INFRASTRUCTURE FOR BIODIVERSITY CONSERVATION IN KIDEPO VALLEY NATIONAL PARK

VOLUME OF DRAWINGS

Construction of Low Water Stream Crossings Structures at "Kalabe, Kurao, Lopiripir, and Tongbore"

Prepared by: USAID / Uganda Architect & Engineering Design and Construction Management Services
Implemented by: MBW Consulting Ltd. and Cardno I.D. USA

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INFRASTRUCTURE FOR BIODIVERSITY CONSERVATION IN KIDEPO VALLEY NP - LOW WATER STREAM CROSSINGS (LWSC)
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PROJECT NAME:
USAID / Uganda Architect & Engineering Design and Construction Management Services

ACTIVITY NAME:
Infrastructure for Biodiversity Conservation in Kidepo Valley NP

DRAWING DESCRIPTION:
LWSC_LIST OF DRAWING
LIST OF DRAWINGS 1

DESIGNED BY:	DRAWN BY:	CHECKED BY:	APPROVED BY:
BB	BK	BB	WF

REV.No.	DATE	DESCRIPTION OF REVISION	BY

ENGINEER'S SEAL

SCALE: As Noted | REF FILE:
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DRAWING NUMBER: 906-01-DWG-C-LD-001

GENERAL NOTES 1: IN CASE OF DISCREPANCIES BETWEEN THE GENERAL NOTES/DETAILS AND ANY NOTES/DETAILS ON INDIVIDUAL DRAWINGS, THE NOTES / DETAILS ON EACH DRAWING TAKE PRECEDENCE

1. GENERAL

1.1. THE STRUCTURES AND THEIR COMPONENTS ARE DESIGNED ACCORDING TO THE CRITERIA INDICATED BY THE REGULATIONS BELOW. ALL THE REGULATIONS BELOW ARE IN THE LATEST VERSIONS:

INTERNATIONAL DESIGNS CODES.

EN 1990 - 'Eurocode 0: Basis of Structural design"

EN 1991 - 'Eurocode 1: Actions on Structures"

EN 1992 - 'Eurocode 2: Design of Concrete Structures"

EN 1993 - 'Eurocode 3: Design of Steel Structures"

EN 1997 - 'Eurocode 7: Geotechnical design"

EN 1998 - 'Eurocode 8: Design of structures for earthquake resistance"

1.2. IN HARMONISATION OF PROFESSIONAL PRACTICE AND ENSURING APPROPRIATE LEVELS OF SAFTETY, HEALTH AND ECONOMY WITH DUE CONSIDERATION OF THE OBJECTIVES CONDITIONS AND NEED OF THE CONSTRUCTION THE STANDARD SPECIFICATION FOR BUILDING WORKS FOR MINISTRY OF WORKS HOUSING AND COMMUNICATIONS SHOULD BE APPLIED HAND IN HAND WITH THE NAMED STANDARDS.

1.3. DIMENSIONS ARE NOT TO BE SCALED FROM THE DRAWINGS. FOLLOW WRITTEN DIMENSIONS ONLY.

1.4. ALL DRAWINGS SHALL BE READ IN CONJUNCTION WITH THE RELEVANT ARCHITECTURAL DRAWINGS, SPECIFICATIONS, BILLS OF QUANTITIES AND ALL OTHER RELEVANT DOCUMENTS. DISCREPANCIES MUST BE REPORTED IMMEDIATELY TO THE ENGINEER PRIOR TO COMMENCEMENT OF ANY WORK.

1.5. THE CONTRACTOR SHALL CHECK AND VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCEMENT OF WORKS AND ANY DISCREPANCIES SHALL BE REPORTED TO THE NOTES 4 ENGINEER BEFORE EXECUTION.

1.6. ALL CONCRETE SIZES AND LEVELS ARE FOR STRUCTURAL ELEMENTS UNLESS OTHERWISE NOTED.

1.7. NO HOLES OR CHASES ARE PERMITTED IN THE CONCRETE MEMBERS OTHER THAN AS DETAILED OR UNLESS APPROVED BY THE ENGINEER.

1.8. CONSTRUCTION JOINTS SHALL BE LOCATED TO THE APPROVAL OF THE ENGINEERS.

1.9. ANY DAMAGE CAUSED TO ANY CIVIL/ STRUCTURAL WORK SHALL BE REINSTATED TO ITS ORIGINAL CONDITION WITH NO COST IMPLICATION TO THE CLIENT.

