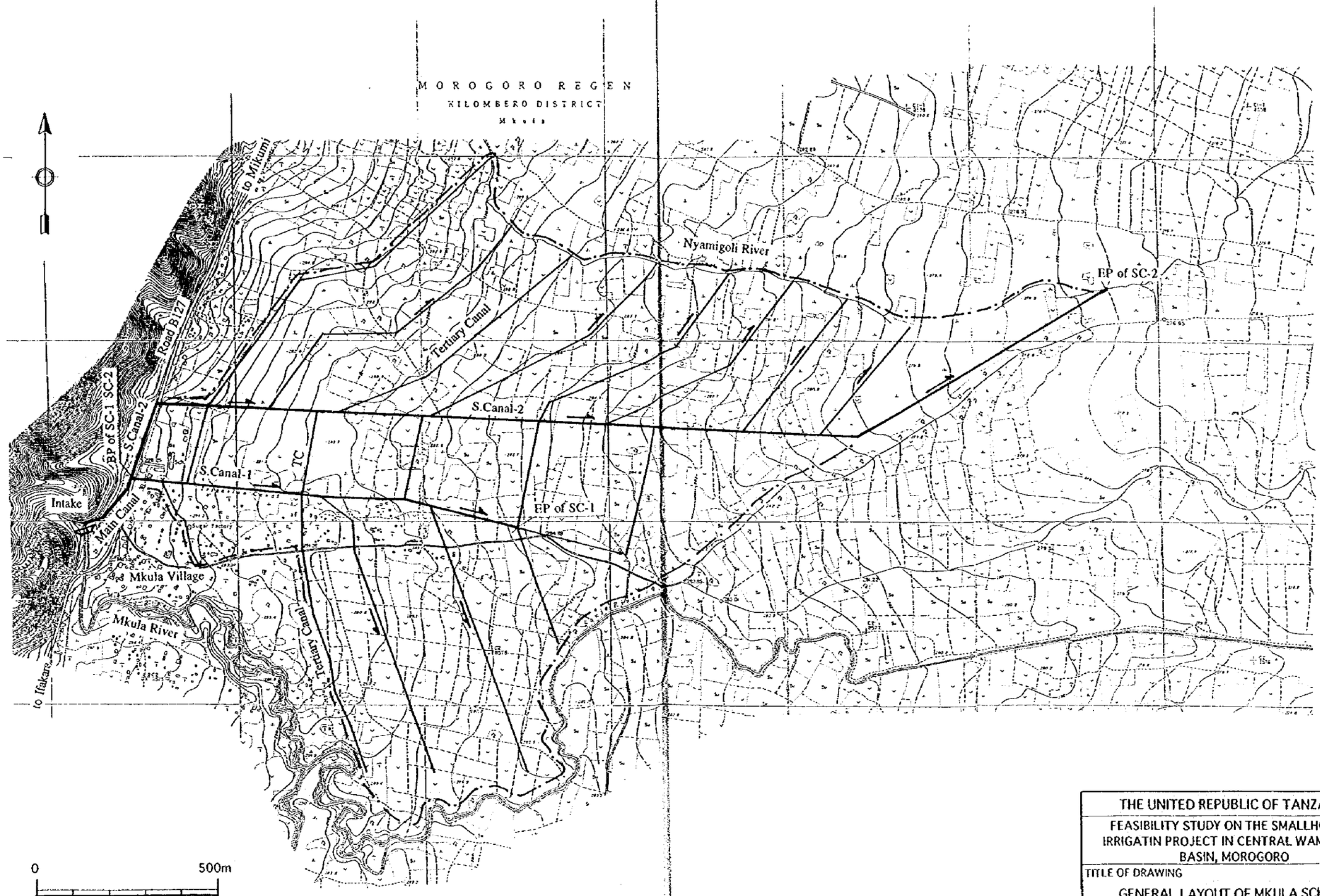
TITLE OF DRAWING MKULA SCHEME

IRRIGATION SUITABILITY MAP

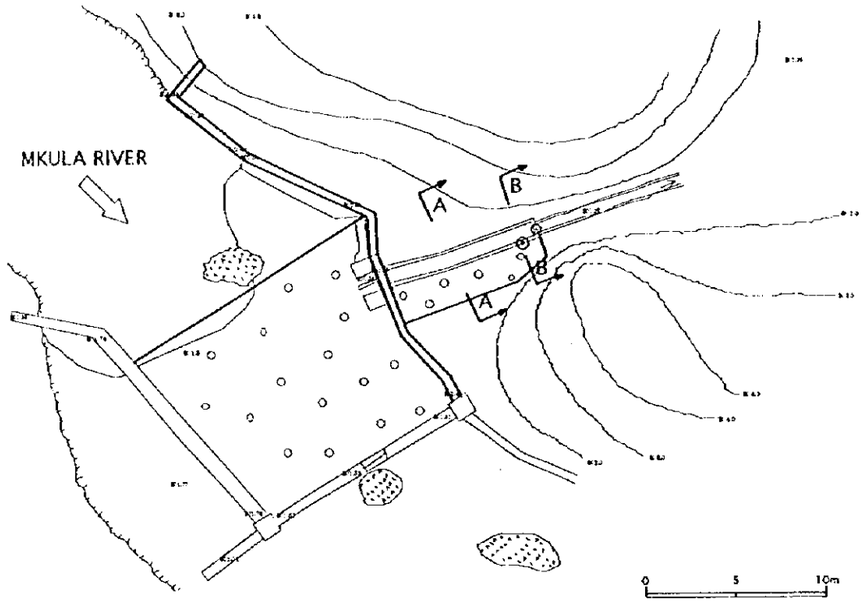
Date		Drawing No.	403

JAPAN INTERNATINAL COOPERATION AGENCY

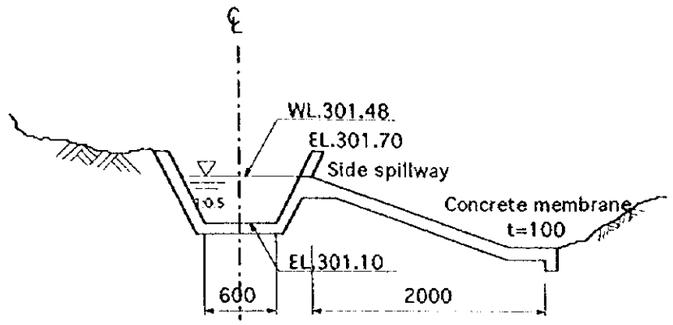
PLATE NO. 56



THE UNITED REPUBLIC OF TANZANIA			
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING GENERAL LAYOUT OF MKULA SCHEME			
Date		Drawing No.	404
JAPAN INTERNATIONAL COOPERATION AGENCY			

