

ROAD ESTIMATE

Longitudinal section, cross sections and quantities of earthwork and pavement

Project	-
Client	-
Location	-
Estimate	Sample 1
Stretch	0/000 to 0/500 (500.00 m)
Prepared by	-
Checked by	-
Length	500.00 m (21 sections)
Earthwork in cutting	427.4 m3
Earthwork in filling	5,293.4 m3
Net (cut - fill)	-4,866.0 m3
PMC 20 mm	37.5 m3
WBM Gr III	140.6 m3
WBM Gr II	140.6 m3
GSB	562.5 m3
PMC 20 mm (surface area)	1,875.0 m2
Date	31 Oct 2026

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1. Basis of the estimate and standard template

Quantities of earthwork and pavement layers worked out from the existing ground levels of the cross-section survey and the proposed finished road levels (FRL). The finished surface has a crown camber across the carriageway and paved shoulders and a steeper cross fall on the earthen shoulders (IRC:73 - at least 0.5 % steeper than the carriageway). The pavement layers are parallel to the finished surface; the formation (top of subgrade) lies the total pavement thickness below it. Side slopes run from the shoulder edge to the ground.

Project	-
Client	-
Location	-
Length	0/000 to 0/500 = 500.00 m, 21 cross sections
Carriageway	3.75 m, crown camber 3 % (IRC:73 / IRC:SP:73)
Shoulders	paved 0 m at the camber; earthen 1.875 m at 4 % cross fall (each side)
Roadway (formation) width	7.5 m
Side slopes	embankment 2 H : 1 V, cutting 1 H : 1 V
Total pavement thickness	320 mm
Proposed profile	vertical intersection points with parabolic vertical curves

Pavement layers of the template

Layer	Thickness (mm)	Extends over	Extra width each side (m)	Width (m)	Area of section (m2)
PMC 20 mm	20	Carriageway only	0	3.750	0.0750
WBM Gr III	75	Carriageway only	0	3.750	0.2812
WBM Gr II	75	Carriageway only	0	3.750	0.2812
GSB	150	Full roadway (incl. earthen shoulders)	-	7.500	1.1250

Carriageway 3.75 m, camber 3 %

Paved shoulder 0 m, earthen 1.875 m @ 4 %

Side slopes fill 2H:1V, cut 1H:1V

CH 0/000

FRL 0.000 GL -1.000 FILL 1.000 m

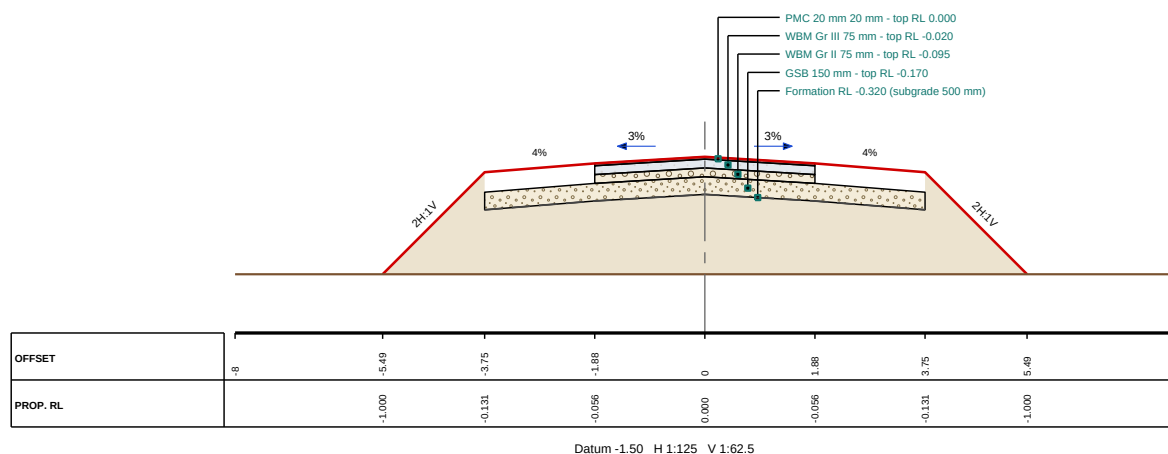


Fig. 1 Standard cross section (template) - vertical scale exaggerated

- Areas of cut and fill at each section by the coordinate (exact) method between the ground line and the earthwork boundary - formation level under the roadway and the side slopes beyond; mixed sections are split at the cross-over points.
- Pavement layer areas = layer thickness x layer width (constant along the road).
- Volumes between sections by the trapezoidal (average end area) rule $V = L (A_1 + A_2) / 2$ and by the prismoidal rule $V = h / 3 (A_1 + 4 A_2 + A_3)$ over pairs of equal intervals (IS 1200 Part 1 measurements of earthwork; the prismoidal correction is shown for comparison).
- Earthen shoulder fill above formation level and the subgrade layer are listed separately.

2. Longitudinal section - levels

Vertical profile - VIPs and vertical curves ($K = L / A$)

VIP chainage	VIP level (m)	Grade in %	Grade out %	A = g2 - g1 %	Curve L (m)	K	Type	BVC - EVC
0/175	102.600	+0.800	-0.857	-1.657	120	72.4	summit	0/115 - 0/235
0/350	101.100	-0.857	+0.867	+1.724	100	58.0	valley	0/300 - 0/400

Level on a vertical curve: $y = y(\text{BVC}) + g_1 x + (g_2 - g_1) x^2 / (2 L)$, x measured from the BVC. The K value (length per % change of grade) is to be checked against the stopping / intermediate sight distance needs of IRC:SP:23 for the design speed.

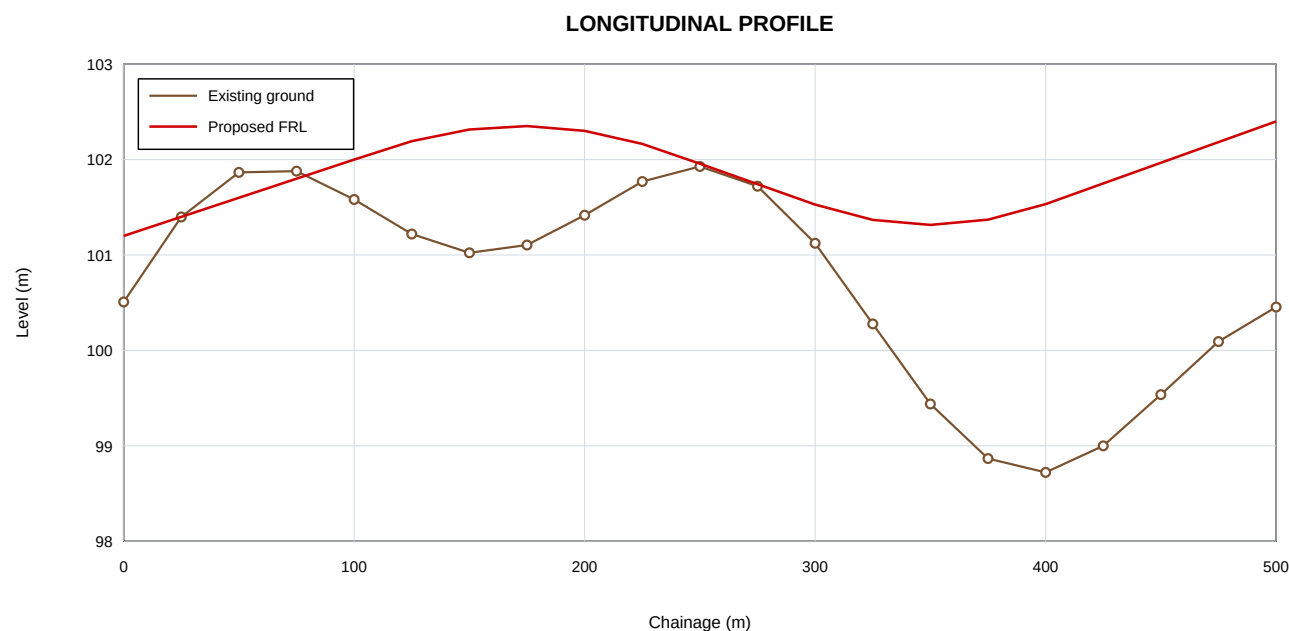


Fig. 2 Longitudinal profile - existing ground and proposed FRL

Centre line levels

Chainage	Existing GL (m)	Proposed FRL (m)	Formation (m)	Fill (m)	Cut (m)
0/000	100.508	101.200	100.880	0.692	
0/025	101.399	101.400	101.080	0.001	
0/050	101.866	101.600	101.280		0.266
0/075	101.879	101.800	101.480		0.079
0/100	101.582	102.000	101.680	0.418	
0/125	101.220	102.193	101.873	0.973	
0/150	101.023	102.315	101.995	1.292	

Chainage	Existing GL (m)	Proposed FRL (m)	Formation (m)	Fill (m)	Cut (m)
0/175	101.105	102.351	102.031	1.246	
0/200	101.417	102.301	101.981	0.884	
0/225	101.770	102.165	101.845	0.395	
0/250	101.928	101.957	101.637	0.029	
0/275	101.721	101.743	101.423	0.022	
0/300	101.123	101.529	101.209	0.406	
0/325	100.278	101.368	101.048	1.090	
0/350	99.439	101.315	100.995	1.876	
0/375	98.867	101.371	101.051	2.504	
0/400	98.722	101.533	101.213	2.811	
0/425	99.000	101.750	101.430	2.750	
0/450	99.537	101.967	101.647	2.430	
0/475	100.093	102.183	101.863	2.090	
0/500	100.455	102.400	102.080	1.945	