2. APPROACH ROADS

2.1. THE APPROACH ROADS AND THEIR COMPONENTS ARE DESIGNED ACCORDING TO THE CRITERIA INDICATED BY THE FOLLOWING ROAD DESIGN MANUALS AND STANDARDS FROM MINISTRY OF WORKS AND TRANSPORT:

Volume 1 - 'Geometric design"

Volume 2 - 'Drainage design manual "

Volume 3 - 'Part I: Flexible Pavement design manual "

Volume 3 - 'Part II: Rigid Pavement design manual"

Volume 3 - 'Part I: Gravel Roads design manual"

Volume 3 - 'Part IV: Pavement Rehabilitation design manual"

Volume 4 - 'Bidge design manual"

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PROJECT NAME:
USAID / Uganda Architect & Engineering Design and Construction Management Services

ACTIVITY NAME:
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DRAWING DESCRIPTION:
LWSC_LIST OF GENERAL NOTES
LIST OF GENERAL NOTES 1

DESIGNED BY:	BB
DRAWN BY:	BK
CHECKED BY:	BB
APPROVED BY:	WF

REV.No.	DATE	DESCRIPTION OF REVISION	BY

ENGINEER'S SEAL

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GENERAL NOTES 2: IN CASE OF DISCREPANCIES BETWEEN THE GENERAL NOTES/DETAILS AND ANY NOTES/DETAILS ON INDIVIDUAL DRAWINGS, THE NOTES / DETAILS ON EACH DRAWING TAKE PRECEDENCE

3. CONCRETE

3.1 UNLESS OTHERWISE SPECIFIED, ALL STRUCTURAL CONCRETE MIX TO BE OF GRADE 30

3.2 ALL CONCRETE STRENGTHS ARE 28 DAYS CUBE STRENGTH.

3.3 UNLESS OTHERWISE SPECIFIED, A LAYER OF 50mm THICK GRADE 15 CONCRETE TO BE PROVIDED BELOW ALL REINFORCED CONCRETE STRUCTURES IN CONTACT WITH THE GROUND.

3.4 UNLESS OTHERWISE SPECIFIED, ALL LEAN CONCRETE MIX TO BE OF GRADE 15.

3.5 MAXIMUM AGGREGATE SIZE SHALL BE 20mm.

3.6 CURING OF CONCRETE

- EXPOSED CONCRETE SURFACES SHOULD BE COVERED WITH DAMP ABSORBENT MATERIAL AFTER PLACING CONCRETE.
- THEY SHOULD BE KEPT CONTINUOUSLY WET BY FREQUENT SPRAYING OF WATER.
- IN COLUMNS CURING SHOULD BE STARTED IMMEDIATELY AFTER REMOVAL OF FORMWORK.
- MINIMUM PERIOD OF CURING IS 4 DAYS.

3.7 REMOVAL OF SHUTTERING:

STRUCTURAL ELEMENTS	MINIMUM PERIOD
VERTICAL FORMWORK TO COLUMNS AND WALLS	24 HOURS
SOFFIT FORMWORK TO SLABS	10 DAYS
SOFFIT FORMWORK TO BEAMS	10 DAYS
PROPS TO BEAMS	14 DAYS

3.8 GRADE OF CONCRETE

CONCRETE	CUBE/ CYLINDER	CHARACTERISTIC STRENGTH, N/mm²
BLINDING SCREED / LEVELING CONCRETE	C15, (C12)	15
MASS CONCRETE	C20, (C15)	20
STRUCTURAL CONCRETE	C30, (C25)	30

4. REINFORCEMENT

4.1. UNLESS OTHERWISE SPECIFIED, ALL STEEL REINFORCEMENT BARS AND WELDED STEEL FABRIC REINFORCEMENTS (WSFR) SHALL COMPLY WITH THE REQUIREMENTS OF EUROCODE 2.

