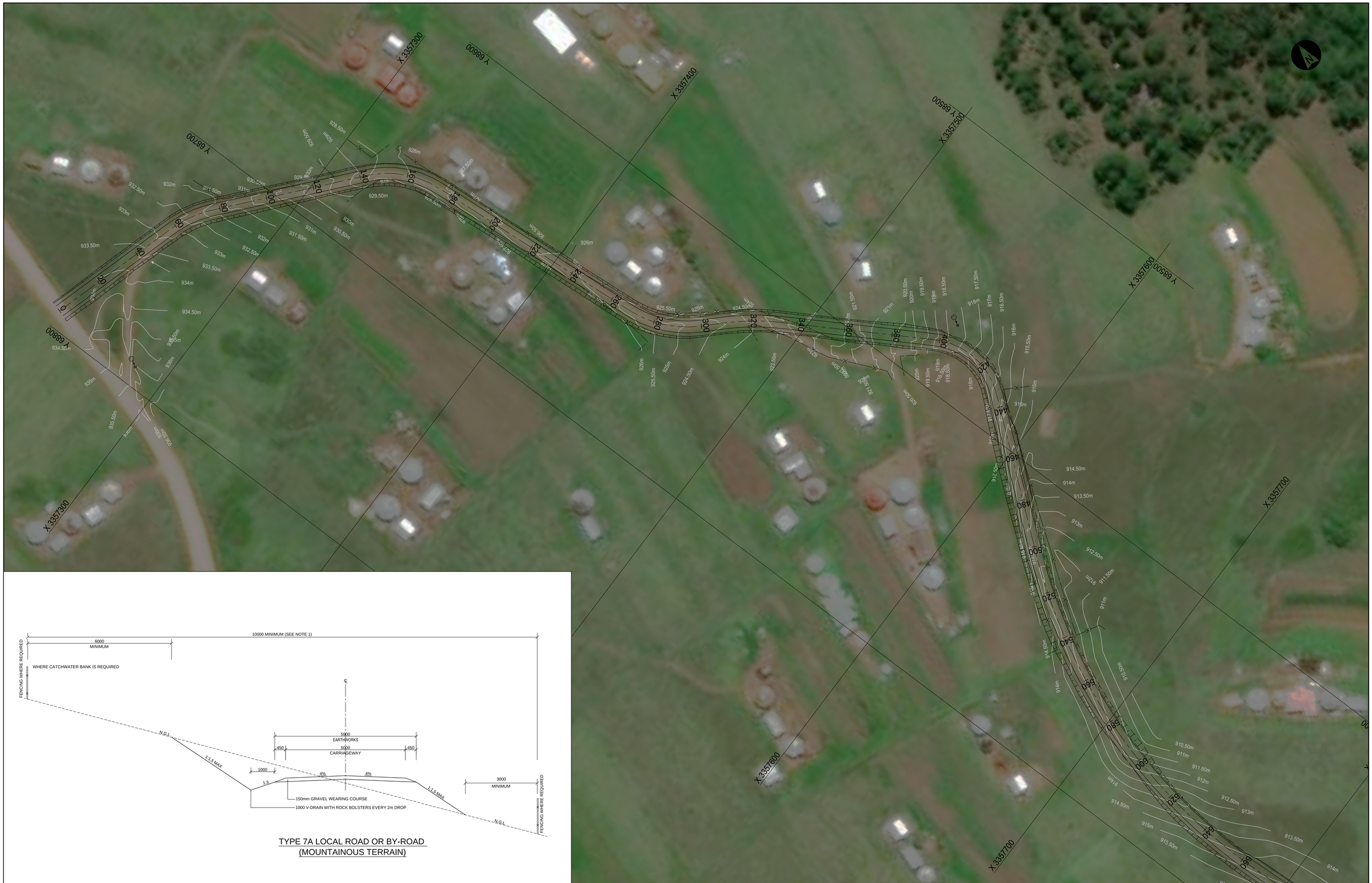
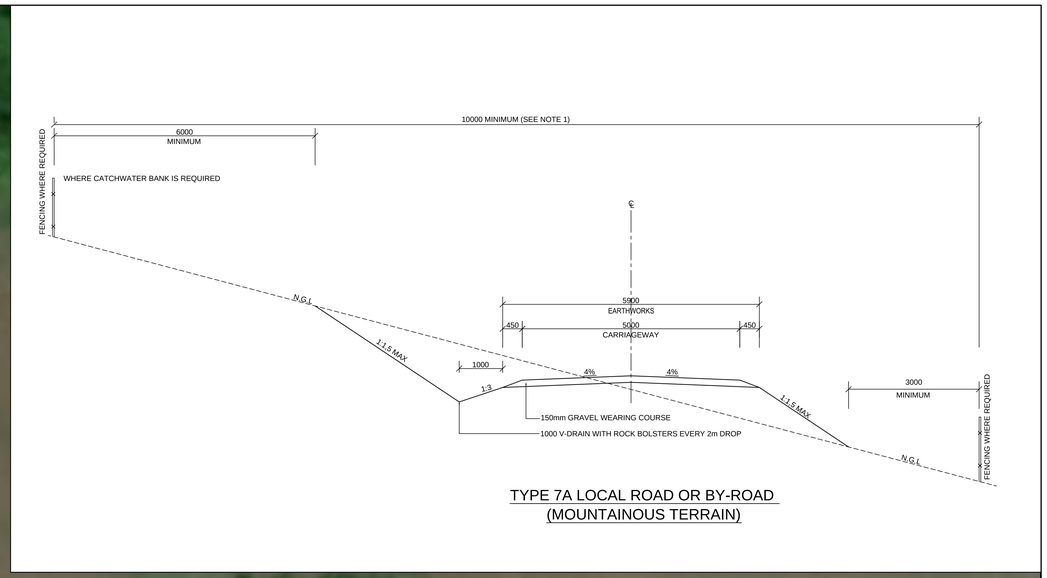

X 3357300
Y 68600
X 3357400
Y 68700
X 3357500
Y 68500
X 3357600
X 3357700
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
420
440
460
480
500
520
540
560
580
600
620
640
660
680
700
720
740
760
780



TYPE 7A LOCAL ROAD OR BY-ROAD
(MOUNTAINOUS TERRAIN)

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No: 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____
CONSULTING ENGINEER