3. Areas at each cross section

Cross-sectional areas (m2)

Chainage	Cut	Fill	Catch L - R (m)	PMC 20 mm	WBM Gr III	WBM Gr II	GSB	Earthen shoulder (above formation)	Subgrade (500 mm, full roadway)
0/000	0.000	2.960	-4.86 / 4.89	0.075	0.281	0.281	1.125	0.637	3.750
0/025	2.721	0.000	-3.86 / 3.82	0.075	0.281	0.281	1.125	0.637	3.750
0/050	4.719	0.000	-4.14 / 4.02	0.075	0.281	0.281	1.125	0.637	3.750
0/075	3.189	0.000	-3.99 / 3.78	0.075	0.281	0.281	1.125	0.637	3.750
0/100	0.114	0.994	-4.13 / 4.92	0.075	0.281	0.281	1.125	0.637	3.750
0/125	0.000	6.396	-5.03 / 6.18	0.075	0.281	0.281	1.125	0.637	3.750
0/150	0.000	9.844	-5.51 / 6.77	0.075	0.281	0.281	1.125	0.637	3.750
0/175	0.000	8.898	-5.32 / 6.50	0.075	0.281	0.281	1.125	0.637	3.750
0/200	0.000	4.609	-4.66 / 5.59	0.075	0.281	0.281	1.125	0.637	3.750
0/225	0.375	0.306	-3.85 / 4.42	0.075	0.281	0.281	1.125	0.637	3.750
0/250	2.955	0.000	-4.02 / 3.84	0.075	0.281	0.281	1.125	0.637	3.750
0/275	2.924	0.000	-3.96 / 3.88	0.075	0.281	0.281	1.125	0.637	3.750
0/300	0.100	0.330	-4.23 / 4.27	0.075	0.281	0.281	1.125	0.637	3.750
0/325	0.000	7.306	-5.65 / 5.81	0.075	0.281	0.281	1.125	0.637	3.750
0/350	0.000	18.127	-7.22 / 7.80	0.075	0.281	0.281	1.125	0.637	3.750
0/375	0.000	28.922	-8.47 / 9.47	0.075	0.281	0.281	1.125	0.637	3.750
0/400	0.000	34.810	-9.01 / 10.28	0.075	0.281	0.281	1.125	0.637	3.750
0/425	0.000	33.298	-8.70 / 10.13	0.075	0.281	0.281	1.125	0.637	3.750

Chainage	Cut	Fill	Catch L - R (m)	PMC 20 mm	WBM Gr III	WBM Gr II	GSB	Earthen shoulder (above formation)	Subgrade (500 mm, full roadway)
0/450	0.000	26.848	-7.83 / 9.28	0.075	0.281	0.281	1.125	0.637	3.750
0/475	0.000	20.632	-6.98 / 8.35	0.075	0.281	0.281	1.125	0.637	3.750
0/500	0.000	17.877	-6.60 / 7.82	0.075	0.281	0.281	1.125	0.637	3.750

CUT AND FILL AREAS AT EACH SECTION

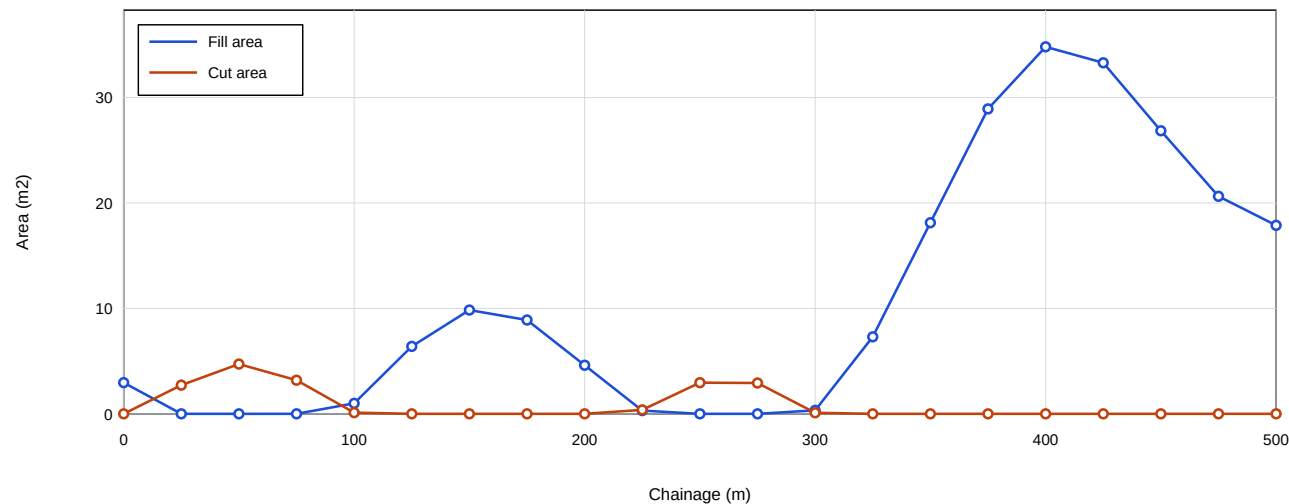


Fig. 3 Cut and fill areas along the road

4. Volumes by the trapezoidal (average end area) rule

Worked example - first interval					OK
Reference	Description	Calculation	Result		
Trapezoidal rule	Cutting $V = L (A_1 + A_2) / 2$	$25 \times (0.000 + 2.721) / 2$	34.01 m³		
Trapezoidal rule	Filling $V = L (A_1 + A_2) / 2$	$25 \times (2.960 + 0.000) / 2$	36.99 m³		

Volumes between consecutive sections (m³)

Stretch	L (m)	Earthwork in cutting	Earthwork in embankment / filling	PMC 20 mm	WBM Gr III	WBM Gr II	GSB	Earthen shoulder (above formation)	Subgrade (500 mm, full roadway)
0/000 - 0/025	25	34.01	36.99	1.88	7.03	7.03	28.12	15.94	93.75
0/025 - 0/050	25	93.00	0.00	1.88	7.03	7.03	28.12	15.94	93.75
0/050 - 0/075	25	98.85	0.00	1.88	7.03	7.03	28.12	15.94	93.75
0/075 - 0/100	25	41.29	12.43	1.88	7.03	7.03	28.12	15.94	93.75
0/100 - 0/125	25	1.43	92.38	1.88	7.03	7.03	28.12	15.94	93.75

Stretch	L (m)	Earthwork in cutting	Earthwork in embankment / filling	PMC 20 mm	WBM Gr III	WBM Gr II	GSB	Earthen shoulder (above formation)	Subgrade (500 mm, full roadway)
0/125 - 0/150	25	0.00	203.00	1.88	7.03	7.03	28.12	15.94	93.75
0/150 - 0/175	25	0.00	234.27	1.88	7.03	7.03	28.12	15.94	93.75
0/175 - 0/200	25	0.00	168.83	1.88	7.03	7.03	28.12	15.94	93.75
0/200 - 0/225	25	4.69	61.44	1.88	7.03	7.03	28.12	15.94	93.75
0/225 - 0/250	25	41.62	3.83	1.88	7.03	7.03	28.12	15.94	93.75
0/250 - 0/275	25	73.49	0.00	1.88	7.03	7.03	28.12	15.94	93.75
0/275 - 0/300	25	37.80	4.12	1.88	7.03	7.03	28.12	15.94	93.75
0/300 - 0/325	25	1.25	95.44	1.88	7.03	7.03	28.12	15.94	93.75
0/325 - 0/350	25	0.00	317.90	1.88	7.03	7.03	28.12	15.94	93.75
0/350 - 0/375	25	0.00	588.11	1.88	7.03	7.03	28.12	15.94	93.75
0/375 - 0/400	25	0.00	796.66	1.88	7.03	7.03	28.12	15.94	93.75
0/400 - 0/425	25	0.00	851.35	1.88	7.03	7.03	28.12	15.94	93.75
0/425 - 0/450	25	0.00	751.82	1.88	7.03	7.03	28.12	15.94	93.75
0/450 - 0/475	25	0.00	593.49	1.88	7.03	7.03	28.12	15.94	93.75
0/475 - 0/500	25	0.00	481.36	1.88	7.03	7.03	28.12	15.94	93.75
Total	500	427.43	5,293.42	37.50	140.62	140.62	562.50	318.75	1,875.00

5. Volumes by the prismoidal rule

Prismoidal (Simpson's) rule over pairs of equal intervals $V = h / 3 (A_1 + 4 A_2 + A_3)$; an unpaired last interval or unequal intervals by the trapezoidal rule.

Earthwork by the prismoidal rule (m3)

Stretch	Rule	Cutting - calculation	Cutting	Filling
0/000 - 0/050	prismoidal	$25 / 3 \times (0.00 + 4 \times 2.72 + 4.72)$	130.02	24.66
0/050 - 0/100	prismoidal	$25 / 3 \times (4.72 + 4 \times 3.19 + 0.11)$	146.57	8.28
0/100 - 0/150	prismoidal	$25 / 3 \times (0.11 + 4 \times 0.00 + 0.00)$	0.95	303.52
0/150 - 0/200	prismoidal	$25 / 3 \times (0.00 + 4 \times 0.00 + 0.00)$	0.00	417.04
0/200 - 0/250	prismoidal	$25 / 3 \times (0.00 + 4 \times 0.38 + 2.95)$	37.13	48.61
0/250 - 0/300	prismoidal	$25 / 3 \times (2.95 + 4 \times 2.92 + 0.10)$	122.93	2.75
0/300 - 0/350	prismoidal	$25 / 3 \times (0.10 + 4 \times 0.00 + 0.00)$	0.83	397.32
0/350 - 0/400	prismoidal	$25 / 3 \times (0.00 + 4 \times 0.00 + 0.00)$	0.00	1,405.22
0/400 - 0/450	prismoidal	$25 / 3 \times (0.00 + 4 \times 0.00 + 0.00)$	0.00	1,623.74
0/450 - 0/500	prismoidal	$25 / 3 \times (0.00 + 4 \times 0.00 + 0.00)$	0.00	1,060.43
Total			438.43	5,291.58

Comparison of the two rules (m3)

Item	Trapezoidal	Prismoidal	Difference %
Earthwork in cutting	427.43	438.43	+2.57
Earthwork in embankment / filling	5,293.42	5,291.58	-0.03

6. Mass haul

Cumulative volume of cut x 1 less fill x 1 (factors for bulking / shrinkage and compaction). A rising line is surplus (cutting), a falling line deficit (filling); a horizontal balance line cuts the curve at the points between which cut and fill balance.