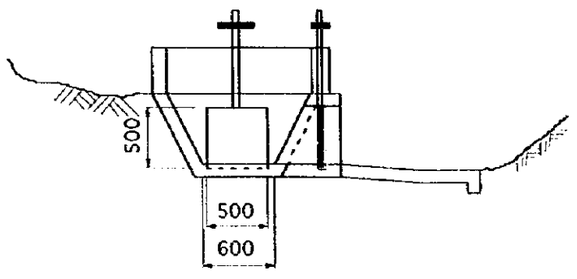


PLAN



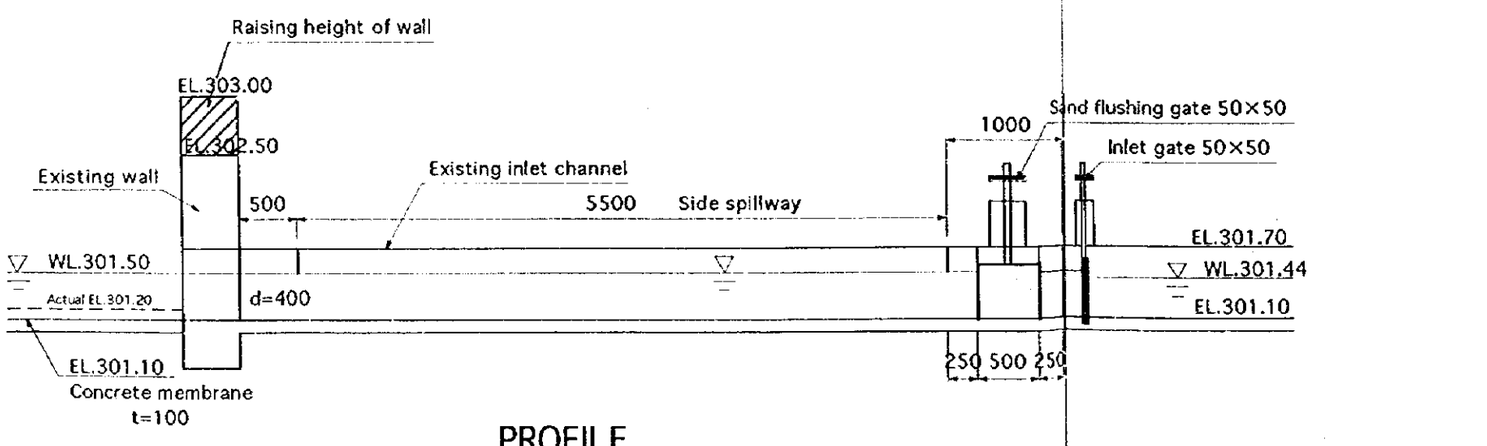
SECTION A-A

SCALE 0 1 2m



SECTION B-B

SCALE 0 1 2m

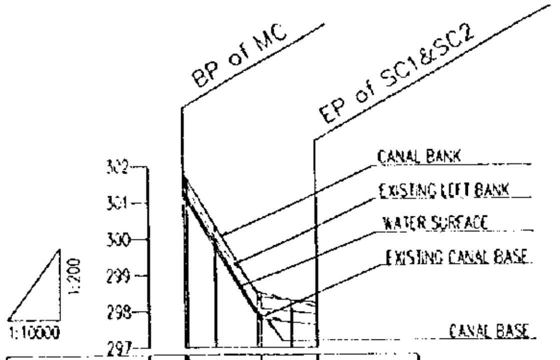


PROFILE

SCALE 0 1 2 3 4 5m

THE UNITED REPUBLIC OF TANZANIA			
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING	MKULA SCHEME INTAKE		
Date		Drawing No.	405
JAPAN INTERNATIONAL COOPERATION AGENCY			

Main canal



CANAL TYPE	① ② ③
CANAL BANK ELEVATION	301.70 301.69 301.65 300.35 298.45 298.29 298.38 298.30 298.23
WATER SURFACE ELEVATION	301.44 301.43 301.18 299.88 297.98 297.81 298.07 297.99 297.92
CANAL BASE ELEVATION	301.10 301.09 301.05 299.75 297.85 297.69 297.78 297.70 297.63
GROUND SURFACE ELEVATION	
EXISTING LEFT BANK ELEVATION	301.63 301.47 299.99 298.53 298.50 298.30 298.10
EXISTING CANAL BASE ELEVATION	301.27 301.12 299.74 297.90 297.88 297.70 297.63
REDUCED DISTANCE	0.00 4.08 43.00 100.00 105.00 145.00 180.00
DISTANCE	0.00 4.08 38.92 57.00 5.00 40.00 35.00
STATION NO.	BP (IP 1)+43 1 +5 (IP 2)+45 EP

CANAL TYPE

① Q=0.18 B=0.6 I=1/500 h=0.34 H=0.6 V=0.87

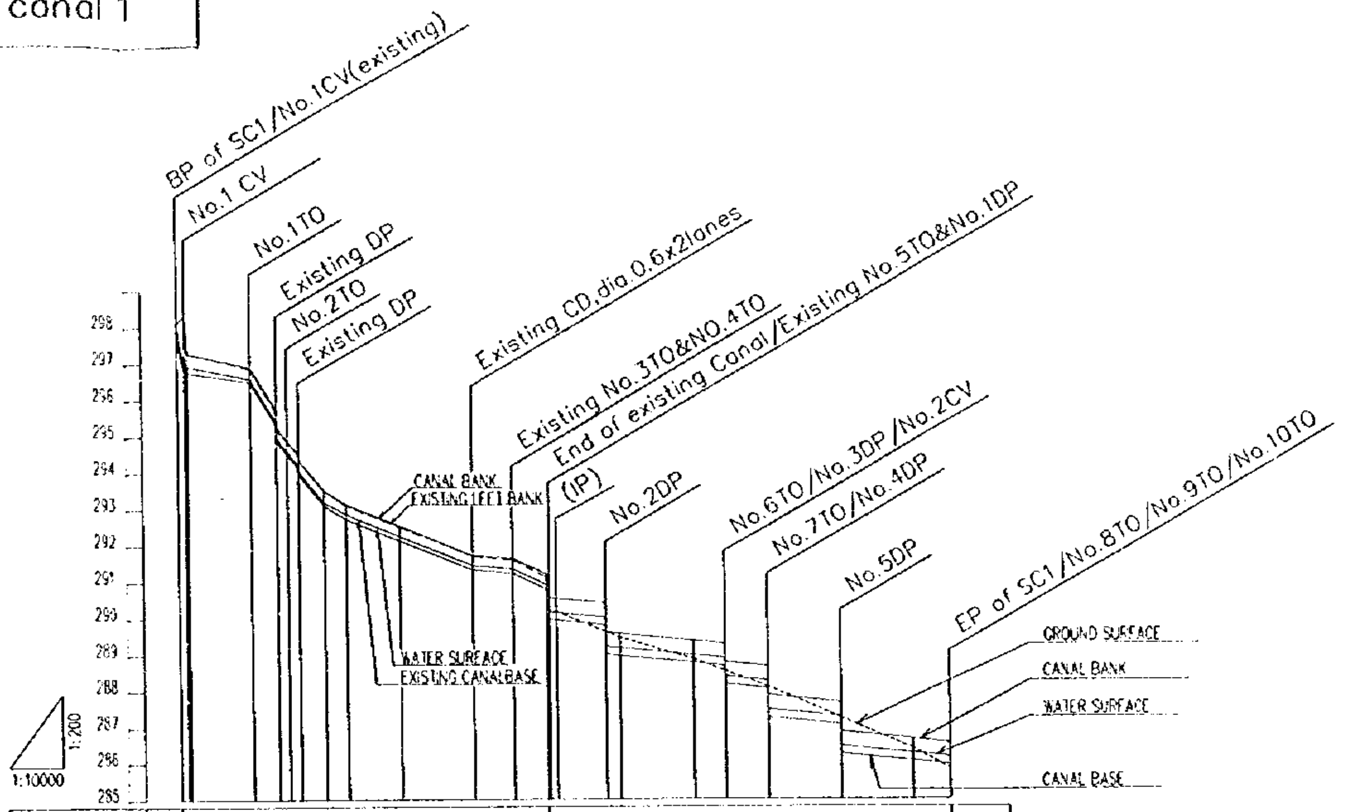
② Q=0.18 B=0.6 I=1/30 h=0.13 H=0.6 V=2.4

③ Q=0.18 B=0.4 I=1/500 h=0.29 H=0.6 V=0.89

Secondary canal 1

ABBREVIATIONS

BP : Beginning Point
EP : End Point
DP : Drop
TO : Turnout
CK : Check
CV : Culvert
CD : Cross Drain