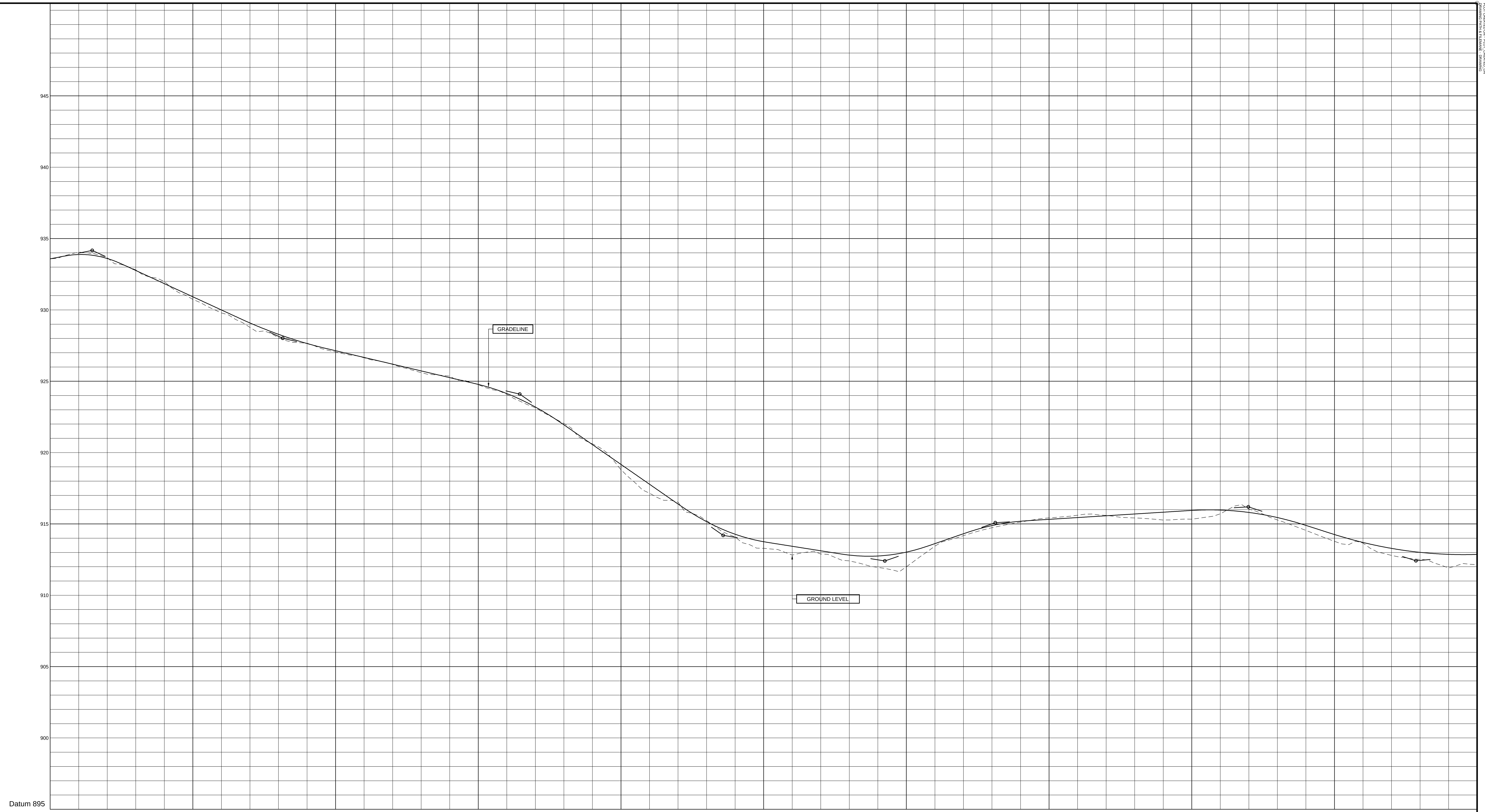
CLIENT LOGO

CLIENT NAME
BUHLEBEZWE MUNICIPALITY

PROJECT TITLE
CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE
GENERAL LAYOUT (2 OF 2)

	RESPONSIBLE PERSON		DATE
DESIGNED	S. ZULU		02-05-2019
CHECKED	D. PILLAY		02-05-2019
DRAWN	S. ZULU		02-05-2019
CHECKED	B. QWABE		02-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-IT-TR-101		REVISION 0



PLOT CREATED ON - PLOT_CREATED_ON
DRAWING PATH & FILEMANE - DRAWING

VERTICAL ALIGNMENT – DESIGNED ROAD LEVELS

DISTANCE	GROUND LEVELS	LEFT EDGE	CENTRE LINE	RIGHT EDGE
0	933.578	933.478	933.578	933.478
20	934.053	933.788	933.888	933.788
40	933.663	933.511	933.611	933.511
60	932.804	932.664	932.764	932.664
80	931.990	931.742	931.841	931.742
100	930.734	930.819	930.919	930.819
120	929.790	929.897	929.997	929.897
140	928.774	928.984	929.084	928.984
160	928.048	928.189	928.289	928.189
180	927.668	927.544	927.644	927.544
200	927.053	927.041	927.141	927.041
220	926.646	926.569	926.669	926.569
240	926.177	926.097	926.197	926.097
260	925.606	925.625	925.725	925.625
280	925.362	925.153	925.253	925.153
300	924.764	924.681	924.781	924.681
320	924.078	924.042	924.142	924.042
340	923.145	923.098	923.198	923.098
360	922.041	921.849	921.949	921.849
380	920.611	920.460	920.560	920.460
400	918.798	919.072	919.172	919.072
420	917.154	917.683	917.783	917.683
440	916.530	916.294	916.394	916.294
460	915.226	915.056	915.156	915.056
480	914.083	914.175	914.275	914.175
500	913.292	913.651	913.751	913.651
520	912.816	913.334	913.434	913.334
540	912.891	913.018	913.118	913.018
560	912.409	912.712	912.812	912.712
580	911.956	912.649	912.749	912.649
600	911.994	912.922	913.022	912.922
620	913.441	913.521	913.620	913.521
640	914.179	914.213	914.313	914.213
660	914.733	914.788	914.888	914.788
680	915.130	915.092	915.192	915.092
700	915.423	915.221	915.321	915.221
720	915.608	915.346	915.446	915.346
740	915.600	915.472	915.572	915.472
760	915.419	915.597	915.697	915.597
780	915.274	915.722	915.822	915.722
800	915.334	915.848	915.948	915.848
820	915.706	915.873	915.973	915.873
840	916.038	915.707	915.807	915.707
860	915.281	915.349	915.449	915.349
880	914.547	914.798	914.898	914.798
900	913.780	914.156	914.256	914.156
920	913.654	913.601	913.701	913.601
940	912.792	913.185	913.285	913.185
960	912.510	912.906	913.006	912.906
980	911.916	912.766	912.866	912.766
1000	912.151	912.764	912.864	912.764

GRADES: 2.007 % | -4.611 % | -2.360 % | -6.944 % | -1.581 % | 3.461 % | 0.626 % | -3.218 % | 0.9

VERTICAL CURVES:
BVC 10 | 29.500 934.170 L = 40m K = 6 | 50 EVC
BVC 133 | 163.031 928.013 L = 60m K = 27 | 193 EVC
BVC 299 | 329.109 924.094 L = 60m K = 13 | 359 EVC
BVC 442 | 471.612 914.199 L = 60m K = 11 | 502 EVC
BVC 555 | 584.936 912.407 L = 60m K = 12 | 615 EVC
BVC 641 | 662.317 915.085 L = 42m K = 15 | 683 EVC
BVC 800 | 839.658 916.196 L = 80m K = 21 | 880 EVC
BVC 897 | 957.135 912.416 L = 120m K = 29