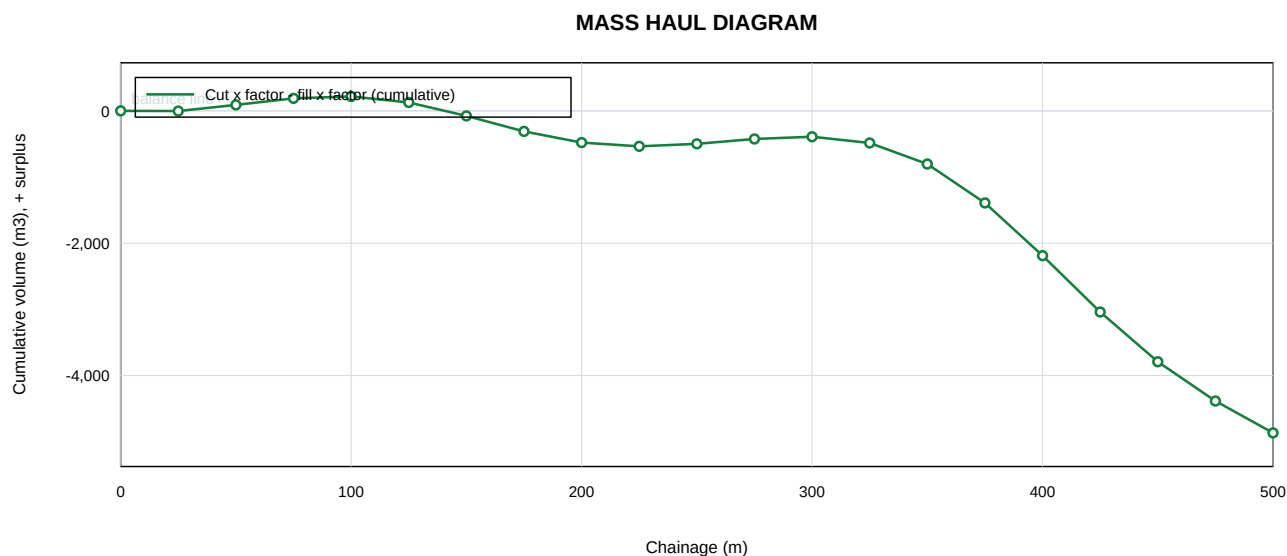


Fig. 4 Mass haul diagram

Mass ordinates

Chainage	Cumulative (m3)
0/000	0.0
0/025	-3.0
0/050	90.0
0/075	188.9
0/100	217.7
0/125	126.8
0/150	-76.2
0/175	-310.5
0/200	-479.3
0/225	-536.1

Chainage	Cumulative (m3)
0/250	-498.3
0/275	-424.8
0/300	-391.1
0/325	-485.3
0/350	-803.2
0/375	-1,391.3
0/400	-2,188.0
0/425	-3,039.3
0/450	-3,791.1
0/475	-4,384.6
0/500	-4,866.0

7. Summary of quantities

Abstract of quantities

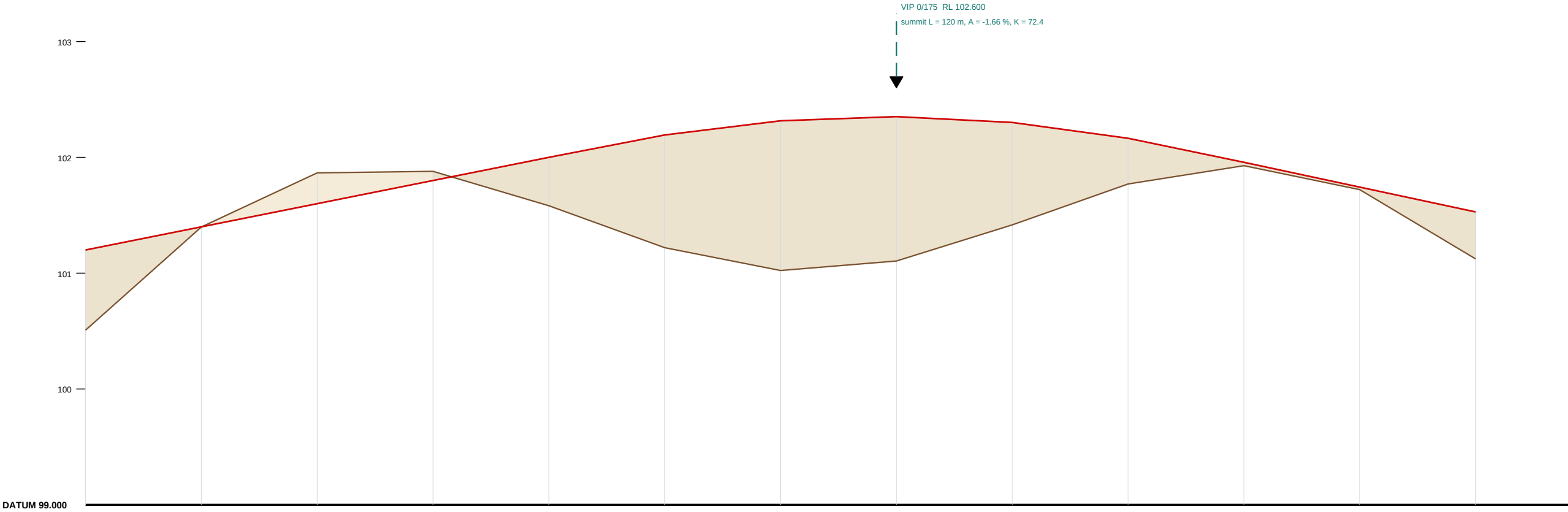
No.	Item	Unit	Trapezoidal	Prismoidal
1	Earthwork in cutting	m3	427.43	438.43
2	Earthwork in embankment / filling	m3	5,293.42	5,291.58
3	PMC 20 mm	m3	37.50	37.50
4	WBM Gr III	m3	140.62	140.63
5	WBM Gr II	m3	140.62	140.63
6	GSB	m3	562.50	562.50
7	Earthen shoulder (above formation)	m3	318.75	318.75
8	Subgrade (500 mm, full roadway)	m3	1,875.00	1,875.00
9	PMC 20 mm - top surface (prime / tack coat, surface dressing)	m2	1,875.00	1,875.00

Adopted rule	trapezoidal (prismoidal shown for comparison)
Surplus (+) / deficit (-) of earth	-4,866.0 m3 (trapezoidal, with factors)

LONGITUDINAL SECTION CH 0/000 TO 0/320

Horizontal scale 1:1000 Vertical scale 1:40 (vertical exaggeration 25)

- Existing ground level
- Proposed finished road level (FRL)



CHAINAGE (km/m)	0+000	0+025	0+050	0+075	0+100	0+125	0+150	0+175	0+200	0+225	0+250	0+275	0+300
EXISTING GROUND LEVEL	100.508	101.399	101.866	101.879	101.582	101.220	101.023	101.105	101.417	101.770	101.928	101.721	101.123
PROPOSED FRL	101.200	101.400	101.600	101.800	102.000	102.193	102.315	102.351	102.301	102.165	101.957	101.743	101.529
FORMATION LEVEL	100.880	101.080	101.280	101.480	101.680	101.873	101.995	102.031	101.981	101.845	101.637	101.423	101.209
FILLING (m)	0.692	0.001			0.418	0.973	1.292	1.246	0.684	0.395	0.029	0.022	0.406
CUTTING (m)			0.266	0.079									
GRADIENT (%)		+0.80	+0.80	+0.80	+0.80	+0.77	+0.49	+0.14	-0.20	-0.55	-0.83	-0.86	-0.86