4.2. 'R' DENOTES MILD STEEL OF YIELD STRENGTH = 250 N/MM²

4.3. T' DENOTES HIGH TENSILE DEFORMED BARS (TYPE 2) OF YIELD STRENGTH = 460 N/MM²

4.4. CONCRETE COVER TO OUTERMOST REINFORCEMENT, INCLUDING LINKS, SHALL BE AS FOLLOWS :

STRUCTURAL ELEMENTS	IN CONTACT WITH GROUND	OTHER
SLABS	50 mm	20 mm
BEAMS	50 mm (TOP) 50 mm (SIDE & BOT.)	25 mm
COLUMNS	50 mm	40 mm
FOOTINGS	50 mm	--

4.5. WELDING OF REINFORCEMENT WILL NOT BE PERMITTED WITHOUT THE APPROVAL OF THE ENGINEER.

BAR SIZE (mm)	6	10	12	16	20	25	32
T = HIGH YIELD STEEL	-	500	600	800	1000	1200	1330
R = MILD STEEL	300	-	-	-	-	-	-

4.6. ALL BARS SHALL BE CUT AND BENT TO CONFORM TO EUROCODE 2. UNLESS OTHERWISE STATED IN THE DRAWINGS, THE MINIMUM LAP LENGTH FOR REINFORCEMENT SHALL BE 50 TIMES THE DIA. OF SMALLER BAR IN THE LAP.

BAR SIZE (mm)	A	B	C
T32	1100	-	900
T25	850	-	700
T20	700	-	330
T16	330	450	450
T12	400	400	400
T10	-	300	-

4.7. ALL BARS AT THE ENDS OF THE BEAMS WHERE THE BEAM IS NO MORE CONTINUOUS SHALL BE ANCHORED EITHER STRAIGHT OR BENT (DEPENDING ON THE WIDTH OF THE SUPPORT) AS SHOWN BELOW. THESE SHALL NOT BE USED IN CANTILEVERED BEAMS OR SLABS. THE ACTUAL DESIGN DRAWING SHALL BE STRICTLY ADHERE TO.

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PROJECT NAME: USAID / Uganda Architect & Engineering Design and Construction Management Services

ACTIVITY NAME: Infrastructure for Biodiversity Conservation in Kidepo Valley NP

DRAWING DESCRIPTION: LWSC_LIST OF GENERAL NOTES
GENERAL NOTES 2

DESIGNED BY:	REV.No.	DATE	DESCRIPTION OF REVISION	BY
BB				
DRAWN BY: BK				
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APPROVED BY: WF				

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GENERAL NOTES 3: IN CASE OF DISCREPANCIES BETWEEN THE GENERAL NOTES/DETAILS AND ANY NOTES/DETAILS ON INDIVIDUAL DRAWINGS, THE NOTES / DETAILS ON EACH DRAWING TAKE PRECEDENCE

5. NOTES ON LOW WATER STEAM CROSSINGS

IN THE CONSTRUCTION OF THE LOW WATER STREAM CROSSING, THE FOLLOWING SPECIFICATIONS SHOULD BE CONSIDERED TO OVERCOME THE PRESENT ENCUMBRANCES EXPERIENCED AT THE SITES:

5.1 UNDER-SCOURING/CUTTING OF THE PAVEMENT HAS BEEN PREVENTED BY INTRODUCING EDGE BEAMS ON TOP OF GABION MATTRESSES FILLED WITH STONES.

5.2 MINIMIZING OR AVOIDING THE DAMMING EFFECT WHICH CREATES SILTING NEAR THE DRIFT UPSTREAM HAS BEEN ACHIEVED BY ENABLING THE DRIFT'S VERTICAL ALIGNMENT TO CREATE A SELF-CLEANING EFFECT AT THE CROSSING THROUGH RIVER TRAINING.

THIS SHOULD BE DONE HAVING IN MIND THAT LWSC ARE DESIGNED FOR OVERTOPPING WITH FLOODWATER AND CONSEQUENTLY HAVE AN INHERENT VERTICAL DIP CHARACTERISTIC. THE APPROACH ROADWAY SHALL BE AT THE NORMAL GROUND LEVEL ON THE STREAM BANKS, WHEREAS THE LOW POINT OF THE CROSSING MAY BE MUCH CLOSER TO THE NORMAL WATER FLOW SURFACE THAN A TYPICAL CULVERTED DESIGN. IT SHOULD HOWEVER BE NOTED THAT THIS SUDDEN DIP IN THE VERTICAL ALIGNMENT IS INCONSISTENT WITH THE DRIVER'S EXPECTATIONS OF A PUBLIC HIGHWAY PROFILE. THAT IS WHY PROPER SIGNAGE SHOULD BE PUT IN PLACE FOR SAFETY. FOR AN EFFECTIVE SELF-CLEANING SYSTEM, IT IS NECESSARY TO TRAIN THE RIVER INCLUDING DREDGING 100 M UPSTREAM AND DOWNSTREAM OF THE DRIFT.