SUPERELEVATION: -4.000

HORIZONTAL CURVES:
Direction 286.32.14
Curve No. 1 Right – 58 B.C.C – R=45 – E.C.C 77 – Angle= 23.45.57
Direction 310.18.11
Curve No. 2 Right – 143 B.C.C – R=40 – E.C.C 174 – Angle= 45.16.26
Direction 355.34.37
Curve No. 3 Left – 268 B.C.C – R=45 – E.C.C 30 – Angle= 40.35.37
Direction 314.59.60
Curve No. 4 Right – 30 B.C.C – R=100 – E.C.C 334 – Angle= 14.21.51
Direction 329.20.51
Curve No. 5 Right – 398 B.C.C – R=30 – E.C.C 434 – Angle= 69.39.56
Direction 39.00.47
501 B.C.C – Curve No. 6 Left – R=230 – Angle= 41.40.12 – E.C.C 668
Direction 357.20.35
Curve No. 7 Left – 827 B.C.C – R=35 – E.C.C 866 – Angle= 64.25.14
Direction 292.55.21
Curve No. 8 – 970 B.C.C – R=25 – Angle= 97.2

ORIGINAL SIZE - A0
ORIGINAL SCALE : 1 : 100

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07
84 Cleland Road, Hayfields, Pietermaritzburg 3201
P.O. Box 28580, Haymarket, Pietermaritzburg 3200
Tel (033) 346 2835
Fax (033) 346 2328
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : ____________

SIGNED BY : ____________ CONSULTING ENGINEER

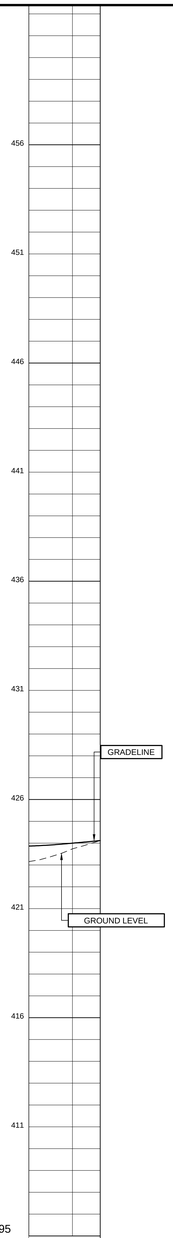
CLIENT LOGO

CLIENT NAME: BUHLEBEZWE MUNICIPALITY

PROJECT TITLE: CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE: LONG SECTION (1 OF 2)

	RESPONSIBLE PERSON	DATE
DESIGNED	S. ZULU	02-05-2019
CHECKED	D. PILLAY	02-05-2019
DRAWN	S. ZULU	02-05-2019
CHECKED	B. QWABE	02-05-2019
SCALES	AS SHOWN / SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-IT-TR-200	REVISION 0



DISTANCE				1020	1032.721
GROUND LEVELS				912.738	913.116
VERTICAL ALIGNMENT	DESIGNED ROAD LEVELS	LEFT EDGE		912.898	913.016
		CENTRE LINE		912.998	913.116
		RIGHT EDGE		912.898	913.016
	GRADES		26 %		
	VERTICAL CURVES			1017 EVC	
SUPERELEVATION					
HORIZONTAL CURVES			Right 1013 C.C 24	Direction 30.15.35	

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mnna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____
CONSULTING ENGINEER

CLIENT LOGO

CLIENT NAME
BUHLEBEZWE MUNICIPALITY

PROJECT TITLE
CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE
LONG SECTION (2 OF 2)

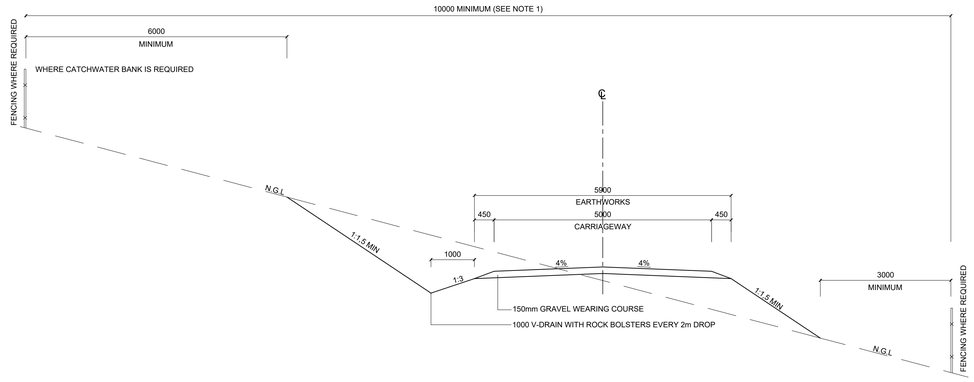
	RESPONSIBLE PERSON		DATE
DESIGNED	S. ZULU		02-05-2019
CHECKED	D. PILLAY		02-05-2019
DRAWN	S. ZULU		02-05-2019
CHECKED	B. QWABE		02-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-IT-TR-201		REVISION 0

THIS DRAWING IS THE COPYRIGHT OF MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd

ORIGINAL SIZE - A0

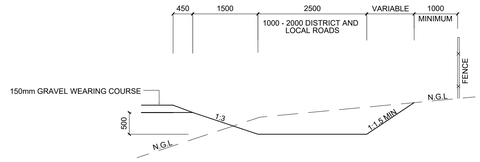
ORIGINAL SCALE : 1 : 100

0m 1m 2m 3m 4m 5m 6m 7m 8m 9m 10m 11m 12m 13m 14m



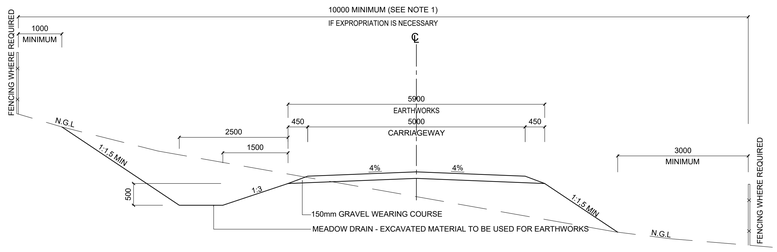
TYPE 7A LOCAL ROAD OR BY-ROAD (MOUNTAINOUS TERRAIN)

SCALE 1=50



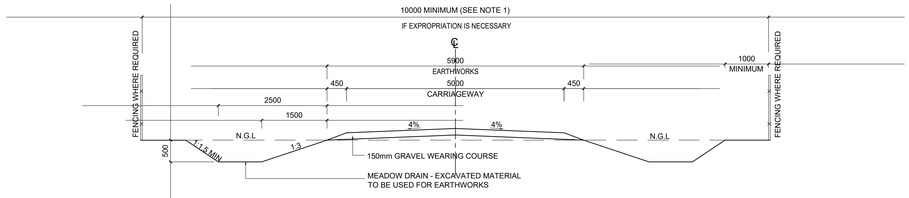
MEADOW DRAIN

SCALE 1=50



TYPE 7A LOCAL ROAD OR BY-ROAD (ROLLING TERRAIN)