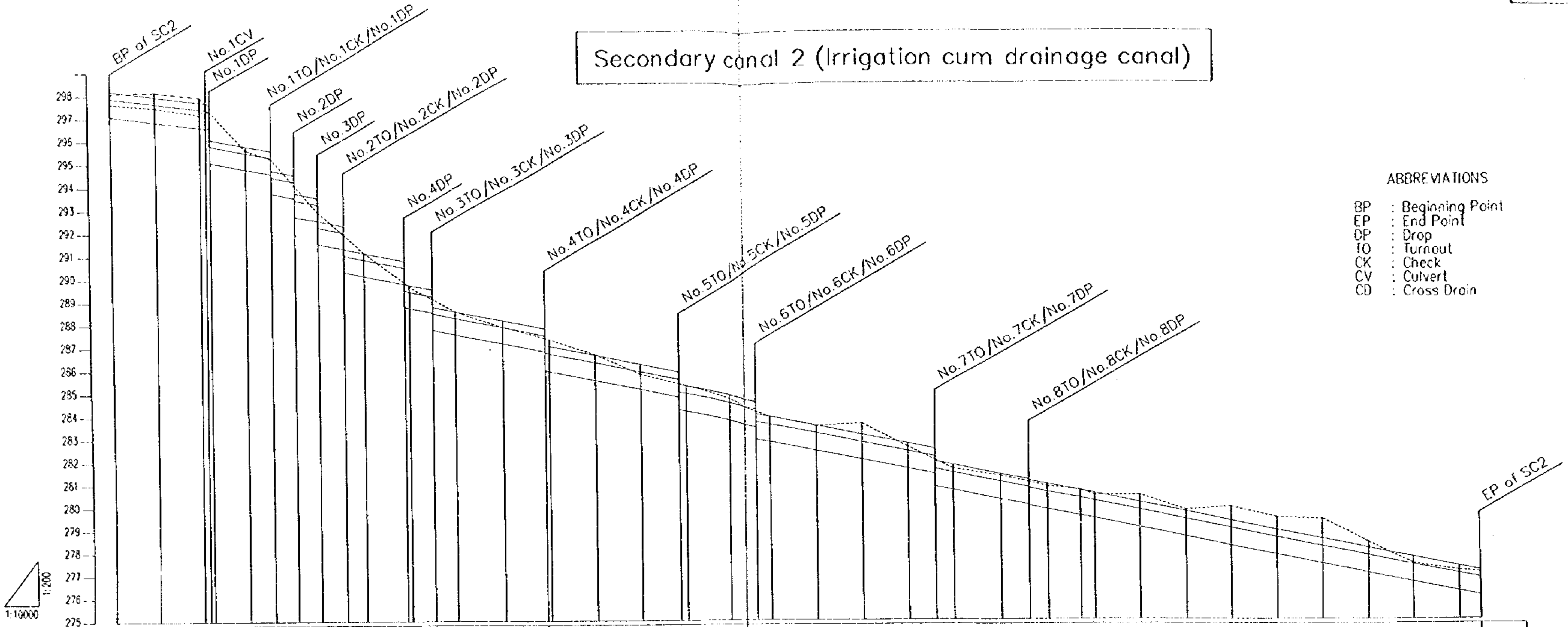


CANAL TYPE	Q=0.08 B=0.6 I=1/31~1/139 h=0.07~0.17 H=0.4 V=0.8~1.8 / Q=0.08 B=0.3 I=1/500 h=0.21 H=0.6 V=0.73
CANAL BANK ELEVATION	298.10 298.27 297.26 296.87 295.70 295.25 294.83 294.49 294.33 293.48 293.11 292.51 291.71 291.61 291.17 291.14 [illegible] 289.72 289.55 289.35 289.26 288.76 288.65 287.85 287.65 286.85 286.65 286.54
WATER SURFACE ELEVATION	297.91 296.90 296.91 296.54 295.37 294.93 294.56 294.17 294.02 293.16 292.93 292.23 291.43 291.33 290.89 290.86 290.15 290.13 290.00 289.70 289.16 288.96 288.87 288.37 288.26 287.46 287.26 286.46 286.26 286.16
CANAL BASE ELEVATION	297.63 296.73 296.74 296.47 295.30 294.85 294.48 294.09 293.93 293.07 292.71 292.11 291.31 291.21 290.77 290.74 [illegible] 288.95 288.75 288.66 288.16 288.05 287.25 287.05 286.25 286.05 285.94
GROUND SURFACE ELEVATION	290.18 290.18 289.60 289.44 288.85 288.51 288.09 287.23 286.39 285.83
EXISTING LEFT BANK ELEVATION	298.10 298.27 297.26 296.83 295.60 295.15 294.83 294.48 294.32 293.48 293.08 292.47 291.69 291.56 291.10 291.07
EXISTING CANAL BASE ELEVATION	297.63 296.73 296.74 296.47 295.30 294.85 294.48 294.09 293.93 293.07 292.71 292.11 291.31 291.21 290.77 290.74
REDUCED DISTANCE	0.00 10.00 14.00 100.00 136.00 150.00 165.00 200.00 230.00 300.00 400.00 454.00 500.00 503.00 512.50 580.00 600.00 700.00 742.50 800.00 900.00 1000.00 1051.00
DISTANCE	0.00 10.00 4.00 86.00 36.00 14.00 15.00 35.00 30.00 70.00 100.00 54.00 46.00 3.00 9.50 67.50 20.00 100.00 42.50 57.50 100.00 100.00 51.00
STATION NO.	BP +10 +14 1 +36 +50 +65 2 +30 3 4 +54 5 +3 (IP 1)+12.5 +80 6 7 (IP 2)+42.5 8 9 10 EP +51

THE UNITED REPUBLIC OF TANZANIA			
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN,MOROGORO			
TITLE OF DRAWING	MKULA SCHEME		
PROFILE OF MAIN & SECONDARY CANAL 1			
Date		Drawing No.	406
JAPAN INTERNATIONAL COOPERATION AGENCY			

PLATE No.59

Secondary canal 2 (Irrigation cum drainage canal)



ABBREVIATIONS

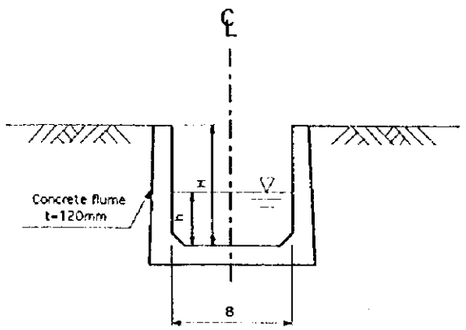
BP : Beginning Point
EP : End Point
DP : Drop
TO : Turnout
CK : Check
CV : Culvert
CD : Cross Drain

CANAL TYPE: 0=1.5 B=0.8 I=1/450 h=0.79 H=1.1 V=0.95 (BP to No.6); 0=1.8 B=0.8 I=1/250 h=0.77 H=1.1 V=1.19 (No.6 to EP)

