



## **KENYA RURAL ROADS AUTHORITY**

### **DESIGN AND CONSTRUCTION SUPERVISION WORKS FOR IMPLEMENTATION OF GOK/EU/AFD ROADS 2000 CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) PROGRAMME**

#### **AREA 2-BATCH 1: ISIOLO COUNTY**

#### **REHABILITATION, IMPROVEMENT, AND ROUTINE MAINTENANCE WORK: ISIOLO-MLANGO-OLDONYIR (C342) (10.0KM)**

#### **FINAL DETAILED ENGINEERING DESIGN BOOK OF DRAWINGS**

**AUGUST 2023**

#### **EMPLOYER:**



DIRECTOR (PLANNING, DESIGN AND ENVIRONMENT)  
KENYA RURAL ROADS AUTHORITY (KeRRA)  
P.O. BOX 48151 – 00100,  
NAIROBI

#### **CONSULTANT:**



CAS CONSULTANTS LTD  
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ISIOLO-MLANGO-OLDONYIRO (C342 02B)	
GRAVEL ROADS BOOK OF DRAWING	
DRAWING No.	GENERAL DRAWINGS
R2000/IMO/2023/GEN/01.	DRAWING INDEX
R2000/IMO/2023/GEN/02.	PROJECT LOCATION MAP
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R2000/IMO/2023/TCS/02	CROSS-SECTION B (REDUCED CROSS-SECTION)
R2000/IMO/2023/TCS/03	CROSS-SECTION C (BLACK COTTON SOIL CROSS-SECTION)
R2000/IMO/2023/TCS/04	CROSS-SECTION D (SIDELONG GROUND CROSS-SECTION)
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R2000/IMO/2023/PC/05	PIPE CULVERT DETAILS
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R2000/IMO/2023/DRT/01	30M LONG DRIFTS
STANDARD DRAWINGS	
R2000/IMO/2023/SD/01	STANDARD JUNCTION AND ACCESS DETAILS
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R2000/IMO/2023/SD/03	STANDARD MARKER POST DETAILS
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GENERAL DRAINAGE	
R2000/IMO/2023/GDR/01	MITRE DRAIN DETAILS
R2000/IMO/2023/GDR/02	SCOUR CHECKS
R2000/IMO/2023/GDR/03	SCOUR CHECKS
R2000/IMO/2023/GDR/04	SCOUR CHECKS
R2000/IMO/2023/GDR/05	ACCESS DRIFTS
TRAFFIC SIGNS	
R2000/IMO/2023/TS/01	STANDARD TRAFFIC SIGNS
PUBLICITY SIGNBOARD	
R2000/IMO/2023/PSB/01	PUBLICITY SIGNBOARD DETAILS

NO Revisions:	Date:	Approved By:
1.		
2.		

Client:




KENYA RURAL ROADS  
AUTHORITY


Financed by:



FRENCH  
DEVELOPMENT  
AGENCY



EUROPEAN  
UNION



GOVERNMENT OF  
KENYA

Consultant:



CAS CONSULTANTS LTD  
Le'Mac Building, 1st Floor, off Church  
Road, Westlands, Nairobi, Kenya  
P.O.Box 20023,00200  
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Project:

DESIGN AND SUPERVISION WORKS FOR  
IMPLEMENTATION OF THE CLIMATE  
PROOFED RURAL ROADS IN ARID AND  
SEMI-ARID LANDS (ASAL) - AREA 2.

AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA  
2: ISIOLO, SAMBURU AND MARSABIT COUNTIES

Drawing title:

GRAVEL ROADS

Scale: (AS SHOWN) Sheet: 1 of 1

Drawn by : R.T

Designed by : N.O

Checked by : C.O

Approved by : C.O

Date : AUGUST, 2023.

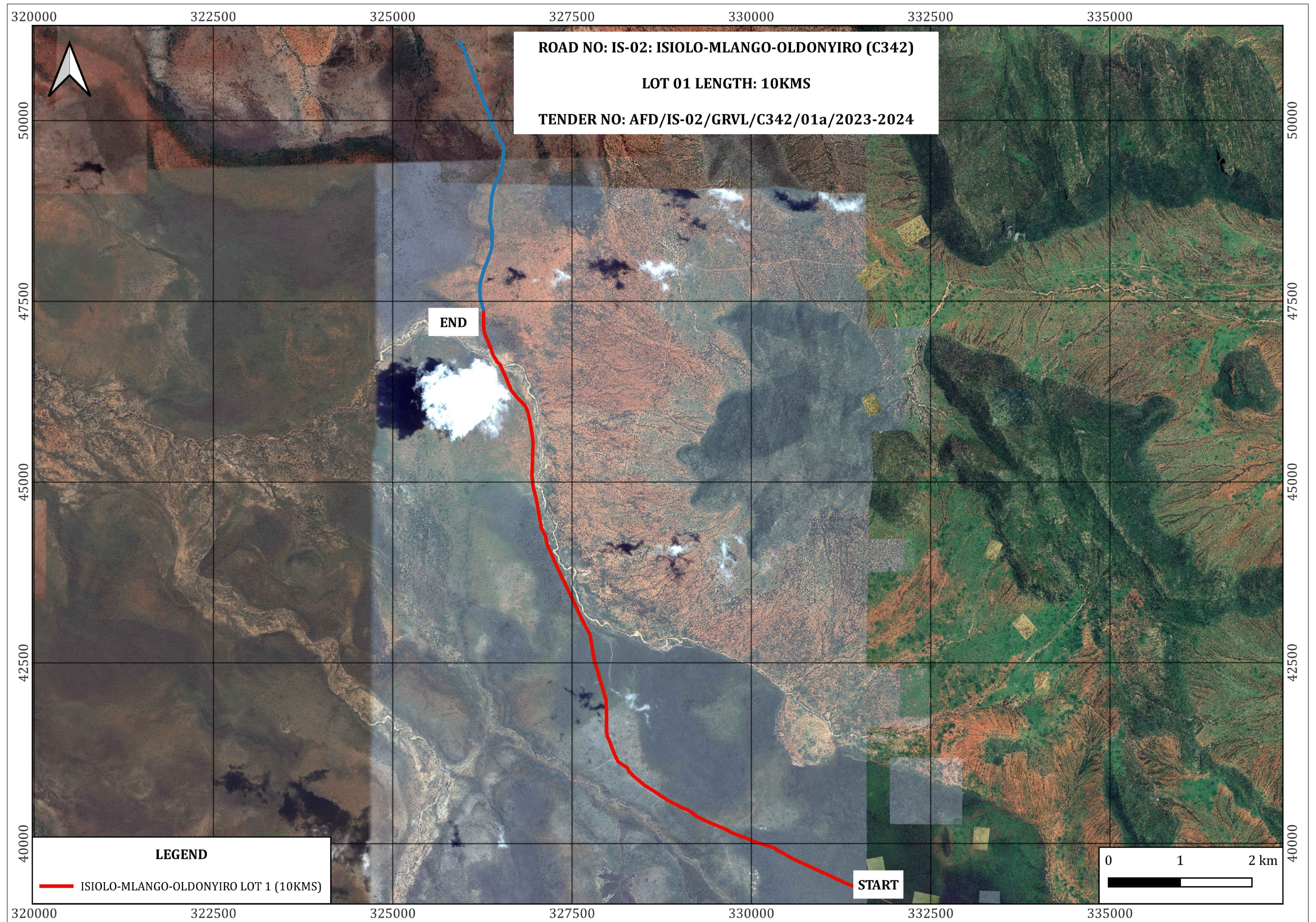
Client approval :



# LOCATION MAP

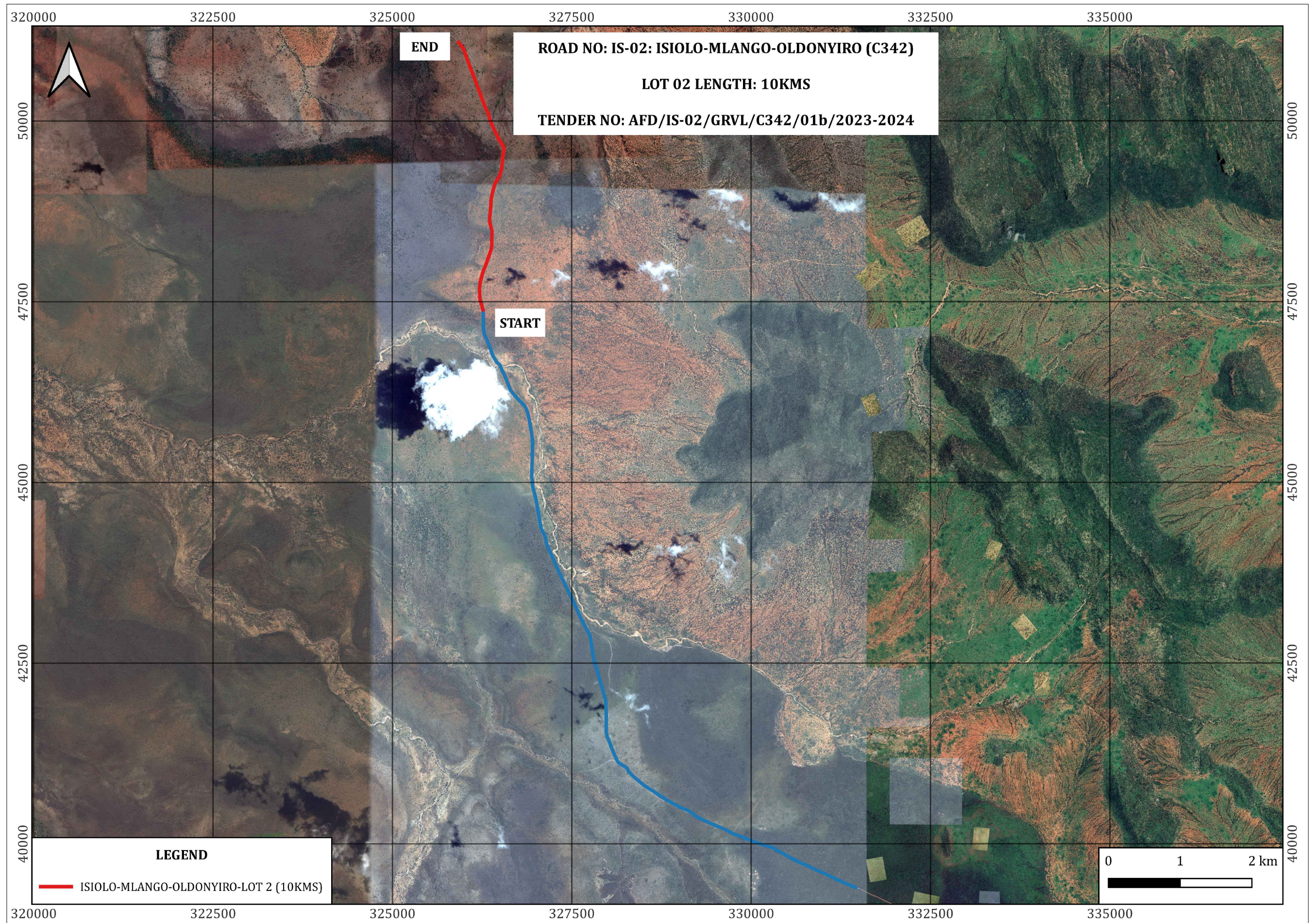
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T					
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 <b>AFD</b> FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	<b>DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.</b>  <b>AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES</b>	<b>LOCATION MAP</b>	Designed by : N.O			
2.													Checked by : C.O
													Approved by : C.O
													Date : AUGUST, 2023.
													Client approval :
							Scale: (AS SHOWN) Sheet: 1 of 1						





NO Revisions:		Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:		Drawn by : A.N		
1.				 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION		 GOVERNMENT OF KENYA	LOCATION MAP:		Designed by :	
2.							 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke		ISIOLO-MLANGO-OLDONYIRO ROAD LOT 1		Checked by : C.O	
									Scale: 1:50,000		Approved by : C.O	
									Sheet:		Date : AUGUST 2023	
									1 of 2		Client approval :	
				 GOVERNMENT OF KENYA					AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES		Drg No. : R2000/IMO/2023/LM/001	





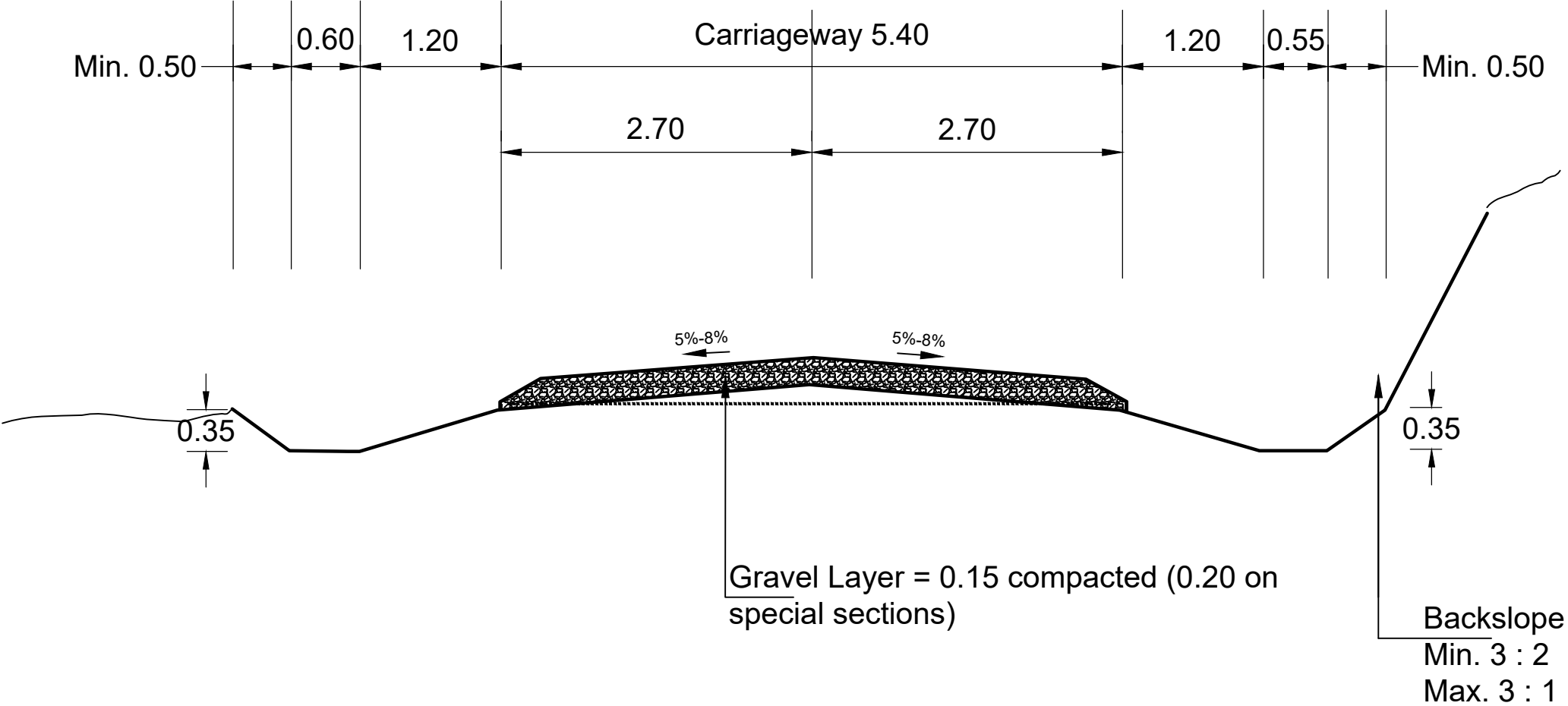
NO Revisions:		Date:	Approved By:	Client:	Financed by:	Consultant:	Project:  DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.  AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Drawing title:		Drawn by : A.N			
1.				 <b>KENYA RURAL ROADS AUTHORITY</b>	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION		 GOVERNMENT OF KENYA	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	LOCATION MAP:		Designed by :	
2.										ISIOLO-MLANGO-OLDONYIRO ROAD LOT 2		Checked by : C.O	
										Scale: 1:50,000		Approved by : C.O	
										Sheet:		Date : AUGUST 2023	
										2 of 2		Client approval :	
												Drg No. : R2000/IMO/2023/LM/002	



# TYPICAL CROSS-SECTIONS

NO Revisions:		Date:	Approved By:	Client:	Financed by:		Consultant:	Project:  DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.  AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Drawing title:		Drawn by : R.T
1.				  KENYA RURAL ROADS AUTHORITY	  FRENCH DEVELOPMENT AGENCY	  EUROPEAN UNION	  GOVERNMENT OF KENYA		TYPICAL CROSS-SECTIONS		Designed by : N.O
2.											Checked by : C.O
											Approved by : C.O
											Date : AUGUST, 2023.
											Client approval :
									Scale: (AS SHOWN)	Sheet: 1 of 1	

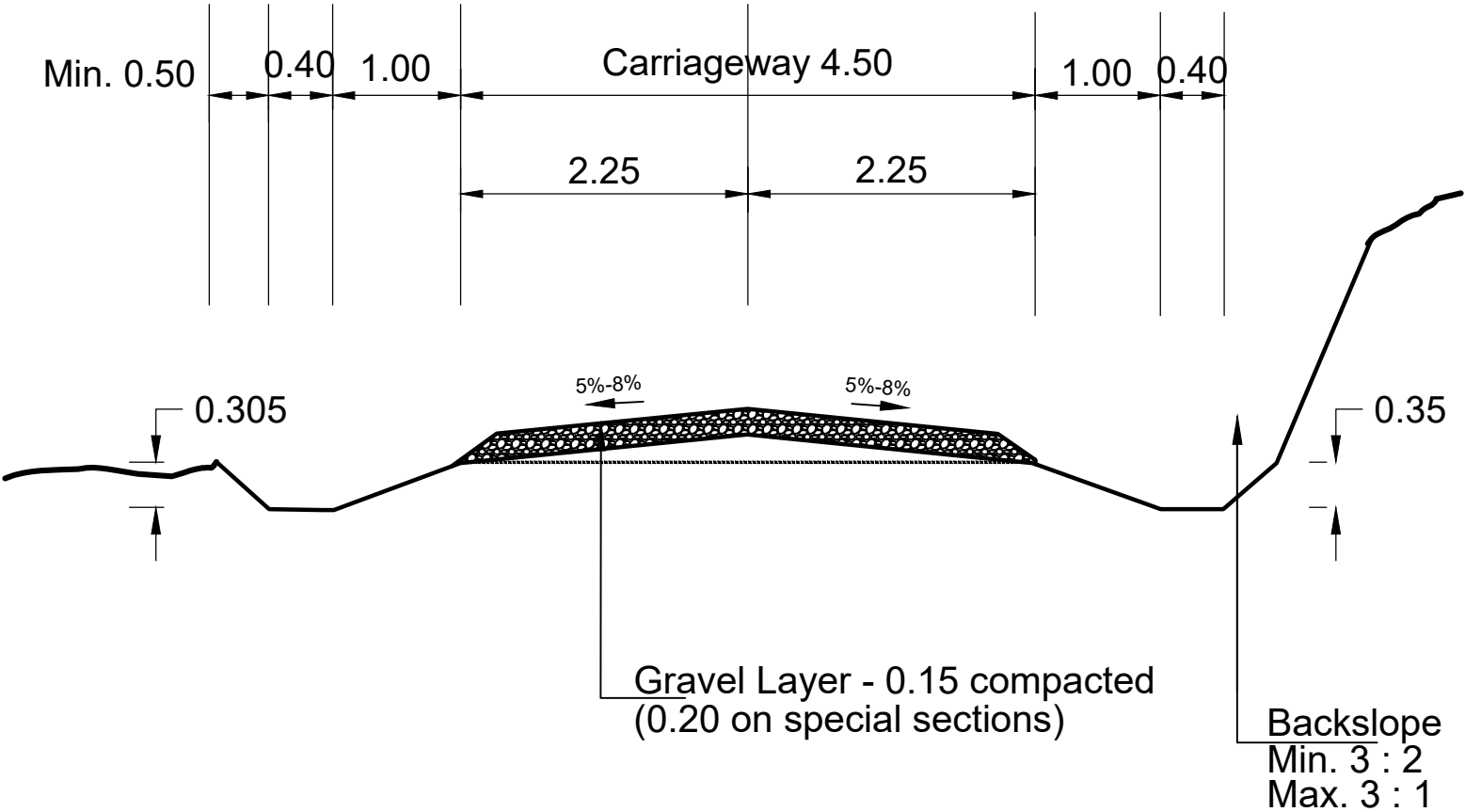
FIGURE H.1 - CROSS SECTION A (MINOR STANDARD CROSS-SECTION)



- NOTE:
- ALL SPECIFIED DIMENSIONS IN m.
  - TRAFFIC LEVELS OF MORE THAN 200 VPD MAY JUSTIFY RUNNING SURFACE WIDTH INCREASE TO 6.50 METRES

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by
1.							CROSS SECTION DRAWINGS	: R.T
2.			KENYA RURAL ROADS AUTHORITY	FRENCH DEVELOPMENT AGENCY	EUROPEAN UNION	GOVERNMENT OF KENYA	STANDARD CROSS-SECTION DETAILS	Designed by : N.O
							Scale: (AS SHOWN)	Checked by : C.O
							Sheet: 1 of 1	Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
								Drg No. : R2000/IMO/2023/TCS/01

FIGURE H.2 - CROSS SECTION B (REDUCED CROSS-SECTION)

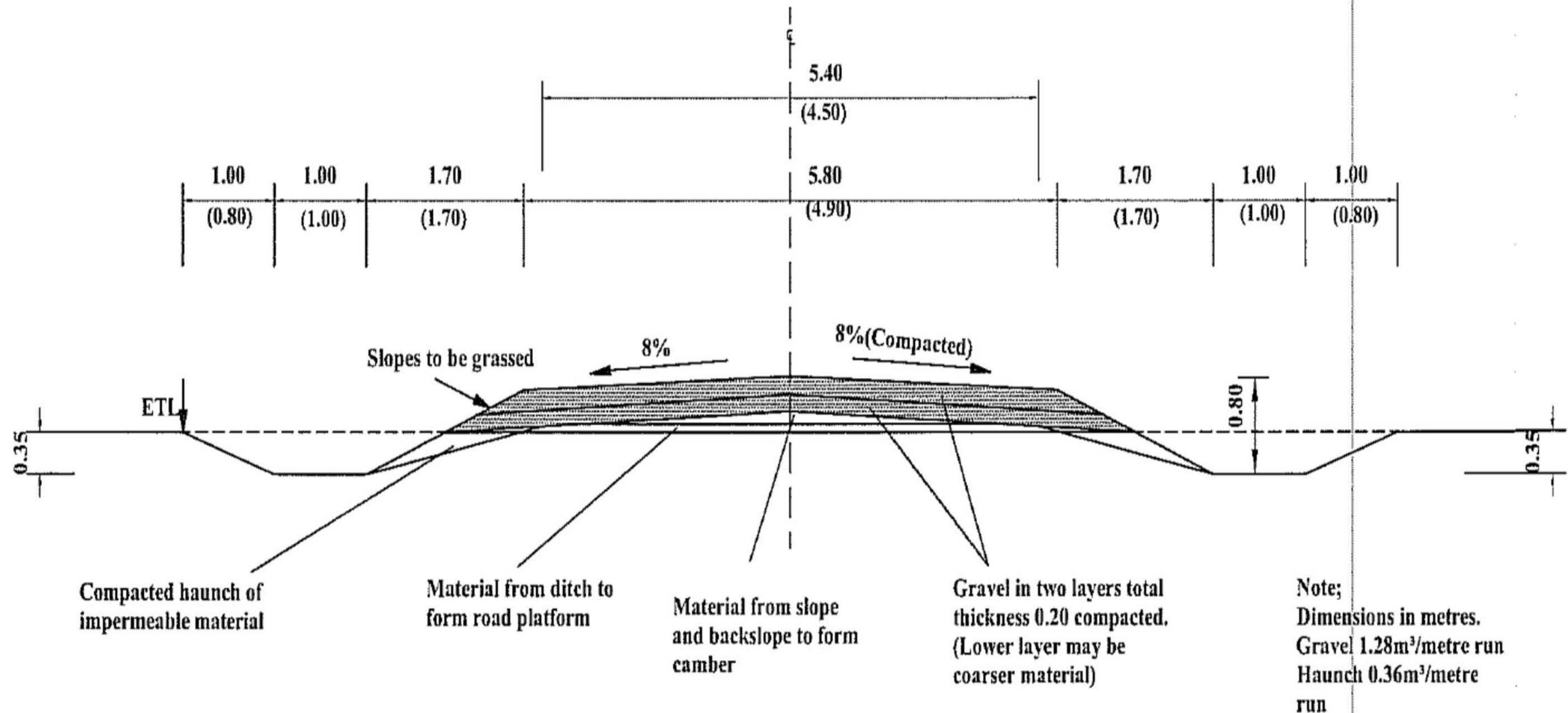







NOTE: - ALL SPECIFIED DIMENSIONS IN m.