SCALE 1=50



TYPE 7A LOCAL ROAD OR BY-ROAD (FLAT TERRAIN)

SCALE 1=50

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS
0	20-05-19	FOR TENDER	S.Z	D.P		

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____
CONSULTING ENGINEER

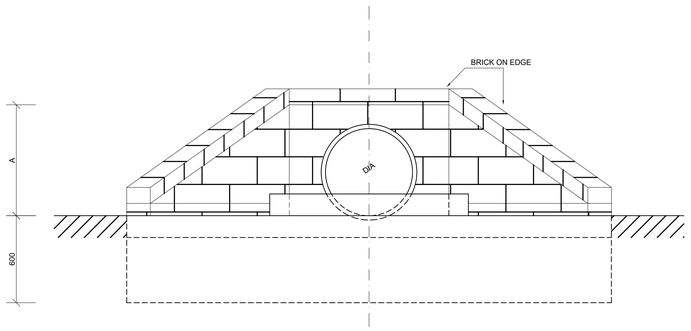
CLIENT LOGO

CLIENT NAME
UBUHLEBEZWE MUNICIPALITY

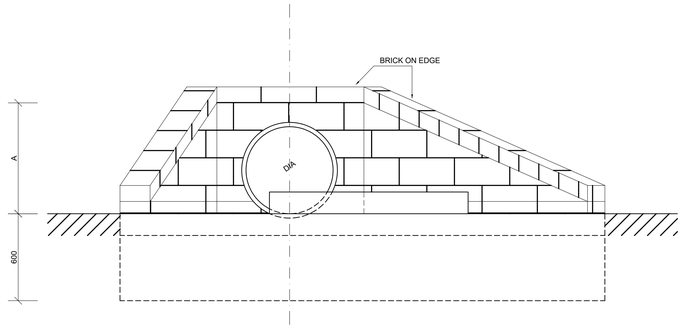
PROJECT TITLE
CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE
TYPICAL DETAILS
TYPE 7A LOCAL GRAVEL ROAD
(SHEET 1 OF 1)

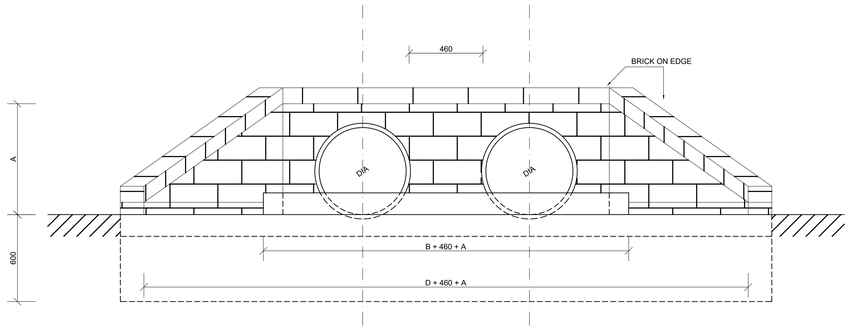
	RESPONSIBLE PERSON		DATE
DESIGNED	S.ZULU		20-05-2019
CHECKED	D.PILLAY		20-05-2019
DRAWN	S.ZULU		20-05-2019
CHECKED	B. QWABE		20-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-FC-TR-300		REVISION 0



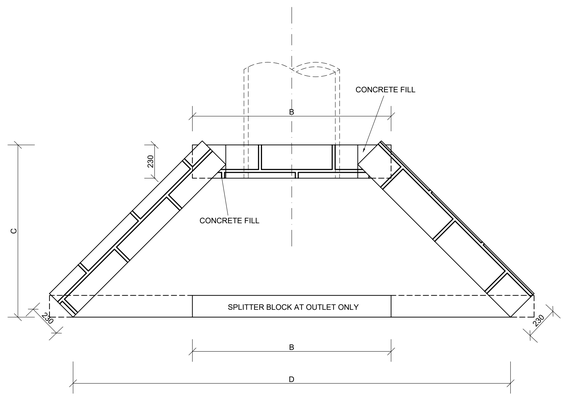
FRONT ELEVATION - SINGLE PIPE



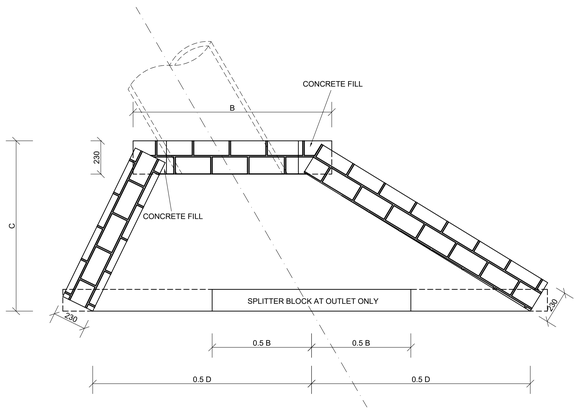
FRONT ELEVATION - SKEW PIPE



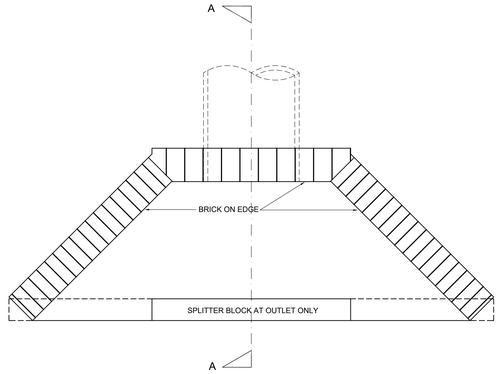
FRONT ELEVATION - DOUBLE PIPE



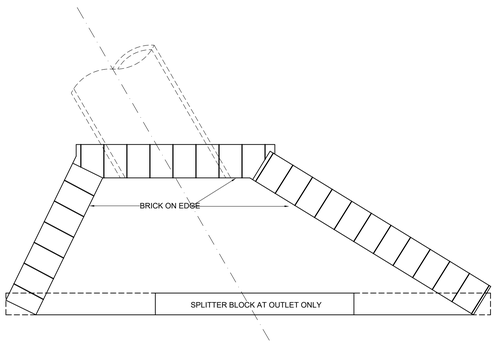
LAYOUT OF BRICKWORK



LAYOUT OF BRICKWORK



PLAN

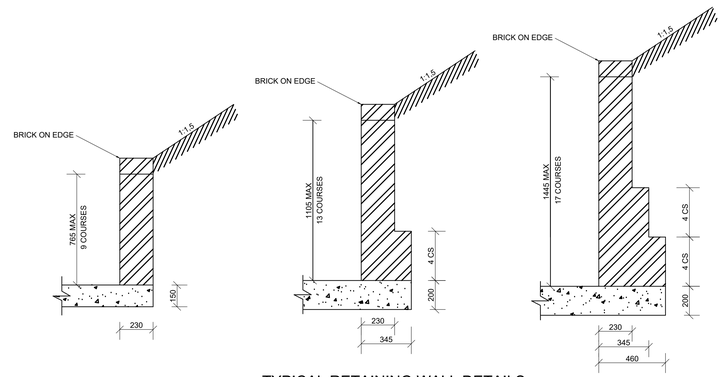


PLAN OF SKEW CULVERT

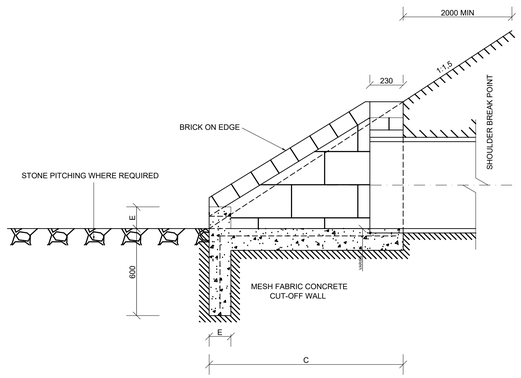
NOTES :