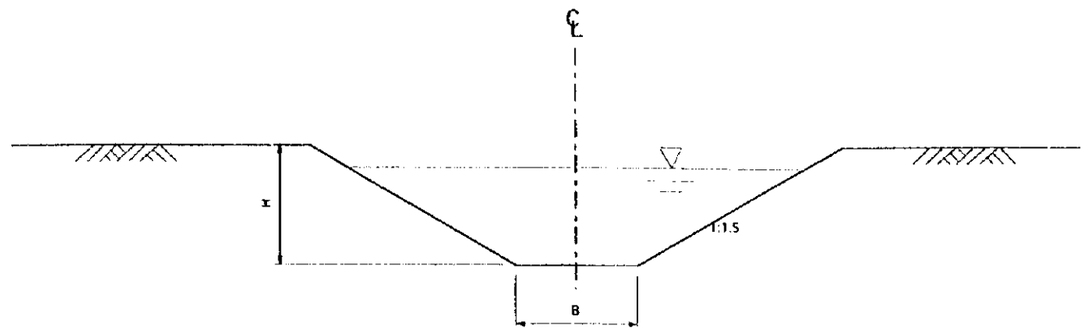
STATION NO.	DISTANCE	REDUCED DISTANCE	CANAL BANK ELEVATION	WATER SURFACE ELEVATION	CANAL BASE ELEVATION	GROUND SURFACE ELEVATION	EXISTING LEFT BANK ELEVATION	EXISTING CANAL BASE ELEVATION
-353	0.00	0.00	298.19	297.88	297.09		298.10	297.63
-253	100.00	100.00	297.94	297.63	296.84		298.14	297.46
-153	100.00	200.00	297.69	297.38	296.59		297.90	297.15
(IP.1)-140	13.00	213.00	297.66	297.35	296.56		297.59	297.43
-130	10.00	223.00	297.57/296.07	297.28/295.78	296.57/295.07	297.29		
-53	77.00	300.00	295.76	295.47	294.76	295.58		
0	53.00	353.00	295.55/294.70	295.26/294.41	294.55/293.70	295.22		
	50.00	403.00	294.50/293.70	294.21/293.41	293.50/292.70	294.05		
1	50.00	453.00	293.50/292.50	293.21/292.21	292.50/291.50	292.88		
+55	55.00	508.00	292.28/291.28	291.99/290.99	291.28/290.28	291.91		
2	45.00	553.00	291.10	290.81	290.10	291.12		
(IP.2)+90	90.00	643.00	290.74/289.74	290.45/289.45	289.74/288.74	289.81		
3	10.00	653.00	289.70	289.41	288.70	289.62		
+50	50.00	703.00	289.50/288.75	289.21/288.46	288.50/287.75	289.09		
4	50.00	753.00	288.55	288.26	287.55	288.56		
5	100.00	853.00	288.15	287.86	287.15	287.87		
+90	90.00	943.00	287.79/287.07	287.50/286.74	286.79/285.97	287.38		
6	10.00	953.00	287.03	286.70	285.93	287.33		
7	100.00	1053.00	286.63	286.30	285.53	286.65		
8	100.00	1153.00	286.23	285.90	285.13	285.79		
+85	85.00	1238.00	285.89/285.34	285.56/285.01	284.79/284.24	285.37		
9	15.00	1253.00	285.28	284.95	284.18	285.29		
10	100.00	1353.00	284.88	284.55	283.78	284.72		
+70	70.00	1423.00	284.80/284.05	284.77/283.77	283.50/282.95	284.77		
11	30.00	1453.00	283.93	283.60	282.83	283.94		
12	100.00	1553.00	283.53	283.20	282.43	283.51		
13	100.00	1653.00	283.13	282.80	282.03	283.61		
14	100.00	1753.00	282.73	282.40	281.63	282.58		
+60	60.00	1813.00	282.49/281.94	282.16/281.61	281.39/280.84	282.00		
15	40.00	1853.00	281.78	281.45	280.68	281.61		
16	100.00	1953.00	281.38	281.05	280.28	281.31		
+60	60.00	2013.00	281.14/281.09	280.81/280.76	280.04/279.99	281.03		
17	40.00	2053.00	280.93	280.60	279.83	280.84		
(IP.3)+70	70.00	2123.00	280.65	280.32	279.55	280.69		
18	30.00	2153.00	280.53	280.20	279.43	280.44		
19	100.00	2253.00	280.13	279.80	279.03	280.44		
20	100.00	2353.00	279.73	279.40	278.63	279.80		
21	100.00	2453.00	279.33	279.00	278.23	279.94		
22	100.00	2553.00	278.93	278.60	277.83	279.48		
23	100.00	2653.00	278.53	278.20	277.43	279.39		
24	100.00	2753.00	278.13	277.80	277.03	278.38		
25	100.00	2853.00	277.73	277.40	276.63	277.44		
26	100.00	2953.00	277.33	277.00	276.23	277.14		
EP	46.00	2999.30	277.15	276.82	276.05	277.05		

THE UNITED REPUBLIC OF TANZANIA	
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN,MOROGORO	
TITLE OF DRAWING	MKULA SCHEME
PROFILE OF SECONDARY CANAL 2	
Date	
Drawing No.	407
JAPAN INTERNATIONAL COOPERATION AGENCY	

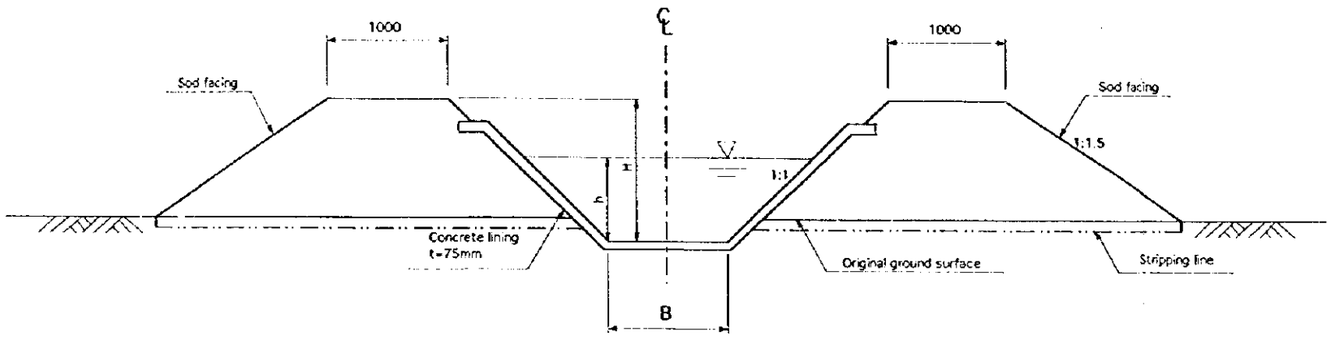
FLUME CANAL



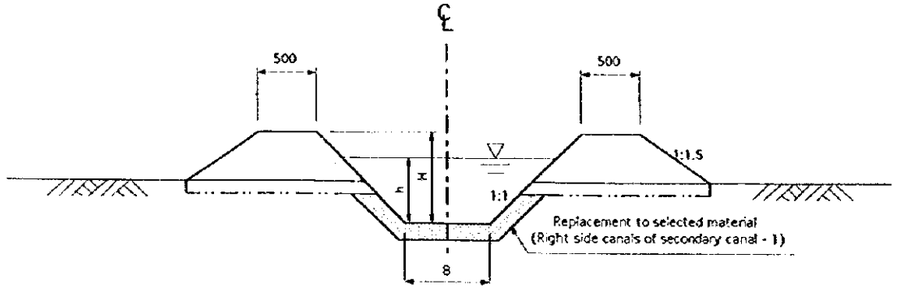
IRRIGATION CUM DRAINAGE CANAL (EARTHEN ROAD & CANAL)



CONCRETE LINING CANAL



TERTIARY CANAL (EARTHEN CANAL)



IRRIGATION CANAL

(Unit : m)