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	CROSS SECTION DRAWINGS  REDUCED CROSS-SECTION DETAILS	: R.T
2.								Designed by : N.O
								Checked by : C.O
								Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
						Scale: (AS SHOWN)	Sheet: 1 of 1	Drg No. : R2000/IMO/2023/TCS/02

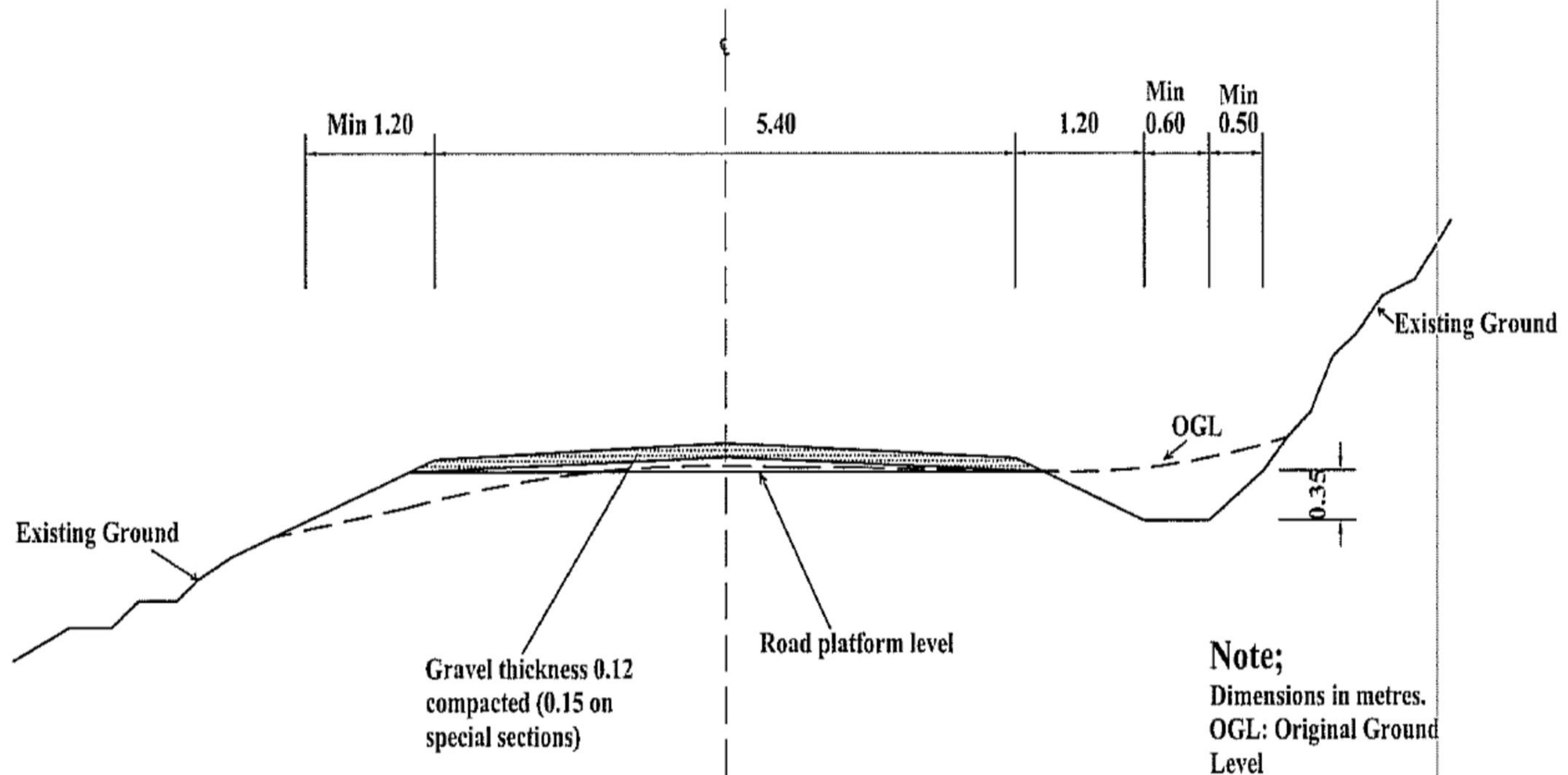




## Cross Section C (Black Cotton Soil)

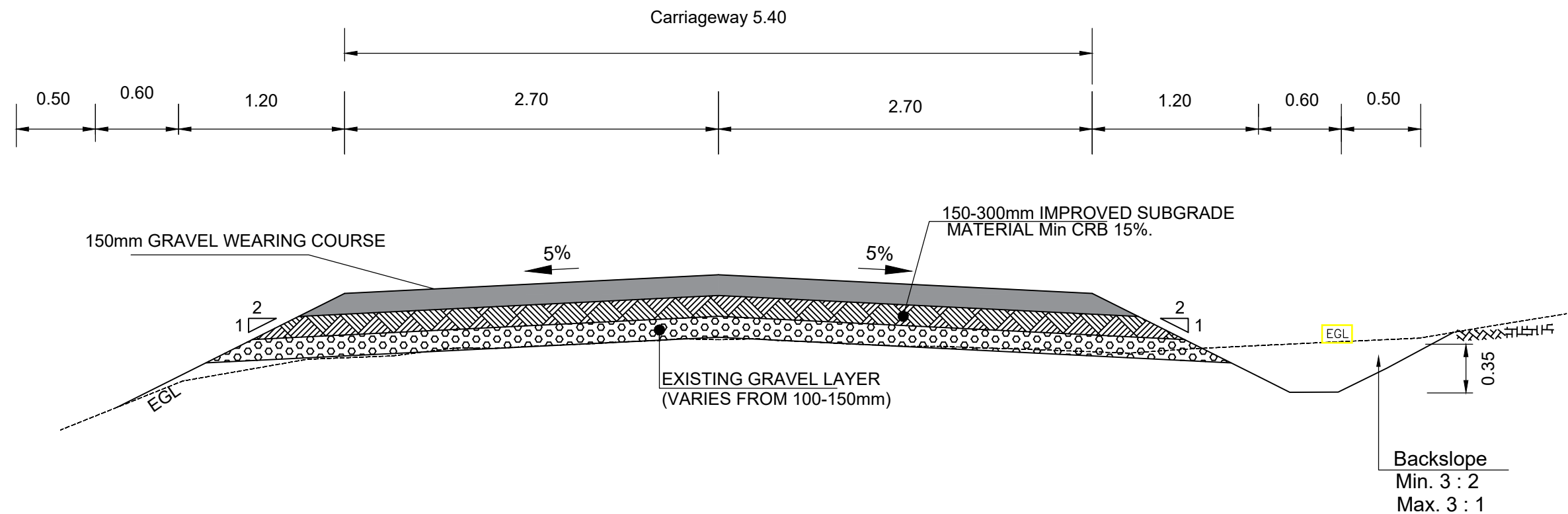


NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by	: R.T			
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISOLO, SAMBURU AND MARSABIT COUNTIES	Drawing title:  CROSS SECTION DRAWINGS  BLACK COTTON SOIL CROSS-SECTION DETAILS	Designed by	: N.O
2.											Checked by	: C.O
											Approved by	: C.O
											Date	: AUGUST, 2023.
											Client approval	:
							Scale: (AS SHOWN)	Sheet:	1 of 1	Drg No.	: R2000/IMO/2023/TCS/04	

## Cross Section D (Sidelong Ground)

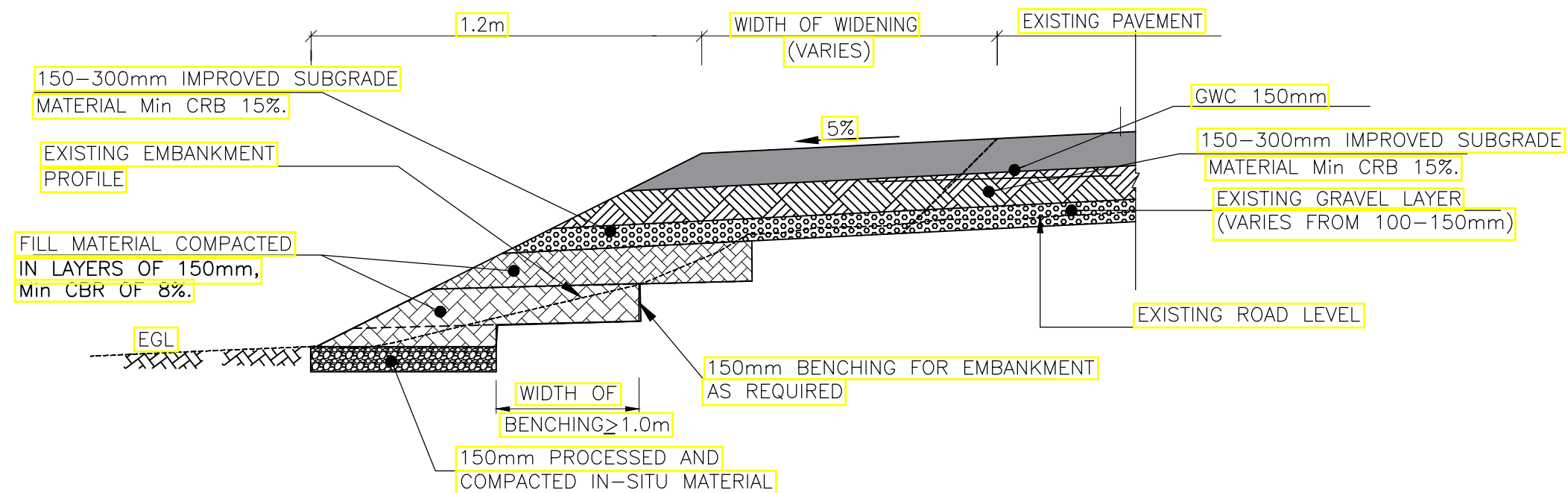


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1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	CROSS SECTION DRAWINGS  SIDELONG GROUND CROSS-SECTION DETAILS	Designed by : N.O
2.								Checked by : C.O
								Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
								Drg No. : R2000/IMO/2023/TCS/05
							Scale: (AS SHOWN) Sheet: 1 of 1	



TYPICAL CROSS-SECTION

SCALE 1:20







PAVEMENT WIDENING DETAILS :

SCALE 1:20

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:		Drawn by : R.T
1.			 KENYA RURAL ROADS AUTHORITY	 AFD FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	Designed by : N.O
2.									Checked by : C.O
									Approved by : C.O
									Date :AUGUST, 2023.
									Client approval :
									Drg No. : R2000/IMO/2023/TCS/06
							Scale: (AS SHOWN)	Sheet: 1 of 1	

# PIPE CULVERTS

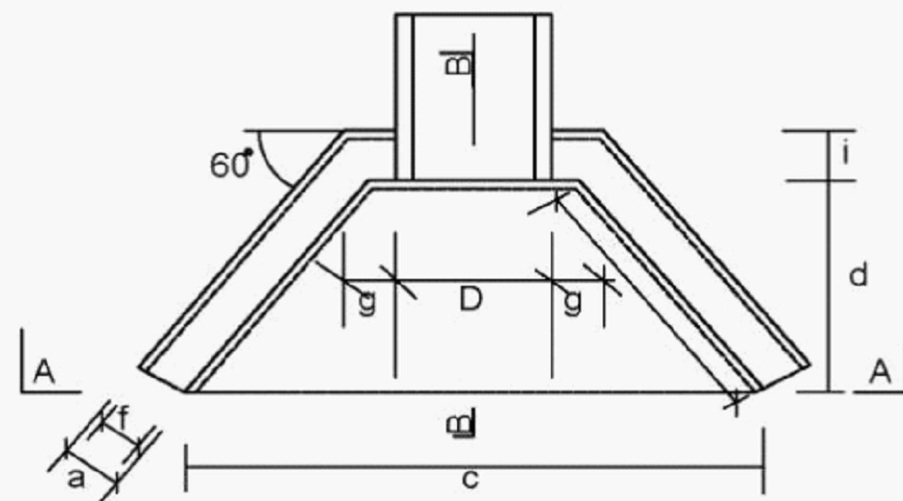
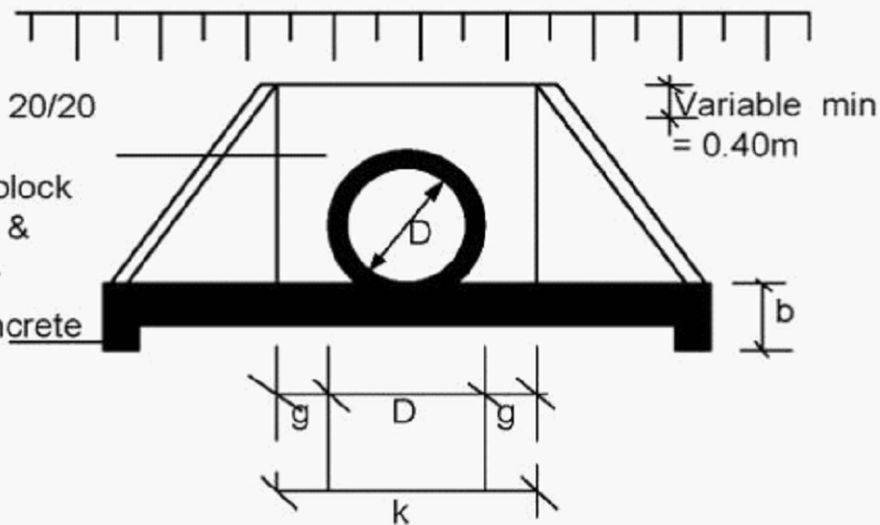
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1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	Designed by : N.O
2.								Checked by : C.O
								Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
							Scale: (AS SHOWN) Sheet: 1 of 7	



## C8- HEADWALL TYPE 1 (HEAD AND WINGWALLS)

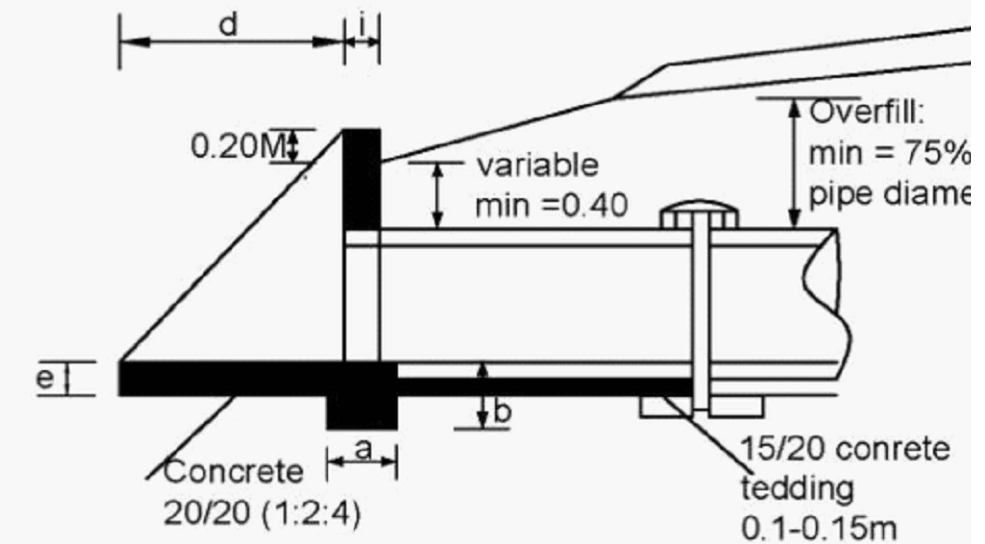
### SECTION A-A

Masonry 20/20  
or (1:2:4)  
concrete block  
wingwalls &  
headwalls  
15/20 Concrete  
(1:3:6)



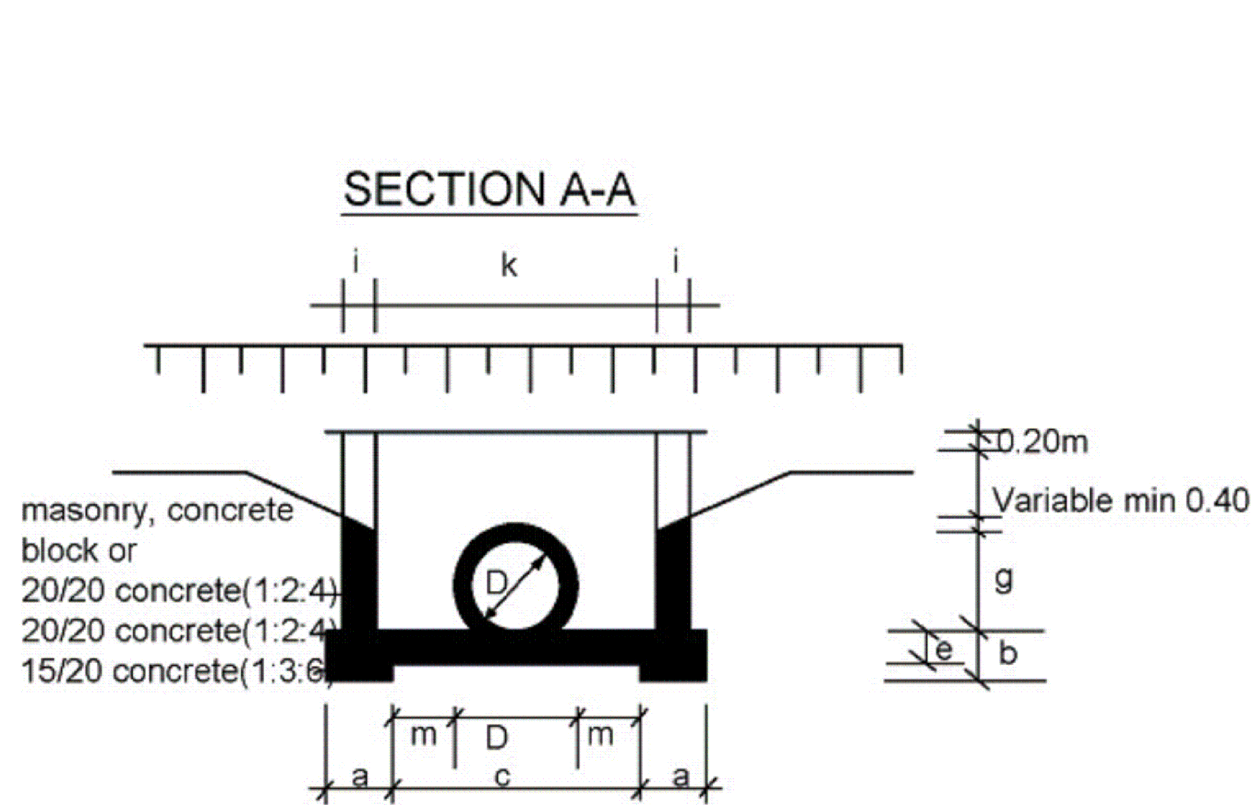
CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

### SECTION B-B

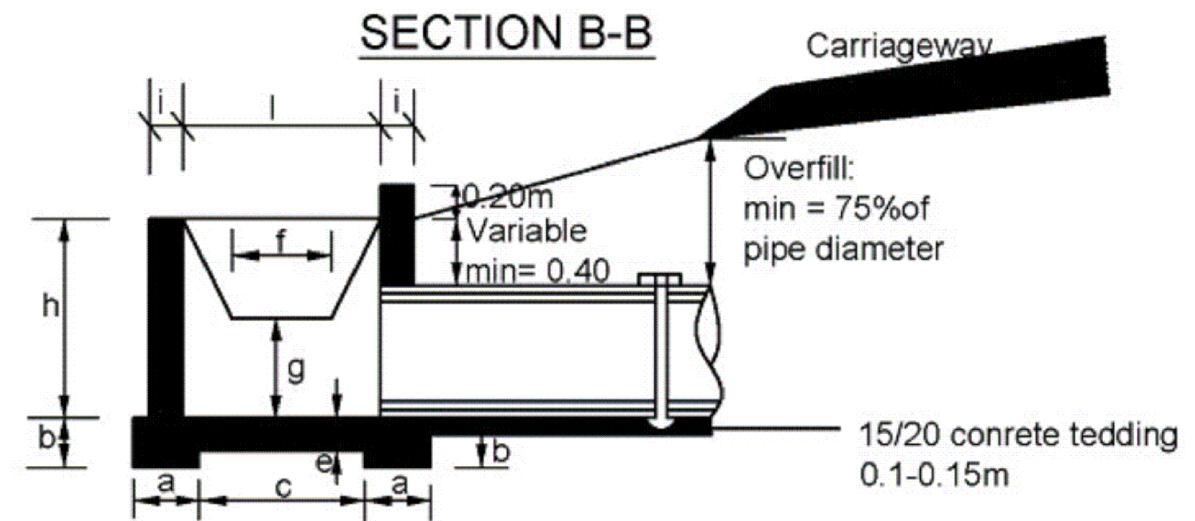
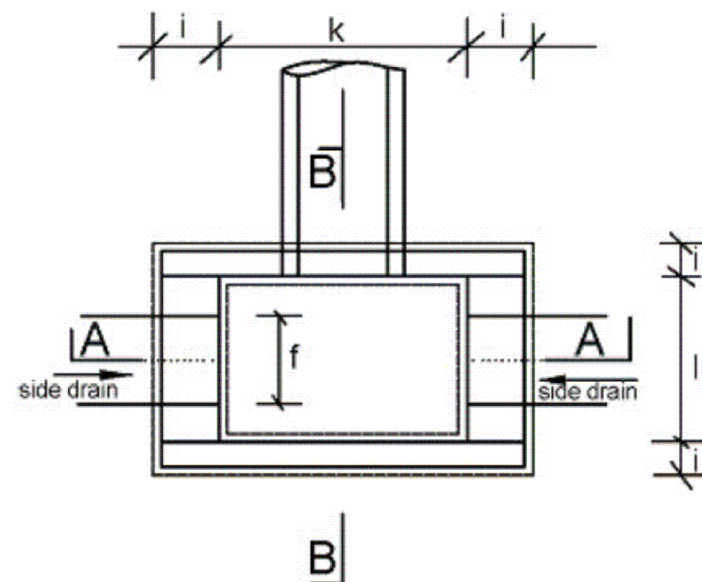