Sample 1

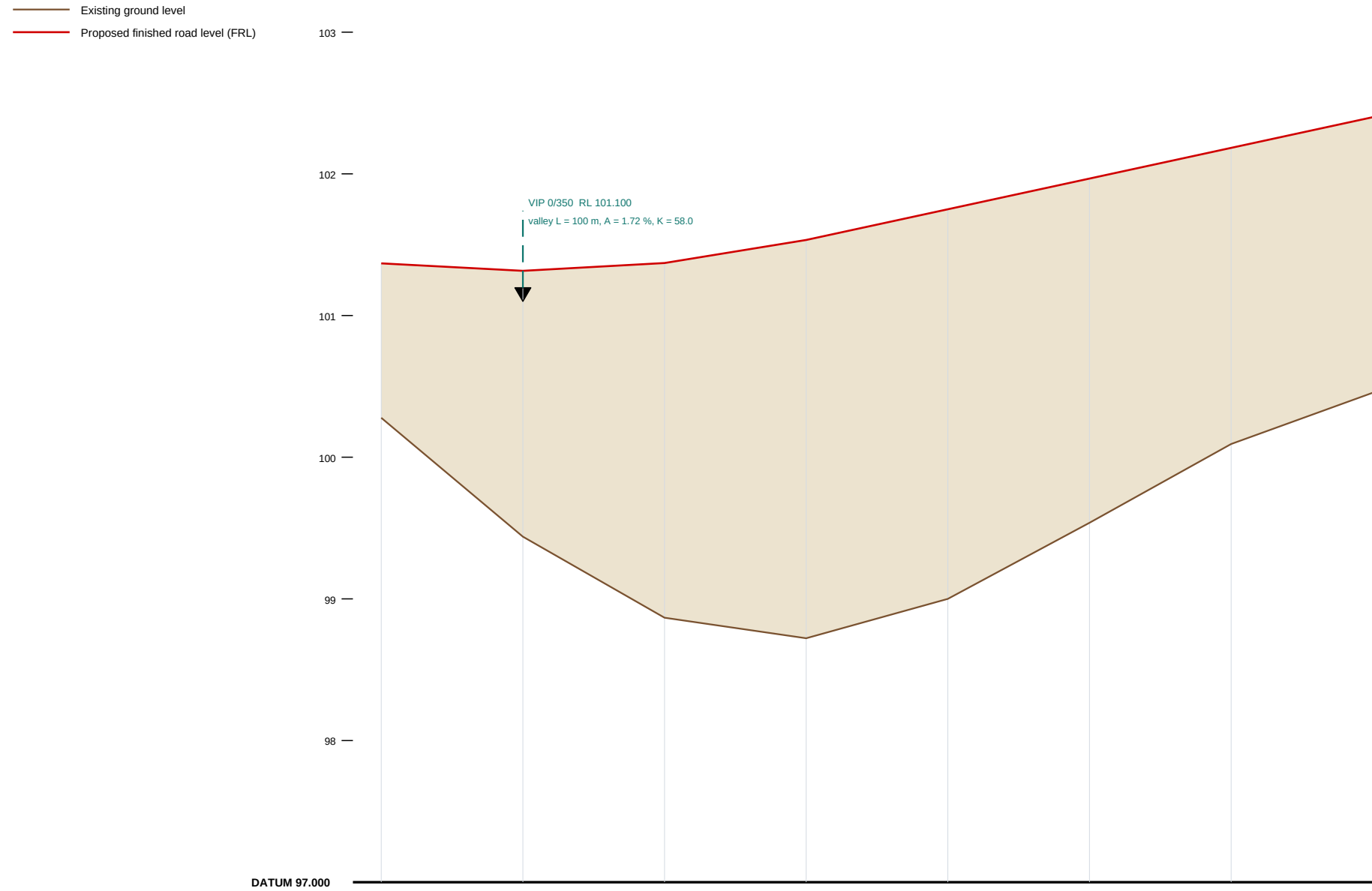
L-section 0/000 - 0/320

Designed: - Checked: -

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LONGITUDINAL SECTION CH 0/320 TO 0/500

Horizontal scale 1:1000 Vertical scale 1:40 (vertical exaggeration 25)



CHAINAGE (km/m)	0/325	0/350	0/375	0/400	0/425	0/450	0/475	0/500
EXISTING GROUND LEVEL	100.278	99.439	98.867	98.722	99.000	99.537	100.093	100.455
PROPOSED FRL	101.368	101.315	101.371	101.533	101.750	101.967	102.183	102.480
FORMATION LEVEL	101.048	100.995	101.051	101.213	101.430	101.647	101.863	102.080
FILLING (m)	1.090	1.876	2.504	2.811	2.750	2.430	2.090	1.945
CUTTING (m)								
GRADIENT (%)	-0.21	+0.22	+0.65	+0.87	+0.87	+0.87	+0.87	

Sample 1

L-section 0/320 - 0/500

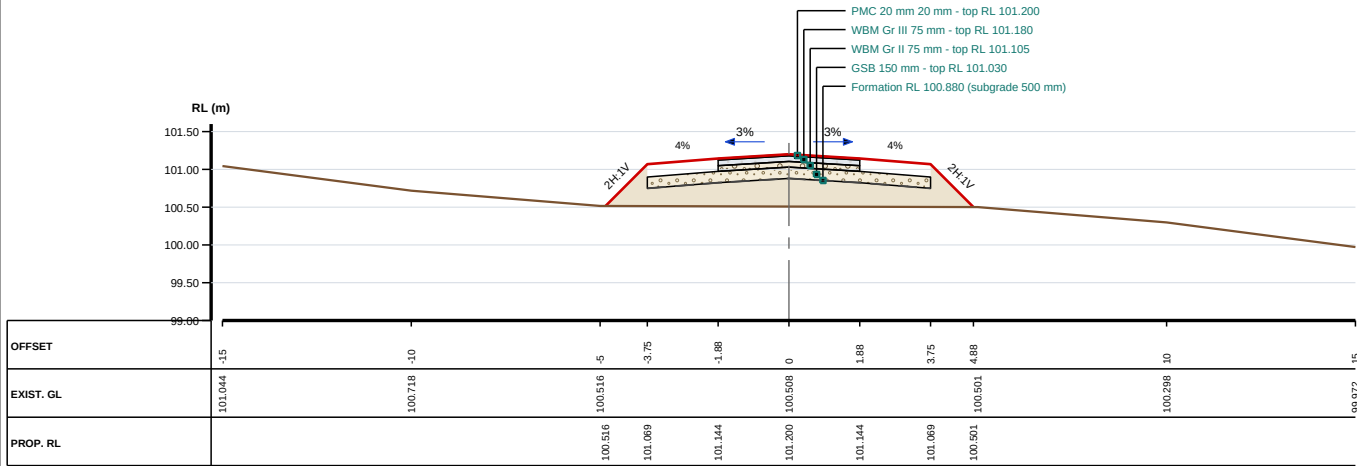
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CROSS SECTIONS (sheet 1 of 6)