Name of Canal	Name of Reache	L (km)	Q (m3/sec)	B	H	h	i (1/a)	V (m/sec)	Remark
Main canal	Reaches-1	0.004	0.18	0.60	0.60	0.34	500	0.87	Flume type
	Reaches-2	0.101	0.18	0.60	0.60	0.13	30	2.40	Flume type
	Reaches-3	0.075	0.18	0.40	0.60	0.29	500	0.89	Concrete Lining type
Secondary canal-1	Reaches-1	0.503	0.08	0.60	0.40	0.07-0.17	31-139	0.8-1.8	Existing Canal
	Reaches-2	0.548	0.08	0.30	0.60	0.21	500	0.73	Concrete Lining type
Secondary canal-2(Irrigation cum drainage canal)	Reaches-1	0.953	1.50	0.80	1.10	0.79	400	0.95	Earthen type
	Reaches-2	2.046	1.80	0.80	1.10	0.77	250	1.19	Earthen type
Tertiary canal	Right side canals of SC1	0.19	0.08	0.50	0.50	0.09	35	1.80	Earthen type (earth lining)
	Others Canals	0.24	0.03	0.40	0.40	0.05	30	1.50	Earthen type

L : length, Q: design discharge, B: bottom width, H : canal height, h : water depth,
i : canal gradient, V: flow velocity in roughness coefficient of 0.015 for concrete lining canal and 0.03 for earthen canal

THE UNITED REPUBLIC OF TANZANIA

FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO

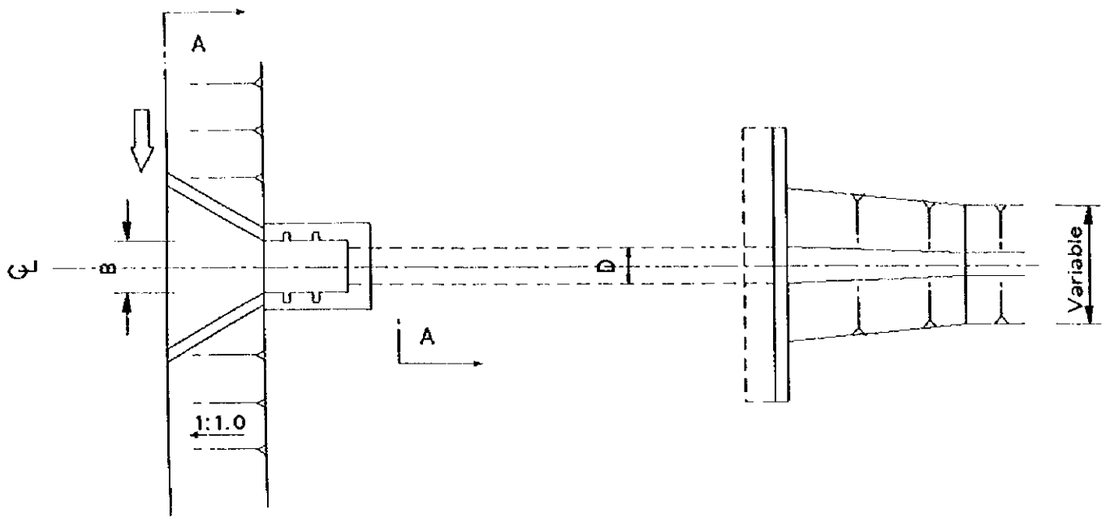
TITLE OF DRAWING MKULA SCHEME

TYPICAL CROSS SECTION OF CANAL

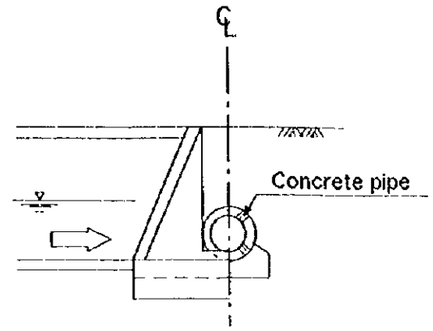
Date		Drawing No.	408

JAPAN INTERNATIONAL COOPERATION AGENCY

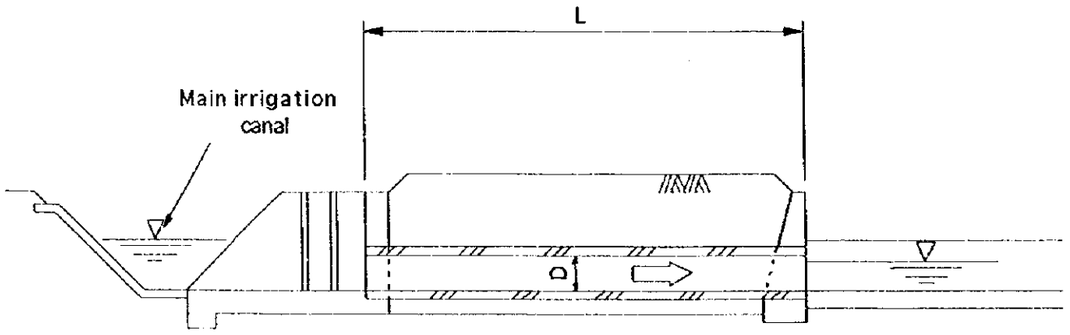
TURNOUT



PLAN



SECTION A-A



PROFILE

DIMENSION OF TURNOUT

(Unit:m)

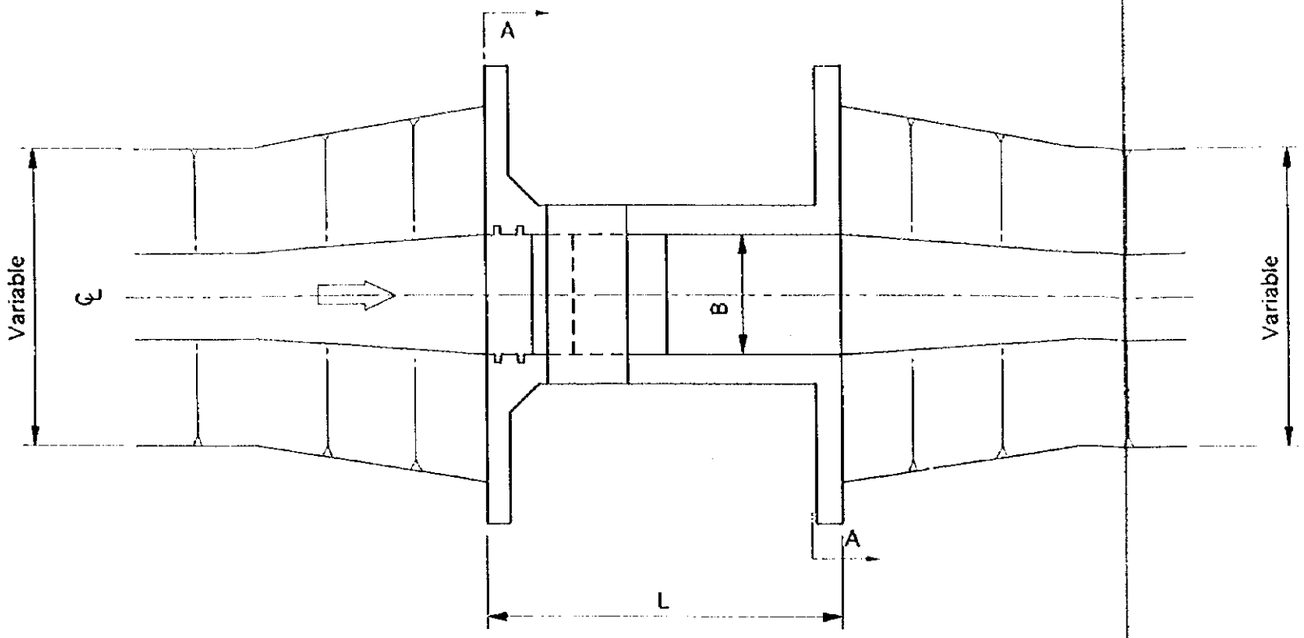
Name of Canal	Name of Structrue	Sta. No.	Qi (m3/sec)	L	D	B	Remarks
SC-1	No.1 Turnout	No.1	0.03	4.00	0.30	0.60	
	No.2 Turnout	No.1+50.00	0.03	1.50	0.30	0.60	
	No.3 Turnout	No.4+54.00	0.03	-	-	-	existing
	No.4 Turnout	No.4+54.00	0.03	4.00	0.30	0.60	
	No.5 Turnout	No.5+3.00	0.03	-	-	-	existing
	No.6 Turnout	No.7+42.50	0.03	4.00	0.30	0.60	
	No.7 Turnout	No.8	0.03	1.50	0.30	0.60	
	No.8 Turnout	EP.(No.10+51.00)	0.03	1.50	0.30	0.60	
	No.9 Turnout	EP.(No.10+51.00)	0.03	4.00	0.30	0.60	
	No.10 Turnout	EP.(No.10+51.00)	0.03	4.00	0.30	0.60	
SC-2	8 turnouts		0.03	4.00	0.30	0.60	