PIPE DIAMETER IN M		TYPE A and C CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
		450	600	900	450	600	900
DIMENSION	UNIT						
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40
b	FOUNDATION	m	0.30	0.30	0.40	0.30	0.30
c	FOUNDATION	m	2.20	2.35	2.89	2.20	2.35
d	APRON	m	1.00	1.00	1.20	1.00	1.00
e	APRON	m	0.20	0.20	0.20	0.20	0.20
f	WALL	m	0.20	0.20	0.20	0.40	0.40
g	WALL	m	0.30	0.30	0.30	0.30	0.30
h	WALL	m	1.15	1.15	1.39	1.15	1.15
i	WALL	m	0.20	0.20	0.20	0.40	0.40
k	APRON	m	1.05	1.20	1.50	1.05	1.20
MATERIAL REQUIREMENT							
FOUNDATION (concrete)	m3	0.30	0.32	0.51	0.40	0.42	1.03
HEAD/WINGWALLS (Concrete/Masonry)	m3	0.42	0.49	0.70	0.84	0.96	1.40
APRON (concrete)	m3	0.33	0.36	0.53	0.33	0.36	0.53

## C9-HEADWALL TYPE 2(DROP INLET)



**PLAN**



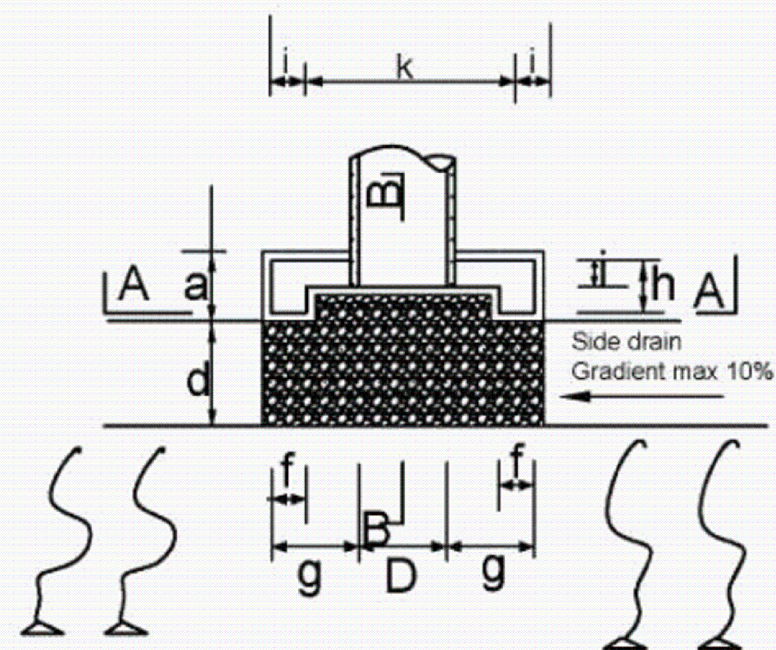
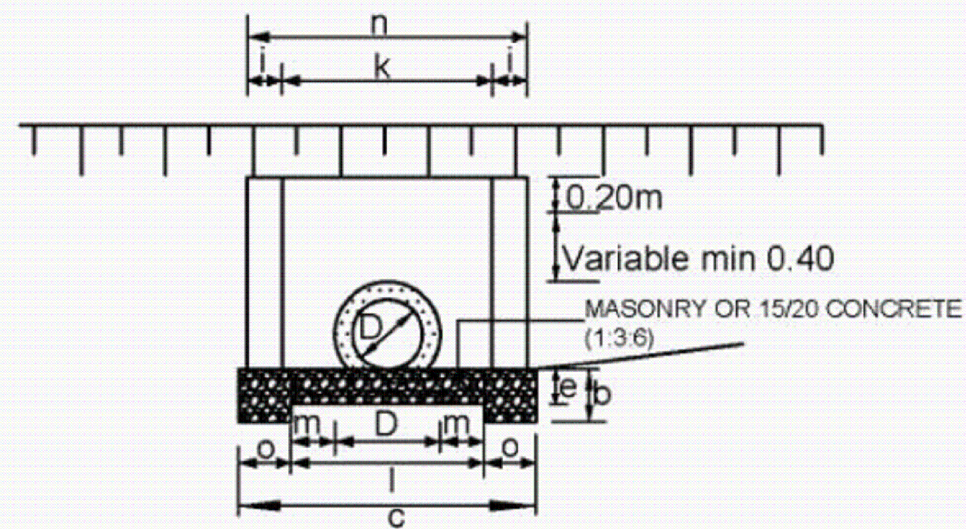
**DIMENSIONS AND MATERIAL REQUIREMENTS**

PIPE DIAMETER IN (M)		TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
		450	600	900	450	600	900
DIMENSION	UNIT						
a	FOUNDATION	m	0.30	0.30	0.30	0.40	0.40
b	FOUNDATION	m	0.30	0.30	0.30	0.30	0.30
c	FOUNDATION	m	1.10	1.10	1.40	1.20	1.20
d	APRON	m	0.90	0.90	0.90	1.00	1.00
e	APRON	m	0.20	0.20	0.20	0.20	0.20
f	DROP INLET	m	0.60	0.60	0.60	0.60	0.60
g	DROP INLET	m	0.30	0.40	0.60	0.30	0.40
h	DROP INLET	m	0.60	0.80	1.20	0.60	0.80
i	DROP INLET	m	0.20	0.20	0.20	0.40	0.40
k	DROP INLET	m	1.20	1.20	1.50	1.20	1.20
l	DROP INLET	m	1.00	1.00	1.00	1.00	1.00
m	DROP INLET	m	0.38	0.30	0.30	0.38	0.30
<b>MATERIAL REQUIREMENT</b>							
FOUNDATION (concrete)		m3	0.47	0.47	0.52	0.72	0.72
HEAD/WINGWALLS (Concrete/Masonry)		m3	0.6	0.72	1.15	1.27	1.63
APRON (concrete)		m3	0.24	0.24	0.30	0.24	0.24

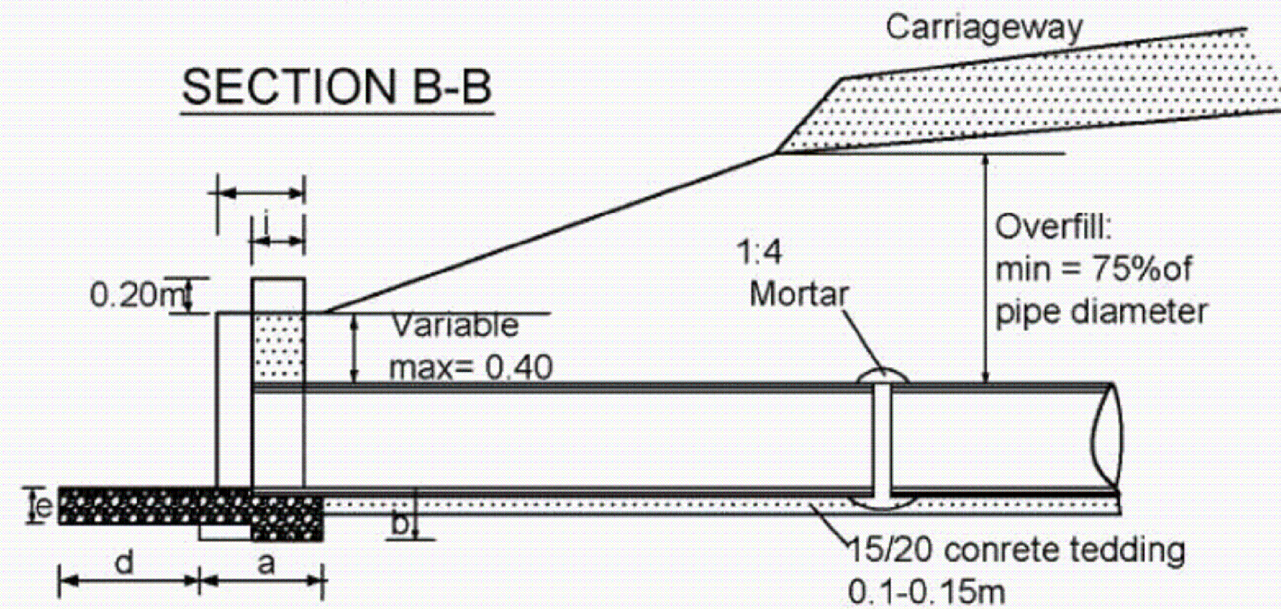


## C.10-HEADWALL TYPE 3A (CONCRETE/ BLOCK HEADWALLS)

### SECTION A-A



### SECTION B-B



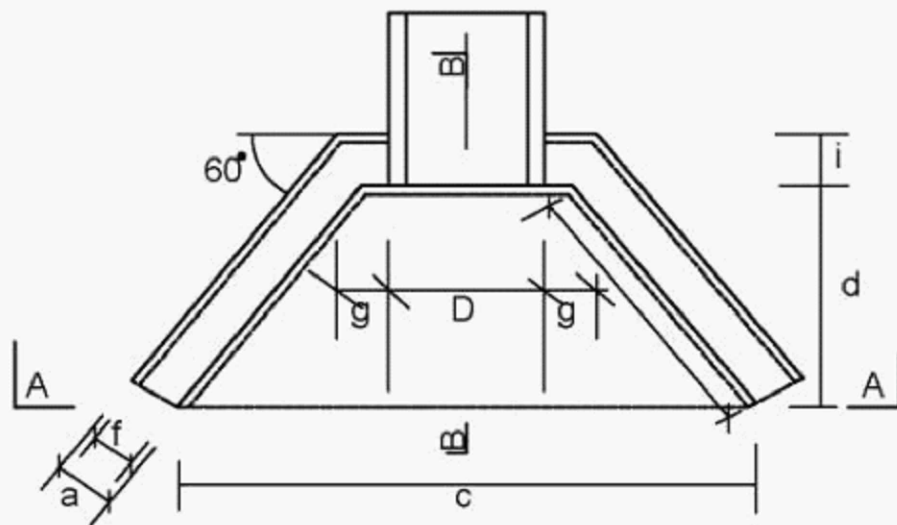
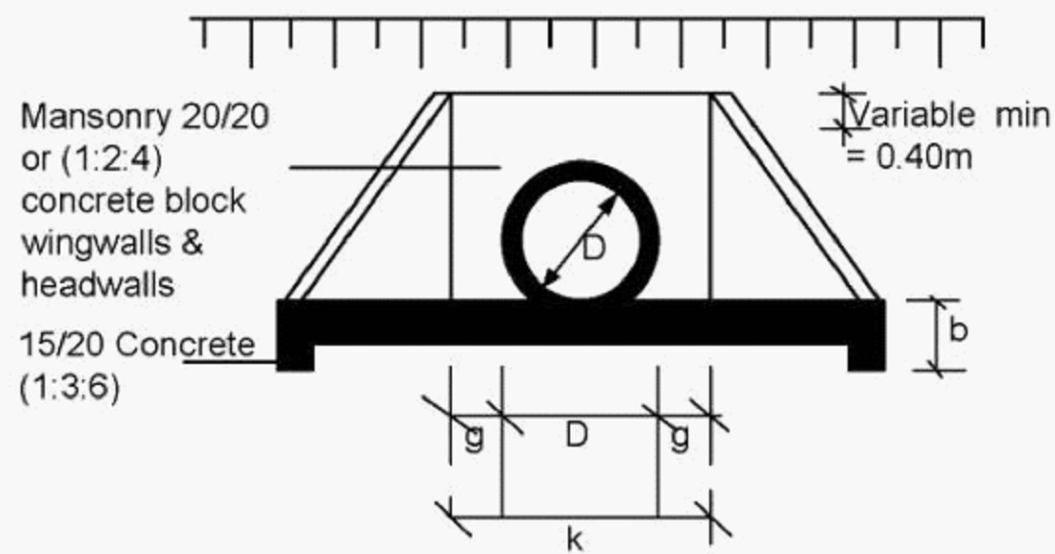
### DIMENSIONS AND MATERIAL REQUIREMENTS

PIPE DIAMETER IN (M)	DIMENSION	UNIT	TYPE A and C CONCRETE BLOCKS	
			450	600
a	FOUNDATION	m	0.50	0.50
b	FOUNDATION	m	0.30	0.30
c	FOUNDATION	m	1.55	1.70
d	APRON	m	0.60	0.60
e	APRON	m	0.20	0.20
f	HEADWALL	m	0.20	0.20
g	HEADWALL	m	0.50	0.50
h	HEADWALL	m	0.50	0.50
i	HEADWALL	m	0.50	0.50
k	HEADWALL	m	0.50	0.50
l	FOUNDATION	m	0.50	0.50
m	FOUNDATION	m	0.50	0.50
n	HEADWALL	m	0.50	0.50
o	FOUNDATION	m	0.50	0.50
MATERIAL REQUIREMENT				
FOUNDATION (concrete)			0.23	0.19
HEADWINGWALLS (Concrete/Masonry)			0.34	0.37
APRON (concrete)			0.95	0.99



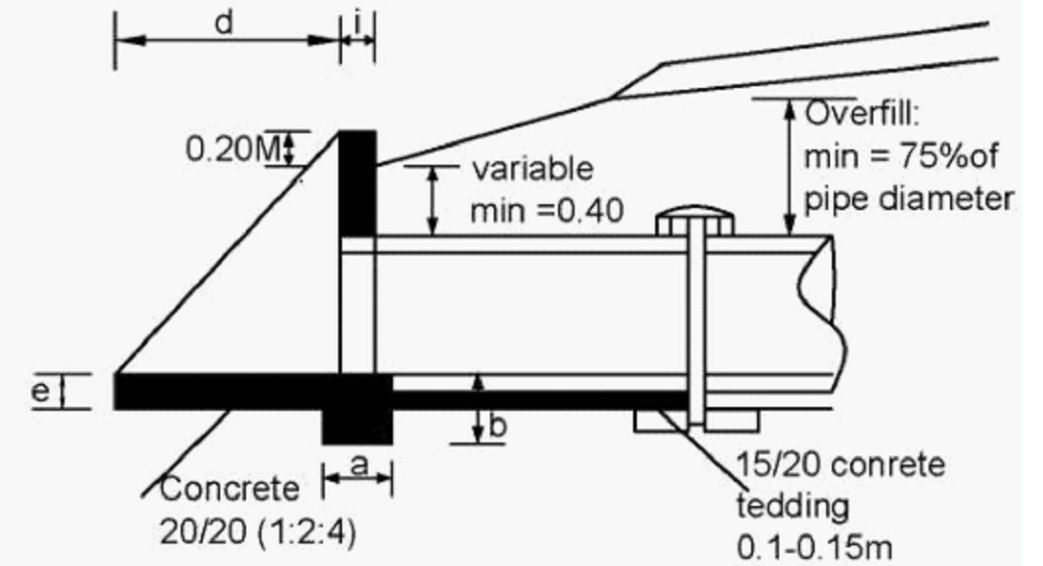
### C12- HEADWALL TYPE 4 (FOR ACCESS CULVERTS)

## SECTION A-A



CULVERT TYPES	
X-SECTION WIDTH-M	No. of pipes
4.50	6.00
5.50	7.00
6.50	8.00

## SECTION B-B



PIPE DIAMETER IN M			TYPE A CONCRETE BLOCKS			TYPE B (STONE MASONRY)		
			450	600	900	450	600	900
DIMENSION	UNIT							
a	FOUNDATION	m	0.30	0.30		0.40	0.40	
b	FOUNDATION	m	0.30	0.30		0.30	0.30	
c	FOUNDATION	m	1.34	1.49		1.34	1.49	
d	APRON	m	0.6	0.6		0.60	0.60	
e	APRON	m	0.20	0.20		0.20	0.20	
f	WALL	m	0.20	0.20		0.40	0.40	
g	WALL	m	0.1	0.10		0.10	0.10	
h	WALL	m	0.69	0.69		0.69	0.69	
i	WALL	m	0.20	0.20		0.40	0.40	
k	APRON	m	0.4	0.40		1.05	1.20	
MATERIAL REQUIREMENT								
FOUNDATION (concrete)		m3	0.18	0.2		0.24	0.26	
HEAD/WING WALLS (Concrete/Masonry)		m3	0.28	0.32		0.53	0.61	
APRON (concrete)		m3	0.12	0.14		0.12	0.14	

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T		
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 <b>FRENCH DEVELOPMENT AGENCY</b>	 <b>EUROPEAN UNION</b>	 <b>GOVERNMENT OF KENYA</b>	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	<b>DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.</b>  <b>AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES</b>	<b>HEADWALL TYPE 1 DETAILS</b>	Designed by : N.O
2.									Checked by : C.O	
									Approved by : C.O	
									Date : AUGUST, 2023.	
									Client approval :	
									Drg No. : R2000/IMO/2023/PC/04	
							Scale: (AS SHOWN) Sheet: 5 of 7			

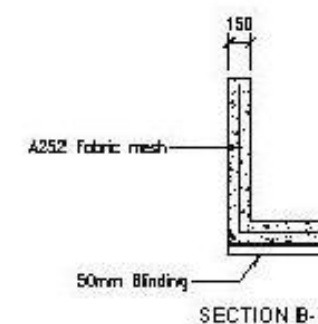
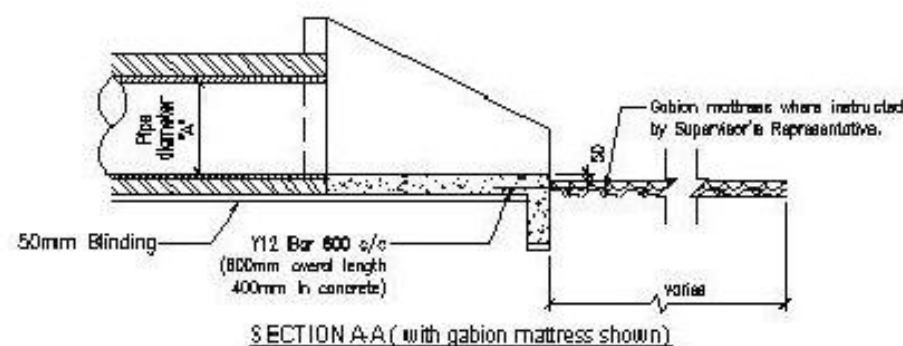
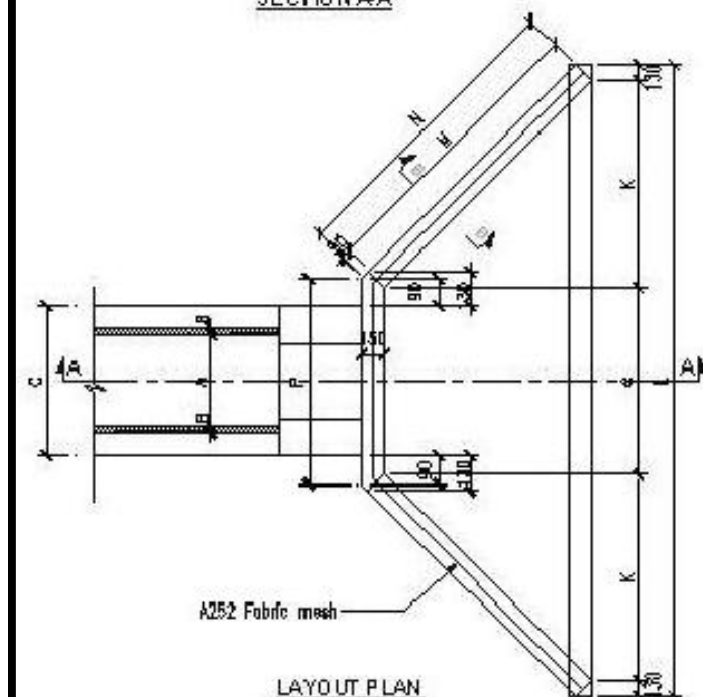
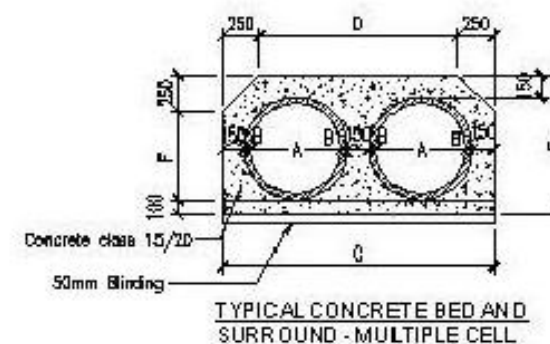
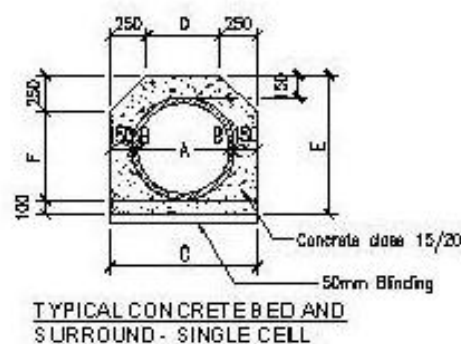
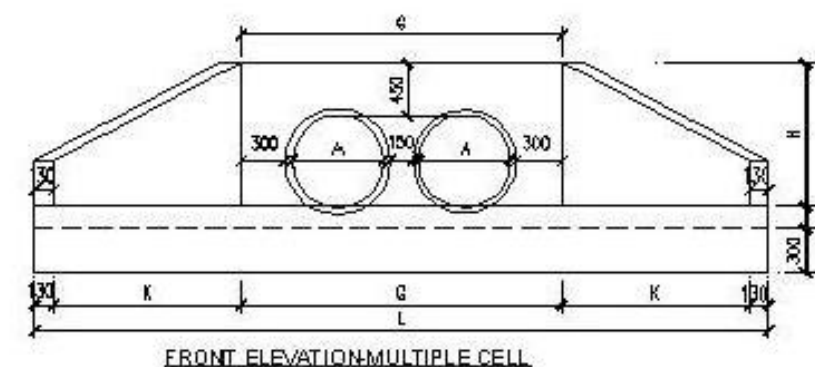
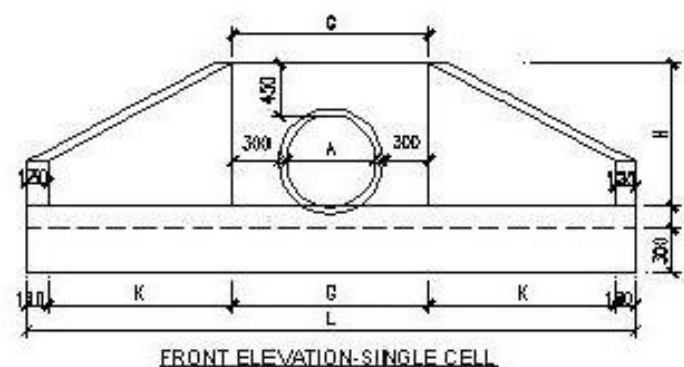
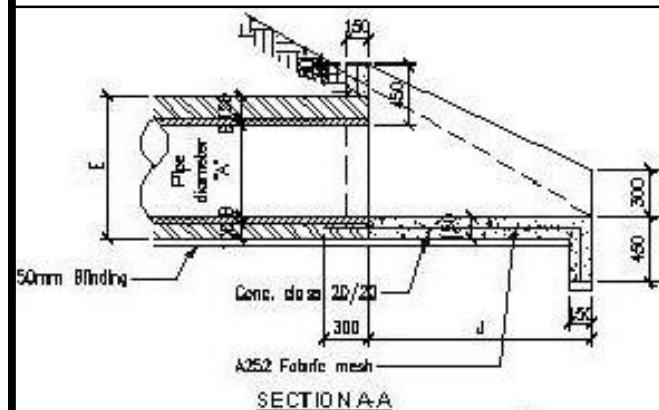