CH 0/000

FRL 101.200 GL 100.508 FILL 0.692 m

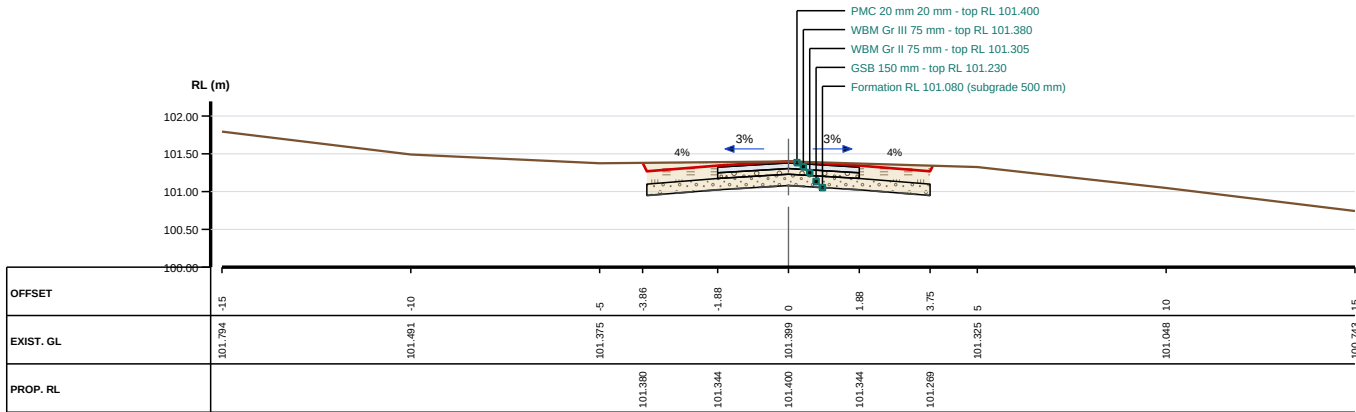


Cut 0.00 m2 Fill 2.96 m2 Width 9.74 m

Datum 99.00 H 1:200 V 1:100

CH 0/025

FRL 101.400 GL 101.399 FILL 0.001 m

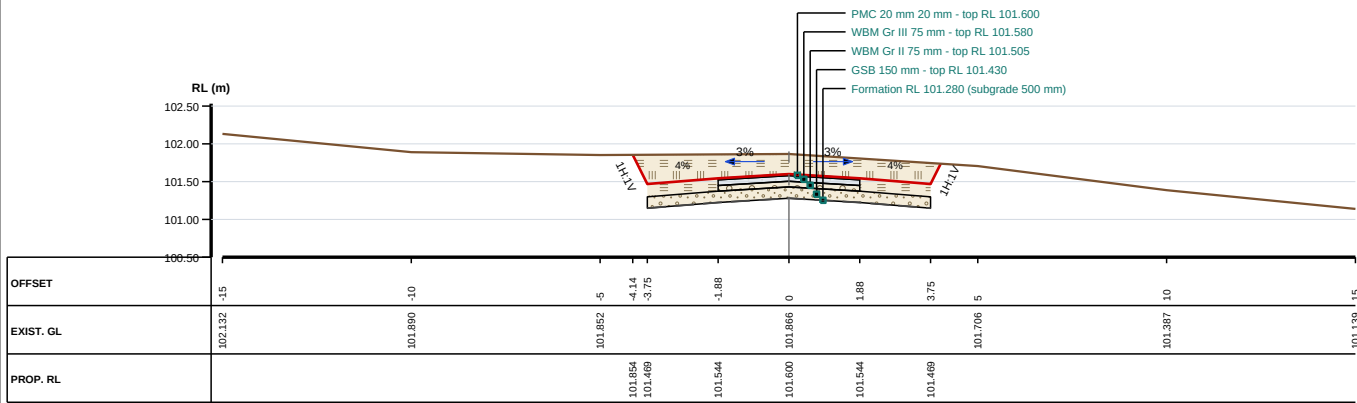


Cut 2.72 m2 Fill 0.00 m2 Width 7.69 m

Datum 100.00 H 1:200 V 1:100

CH 0/050

FRL 101.600 GL 101.866 CUT 0.266 m

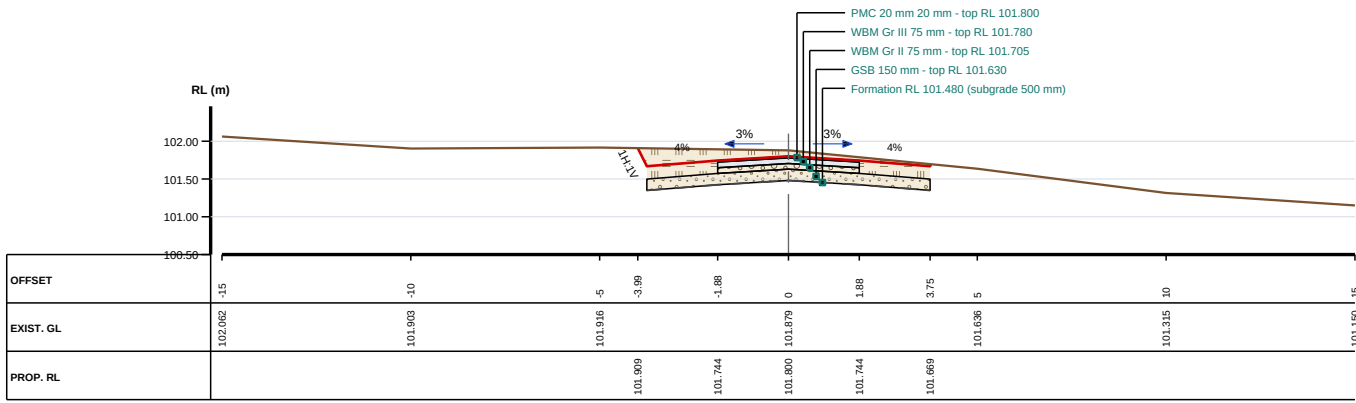


Cut 4.72 m2 Fill 0.00 m2 Width 8.15 m

Datum 100.50 H 1:200 V 1:100

CH 0/075

FRL 101.800 GL 101.879 CUT 0.079 m



Cut 3.19 m2 Fill 0.00 m2 Width 7.77 m

Datum 100.50 H 1:200 V 1:100

Sample 1

Cross sections ch 0/000 - 0/075

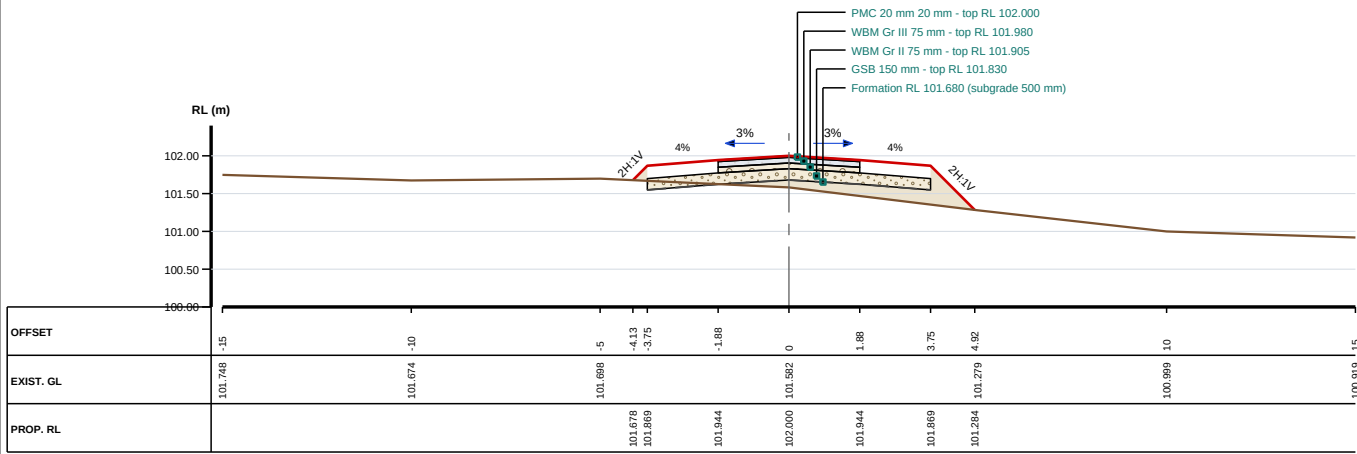
Designed: - Checked: -

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CROSS SECTIONS (sheet 2 of 6)