Qi : design offtake discharge

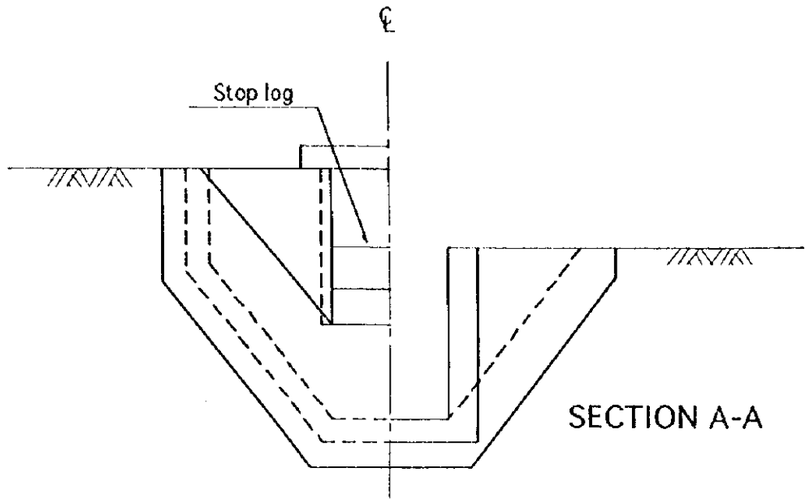
THE UNITED REPUBLIC OF TANZANIA			
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING	MKULA SCHEME TURNOUT		
Date		Drawing No.	409
JAPAN INTERNATIONAL COOPERATION AGENCY			

PLATE NO, 62

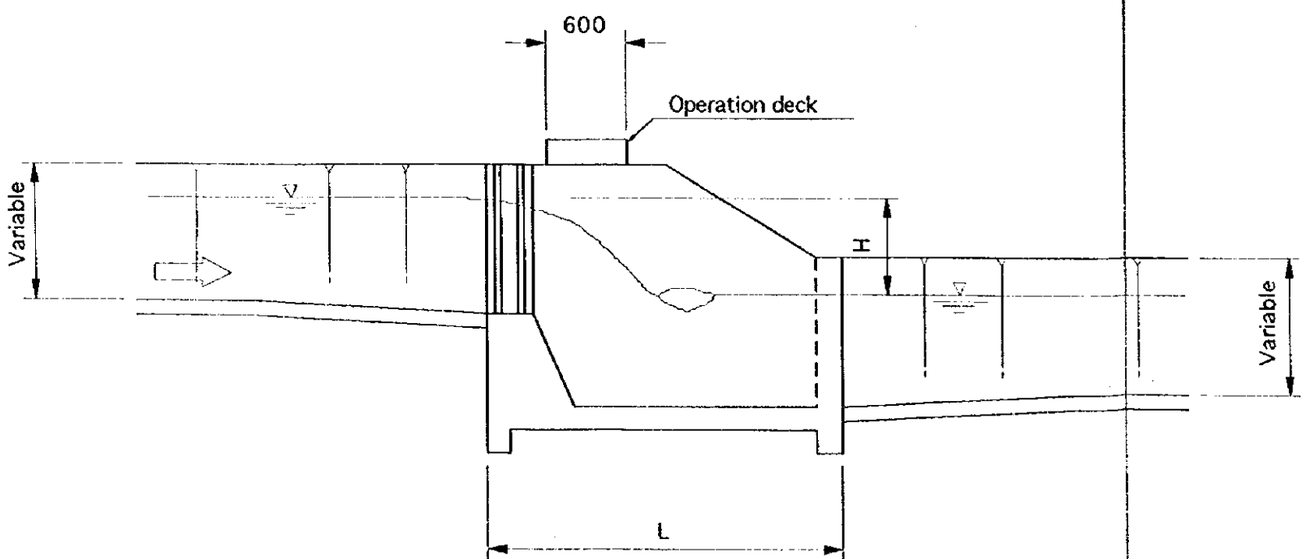
DROP



PLAN



SECTION A-A



PROFILE

DIMENSION OF DROP

(Unit:m)

Name of Canal	Name of Structure	Sta. No.	Qi (m3/sec)	H	L	B
SC-1	No.1 Drop	No.5+3.00	0.08	0.80	2.40	0.50
	No.2 Drop	No.5+80.00	0.08	0.80	2.40	0.50
	No.3 Drop	No.7+42.50	0.08	0.50	1.50	0.50
	No.4 Drop	No.8	0.08	0.80	2.40	0.50
	No.5 Drop	No.9	0.08	0.80	2.40	0.50
SC-2	No.1 Drop	-130	1.50	1.50	4.50	1.20
	No.2 Drop	-50	1.50	0.80	2.40	1.20
	No.3 Drop	No.1	1.50	1.00	3.00	1.20
	No.4 Drop	No.2+90.00	1.50	1.00	3.00	1.20