1. SPLITTER BLOCK AND PITCHING TO BE PROVIDED AT ALL OUTLETS WHERE EROSION IS LIKLEY TO OCCUR
2. SPLITTER BLOCK MAY BE OMITTED IF DISCHARGE VELOCITY IS LESS THAN 0.9m/s
3. CUT-OFF WALLS MAY BE OMITTED IF STRUCTURE IS FOUNDED ON ROCK
4. FOR MULTIPLE PIPE CULVERTS INCREASE DIMENSIONS "E" AND "F" BY (n-1)(A+460)mm : WHERE n = NUMBER OF PIPES AND A = NOMINAL DIAMETER OF PIPES
5. PIPES TO BE CUT FLUSH WITH HEADWALL
6. FOR SKEW PIPE CULVERTS THE HEADWALL SHALL BE PARALLEL TO THE CENTRE LINE OF THE ROAD
7. IF CORRUGATED METAL PIPES ARE USED 4 x 20mm x 150mm LONG GALVANISED ANCHOR BOLTS IN THE HOLLOWS OF THE CORRUGATION ARE TO BE USED
8 ALL CONCRETE IS TO BE 20MPa
9. SQUARE MESH FABRIC (REFERENCE S.M.F. 193) IS TO BE PLACED 50mm FROM TOP IN ALL APRON SLABS AND CENTRALLY IN CUT-OFF WALLS.
10. BRICKWORK IS TO CONSIST OF GOOD QUALITY BURNT CLAY COMMON BRICKS IN ACCORDANCE WITH SABS 227 SPECIFICATION, OR CEMENT BRICKS IN ACCORDANCE WITH SABS 987 SPECIFICATION UNIFORM IN SIZE AND SHAPE LAYED IN STRETCHER BOND STYLE WITH THE SKINS TIED TOGETHER WITH GALVANISED CRIMPED WIRE WALL TIES
11. BRICKFORCE IS TO BE PLACED EVERY 4th COURSE
12. JOINTING ON ALL VISIBLE FACES TO BE POINTED
13. NO IN-FILL SHALL BE LARGER THAN A HALF STANDARD BRICK SIZE UNLESS 15MPa CONCRETE IS USED

DIMENSION (mm)					
NOMINAL DIA.	A	B	C	D	E
450	595	1 150	1 050	2 700	150
600	765	1 380	1 200	3 000	150
750	935	1 610	1 350	3 300	150
900	1 105	1 840	1 500	3 600	230
1 050	1 275	2 070	1 750	3 900	230
1 200	1 445	2 300	1 900	4 200	230



TYPICAL RETAINING WALL DETAILS



SECTION A-A

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS
0	20-05-19	FOR TENDER	S.Z	D.P		

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____

CONSULTING ENGINEER

CLIENT LOGO

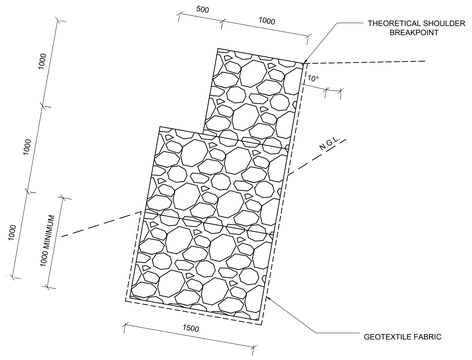
CLIENT NAME: UBUHLEBEZWE MUNICIPALITY

PROJECT TITLE: CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE: TYPICAL DETAILS PIPE CULVERT HEADWALLS

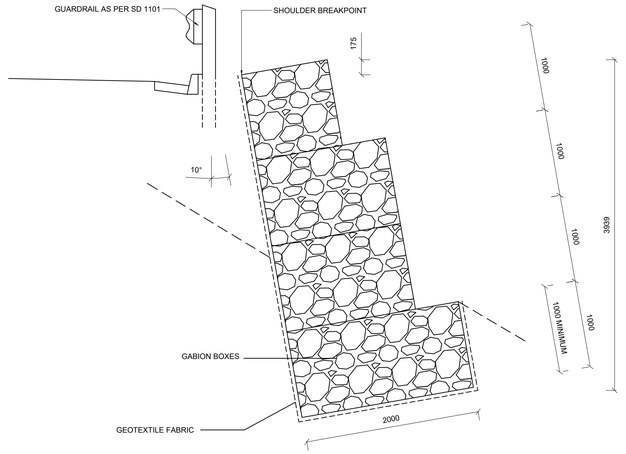
(SHEET 1 OF 1)

	RESPONSIBLE PERSON		DATE
DESIGNED	S.ZULU		20-05-2019
CHECKED	D.PILLAY		20-05-2019
DRAWN	S.ZULU		20-05-2019
CHECKED	B. QWABE		20-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-FT-TR-302		REVISION 0



3m GABION RETAINING WALL

Scale 1 : 50



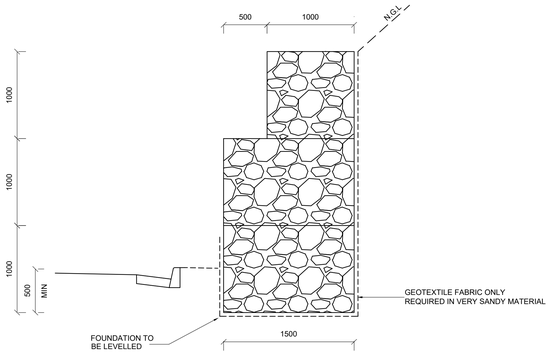
4m GABION RETAINING WALL

Scale 1 : 50

NOTES:

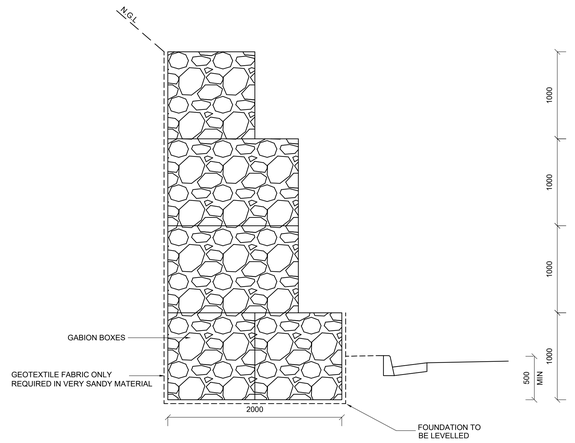
1. THE GABION DESIGN SHOWN IS TYPICAL
   EACH APPLICATION OF GABION BOXES
   SHALL BE DESIGNED BY THE PLANNING OR
   BRIDGE ENGINEER TO SUIT THE SPECIFIIC
   PREVAILING CONDITIONS
2. FOUNDATIONS TO BE STEPPED AND PREPARED
   AS INSTRUCTED BY THE ENGINNEER
3. GEOTEXTILE FABRIC TO BE GRADE C OR SIMILAR
   AS INSTRUCTED BY THE ENGINEER.
4. ALL WIRE USED IN THE MAKING OF GABIONS SHALL BE
   GALVANISED IN ACCORDANCE WITH THE PROVISIONS S.A.B.S. 1580:1993
   OR CLASS A HEAVY GALVANISED MILD-STEEL WIRE.
5. THE STANDARD SIZES OF GABIONS ARE AS FOLLOWS :
   LENGTH : 1,0M , 2,0M , 3,0M & 4,0M
   WIDTH : 1,0M 1,5M.
   DEPTH : 0,5M & 1,0M
   DIAPHRAGM SPACING : 1,0M
6. LACING AND BRACING TO BE DONE IN ACCORDANCE WITH
   MANUFACTURES RECOMMENDATIONS.

FILL CONDITION



3m GABION RETAINING WALL

Scale 1 : 50



4m GABION RETAINING WALL

SCALE 1 : 50

Depth of gabion (m)		Nominal mesh dimensions (mm)		Nominal wire diameter (mm)	
Exceeding	Not exceeding	Cross dimension b Tolerances: -2 +5	Long dimension l Tolerances: ±25	Mesh wire	Selvedge
-	0,3	80	100	2,5	3,0
0,3	1,0	80	100	2,7	3,4

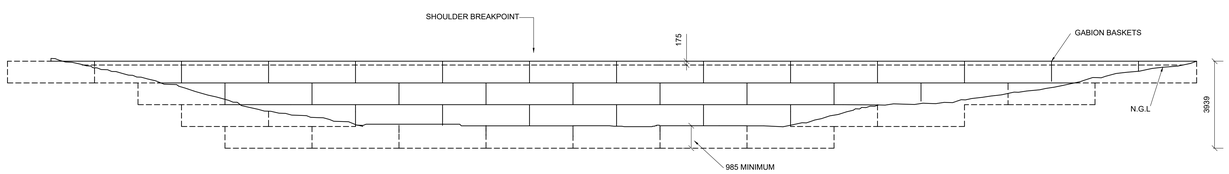
(As per SABS 1580 / 1993)

Depth of cage (m)	Rock size according to the largest dimension of rock	
	Minimum (mm)	Maximum (mm)
0,2	100	125
0,3	100	200
0,5	100	250
1,0	100	250

Nominal diameter of wire mm		Minimum mass of zinc coating per unit area (g/m) 2
Exceeding	Not exceeding	
2,40	2,50	260
2,51	3,50	275
3,51	5,00	290

(As per SABS 1580 / 1993)

CUT CONDITION



TYPICAL SIDE ELEVATION IN FILL CONDITION (4,0m WALL)

Scale 1 : 200

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS
0	20-05-19	FOR TENDER	S.Z	D.P		

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____

CONSULTING ENGINEER

CLIENT LOGO

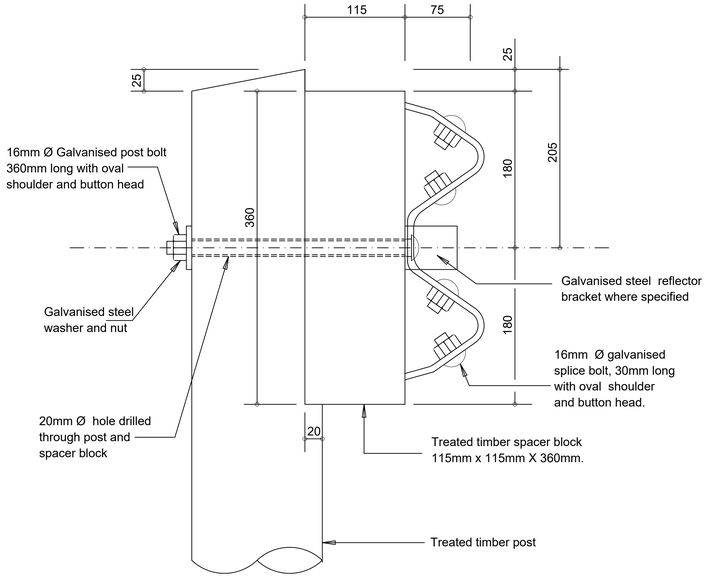
CLIENT NAME: UBUHLEBEZWE MUNICIPALITY

PROJECT TITLE: CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE: TYPICAL DETAILS GABION RETAINING WALL

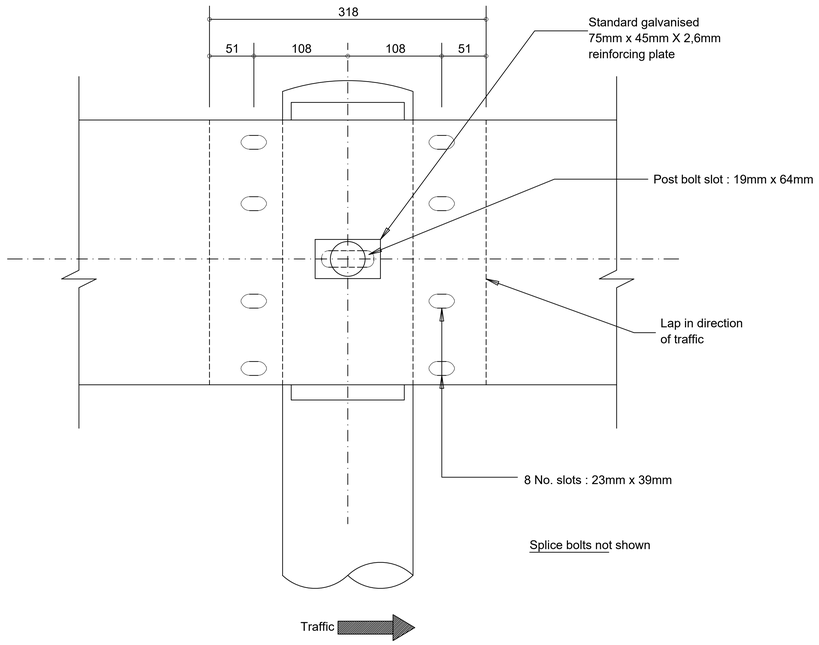
(SHEET 1 OF 1)