5.3 TO CREATE A GOOD BASE/FOUNDATION FOR THE DRIFT AND AT THE SAME TIME REDUCE THE VERTICAL GRADE OF THE ROAD AT THE CROSSING, IT MAY BE NECESSARY TO FILL THE RIVERBED WITH COMPACTED APPROVED GRAVEL AND HARDCORE IN LAYERS. NOTES 4

5.4 THE DRIFT SHOULD HAVE ANCHORAGE PREFERABLY AT THE RIVER BANK IN FORM OF A STABLE ROCK TO PREVENT IT FROM BEING WASHED AWAY BY THE RIVER FLOW. IN CASE A STABLE ROCK IS NOT AVAILABLE, A REINFORCED CONCRETE ANCHORAGE SHOULD BE PROPOSED.

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PROJECT NAME: USAID / Uganda Architect & Engineering Design and Construction Management Services

ACTIVITY NAME: Infrastructure for Biodiversity Conservation in Kidepo Valley NP

DRAWING DESCRIPTION: LWSC_LIST OF GENERAL NOTES GENERAL NOTES 3

DESIGNED BY: BB
DRAWN BY: BK
CHECKED BY: BB
APPROVED BY: WF

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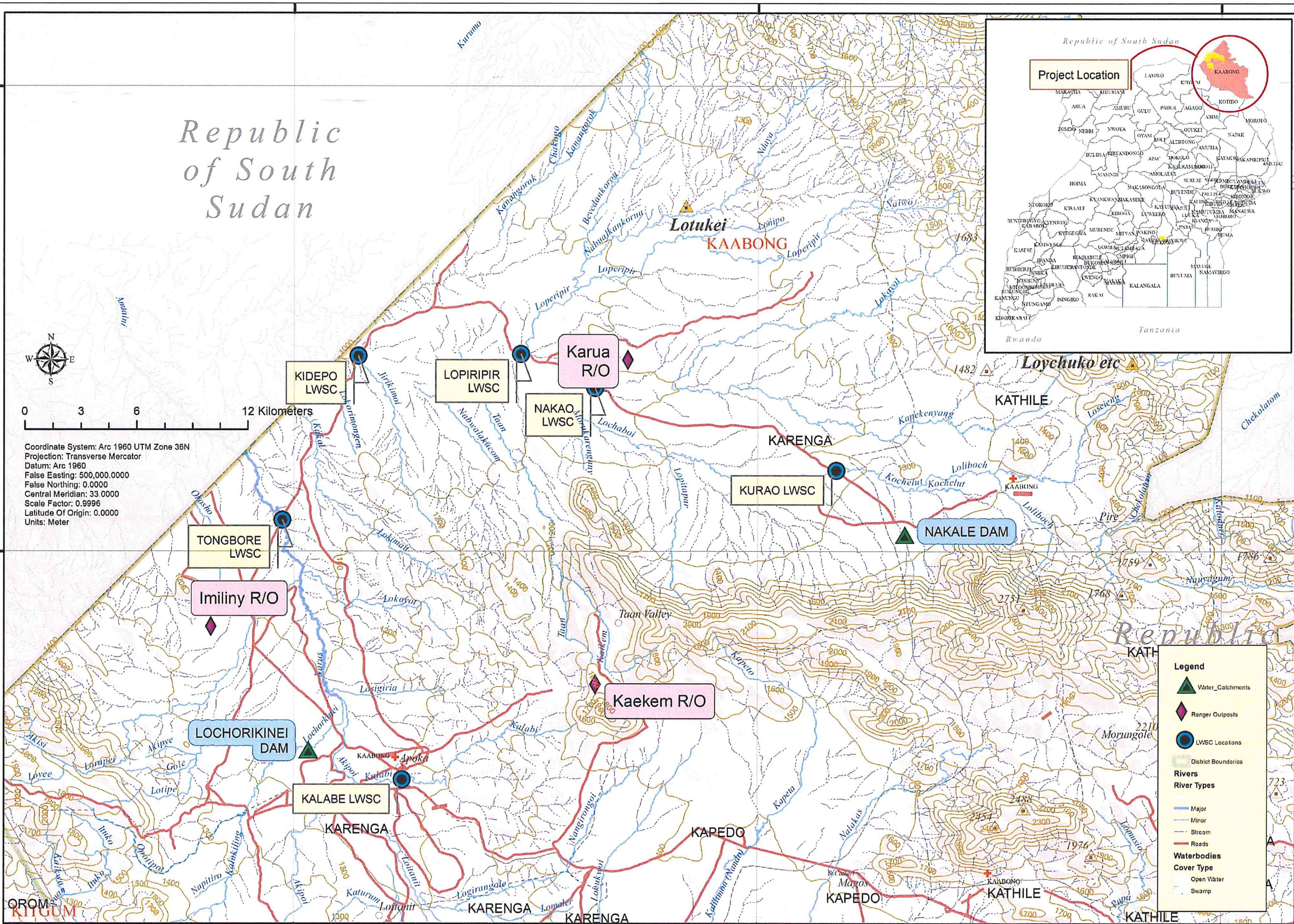
LOCATION MAP