TABLE A - 1-CELL CONCRETE PIPE CULVERTS

CULVERT	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	1.00	0.50	0.95	0.60	1.20	0.95	1.25	0.72	3.00	1.44	1.53	1.18	1.58m <sup>3</sup>	0.50m <sup>3</sup>
Diameter 0.90m	0.90	0.09	1.38	0.88	1.33	0.98	1.50	1.25	2.25	1.30	4.54	2.60	2.69	1.56	4.07m <sup>3</sup>	0.86m <sup>3</sup>
Diameter 1.20m	1.20	0.10	1.80	1.30	1.70	1.35	1.80	1.55	2.85	1.65	5.56	3.29	3.38	1.88	5.92 m <sup>3</sup>	1.46 m <sup>3</sup>

TABLE B - 2-CELL CONCRETE PIPE CULVERTS

CULVERT	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	1.85	1.35	0.95	0.60	2.15	0.95	1.25	0.72	3.85	1.44	1.53	2.03	2.22m <sup>3</sup>	0.93m <sup>3</sup>
Diameter 0.90m	0.90	0.09	2.61	2.11	1.33	0.98	2.91	1.25	2.25	1.30	5.77	2.60	2.69	2.79	4.89m <sup>3</sup>	1.58m <sup>3</sup>
Diameter 1.20m	1.20	0.10	3.25	2.75	1.70	1.35	3.55	1.55	2.85	1.65	7.11	3.29	3.38	3.43	7.24m <sup>3</sup>	2.38m <sup>3</sup>

TABLE C - 3-CELL CONCRETE PIPE CULVERTS

CULVERTS	A (m)	B (m)	C (m)	D (m)	E (m)	F (m)	G (m)	H (m)	J (m)	K (m)	L (m)	M (m)	N (m)	P (m)	CONCRETE CLASS 20/20 Inlet & Outlet	CONCRETE CLASS 15/20 Surround & Bed per running m
Diameter 0.60m	0.60	0.05	2.70	2.20	0.95	0.60	3.00	0.95	1.25	0.72	4.70	1.44	1.53	2.88	2.66m <sup>3</sup>	1.35m <sup>3</sup>
Diameter 0.90m	0.90	0.09	3.84	3.34	1.33	0.98	4.14	1.25	2.25	1.30	7.00	2.60	2.69	4.02	5.88m <sup>3</sup>	2.30m <sup>3</sup>
Diameter 1.20m	1.20	0.10	4.80	4.30	1.70	1.35	5.10	1.55	2.85	1.65	8.88	3.29	3.38	4.98	8.73m <sup>3</sup>	3.48m <sup>3</sup>

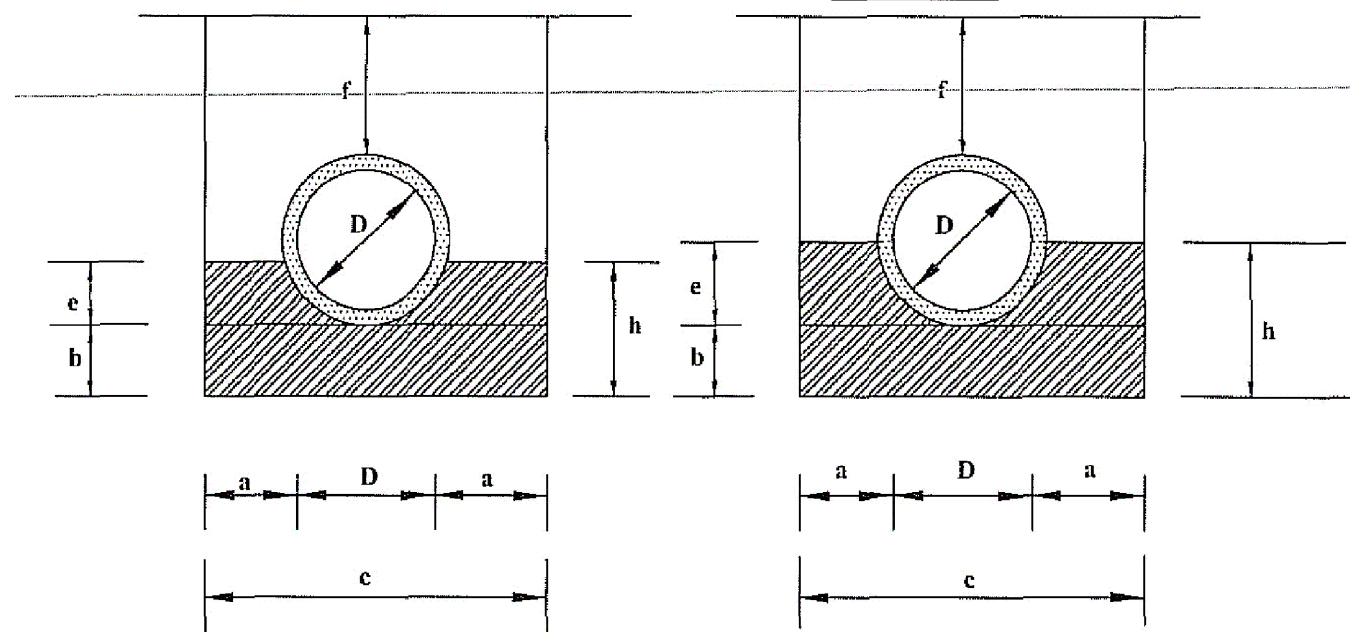
NOTES:

1. All dimensions are in millimetres, unless otherwise indicated

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by :	R.T
1.						DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	STANDARD PIPE CULVERT DRAWINGS	Designed by :	N.O
2.								Checked by :	C.O
								Approved by :	C.O
								Date :	AUGUST, 2023.
								Client approval :	
								Drg No. :	R2000/IMO/2023/PC/05
								Scale: (1:2000)	Sheet: 6 of 7

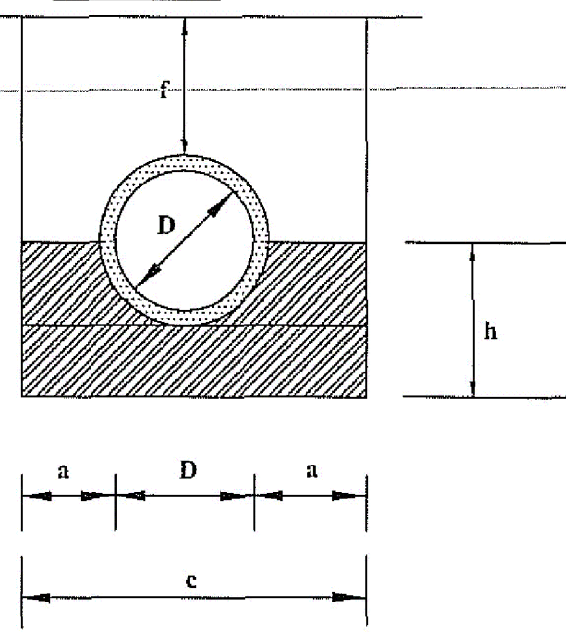


**PROFILE 1**  
**(CONCRETE)**



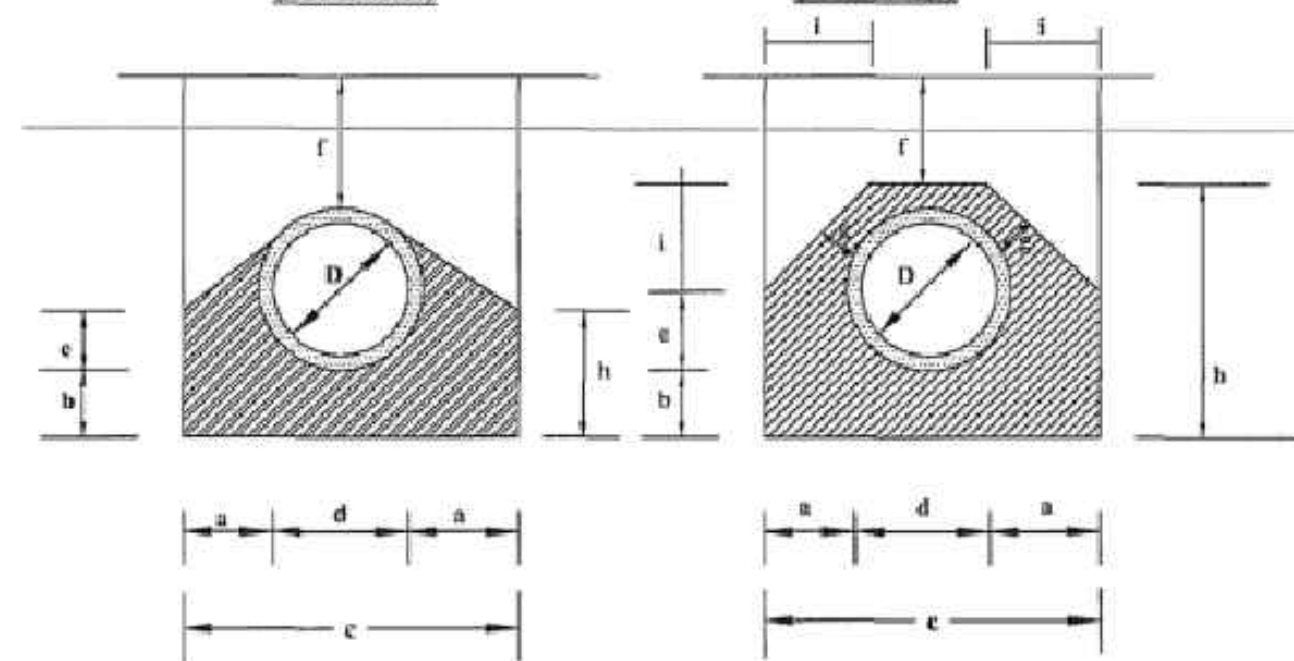
Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.14	0.18	0.27
f(min)	0.34	0.45	0.68
g	-	-	-
h	0.24	0.33	0.42
i	-	-	-
Concrete Class 15/20	Volume in (m3/m)		
	0.24	0.24	0.24
Application	-Fair subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		

**PROFILE II**  
**(CONCRETE)**



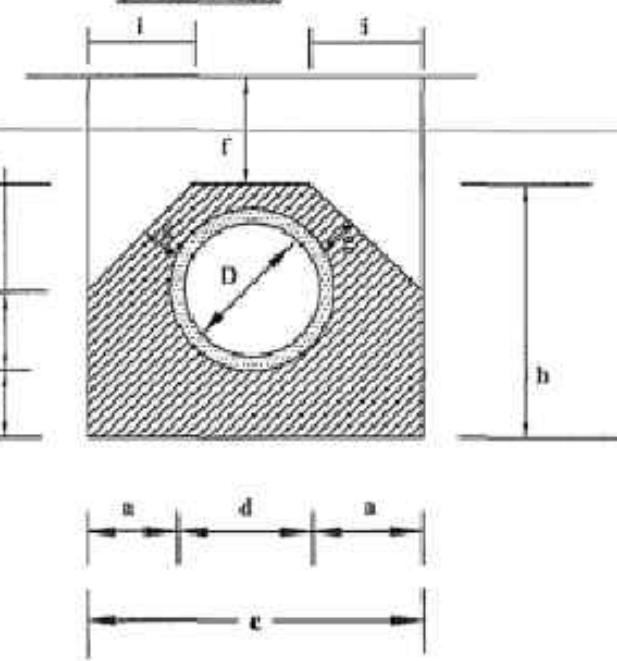
450 (mm)	600 (mm)	900 (mm)
0.15	0.20	0.20
0.10	0.15	0.15
0.86	1.12	1.48
0.56	0.72	1.08
0.28	0.36	0.54
0.34	0.45	0.68
-	-	-
0.38	0.51	0.69
-	-	-
<b>Volume in (m3/m)</b>		
<b>0.20</b>	<b>0.37</b>	<b>0.56</b>
<b>-Fair to poor subgrade condition</b> <b>-Overfill &gt; 75% of the pipe diameter</b> <b>-Seasonal water flow only</b>		
<b>Material for back/overfill shall be approved by the Engineer</b>		

### PROFILE III (CONCRETE)

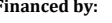




Diameter (D)	450 (mm)	600 (mm)	900 (mm)
a	0.15	0.20	0.20
b	0.10	0.15	0.15
c	0.86	1.12	1.48
d	0.56	0.72	1.08
e	0.42	0.54	0.81
f(min)	0.23	0.3	0.45
g	-	-	-
h	0.52	0.69	0.96
i	-	-	-
Concrete Class 15/20	Volume in (m <sup>3</sup> /m)		
	0.26	0.47	0.71
Application	-Fair subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Remarks	Material for back/overfill shall be approved by the Engineer		






#### PROFILE IV (CONCRETE)



450 (mm)	600 (mm)	900 (mm)
0.15	0.20	0.20
0.10	0.15	0.15
0.86	1.12	1.48
0.56	0.72	1.08
0.46	0.52	0.78
0.15	0.15	0.15
0.15	0.15	0.15
0.81	1.02	1.38
0.28	0.35	0.45
Volume in (m <sup>3</sup> /m)		
0.37	0.61	0.92
-Fair to poor subgrade condition -Overfill > 75% of the pipe diameter -Seasonal water flow only		
Material for back/overfill shall be approved by the Engineer		

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by	: R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Designed by	: N.O
2.									Checked by	: C.O
									Approved by	: C.O
									Date	: AUGUST, 2023.
									Client approval	:
							Scale: (AS SHOWN)	Sheet:	7 of 7	
								Drq No.	: R2000/IMO/2023/PC/06	

# MAJOR DRAINAGE STRUCTURES

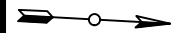
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:		Drawn by : R.T				
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 <b>AFD</b> FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands,Nairobi, Kenya P.O.Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	<b>DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.</b>  <b>AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES</b>	<b>STANDARD DRAWINGS</b>	Designed by : N.O			
2.													Checked by : C.O
													Approved by : C.O
													Date : AUGUST, 2023.
													Client approval :
							Scale: (AS SHOWN) Sheet:	1 of 5					

# ISIOLO-MLANGO-OLONYIRO ROAD (KM 9+920)

## 1 CELL 5.0x1.5m BOX CULVERT

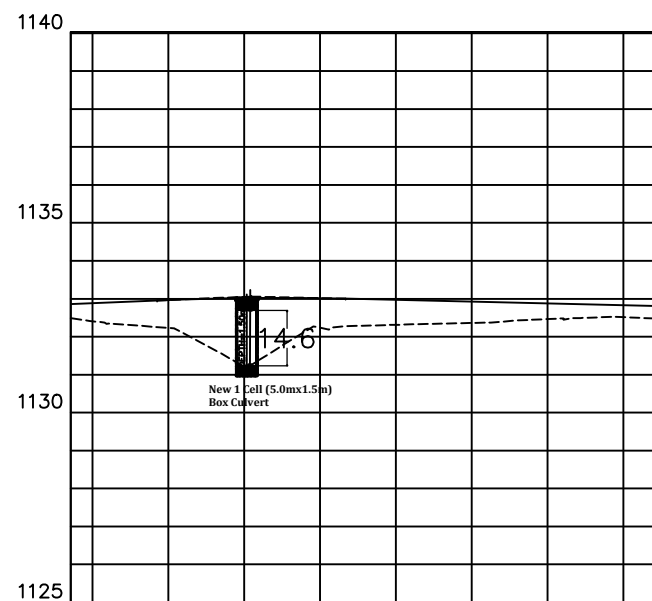
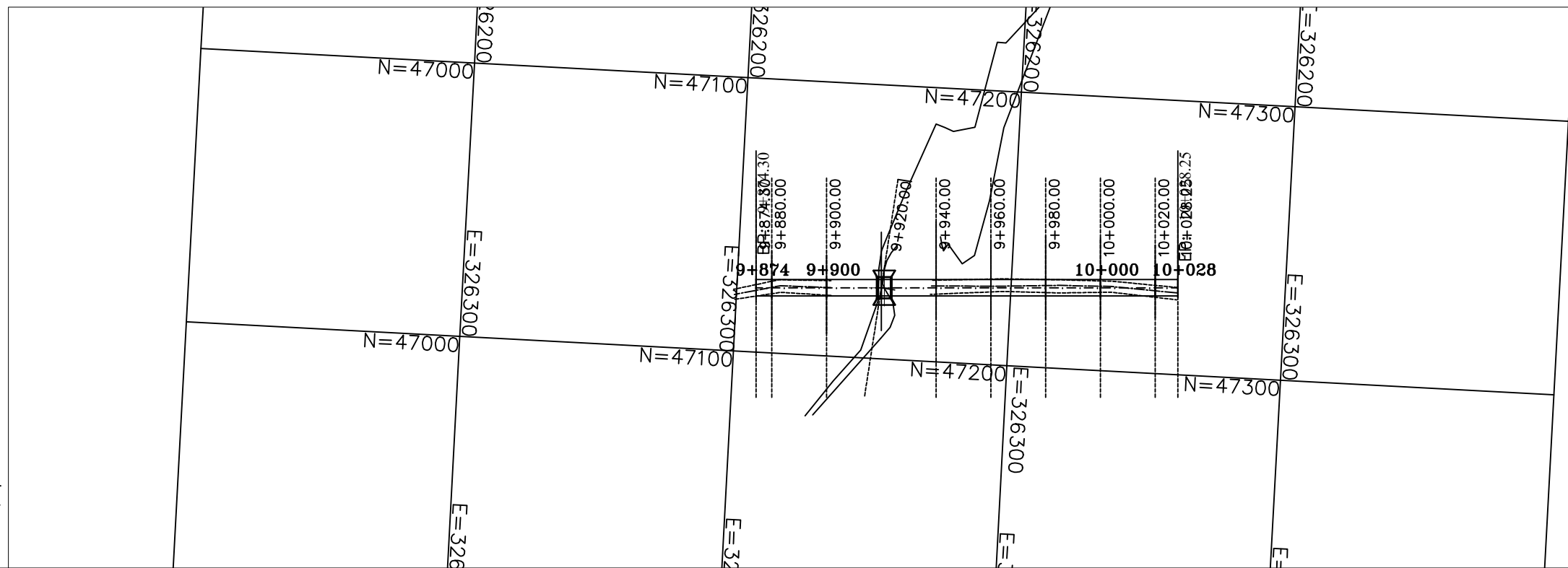
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1.							1 CELL 5.0x1.5m BOX CULVERT- DETAILS	: P.K
2.			KENYA RURAL ROADS AUTHORITY	FRENCH DEVELOPMENT AGENCY	EUROPEAN UNION	GOVERNMENT OF KENYA	ISIOLO-MLANGO-OLONYIRO ROAD KM 9+920	: D.W
						CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	Scale: AS SHOWN	: D.W
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Sheet: 1 of 1	: C.O
								: AUGUST, 2023.
								: Client approval
								: Drg No. : R2000/IMO/2023/CBC





#### LEGENDS

PIPE CULVERT	
BOX CULVERT	
BRIDGE	
DESIGNED ROAD CENTERLINE	
DESIGNED ROAD EDGE	
EXISTING ROAD EDGE	
CUT SECTION	
CONSTRUCTION EDGE	
FILL SECTION	
DRAIN	
FENCE	
BUILDING LINE	
POWER LINE	
SURVEY CONTROL POINT	



STATION	9+900				10+000					
EXISTING GROUND LEVELS	1132.49	1132.41	1132.23	1131.26	1132.23	1132.31	1132.36	1132.46	1132.51	1132.48
PROPOSED ROAD LEVELS	1132.882	1132.966	1133.016	1133.014	1132.970	1132.923	1132.876	1132.829	1132.809	1132.789
VERTICAL ALIGNMENT	22.51 0.42%		LVC=49.69 k=75.623			126.55 -0.23%				
HORIZONTAL ALIGNMENT	L=153.95									
LEFT	-----									
SUPERELEVATION										
RIGHT	-----									

NO Revisions:	Date:	Approved By:
1.		
2.		