	RESPONSIBLE PERSON		DATE
DESIGNED	S.ZULU		20-05-2019
CHECKED	D.PILLAY		20-05-2019
DRAWN	S.ZULU		20-05-2019
CHECKED	B. QWABE		20-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-FT-TR-307		REVISION 0



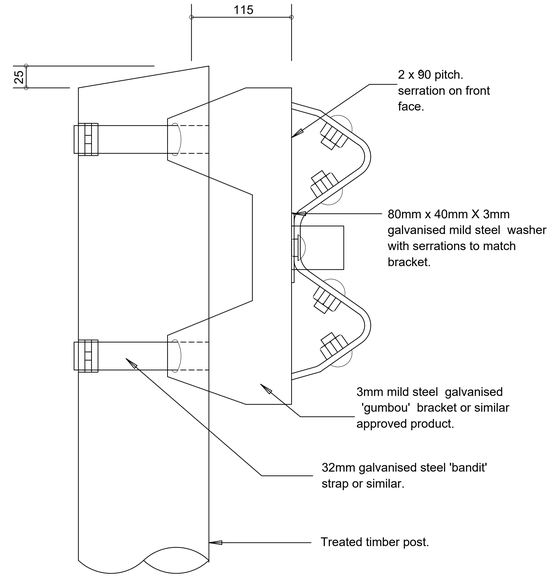
SIDE ELEVATION

Scale 1 : 2.5



FRONT ELEVATION

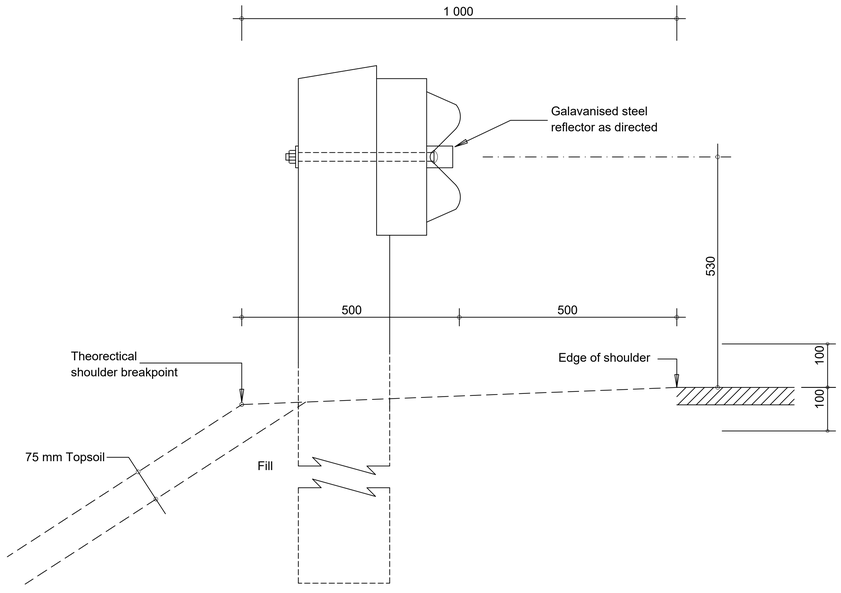
Scale 1 : 2.5



ALTERNATIVE INSTALLATION WITH STRAP-ON

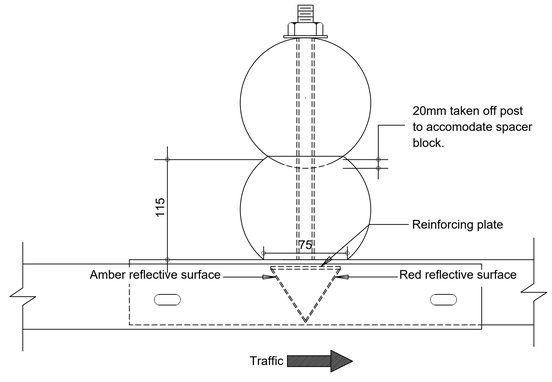
MILD STEEL GUARDRAIL BRACKET

Scale 1 : 2.5



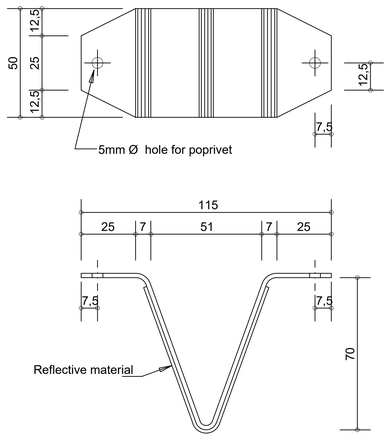
GUARDRAIL INSTALLATION

Scale : 1 : 5



PLAN

Scale 1 : 2.5



DETAIL OF GUARDRAIL REFLECTOR

Scale 1 : 1

NOTES :

1. The top of the guardrail post shall be angle-cut and drilled such that the slope is away from the guardrail face.
2. All wooden posts and spacer blocks shall be treated after drilling and cutting and shall bear the SABS mark.
3. Reinforcing plates must be used on every post, however, reflector brackets are to be used where specified by the Engineer.
4. All guardrails, brackets, nuts, bolts and washers shall be galavanised with a hot-dip galvanised zinc coating which complies with the requirements of SABS 457-1982.
5. The galvanised steel reflector bracket shall be reflectorised with "Scotchlite" Reflective Sheeting (high intensity grade), or similar approved product.
6. Posts to be 150 - 230mm and 1,8m long (2,1mØ post can be used where required).
7. Alternative posts types to be used only where approved.

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS
0	20-05-19	FOR TENDER	S.Z	D.P		

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____

CONSULTING ENGINEER

CLIENT LOGO

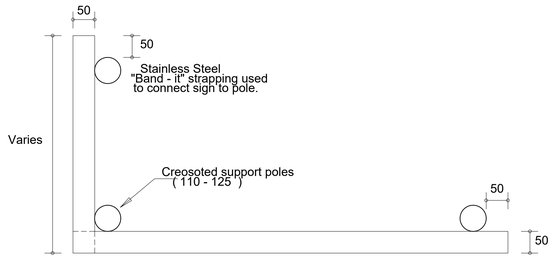
CLIENT NAME: UMLALAZI MUNICIPALITY

PROJECT TITLE: CONSTRUCTION OF KHAMBULA ACCESS ROAD

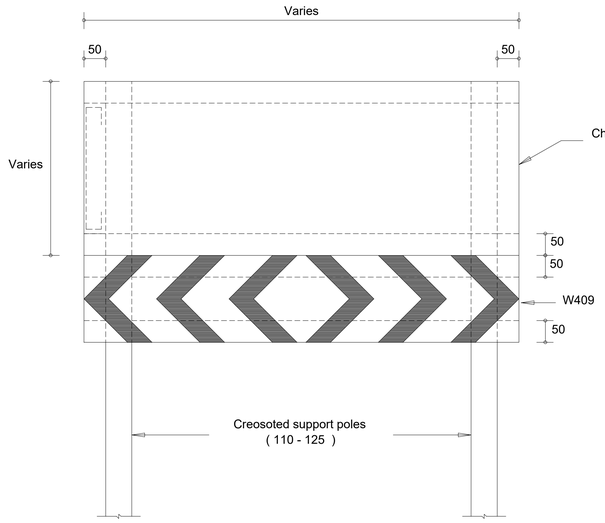
DRAWING TITLE: TYPICAL DETAILS GUARD RAIL ERECTION

(SHEET 1 OF 1)