CH 0/100

FRL 102.000 GL 101.582 FILL 0.418 m

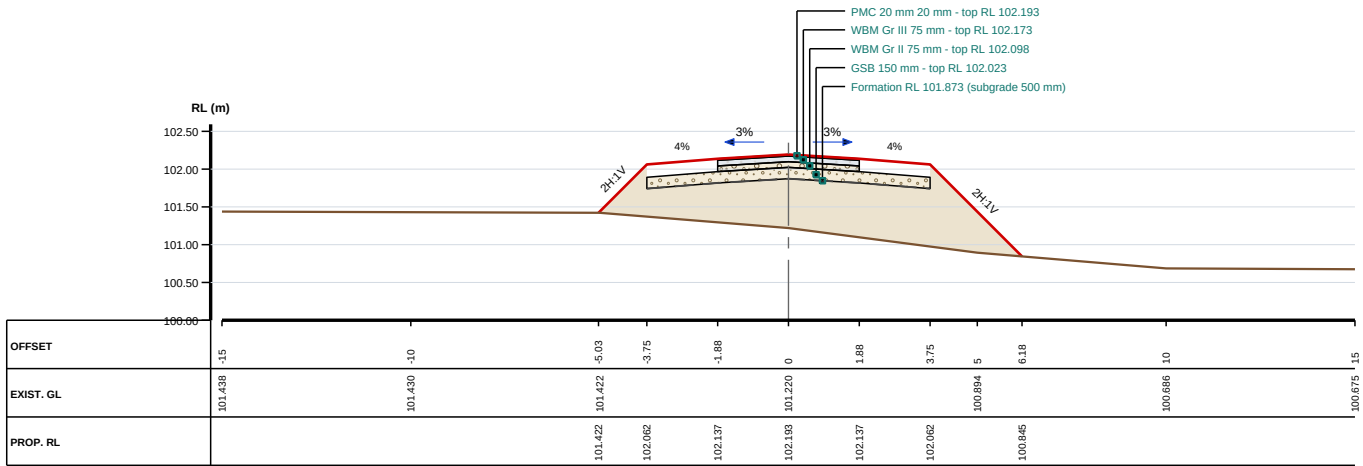


Cut 0.11 m2 Fill 0.99 m2 Width 9.05 m

Datum 100.00 H 1:200 V 1:100

CH 0/125

FRL 102.193 GL 101.220 FILL 0.973 m

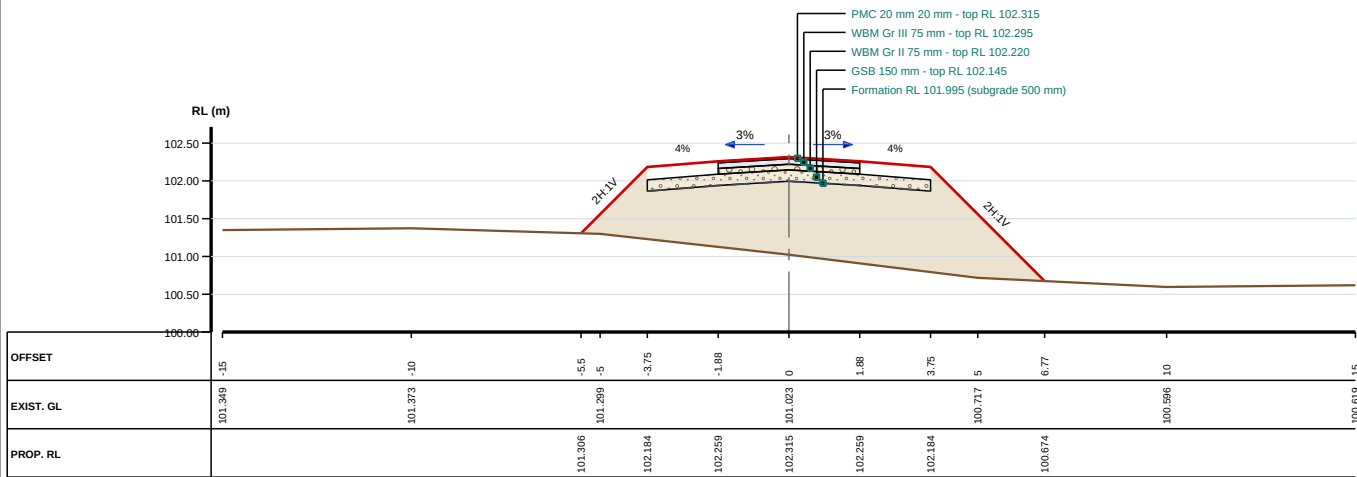


Cut 0.00 m2 Fill 6.40 m2 Width 11.21 m

Datum 100.00 H 1:200 V 1:100

CH 0/150

FRL 102.315 GL 101.023 FILL 1.292 m

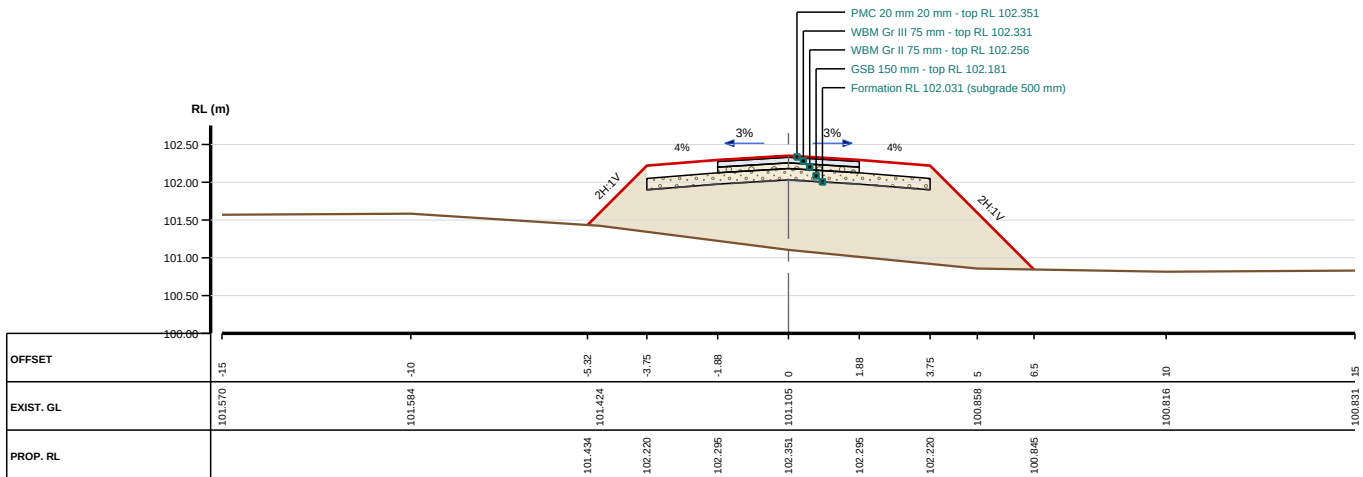


Cut 0.00 m2 Fill 9.84 m2 Width 12.28 m

Datum 100.00 H 1:200 V 1:100

CH 0/175

FRL 102.351 GL 101.105 FILL 1.246 m



Cut 0.00 m2 Fill 8.90 m2 Width 11.82 m

Datum 100.00 H 1:200 V 1:100

Sample 1

Cross sections ch 0/100 - 0/175

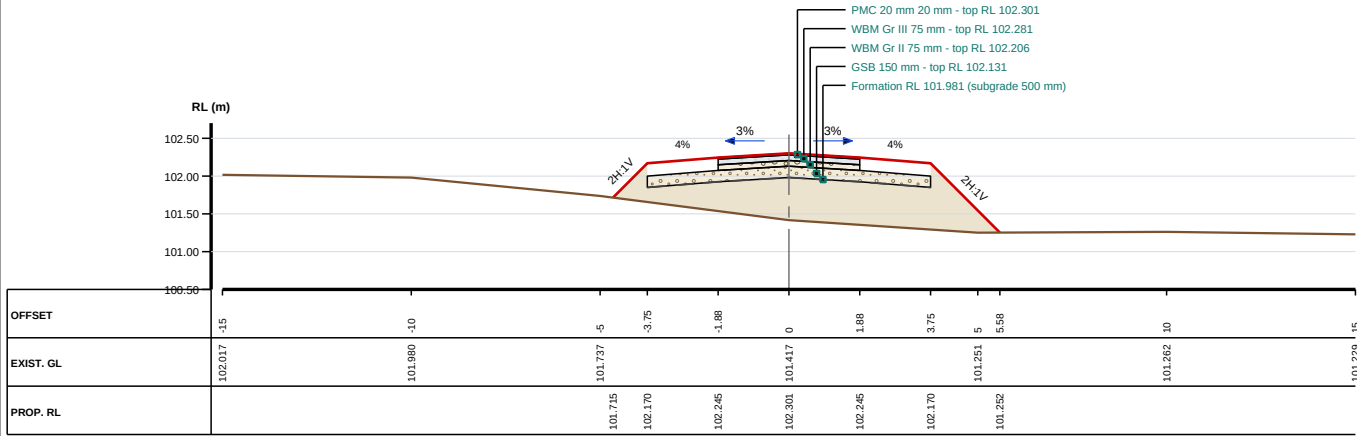
Designed: - Checked: -

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CROSS SECTIONS (sheet 3 of 6)