Republic of South Sudan
KIDEPO LWSC
LOPIRIPIR LWSC
Karua R/O
NAKAO LWSC
KURAO LWSC
NAKALE DAM
TONGBORE LWSC
Imiliny R/O
Kaekem R/O
LOCHORIKINEI DAM
KALABE LWSC
Lotukei
KAABONG
Loychuko etc
KATHILE
KARENGA
KAPEDO
Taan Valley
0 3 6 12 Kilometers
Coordinate System: Arc 1960 UTM Zone 36N
Projection: Transverse Mercator
Datum: Arc 1960
False Easting: 500,000.0000
False Northing: 0.0000
Central Meridian: 33.0000
Scale Factor: 0.9996
Latitude Of Origin: 0.0000
Units: Meter
450000
425000
575000
600000
625000
Project Location
Republic of South Sudan
Tanzania
Rwanda
Legend
Water_Catchments
Ranger Outposts
LWSC Locations
District Boundaries
Rivers
River Types
Major
Minor
Stream
Roads
Waterbodies
Cover Type
Open Water
Swamp

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PROJECT NAME: USAID / Uganda Architect & Engineering Design and Construction Management Consulting Services

ACTIVITY NAME: Infrastructure for Biodiversity Conservation in Kidepo Valley NP

DRAWING DESCRIPTION: Low water Stream Crossing River Training section Location Map

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DRAWN BY: SRO				
CHECKED BY: BK				
APPROVED BY: WF	REV. No	DATE	DESCRIPTION OF REVISION	BY

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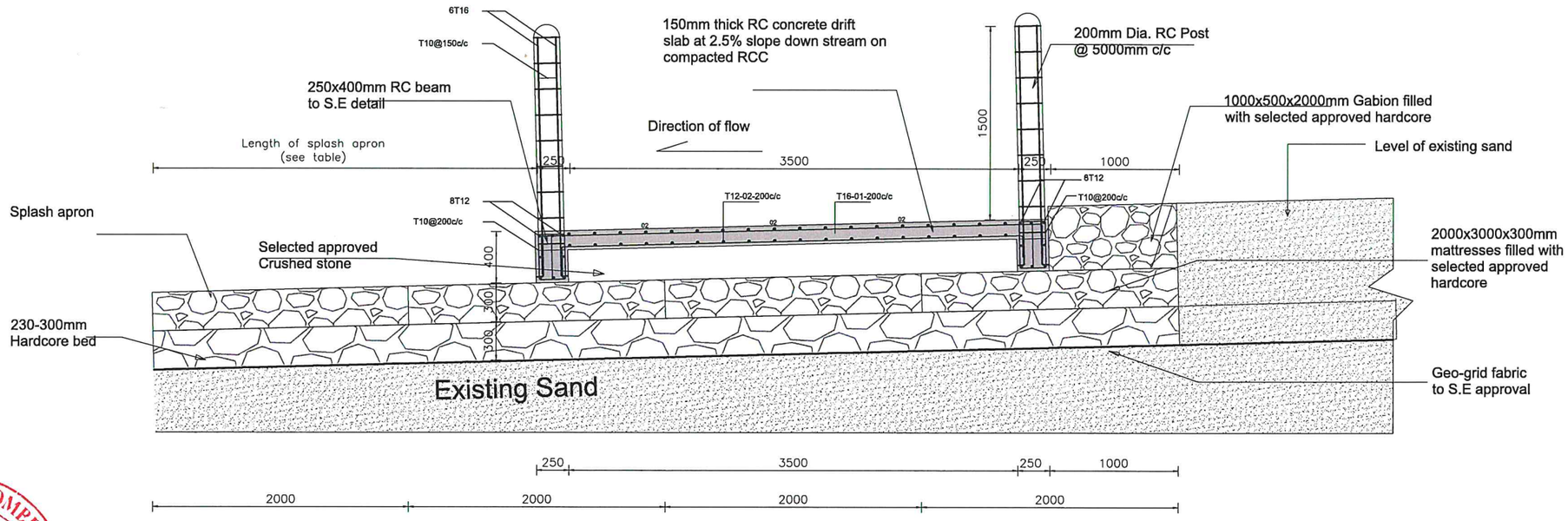
DRAWING NUMBER: 905-01-DWG-C-GD-002