Client:




**KENYA RURAL ROADS  
AUTHORITY**


Financed by:



**AFD**  
FRENCH  
DEVELOPMENT  
AGENCY



EUROPEAN  
UNION



GOVERNMENT OF  
KENYA

Consultant:



**CAS CONSULTANTS LTD**  
Le'Mac Building, 1st Floor, off Church  
Road, Westlands, Nairobi, Kenya  
P.O.Box 20023, 00200  
Tel+254 (020) 4445265, +254722829554  
Email: info@casconsultants.co.ke

Project:

**DESIGN AND SUPERVISION WORKS FOR  
IMPLEMENTATION OF THE CLIMATE  
PROOFED RURAL ROADS IN ARID AND  
SEMI-ARID LANDS (ASAL) - AREA 2.**

**AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA  
2: ISIOLO, SAMBURU AND MARSABIT COUNTIES**

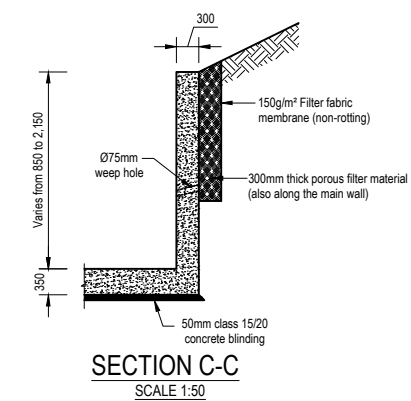
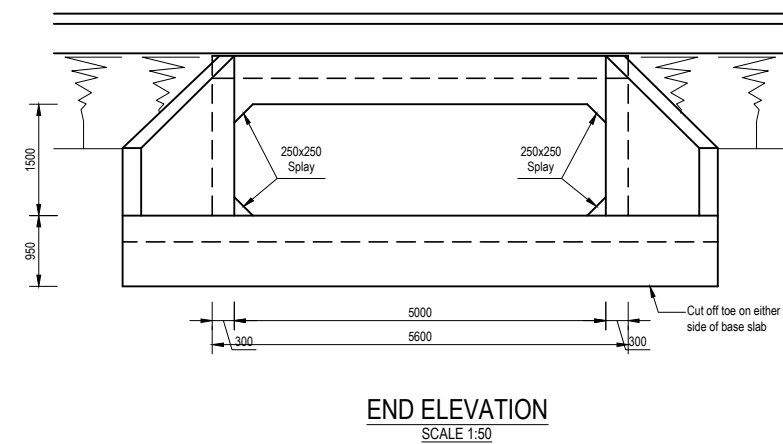
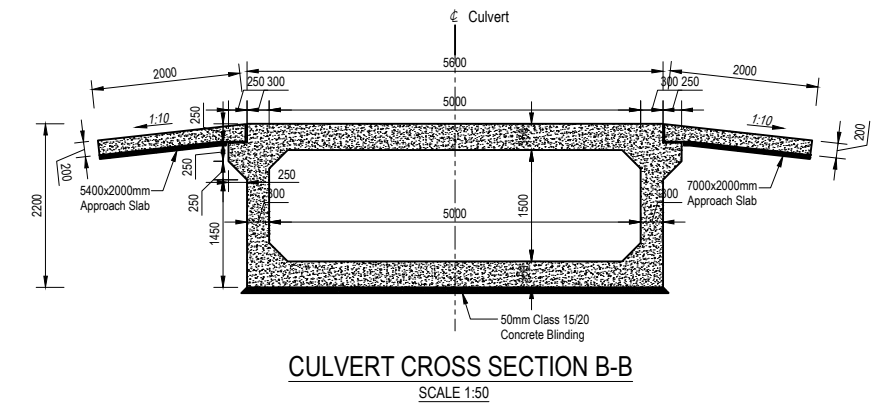
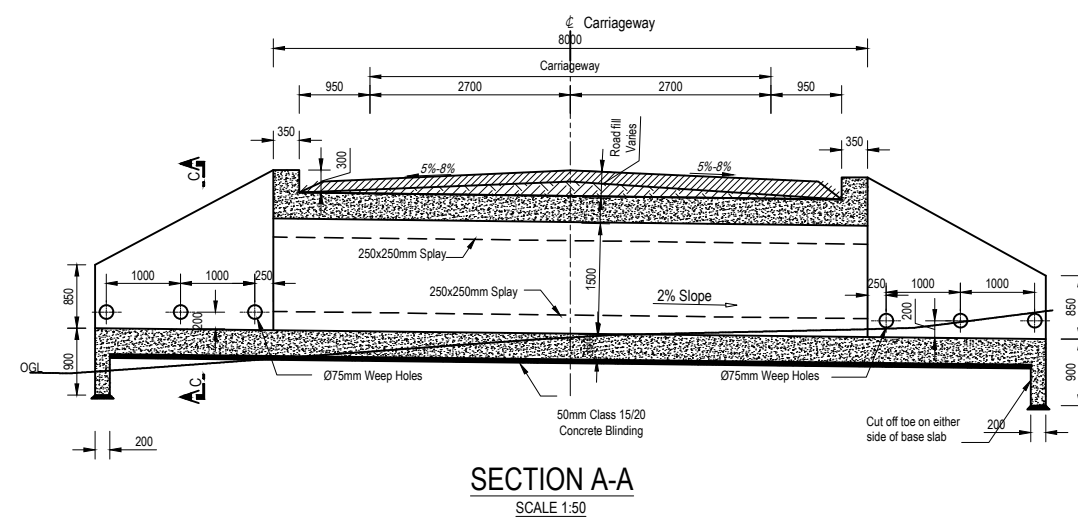
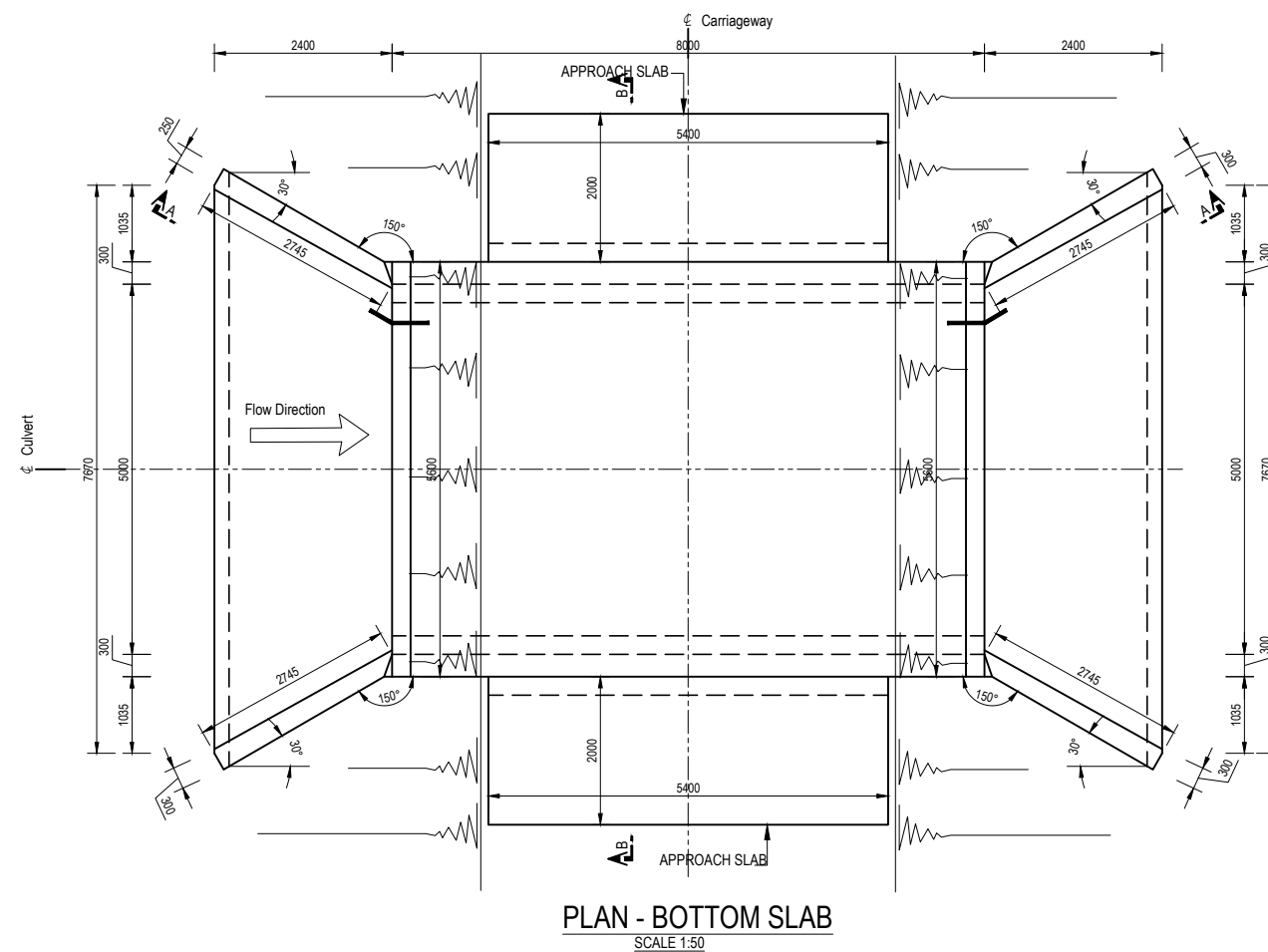
Drawing title:

PLAN AND PROFILE

**ISIOLO-MLANGO-OLONYIRO RD KM  
9+920**


Scale:	VER 1:100 HOR 1:1000	Sheet:	1 of 1
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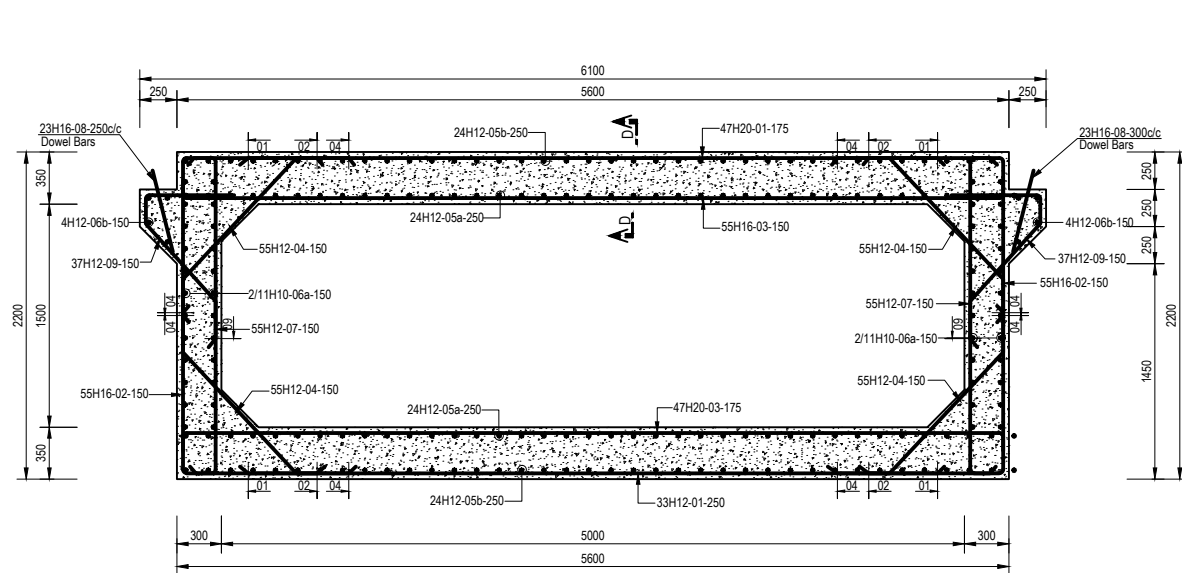
Drawn by	: P.K
Designed by	: N.O
Checked by	: C.O
Approved by	: C.O
Date	: JULY, 2023.
Client approval	:
Drg No.	: MTR/PP/01



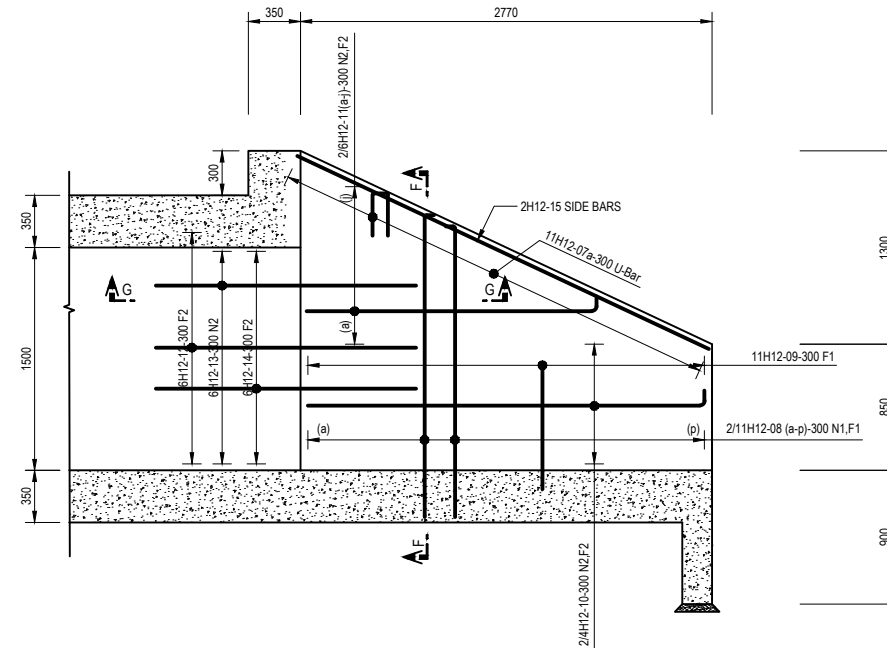
**NOTES:**

1. FINAL CULVERT DIMENSIONS, FORMATION LEVELS & INVERT LEVELS TO BE CONFIRMED ON SITE AT THE TIME OF CONSTRUCTION.
2. A TRAFFIC DIVERSION ROUTE WILL BE REQUIRED DURING CONSTRUCTION.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.
4. STRUCTURE TO BE PAINTED ON THE OUTER FACES WITH SYNTHETIC ENAMEL PAINT APPROVED BY THE ENGINEER
5. INDICATED ROAD LEVELS TO BE CONFIRMED WITH PLAN & PROFILE DRAWINGS

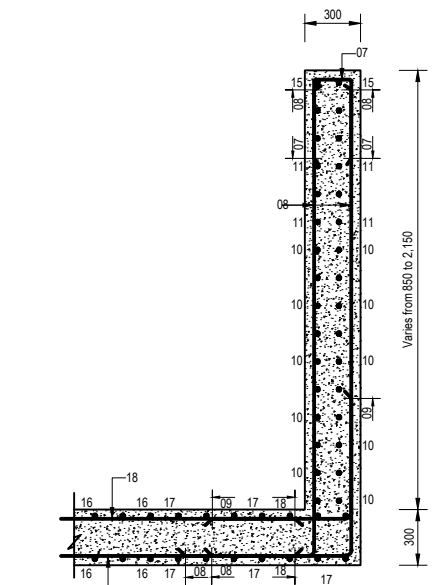
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : P.K					
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.  AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	1 CELL 5.0x1.5m BOX CULVERT- DETAILS	Designed by : D.W			
2.													Checked by : D.W
													Approved by : C.O
													Date : AUGUST, 2023.
													Client approval :
							Scale: Sheet: 1 of 2	Drg No. : R2000/IMO/2023/CBC/001					



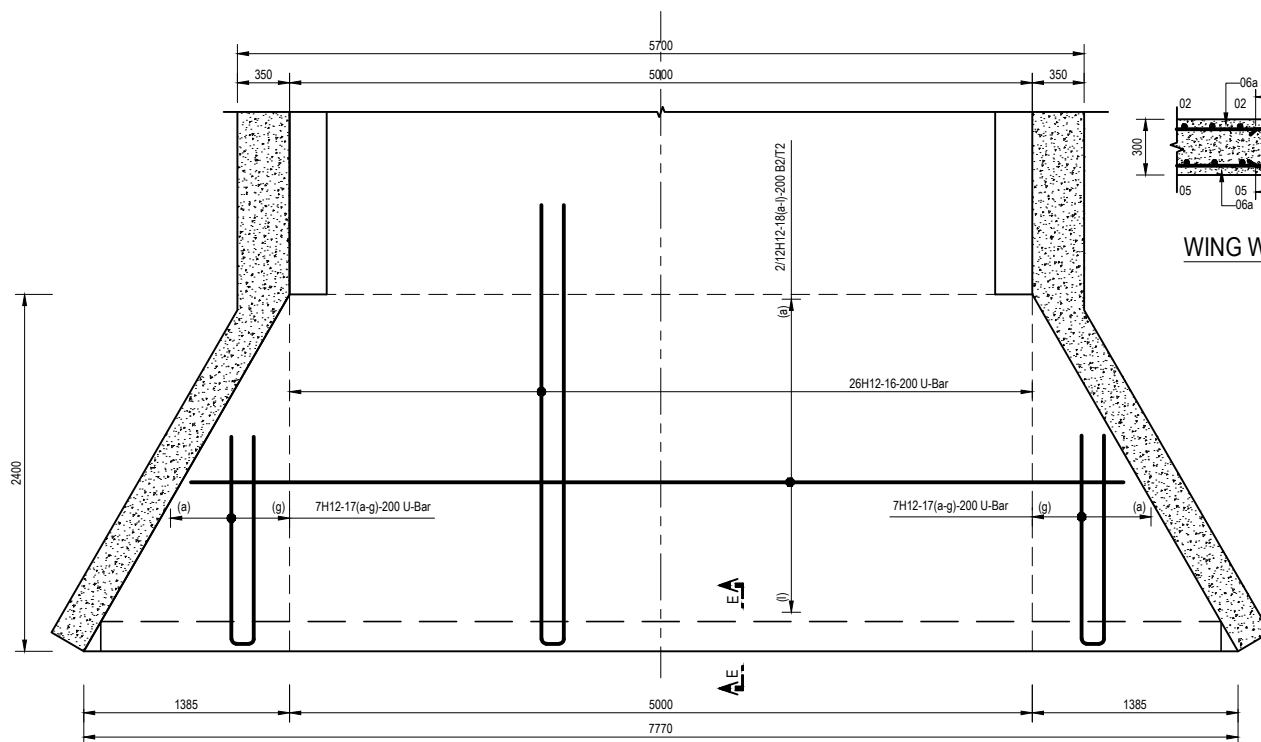
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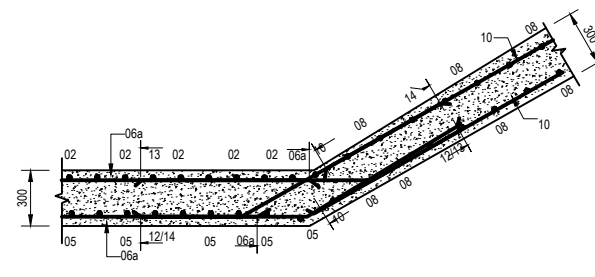
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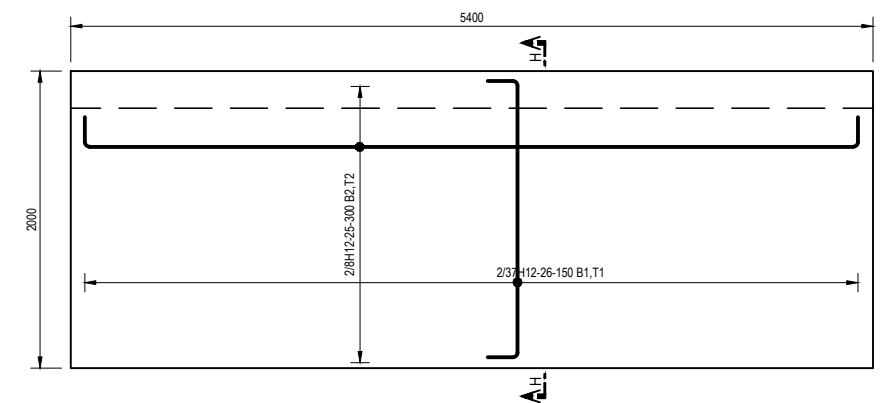
WING WALL RC DETAILS (SECTION F-F)  
SCALE 1:20



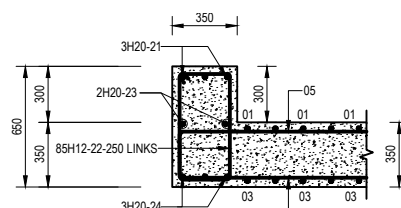
APRON SLAB RC DETAILS (2 Nos.)  
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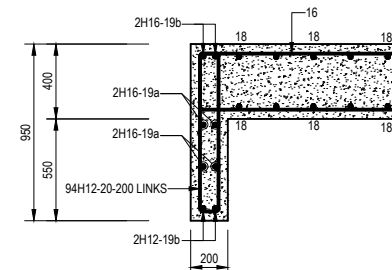
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(SECTION G-G)  
SCALE 1:20



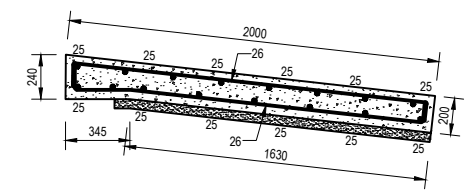
APPROACH SLAB RC DETAILS (2 Nos.)  
SCALE 1:25



HEAD WALL RC DETAILS  
(SECTION D-D)  
SCALE 1:20



CUT OFF WALL RC DETAILS  
(SECTION E-E) [2 Nos.]  
SCALE 1:20



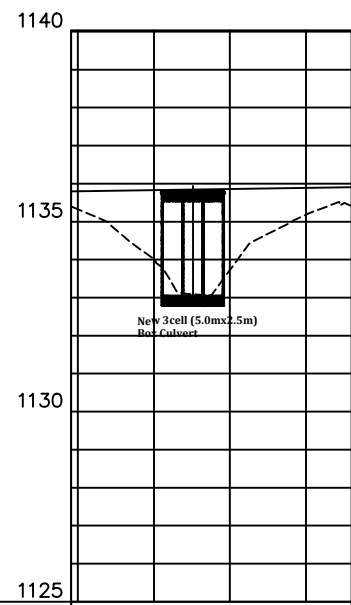
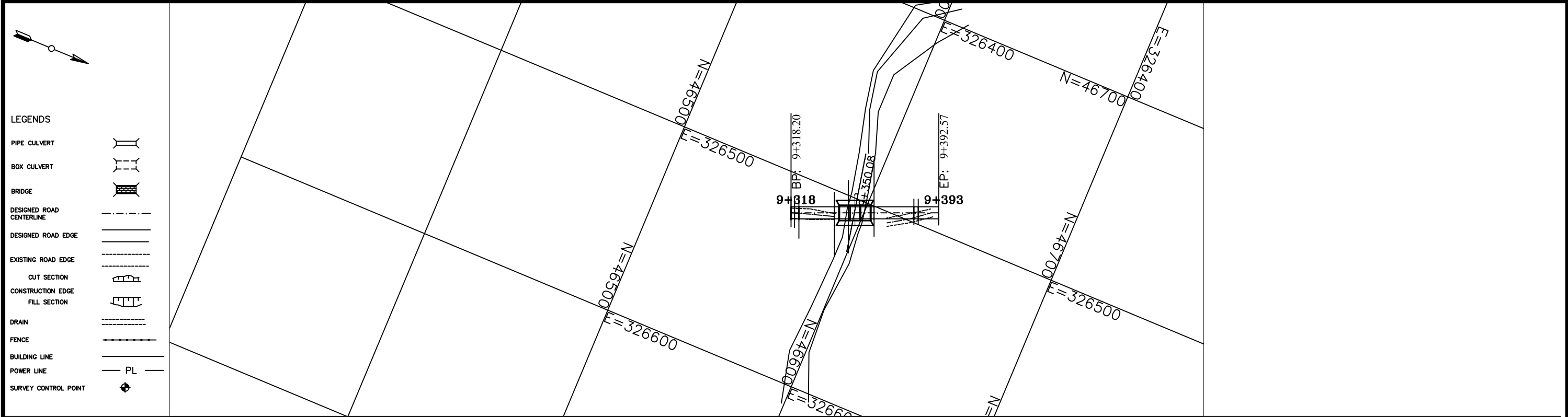
APPROACH SLAB RC DETAILS  
(SECTION H-H)  
SCALE 1:20