Qi : design discharge

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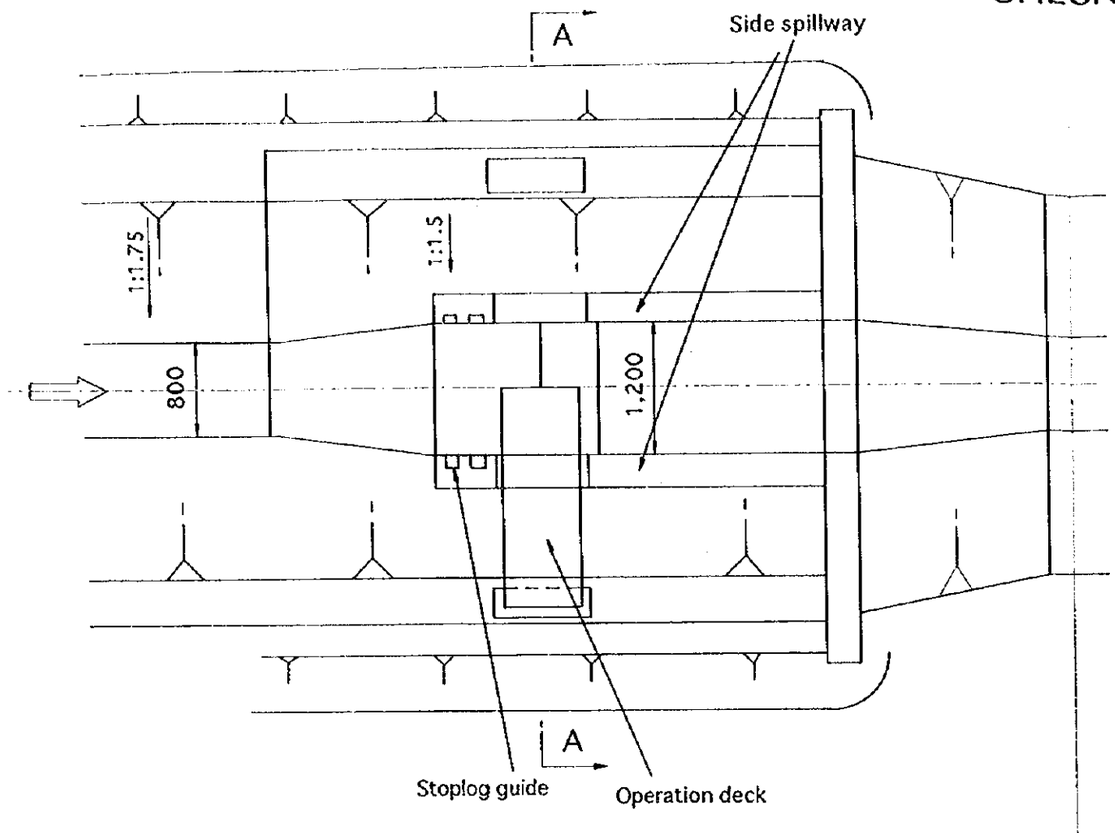
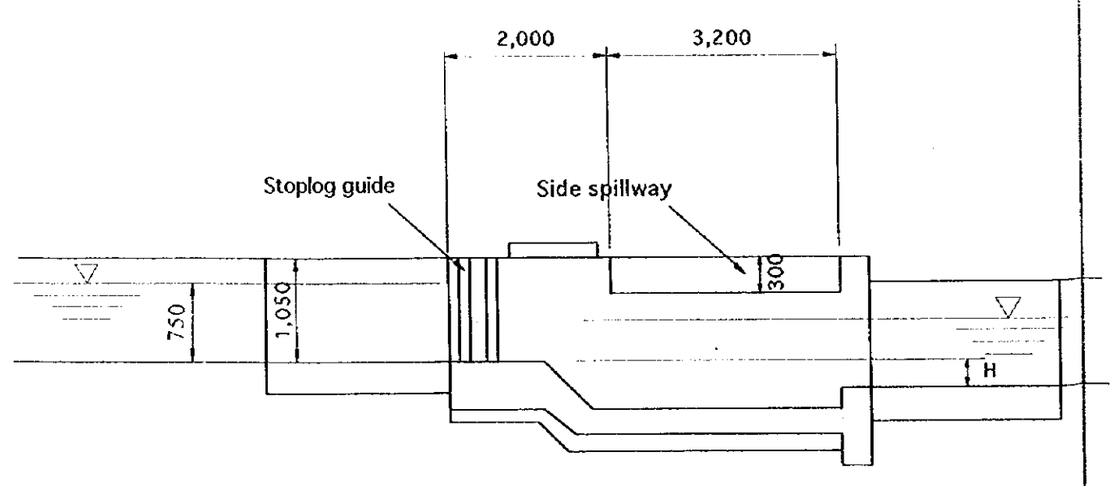
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING	MKULA SCHEME		
DROP			
Date		Drawing No.	410
JAPAN INTERNATIONAL COOPERATION AGENCY			

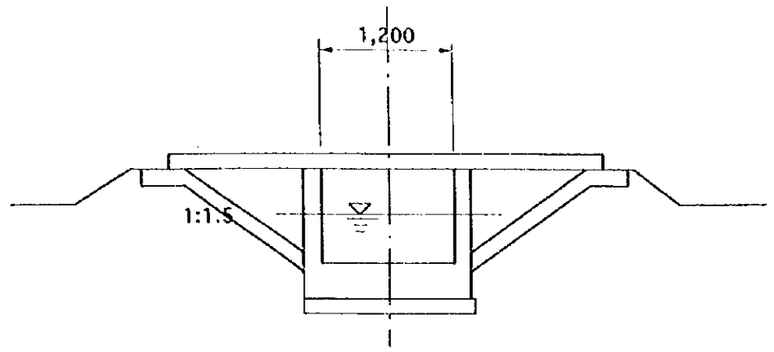
CHECK CUM DROP



PLAN



PROFILE



SECTION A-A

DIMENSION OF CHECK CUM DROP

(Unit:m)

Name of Canal	Name of structure	Sta. No.	H
SC-2	No.1 Check cum Drop	No.0	0.80
	No.2 Check cum Drop	No.1+ 50.00	1.00
	No.3 Check cum Drop	No.3+ 50.00	0.70
	No.4 Check cum Drop	No.5+ 90.00	0.70
	No.5 Check cum Drop	No.8+ 85.00	0.50
	No.6 Check cum Drop	No.10 + 50.00	0.50
	No.7 Check cum Drop	No.14 + 60.00	0.50
	No.8 Check cum Drop	No.16 + 60.00	0.50

H : drop

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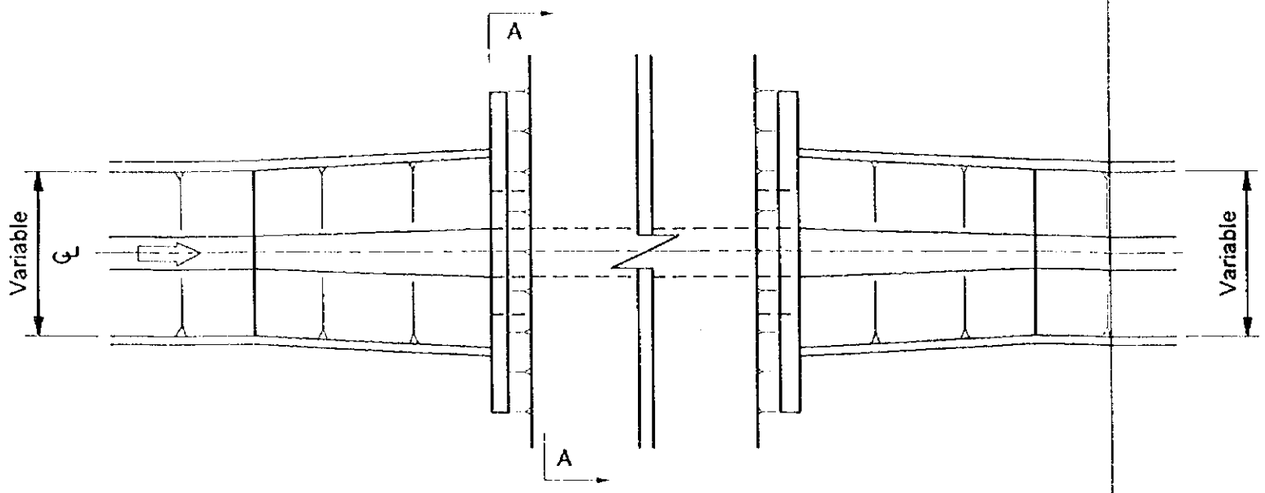
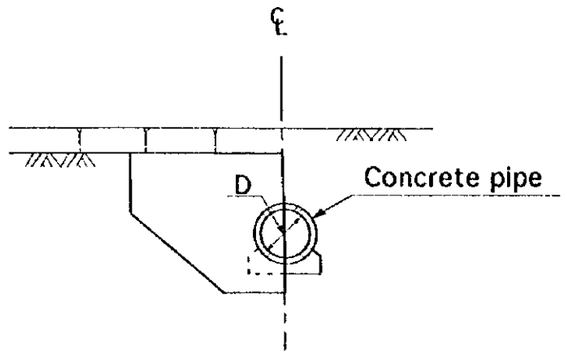
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING MKULA SCHEME CHECK CUM DROP			
Date		Drawing No.	411
JAPAN INTERNATIONAL COOPERATION AGENCY			