TYPICAL DRAWINGS OF LWSC AND APPROACH ROAD



LWSC _ TYPICAL SECTION 1
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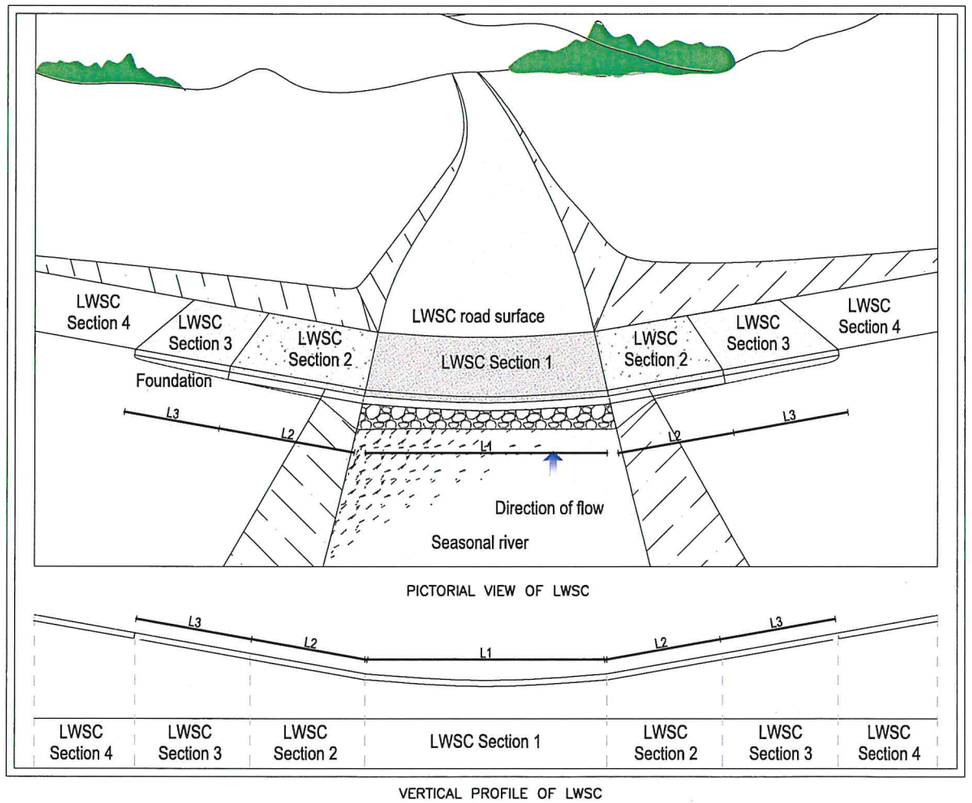

SCHEMATIC DIAGRAM OF LWSC

LWSC	Splash apron (m)	L1 (m)	L2 (m)	L3 (m)
Kalabe	8.00	26.00	9.00	-
Kurao	1.90	18.00	7.00	-
Lopiripir	3.30	28.00	11.00	11.00
Nakao	1.80	32.00	4.00	-
Tongbore	6.20	10.00	5.00	20.00
Kidepo	2.60	42.00	24.00	-

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ERB REGISTRATION NO:
9/12/2022

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PROJECT NAME:
USAID / Uganda Architect & Engineering Design and Construction Management Services

ACTIVITY NAME:
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DRAWING DESCRIPTION:
LWSC_RIVER APPROACH
TYPICAL APPROACH ROAD SECTIONS_01

DESIGNED BY: BB
DRAWN BY: BK
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ENGINEER'S SEAL