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by
1.			KENYA RURAL ROADS AUTHORITY	AFD	CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	1 CELL 5.0x1.5m BOX CULVERT- DETAILS	: P.K
2.								
							ISILO-MLANGO-OLONYIRO ROAD KM 9+920	Designed by : D.W
							Scale: AS SHOWN	Checked by : D.W
							Sheet: 2 of 2	Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
								Drg No. : R2000/IMO/2023/CBC/002

# ISIOLO-MLANGO-OLONYIRO ROAD (KM 9+350)

## 3 CELL 5.0x2.5m BOX CULVERT

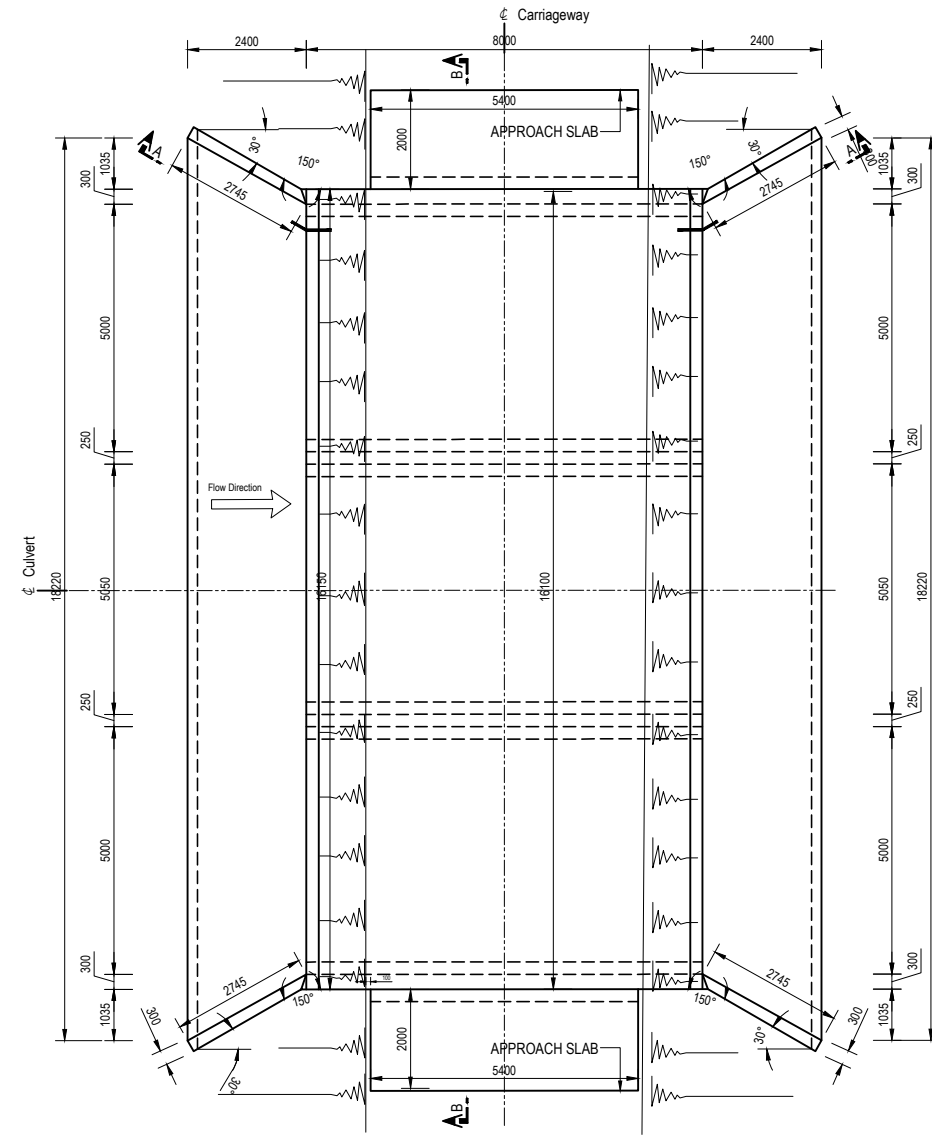
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by	
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 <b>AFD</b>  FRENCH DEVELOPMENT AGENCY	  EUROPEAN UNION	  GOVERNMENT OF KENYA	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	3 CELL 5.0x2.5m BOX CULVERT- DETAILS	: P.K
2.									Designed by
									Checked by
									Approved by
									Date
									Client approval
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Sheet: 1 of 1	Drg No. : R2000/GM/2023/CBC	



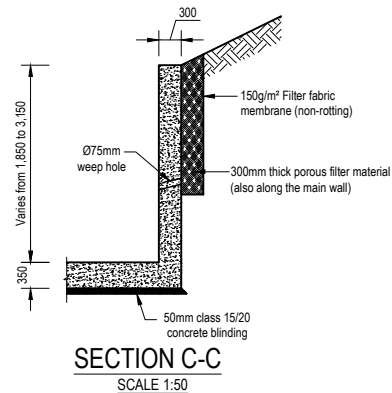
STATION	9+318	9+392
EXISTING GROUND LEVELS	1135.49	1135.41
PROPOSED ROAD LEVELS	1135.827	1135.886
VERTICAL ALIGNMENT	76.41 0.15%	
HORIZONTAL ALIGNMENT	L=74.37	
LEFT	-----	
SUPERELEVATION		
RIGHT	-----	

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : P.K
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	Designed by : N.O
2.								Checked by : C.O
								Approved by : C.O
								Date : JULY, 2023.
								Client approval :
								Drg No. : MTR/PP/01
						Scale: VER 1:100 HOR 1:1000	Sheet: 1 of 1	





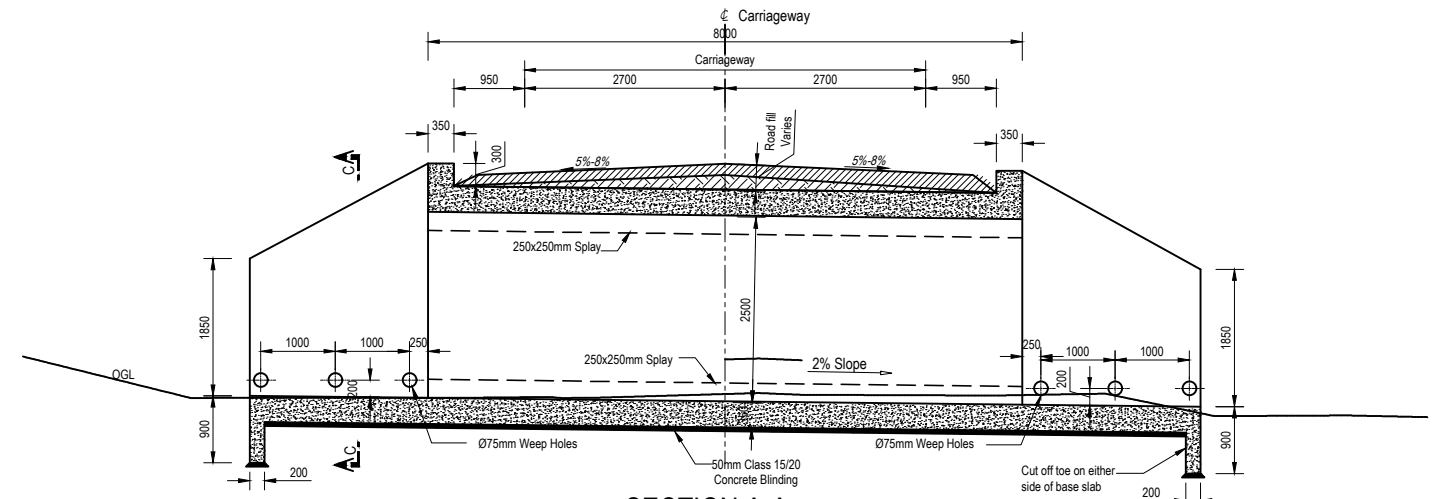
PLAN - BOTTOM SLAB  
SCALE 1:75



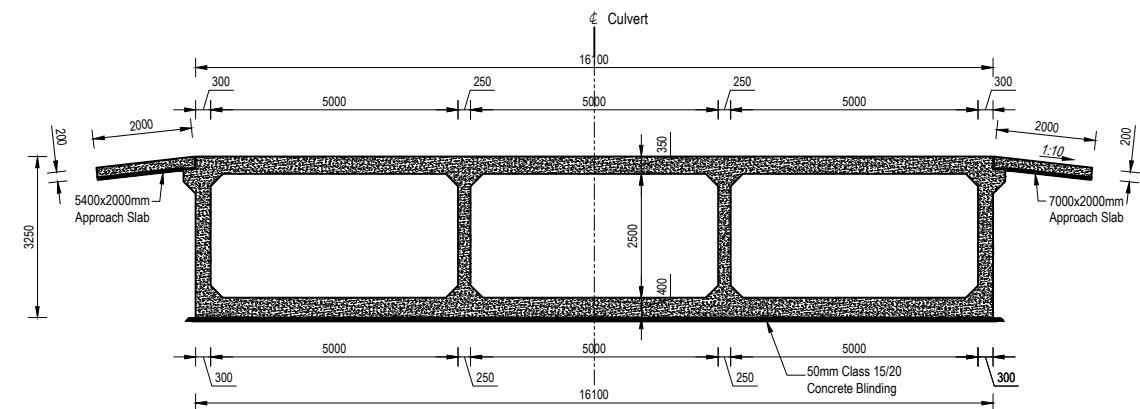
SECTION C-C  
SCALE 1:50

### NOTES:

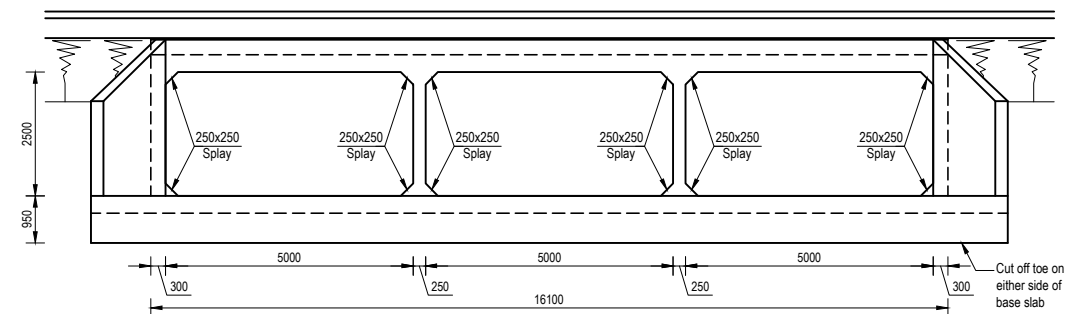
1. FINAL CULVERT DIMENSIONS, FORMATION LEVELS & INVERT LEVELS TO BE CONFIRMED ON SITE AT THE TIME OF CONSTRUCTION.
2. A TRAFFIC DIVERSION ROUTE WILL BE REQUIRED DURING CONSTRUCTION.
3. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE INDICATED.
4. STRUCTURE TO BE PAINTED ON THE OUTER FACES WITH SYNTHETIC ENAMEL PAINT APPROVED BY THE ENGINEER
5. INDICATED ROAD LEVELS TO BE CONFIRMED WITH PLAN & PROFILE DRAWINGS



SECTION A-A  
SCALE 1:50



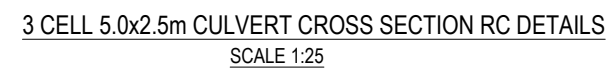
CULVERT CROSS SECTION B-B  
SCALE 1:75



END ELEVATION  
SCALE 1:75

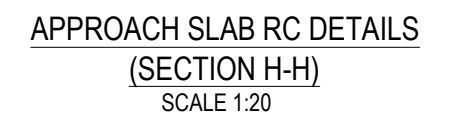
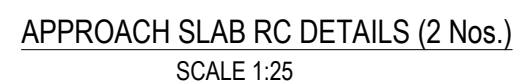
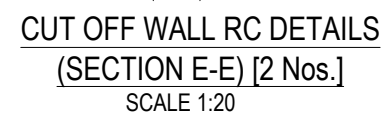
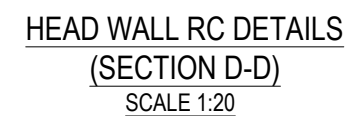
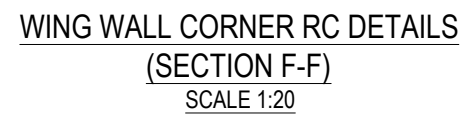
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by
1.			KENYA RURAL ROADS AUTHORITY	AFD	CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	3 CELL 5.0x2.5m BOX CULVERT- DETAILS	: P.K
2.								Designed by : D.W
							ISILOLO-MLANGO-OLONYIRO ROAD KM 9+350	Checked by : D.W
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISILOLO, SAMBURU AND MARSABIT COUNTIES	Scale: AS SHOWN Sheet: 1 of 3	Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
								Drg No. : R2000/IMO/2023/CBC/002/1





NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : P.K	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P. O. Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	3 CELL 5.0x2.5m BOX CULVERT- DETAILS	Designed by : D.W
2.									Checked by : D.W
									Approved by : C.O
									Date : AUGUST, 2023.
									Client approval : Drg No. : R2000/IMO/2023/CBC/002/2
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	ISIOLO-MLANGO-OLONYIRO ROAD KM 9+350	Scale: Sheet: AS SHOWN 2 of 3	





NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : P.K			
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 <b>FRENCH DEVELOPMENT AGENCY</b>	 <b>EUROPEAN UNION</b>	 <b>GOVERNMENT OF KENYA</b>	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands,Nairobi, Kenya P. O. Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	<b>DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.</b>	<b>AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES</b>	<b>3 CELL 5.0x2.5m BOX CULVERT- DETAILS</b>  ISIOLO-MLANGO-OLONYIRO ROAD KM 9+350	Designed by : D.W
2.											Checked by : D.W
											Approved by : C.O
											Date : AUGUST, 2023.
											Client approval :
											Scale: AS SHOWN      Sheet: 3 of 3      Drg No. : R2000/IMO/2023/CBC/002/3

# ISIOLO-MLANGO-OLONYIRO ROAD (KM 17+070)





## 30M LONG DRIFT

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : P.K
1.			 KENYA RURAL ROADS AUTHORITY	 AFD FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	Designed by : D.W
2.								Checked by : D.W
								Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
								Drg No. : R2000/IMO/2023/D
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Scale: AS SHOWN Sheet: 1 of 1	

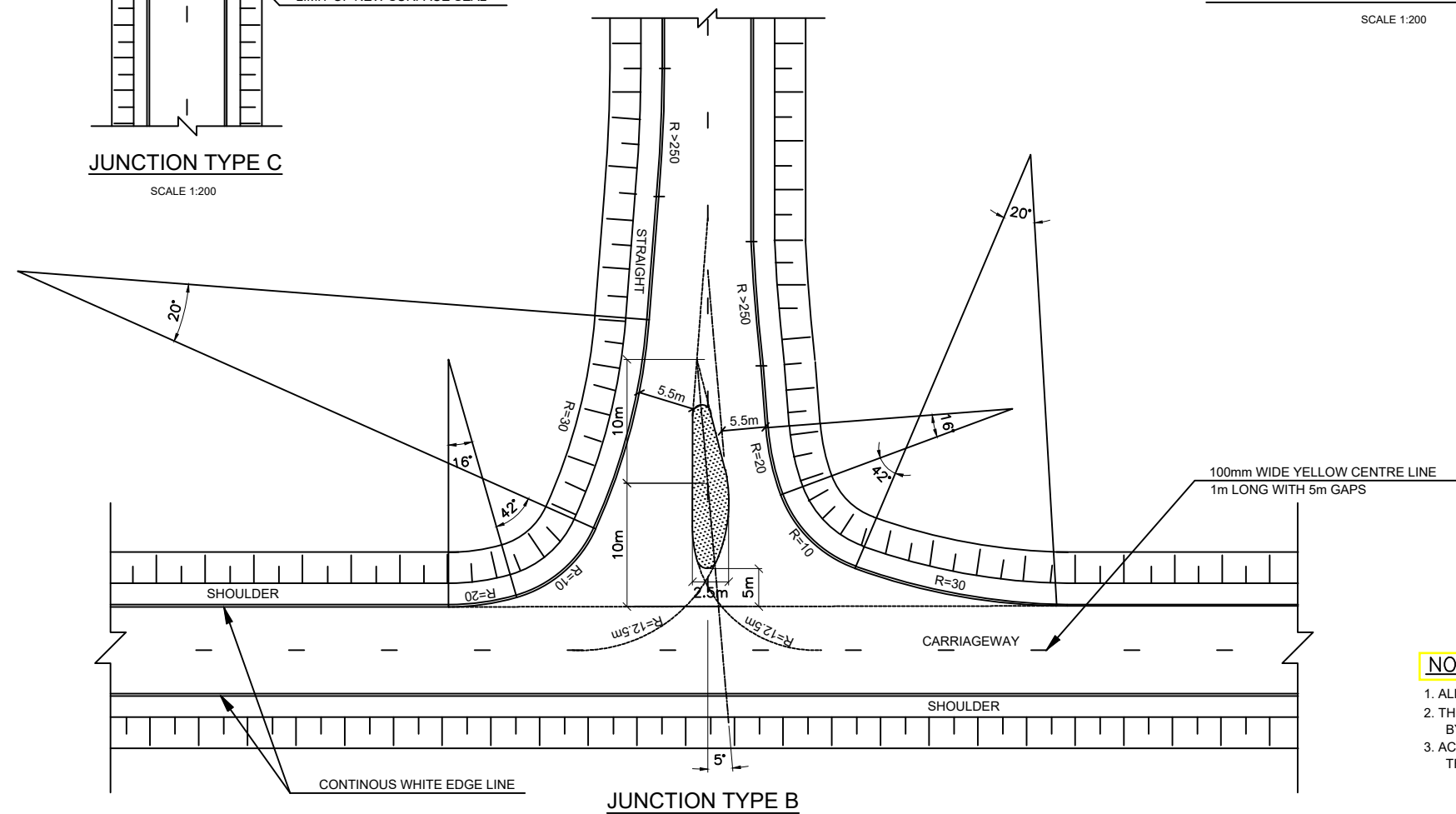
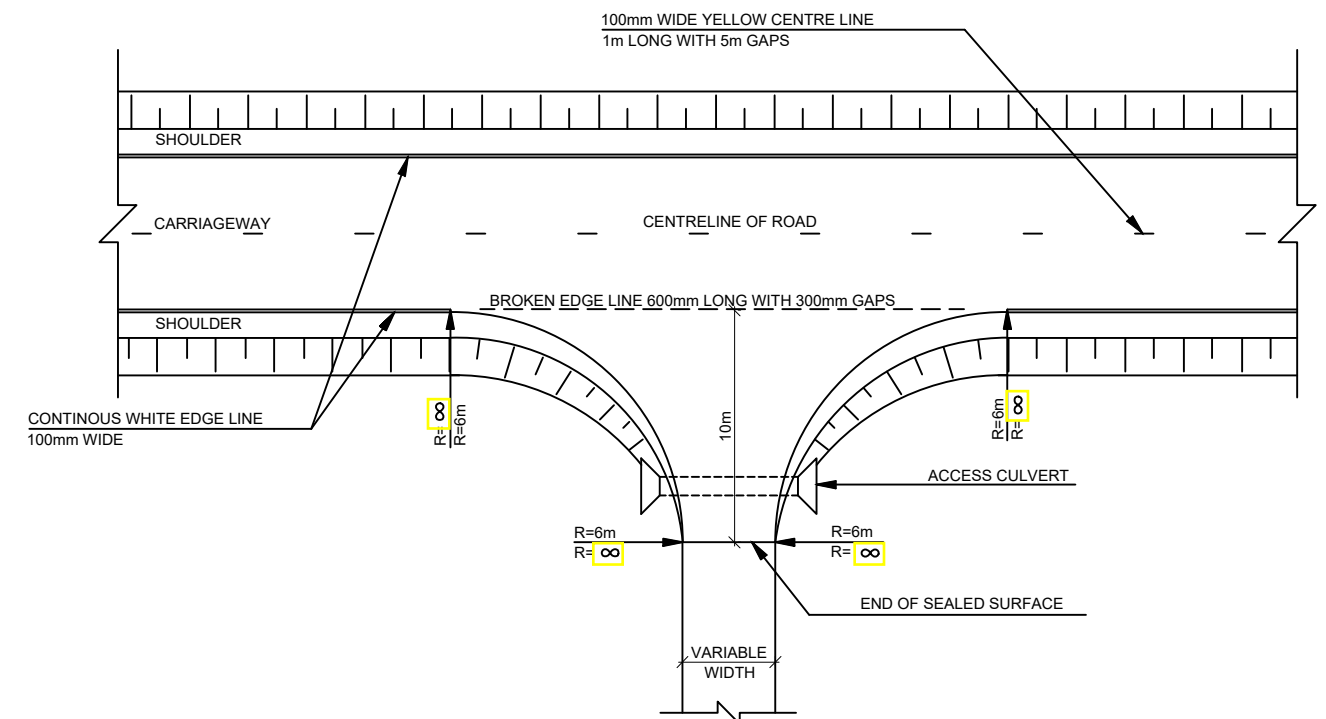
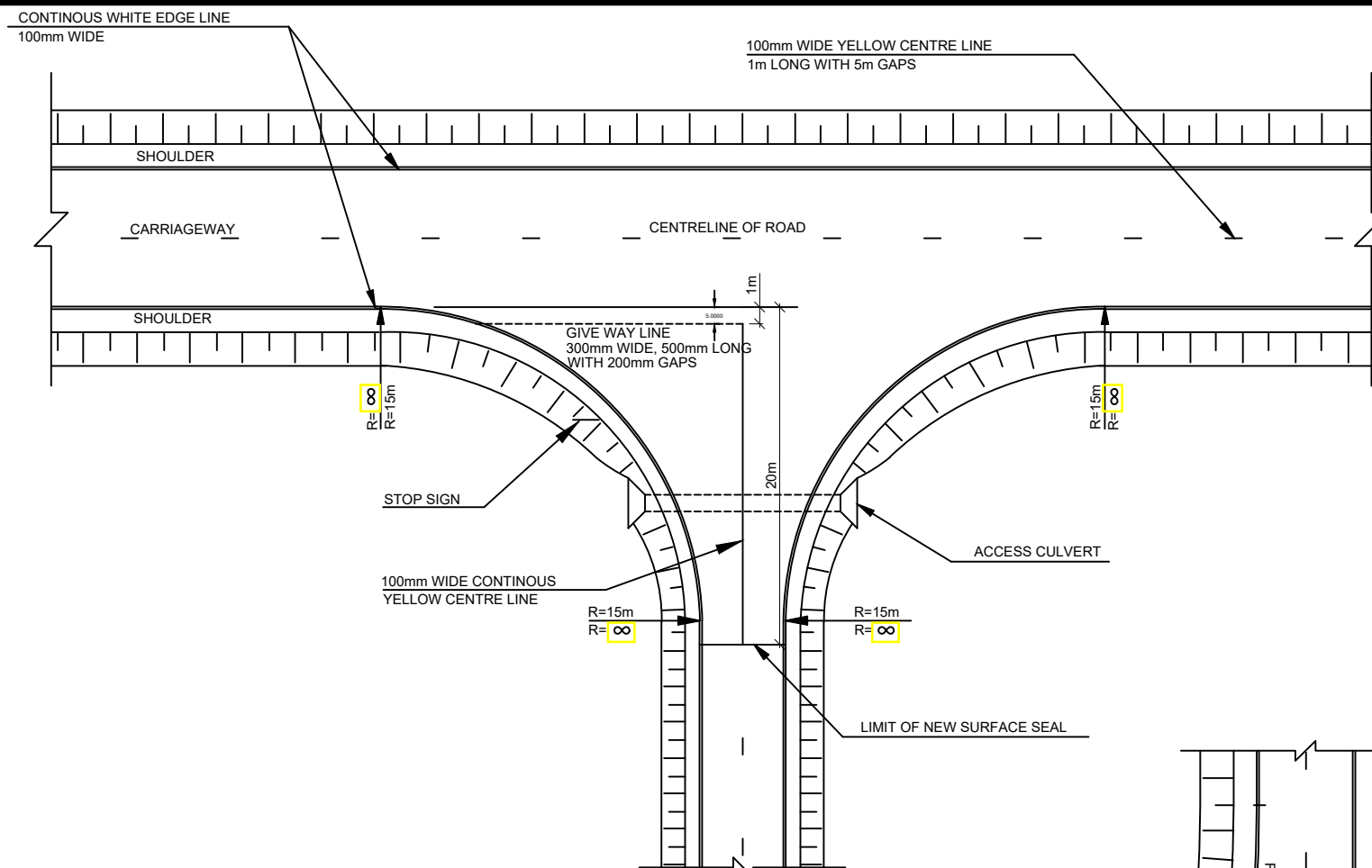




# STANDARD DRAWINGS


NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	STANDARD DRAWINGS	Designed by : N.O
2.								Checked by : C.O
								Approved by : C.O
								Date : AUGUST, 2023.
								Client approval :
							Scale: (AS SHOWN) Sheet: 1 of 5	





NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. THE ACTUAL LOCATION OF PRIVATE ACCESS TO BE AS DIRECTED BY THE ENGINEER ON SITE.
3. ACCESS CULVERTS, AS REQUIRED, SHALL BE AS DIRECTED BY THE ENGINEER.