CH 0/200

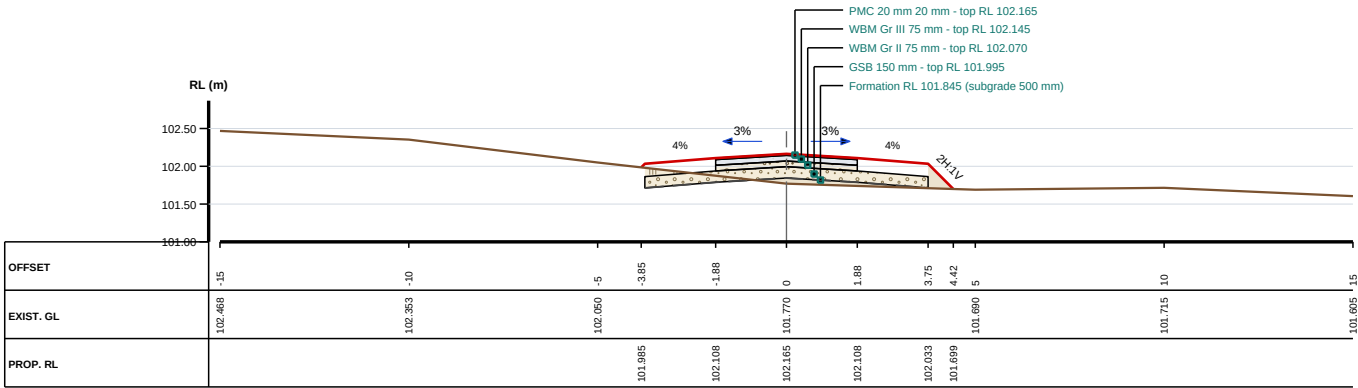
FRL 102.301 GL 101.417 FILL 0.884 m



Cut 0.00 m2 Fill 4.61 m2 Width 10.24 m
Datum 100.50 H 1:200 V 1:100

CH 0/225

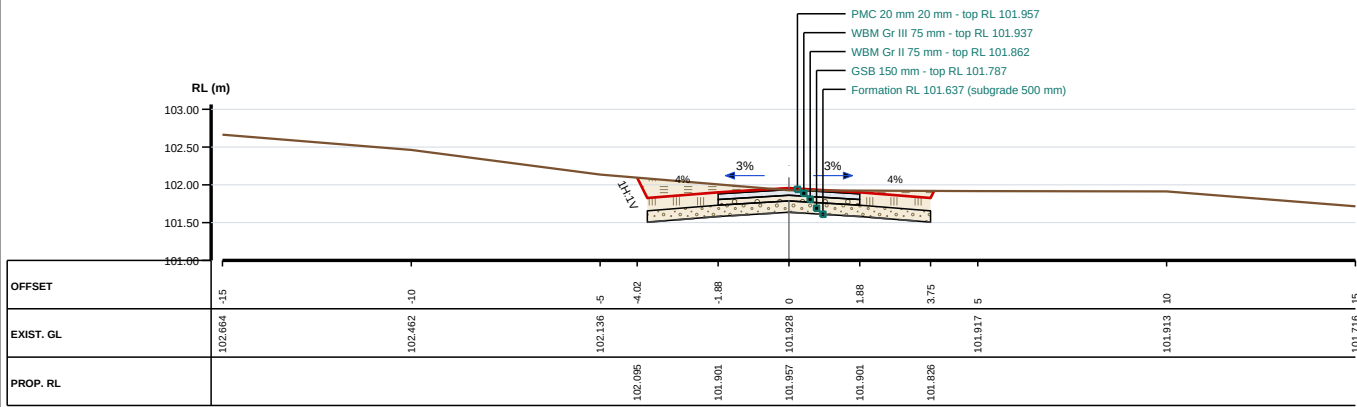
FRL 102.165 GL 101.770 FILL 0.395 m



Cut 0.38 m2 Fill 0.31 m2 Width 8.26 m
Datum 101.00 H 1:200 V 1:100

CH 0/250

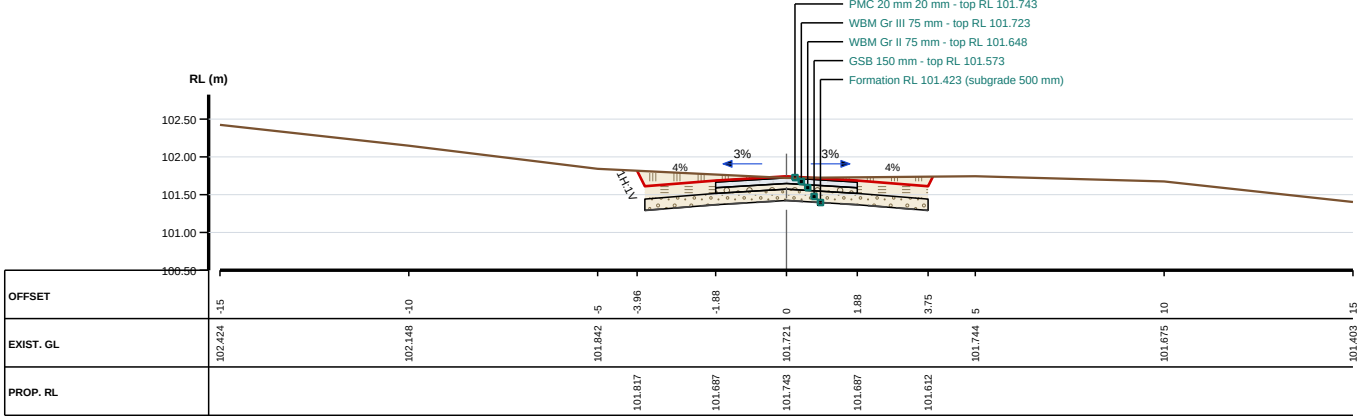
FRL 101.957 GL 101.928 FILL 0.029 m



Cut 2.95 m2 Fill 0.00 m2 Width 7.86 m
Datum 101.00 H 1:200 V 1:100

CH 0/275

FRL 101.743 GL 101.721 FILL 0.022 m



Cut 2.92 m2 Fill 0.00 m2 Width 7.83 m
Datum 100.50 H 1:200 V 1:100

Sample 1

Cross sections ch 0/200 - 0/275

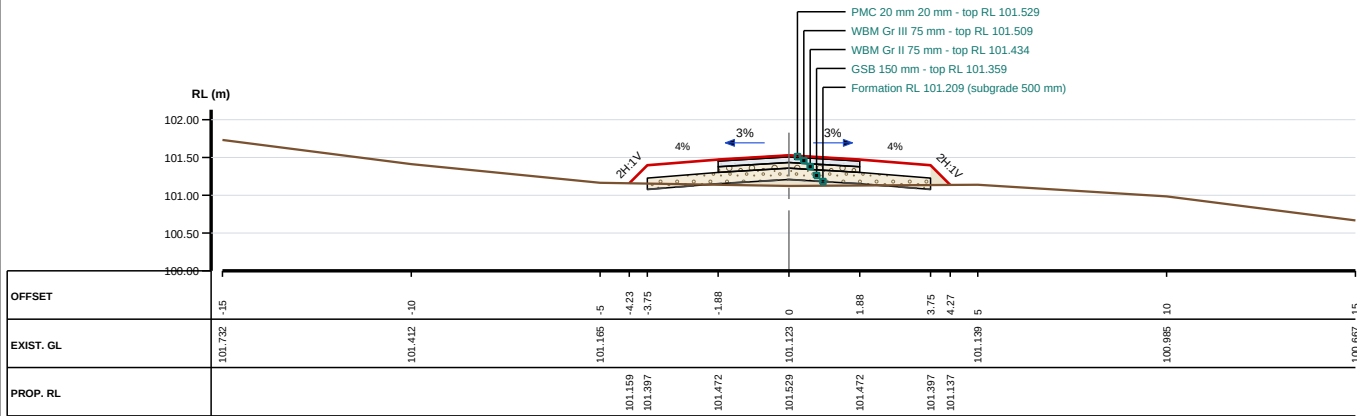
Designed: - Checked: -

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CROSS SECTIONS (sheet 4 of 6)