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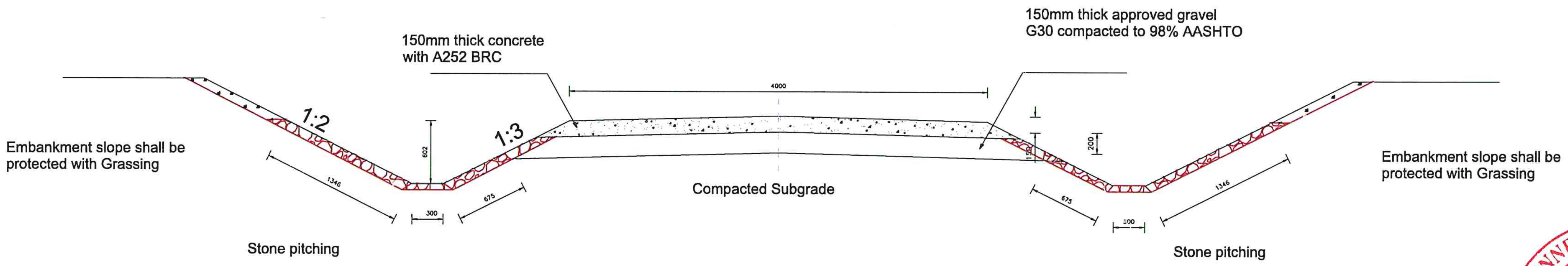
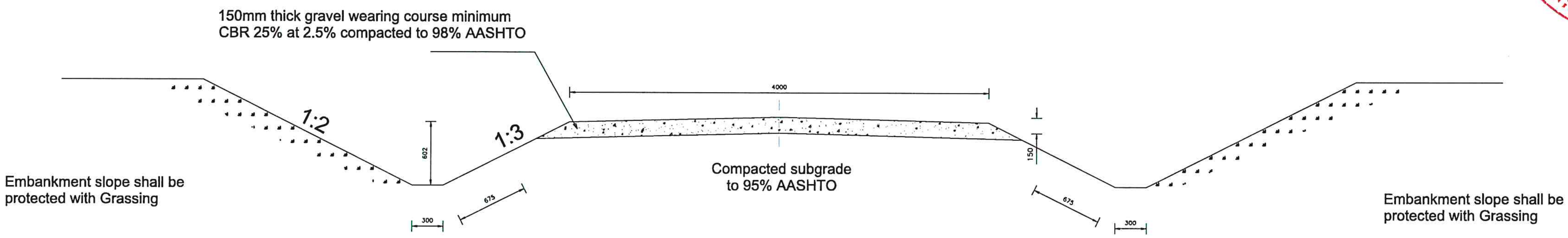
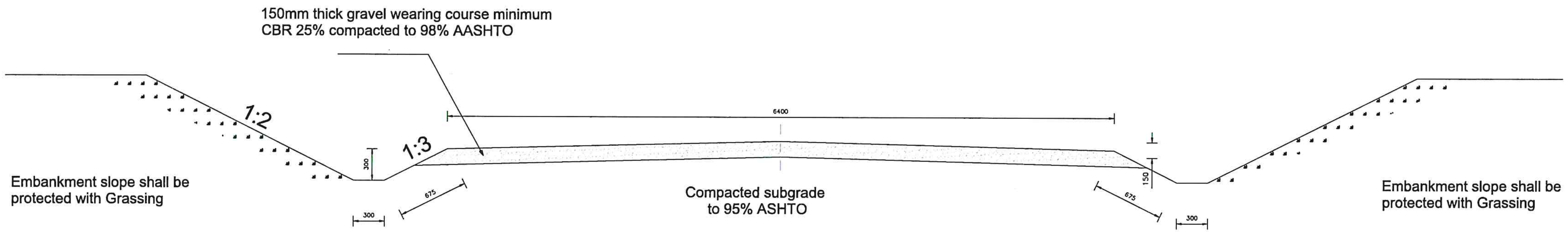


LWSC APPROACH ROAD_SECTION 2
Scale 1:25



LWSC APPROACH ROAD_SECTION 3
Scale 1:25



LWSC APPROACH ROAD SECTION 4
Scale 1:25

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PROJECT NAME: USAID / Uganda Architect & Engineering Design and Construction Management Services

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DRAWING DESCRIPTION: LWSC_RIVER APPROACH
TYPICAL APPROACH ROAD SECTIONS_02

DESIGNED BY: BB				
DRAWN BY: BK				
CHECKED BY: BB				
APPROVED BY: WF	REV.No.	DATE	DESCRIPTION OF REVISION	BY

ENGINEER'S SEAL

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