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	Designed by : N.O	
2.								Checked by : C.O	
								Approved by : C.O	
								Date : AUGUST, 2023.	
							Scale: (AS SHOWN)	Sheet: 2 of 5	Client approval :
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES			Drg No. : R2000/GM/2023/GD/01





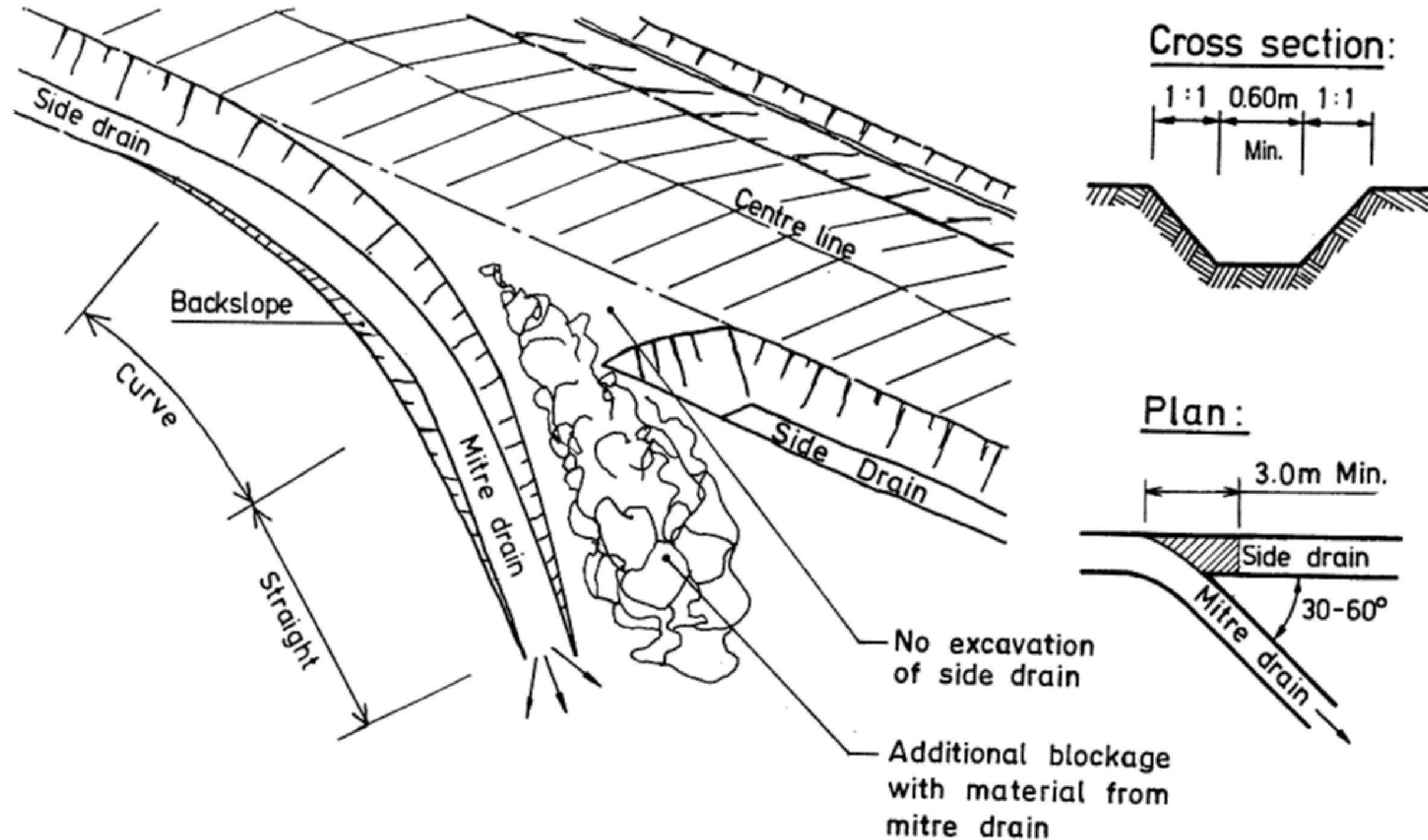




# GENERAL DRAINAGE

NO Revisions:		Date:	Approved By:	Client:	Financed by:		Consultant:	Project:	Drawing title:		Drawn by : R.T
1.				 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA		GENERAL DRAINAGE		Designed by : N.O
2.										Checked by : C.O	
										Approved by : C.O	
										Date : AUGUST, 2023.	
										Client approval :	
		</									



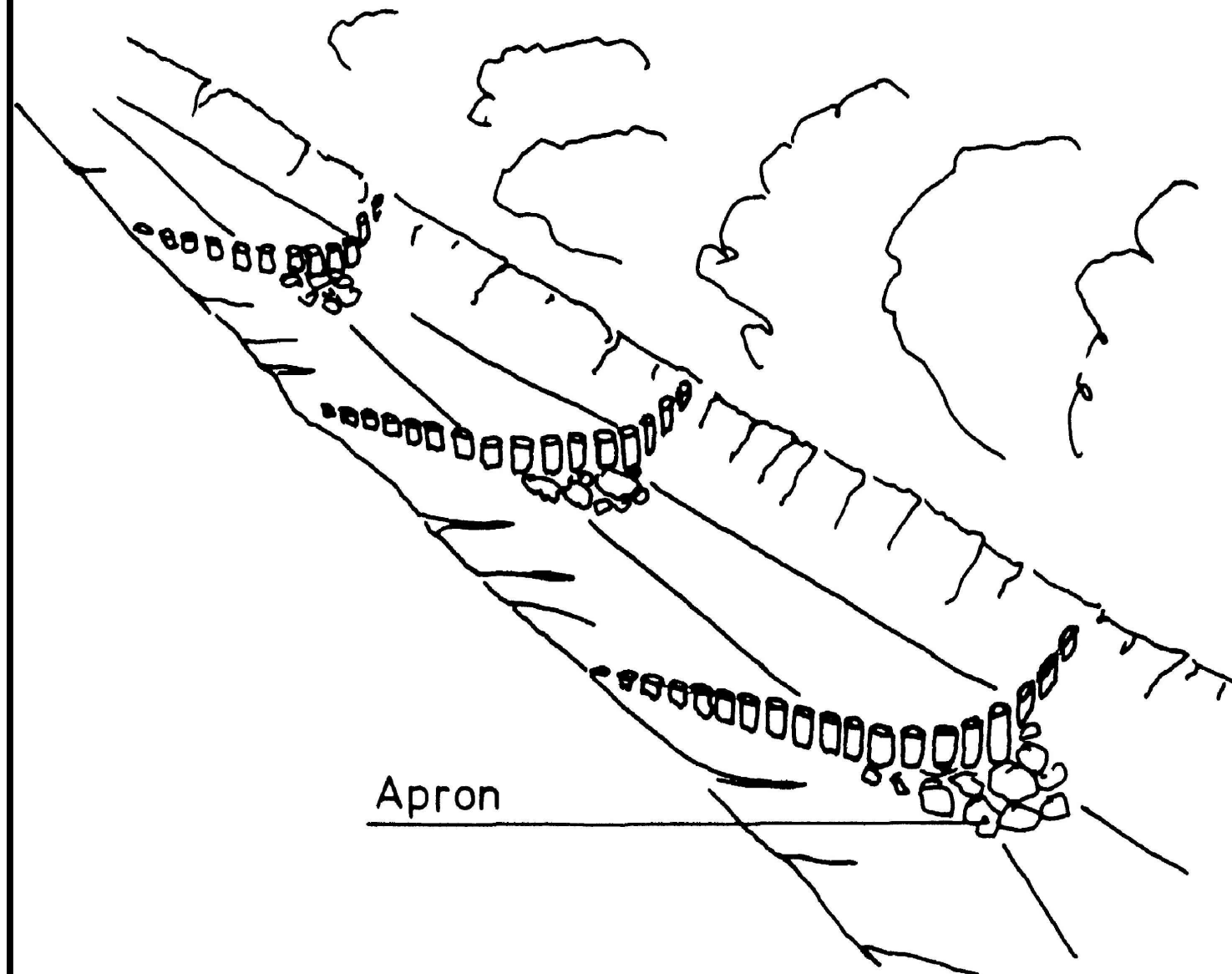
# MITRE DRAIN



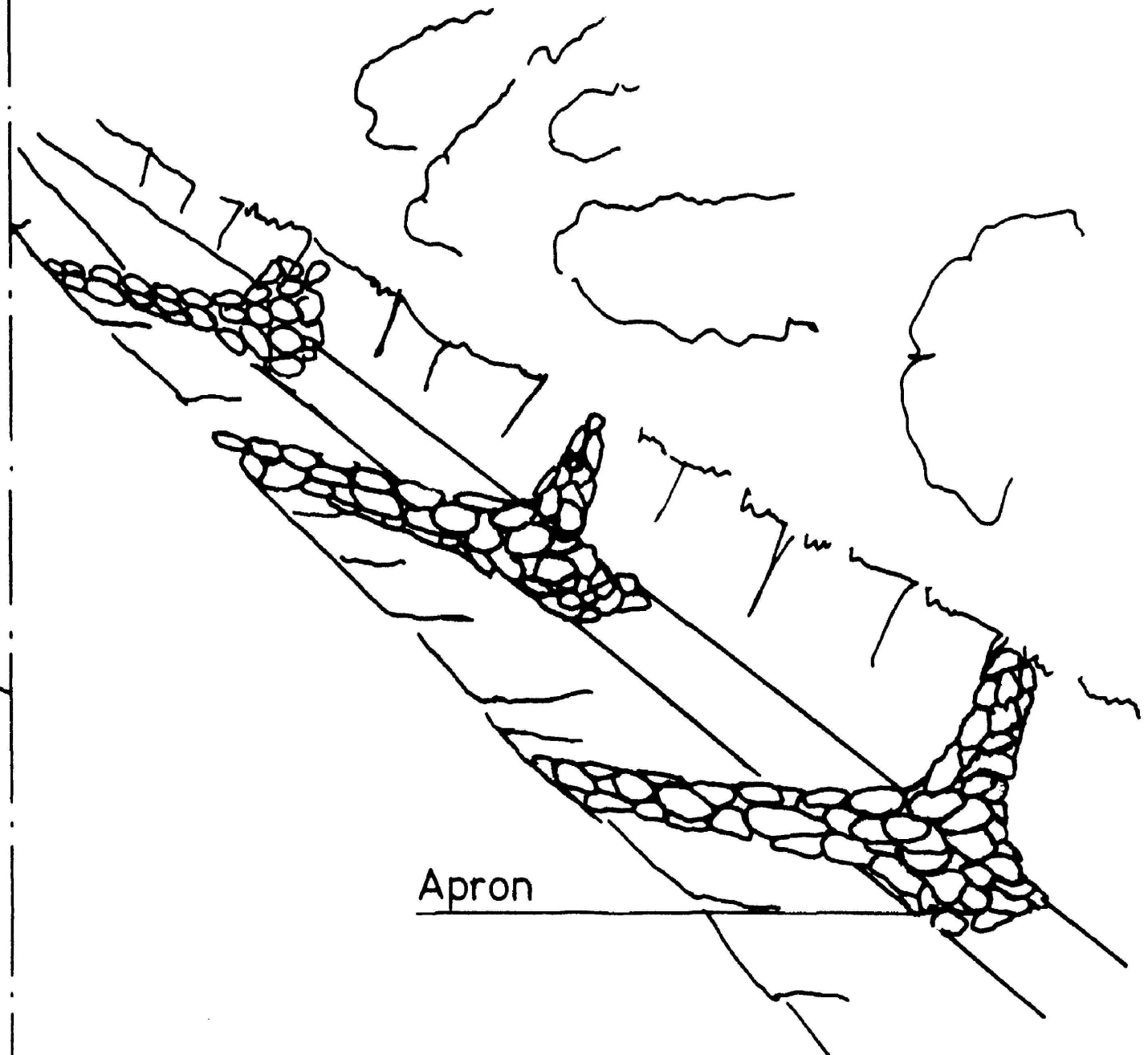
NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	Designed by : N.O	
2.								Checked by : C.O	
								Approved by : C.O	
								Date : AUGUST, 2023.	
							Scale: (1:2000)	Sheet: 2 of 6	Client approval : Drg No. : R2000/IMO/2023/GD/01

# SCOUR CHECKS

Scour checks made of wooden stakes:



Scour checks made of stones:

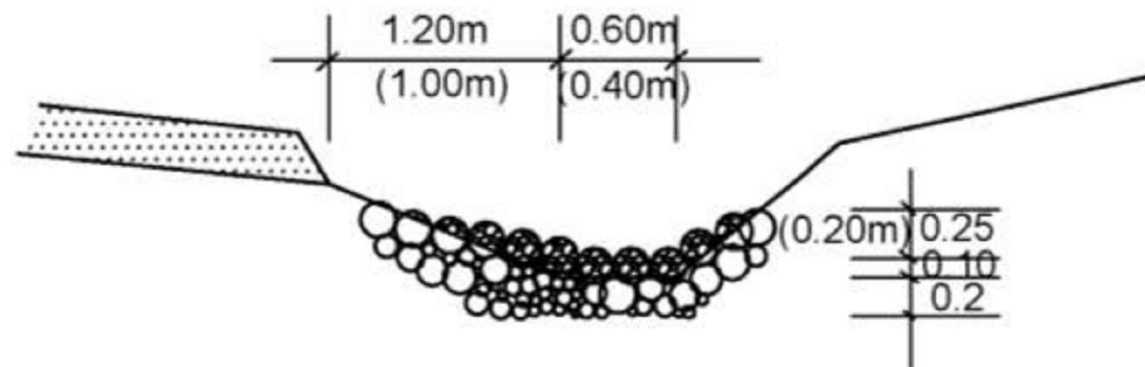


NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by
1.			 KENYA RURAL ROADS AUTHORITY	 AFD FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	SCOUR CHECKS	: R.T
2.								Designed by
								Checked by
								Approved by
								Date
								Client approval
						Scale: (1:2000)	Sheet: 3 of 6	Drg No. : R2000/IMO/2023/GDR/02