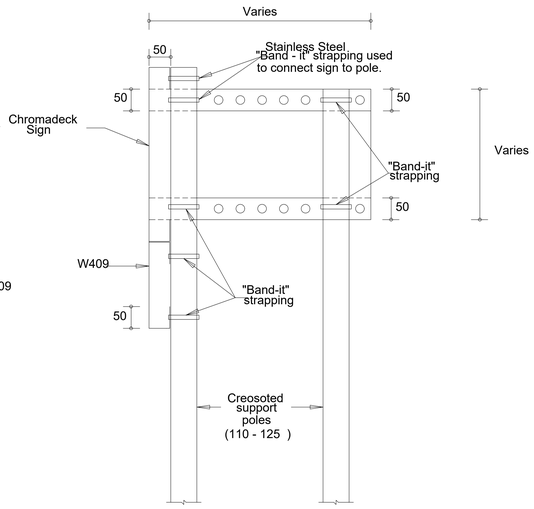
	RESPONSIBLE PERSON		DATE
DESIGNED	S.ZULU		20-05-2019
CHECKED	D.PILLAY		20-05-2019
DRAWN	S.ZULU		20-05-2019
CHECKED	B. QWABE		20-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-FT-TR-308		REVISION 0



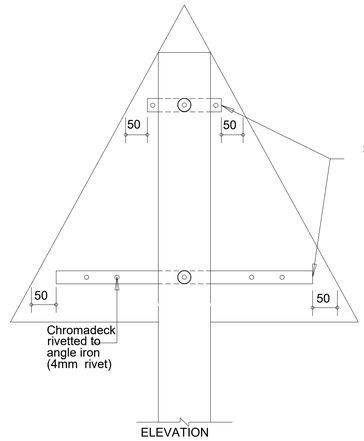
PLAN



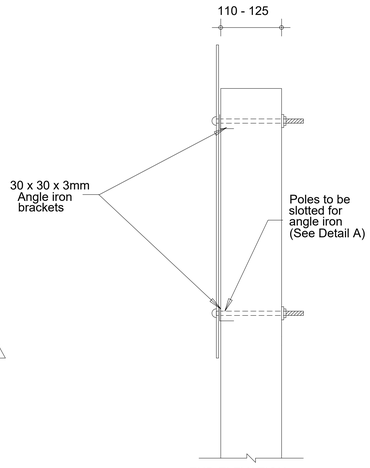
FRONT ELEVATION



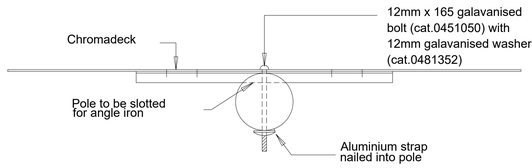
SIDE ELEVATION



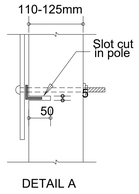
ELEVATION



END ELEVATION

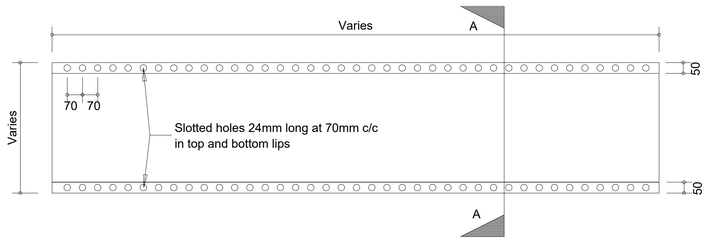


PLAN



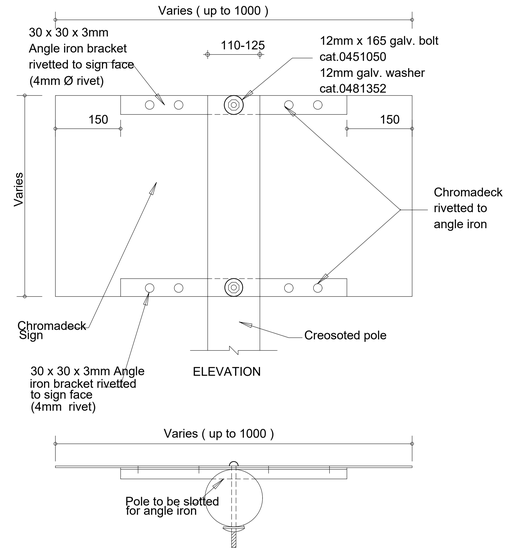
DETAIL A

FIXING OF STOCK TYPE SIGNS ON SINGLE SUPPORT POLES

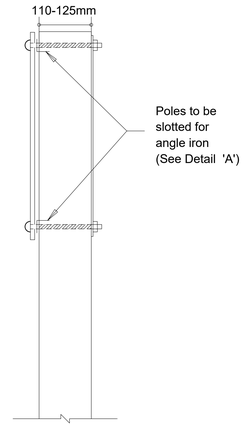


VIEW ON BACK ON SIGN PANNEL
FIXING OF STACK TYPE SIGNS

NOTE : 2 x 25m Ø holes are to be drilled perpendicular to the traffic flow direction at 75mm and 600mm above ground level, in all creosoted wooden poles, to faciliate breakaway in the event of impact.



PLAN



END ELEVATION

FIXING OF SIGNS OF 1 METRE AND
LESS ON ONE SUPPORT POLE

REV	DATE	REVISION DESCRIPTION	BY	CHK	DRG. NO.	REFERENCE DRAWINGS
0	20-05-19	FOR TENDER	S.Z	B.Q		

MAKHAOTSE, NARASIMULU & ASSOCIATES (Pty) Ltd
Consulting Civil Engineers and Project Managers
Reg No. 2009/010089/07

84 Cleland Road
Hayfields
Pietermaritzburg 3201
Tel (033) 346 2835
Fax (033) 346 2328

P.O. Box 28580
Haymarket
Pietermaritzburg 3200
e-mail: pmb@mna-sa.co.za

FOR TENDER

DATE : _____

SIGNED BY : _____
CONSULTING ENGINEER

CLIENT LOGO

CLIENT NAME
UBUHLEBEZWE MUNICIPALITY

PROJECT TITLE
CONSTRUCTION OF KHAMBULA ACCESS ROAD

DRAWING TITLE
TYPICAL DETAILS ERECTION OF SIGNS
(SHEET 1 OF 1)

	RESPONSIBLE PERSON		DATE
DESIGNED	S.ZULU		20-05-2019
CHECKED	D. PILLAY		20-05-2019
DRAWN	S.ZULU		20-05-2019
CHECKED	B. QWABE		20-05-2019
SCALES	AS SHOWN	SHEET SIZE	A0
DRAWING NO.	WP2209-MNA-FT-TR-309		REVISION 0