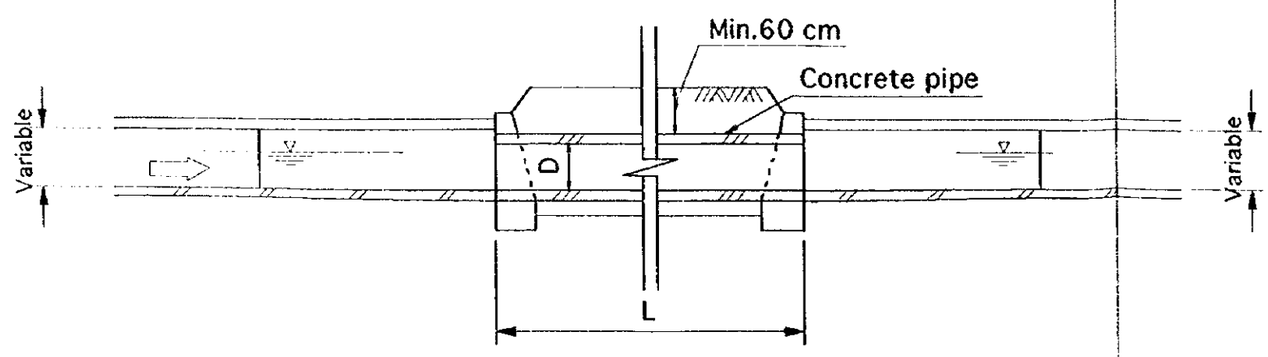
CULVERT



PLAN



SECTION A-A



PROFILE

DIMENSION OF CULVERT

(Unit : m)

Name of Canal	Name of Structure	Sta. No.	Qi (m3/sec)	L	D	Remark
SC-1	No.1 Culvert	BP.	0.08	10.00	-	Existing
	No.2 Culvert	No.7+42.50	0.08	4.00	0.40	Existing
SC-2	No.1 Culvert	-140	1.50	10.00	1.00	Existing
Tertiary Canal	3nos		0.03	4.00	0.30	Existing

Qi : design canal discharge

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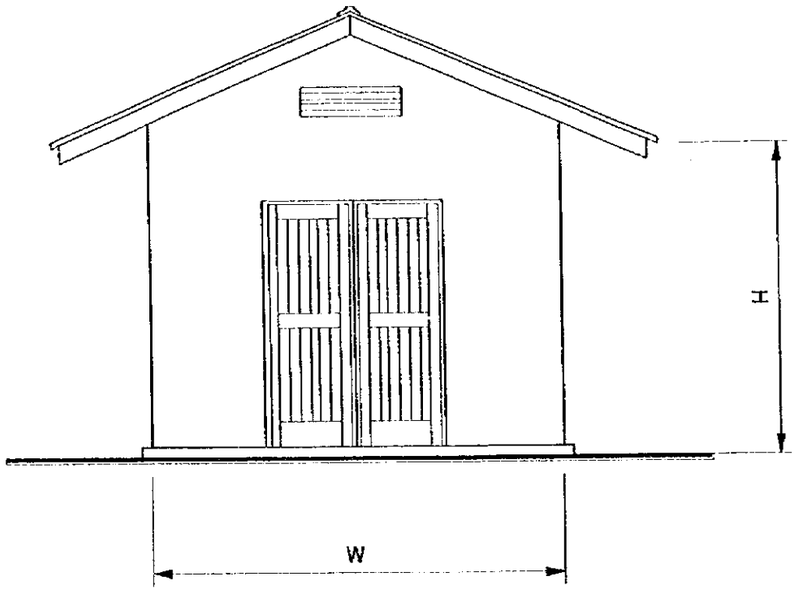
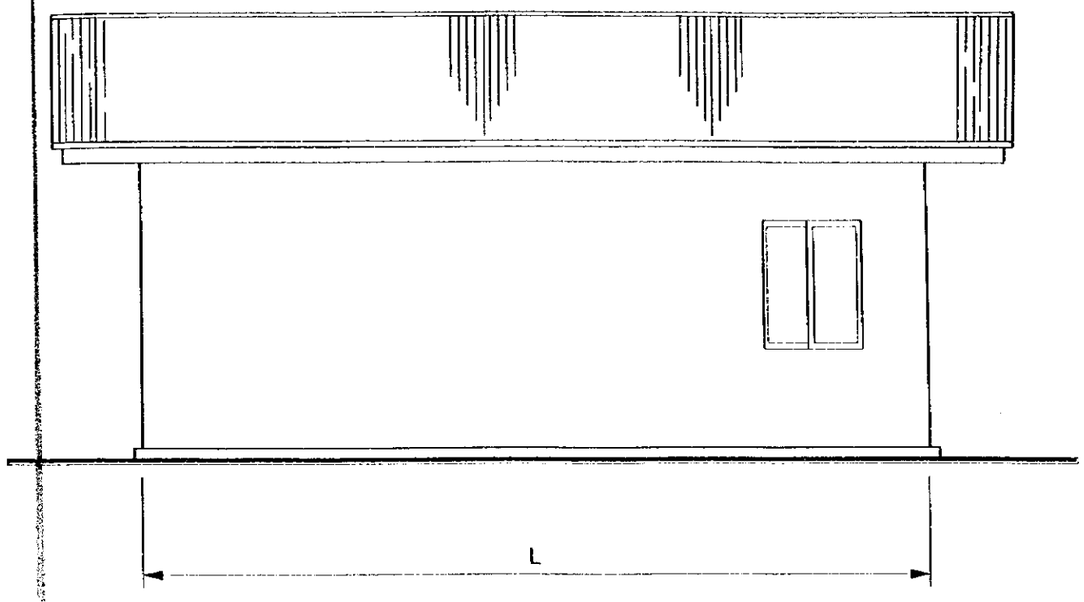
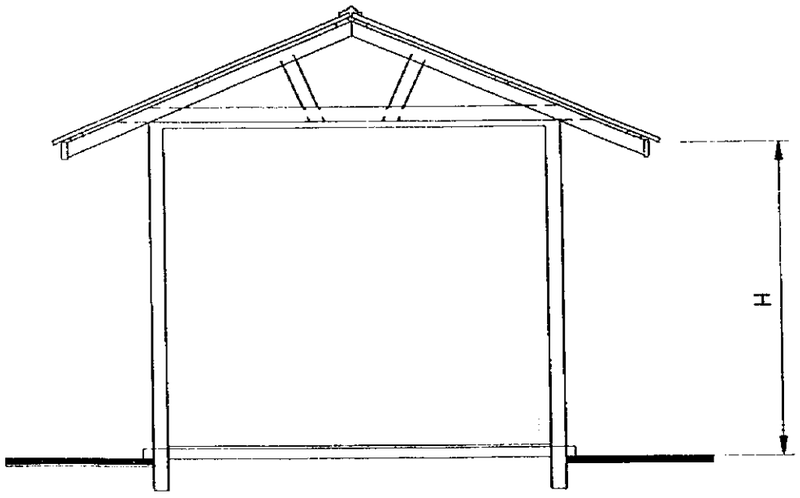
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING	MKULA SCHEME CULVERT		
Date		Drawing No.	412
JAPAN INTERNATIONAL COOPERATION AGENCY			

STORAGE & WUG OFFICE







(Unit : m)

ITEM	L	W	H
STORAGE	10.00	6.00	3.00
WUG OFFICE	10.00	10.00	3.00

THE UNITED REPUBLIC OF TANZANIA			
FEASIBILITY STUDY ON THE SMALLHOLDER IRRIGATIN PROJECT IN CENTRAL WAMI RIVER BASIN, MOROGORO			
TITLE OF DRAWING MKULA SCHEME STORAGE & WUG OFFICE			
Date		Drawing No.	413
JAPAN INTERNATIONAL COOPERATION AGENCY			