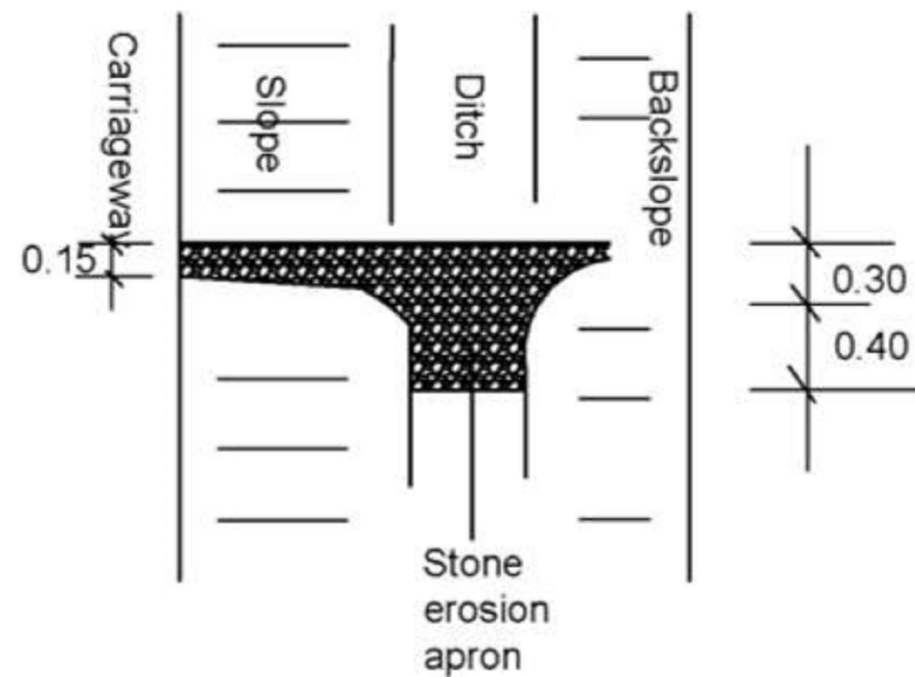


## Scour checks made of stones

Cross section



Ground plan

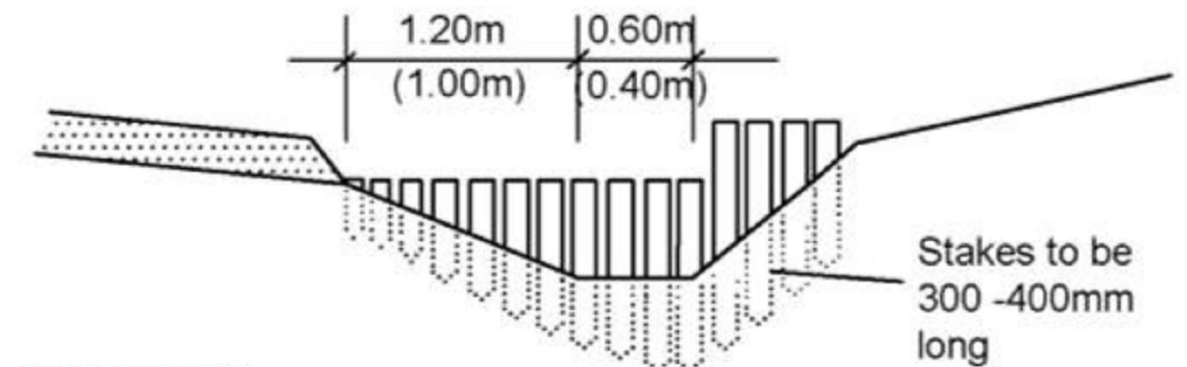


STONE WEIGHT: MIN 10KG  
STAKE DIAMETER: MIN. 0.10m

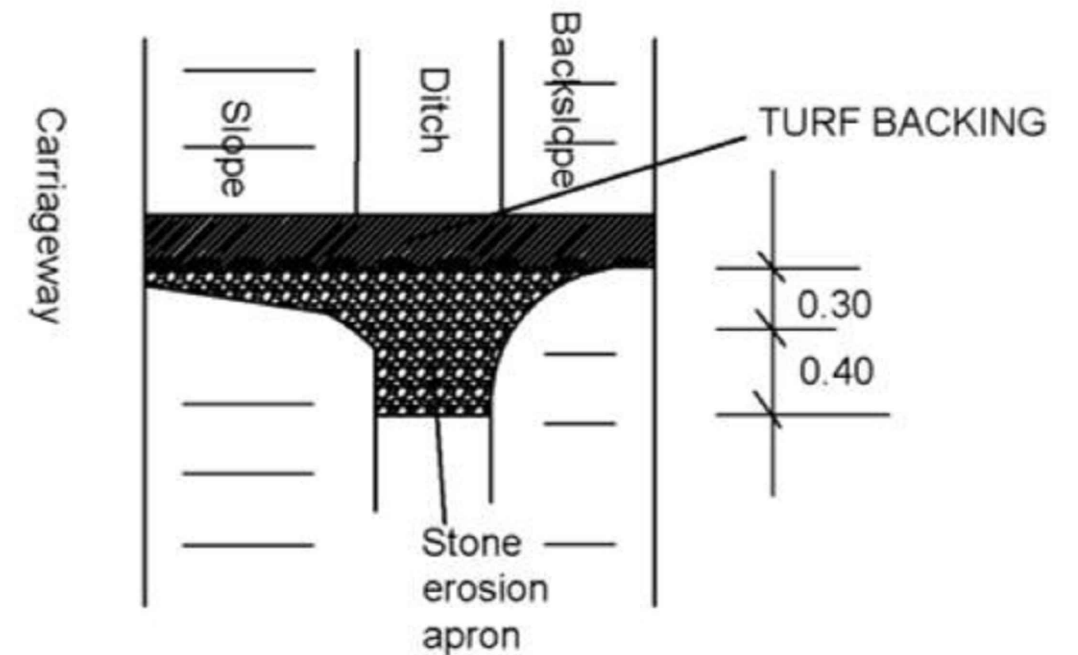
**NOTE**  
1Dimensions in metres

## Scour checks made of wooden stakes

Cross section

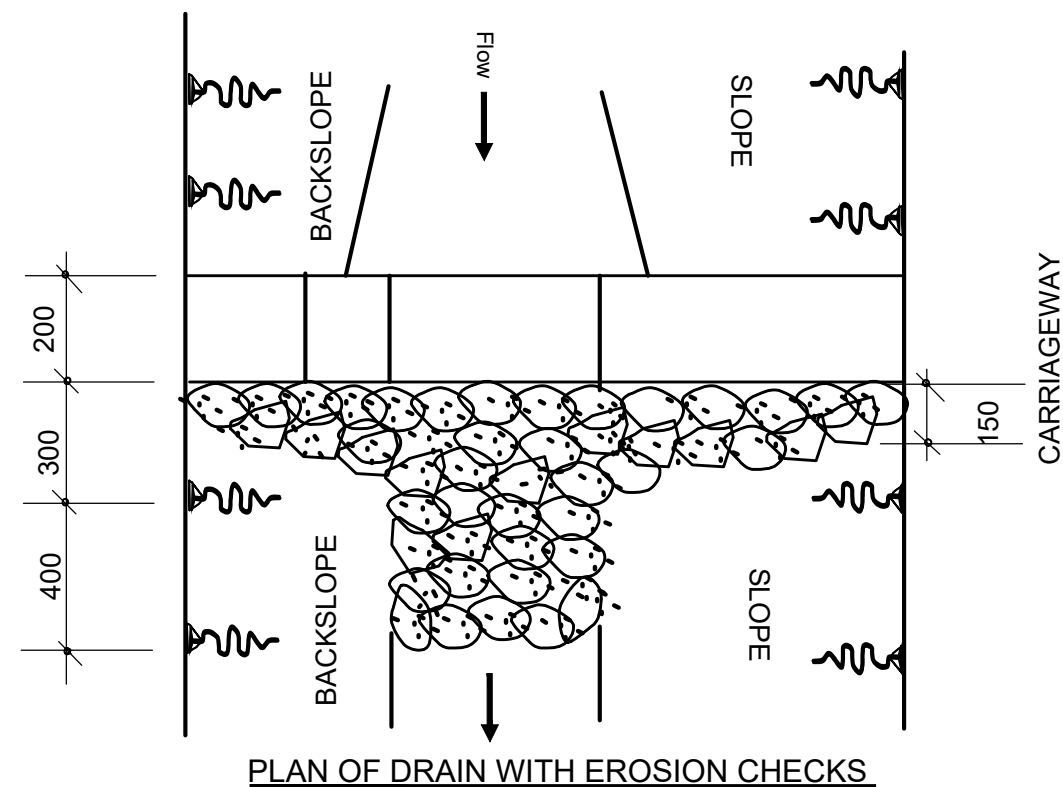
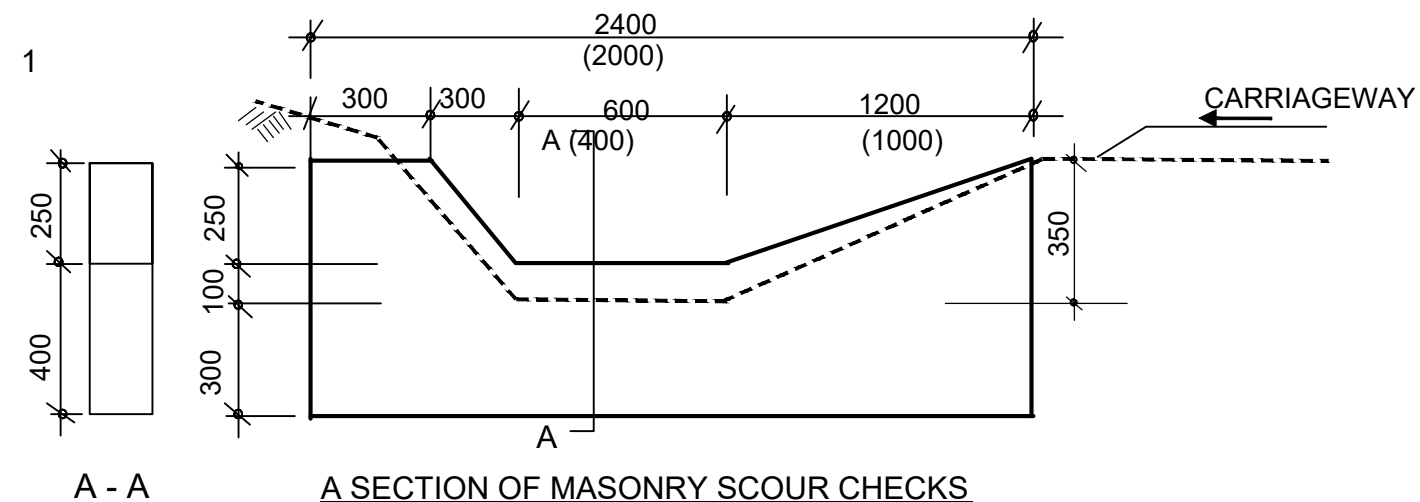


Ground plan



NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by	: R.T	
1.			 <b>KENYA RURAL ROADS AUTHORITY</b>	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 <b>CAS CONSULTANTS LTD</b> Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	SCOUR CHECKS	Designed by	: N.O
2.									Checked by	: C.O
									Approved by	: C.O
									Date	: AUGUST, 2023.
									Client approval	:
						<b>AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES</b>	Scale: (1:2000)	Sheet: 4 of 6	Drg No. : R2000/IMO/2023/GDR/03	

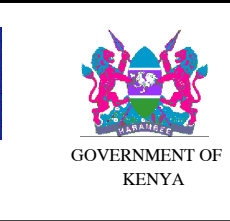
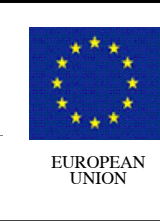
- MASONRY SCOUR CHECKS



QUANTITIES TABLE

Cross-Section	Sizes in mm			Excav. (m3)	Stone masonry (m3)	Apron stone pitching (m3)
	Length	Width	Depth			
A	2400	200	550	0.22	0.25	0.18
B	2000	200	500	0.18	0.2	0.14

NO Revisions:	Date:	Approved By:
1.		
2.		



Project:

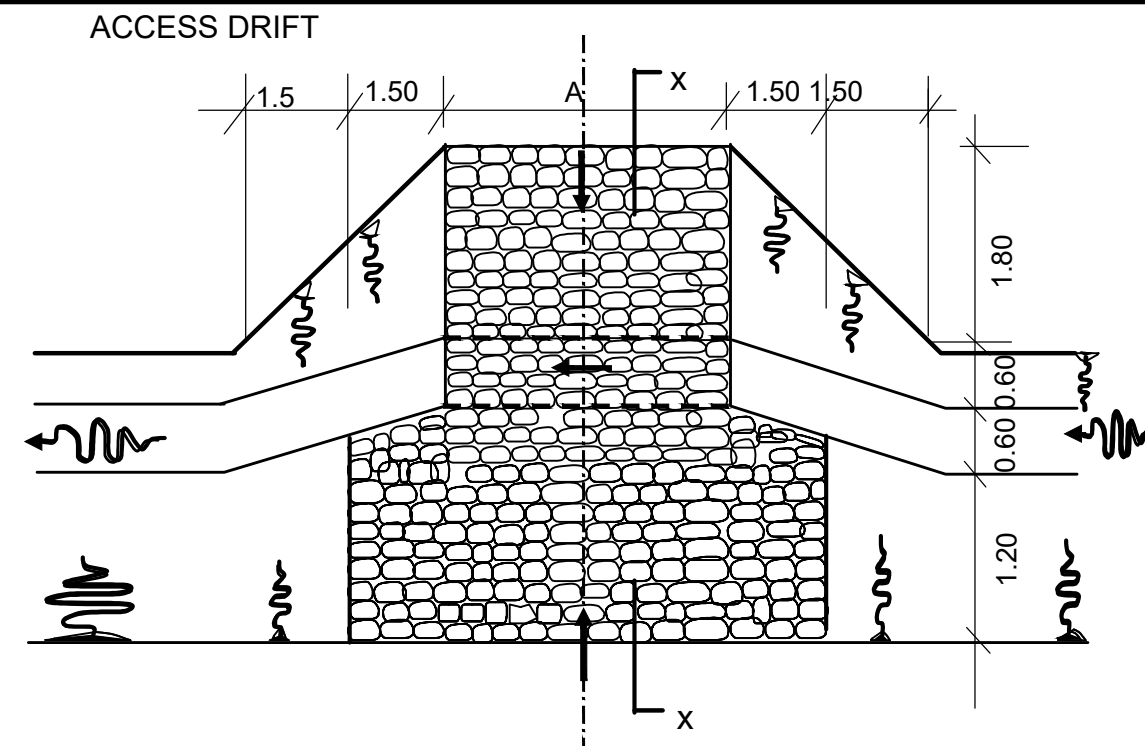
DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.

AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES

Drawing title:	
SCOUR CHECKS	
Scale: (1:2000)	Sheet: 5 of 6

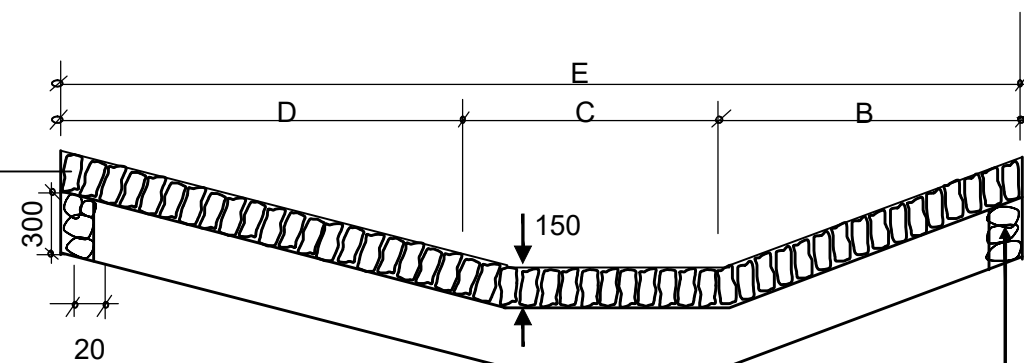
Drawn by : R.T
Designed by : N.O
Checked by : C.O
Approved by : C.O
Date : AUGUST ,2023.
Client approval :
Drg No. : R2000/IMO/2023/GDR/04





PLAN

150mm GROUTED  
STONE PITCHING



X-SECTION X-X

STONE MASONRY TOES  
ON FOUR SIDES OF  
STRUCTURE (200X300mm)

QUANTITIES TABLE								
Cross section	DIMENSIONS					Excavation (m3)	Stone masonry (m3)	150mm Grouted stone pitching (m3)
	A	B	C	D	E			
A	4000	1800	600	1800	4200	7.50	1.30	21.75
	6000	1800	600	1800	4200	10.00	1.60	30.15
B	4000	1400	400	1800	3600	7.00	1.20	18.30
	6000	1400	400	1800	3600	9.00	1.50	25.50

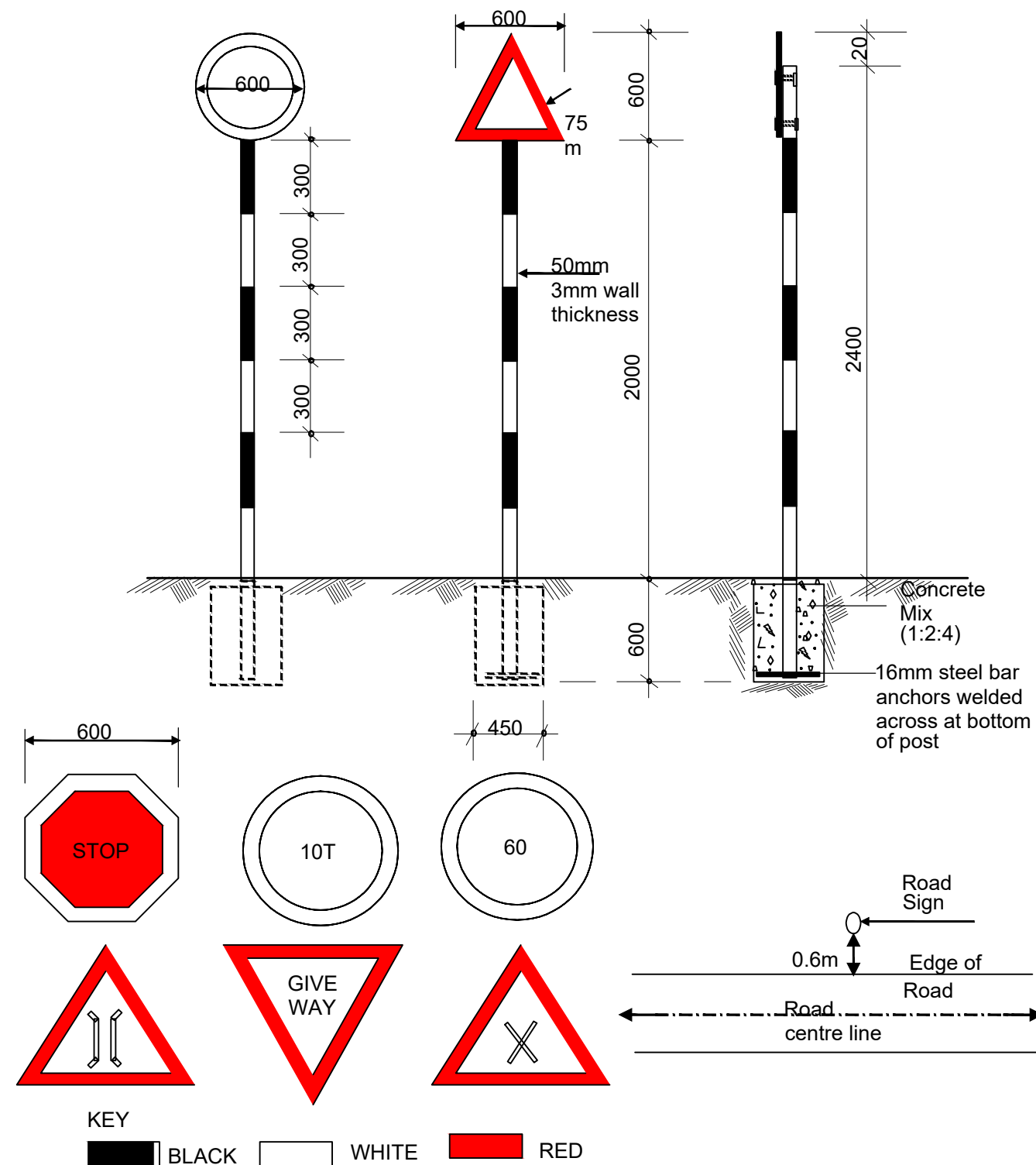




# TRAFFIC SIGNS

NO Revisions:		Date:	Approved By:	Client:	Financed by:		Consultant:	Project:		Drawing title:		Drawn by : R.T
1.				 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.	TRAFFIC SIGNS		Designed by : N.O
2.												Checked by : C.O
												Approved by : C.O
												Date : AUGUST, 2023.
												Client approval :
										Scale: (1:2000)	Sheet: 1 of 2	

## TRAFFIC SIGNS



1. The type of sign required and their location shall be as shown on the improvement plan and as directed by the Engineer
2. Sign plate to be 2 mm thick mild steel plate
3. Sign post to be 50 mm internal diameter steel pipe with wall thickness of 3 mm.
4. Sign plate to fixed to steel tube by 4 Nos M10 bolts and 2 Nos 50 mm f fixing clamps/brackets.
5. Sign paints shall be reflective.
6. The sign plate and post shall be treated by applying two coats of lead red oxide paint before applying priming and two finish coats of approved paints . Paints used shall have a hard, durable and glossy finish.

## TEMPORARY SIGNS



## “Men Working”



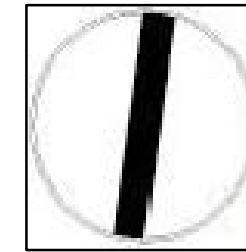
“Road narrows on Right Ahead”(sign may be reversed)



“Turn Left” (direction of arrow may be reversed)



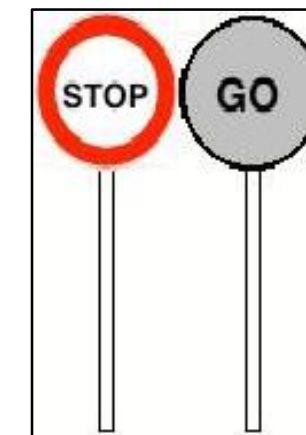
“Keep Left” (direction of Arrow may be reversed)



## “Road Clear”



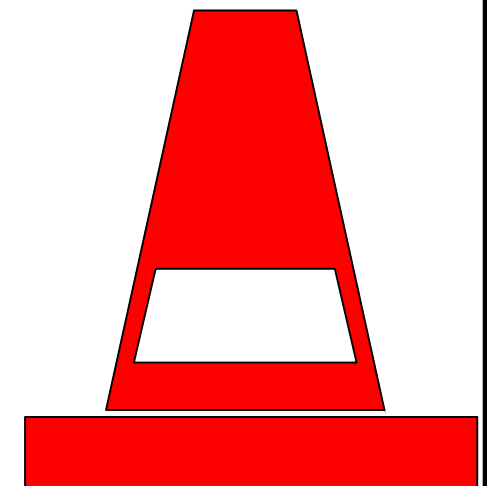
## “Speed Limit”





## Reversible stop/go signs



## “No Overtaking”



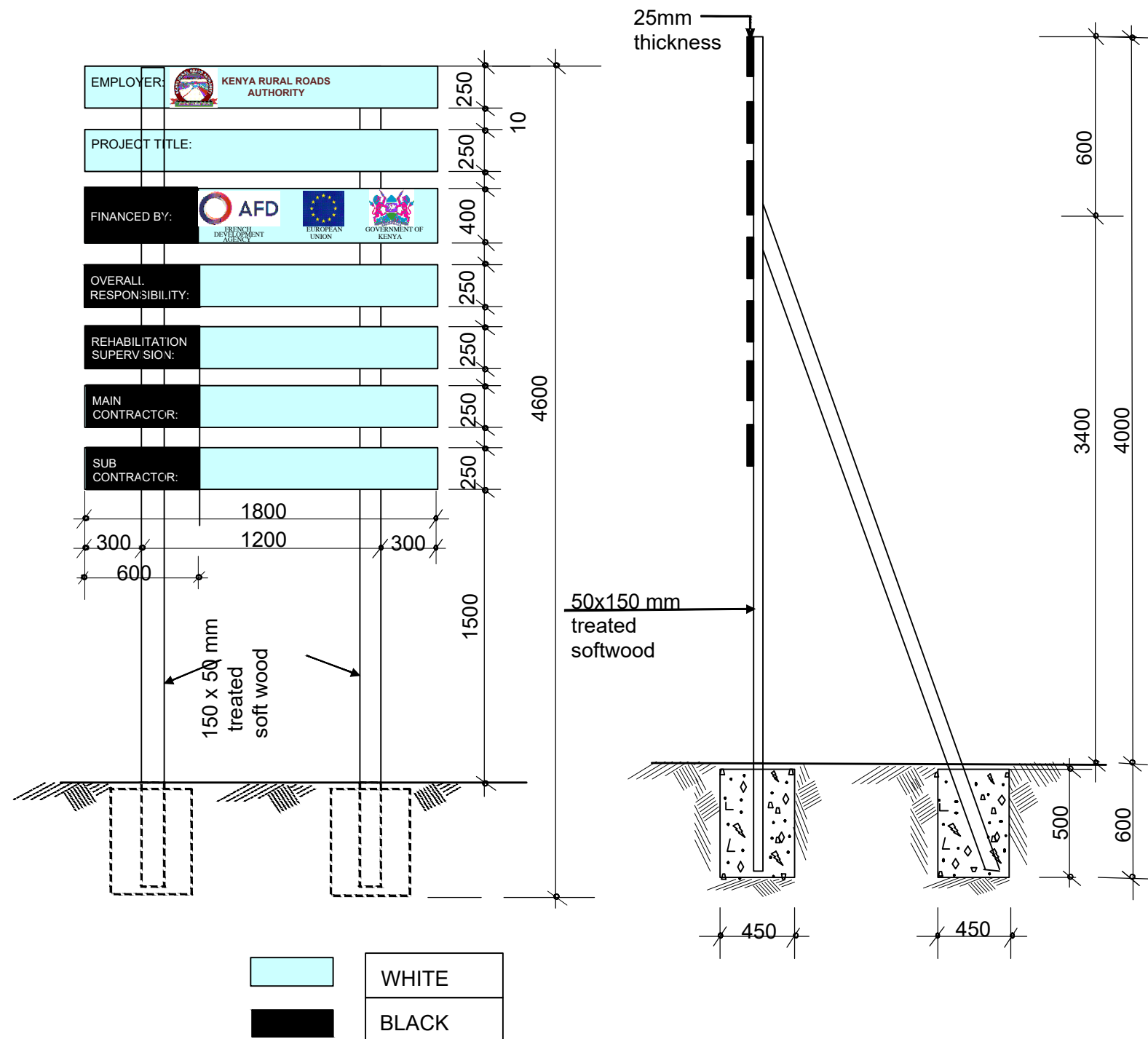
## Traffic cones

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by	: R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	STANDARD DRAWINGS	Designed by	: N.O
2.									Checked by	: C.O
									Approved by	: C.O
									Date	: AUGUST, 2023.
									Client approval	:
									Dwg No.	: R2000/IMO/2023/TS/01
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Scale: (1:2000)	Sheet: 2 of 2		



# PUBLICITY SIGNBOARD

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 AFD FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands, Nairobi, Kenya P.O.Box 20023, 00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	PUBLICITY BILLBOARD	Designed by : N.O
2.									Checked by : C.O
									Approved by : C.O
									Date : AUGUST, 2023.
									Client approval :
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Scale: (1:2000)	Sheet: 1 of 2	



#### NOTES

1. The wording of the project signboard and the location to be installed to be as directed by the Engineer
2. Materials to be used for fabrication of signboard shall be pressure impregnated treated softwood timber sizes as indicated in the drawing
3. Wording boards to be nailed to the posts using nails.
4. Project board posts and struts to be embedded in concrete ratio 1:2:4

NO Revisions:	Date:	Approved By:	Client:	Financed by:	Consultant:	Project:	Drawing title:	Drawn by : R.T	
1.			 KENYA RURAL ROADS AUTHORITY	 FRENCH DEVELOPMENT AGENCY	 EUROPEAN UNION	 GOVERNMENT OF KENYA	 CAS CONSULTANTS LTD Le'Mac Building, 1st Floor, off Church Road, Westlands,Nairobi, Kenya P.O.Box 20023,00200 Tel+254 (020) 4445265, +254722829554 Email: info@casconsultants.co.ke	PUBLICITY SIGN BOARD	Designed by : N.O
2.									Checked by : C.O
									Approved by : C.O
									Date : AUGUST, 2023.
									Client approval :
									Drg No. : R2000/IMO/2023/PSB/02
						AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES	Scale: (1:2000)	Sheet: 1 of 1	

Project:  
DESIGN AND SUPERVISION WORKS FOR IMPLEMENTATION OF THE CLIMATE PROOFED RURAL ROADS IN ARID AND SEMI-ARID LANDS (ASAL) - AREA 2.  
AFD/EU/GOK ROADS 2000 CLIMATE PROOFED, AREA 2: ISIOLO, SAMBURU AND MARSABIT COUNTIES