CH 0/300

FRL 101.529 GL 101.123 FILL 0.406 m

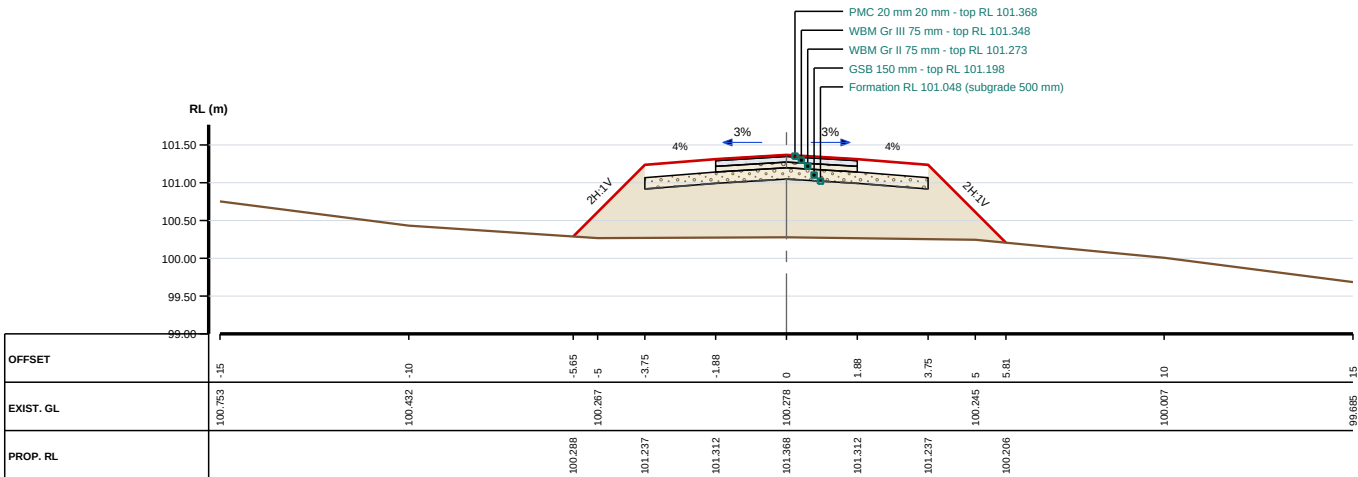


Cut 0.10 m2 Fill 0.33 m2 Width 8.50 m

Datum 100.00 H 1:200 V 1:100

CH 0/325

FRL 101.368 GL 100.278 FILL 1.090 m

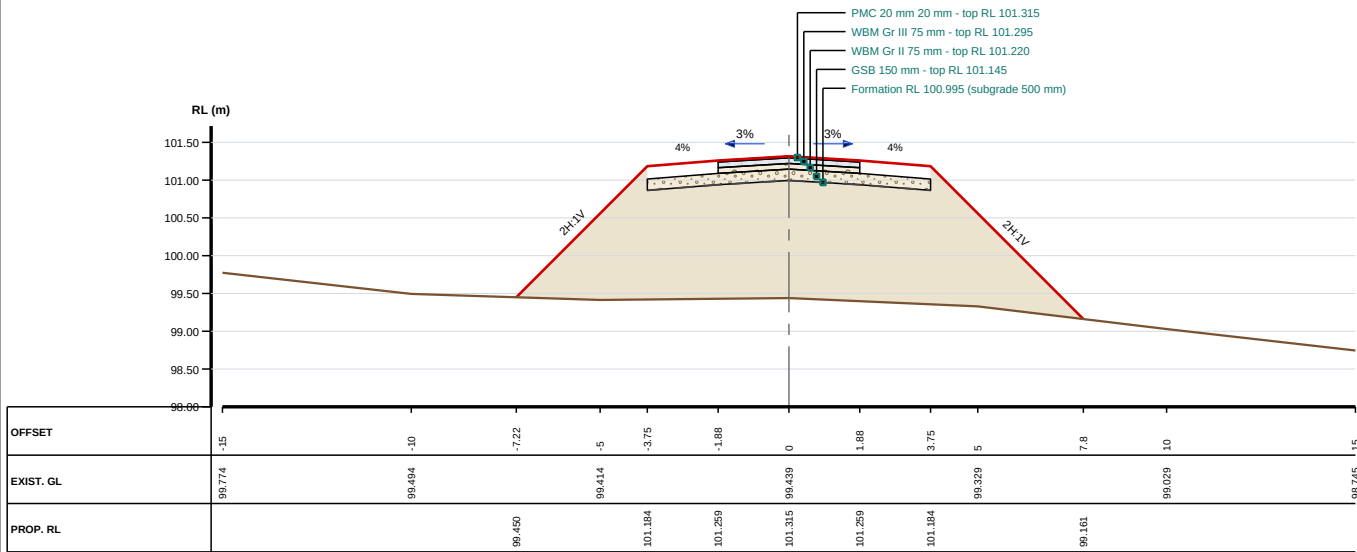


Cut 0.00 m2 Fill 7.31 m2 Width 11.46 m

Datum 99.00 H 1:200 V 1:100

CH 0/350

FRL 101.315 GL 99.439 FILL 1.876 m

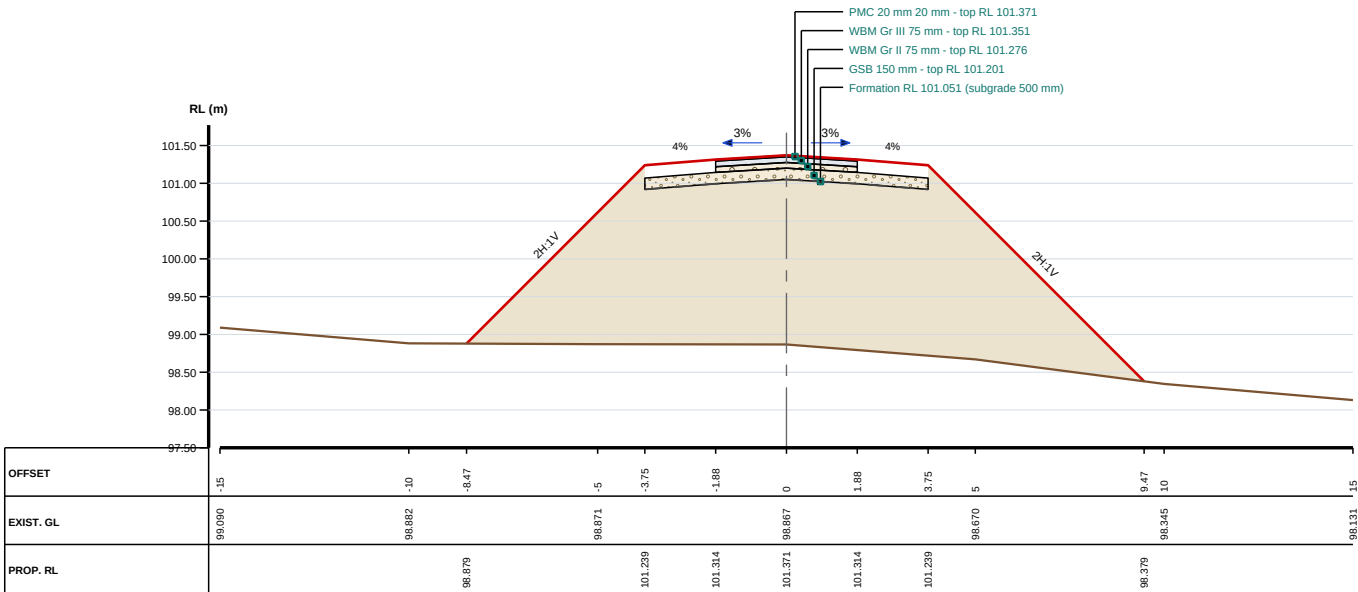


Cut 0.00 m2 Fill 18.13 m2 Width 15.02 m

Datum 98.00 H 1:200 V 1:100

CH 0/375

FRL 101.371 GL 98.867 FILL 2.504 m



Cut 0.00 m2 Fill 28.92 m2 Width 17.94 m

Datum 97.50 H 1:200 V 1:100

Sample 1

Cross sections ch 0/300 - 0/375

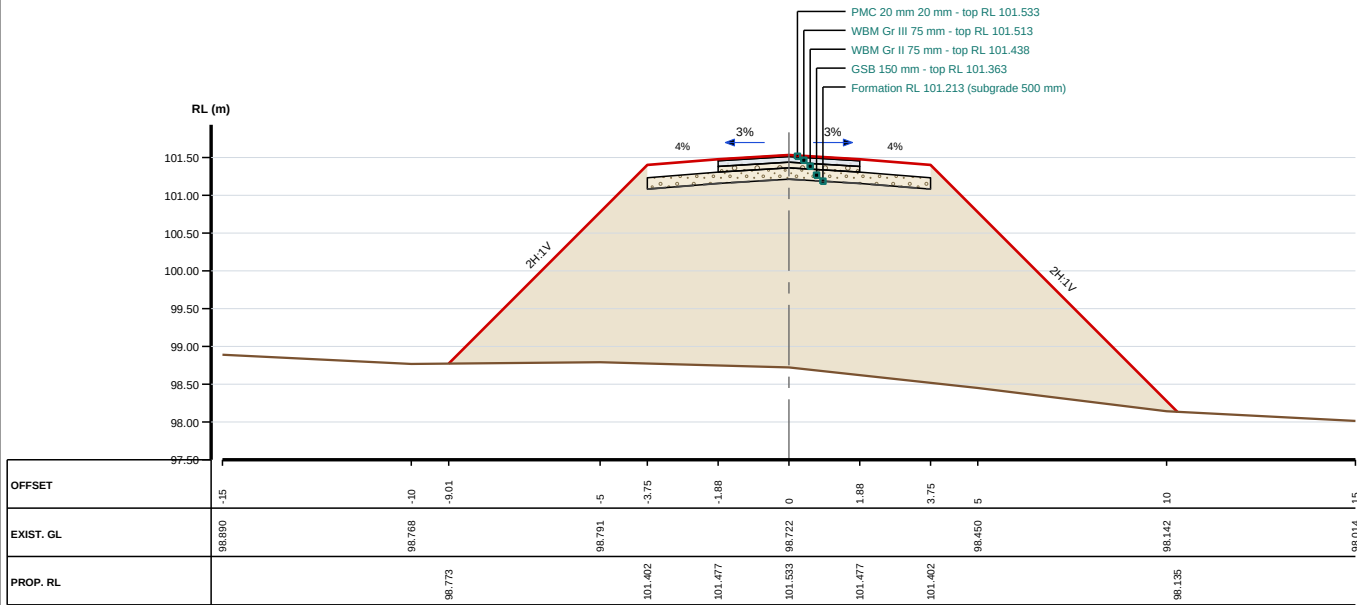
Designed: - Checked: -

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CROSS SECTIONS (sheet 5 of 6)

CH 0/400

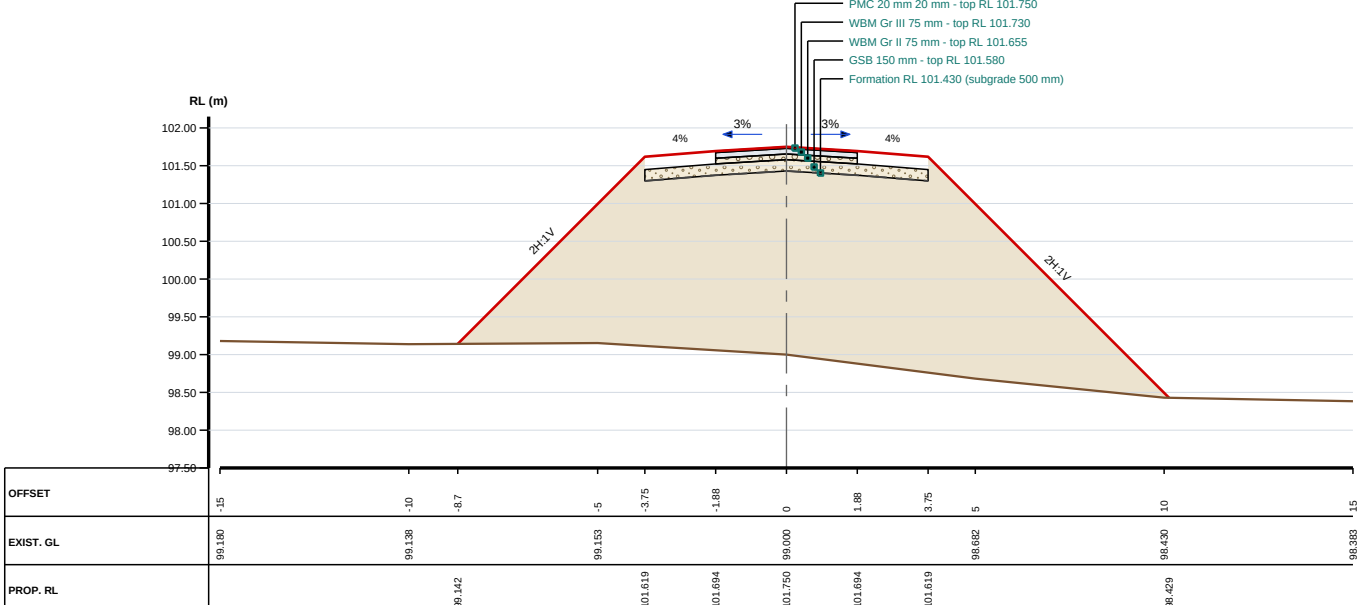
FRL 101.533 GL 98.722 FILL 2.811 m



Cut 0.00 m2 Fill 34.81 m2 Width 19.29 m
Datum 97.50 H 1:200 V 1:100

CH 0/425

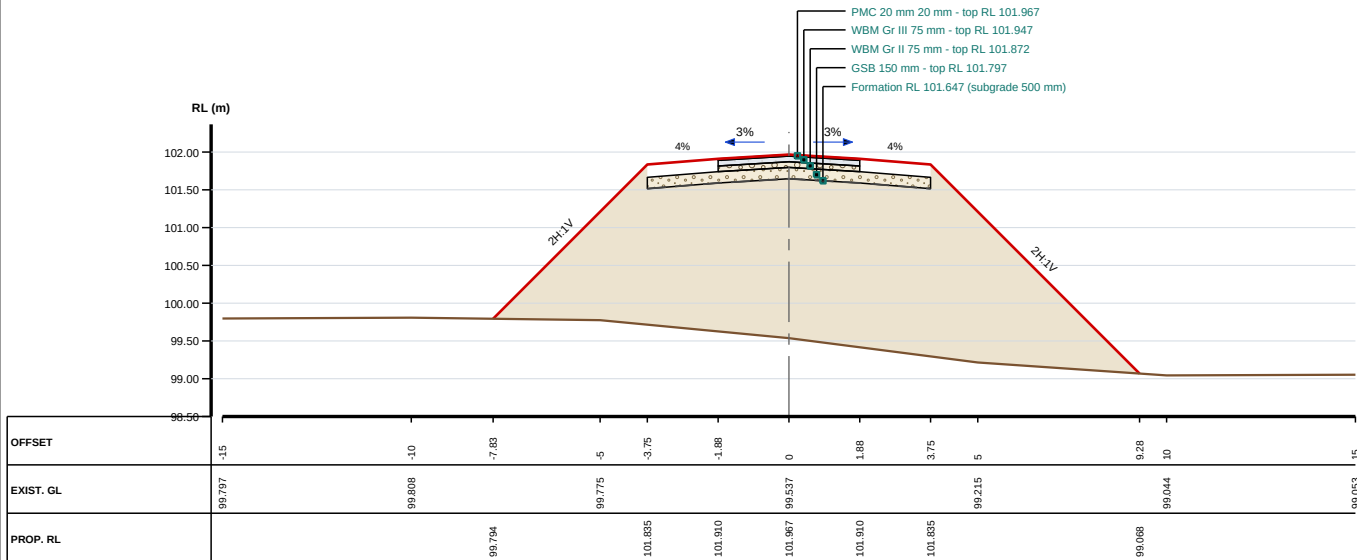
FRL 101.750 GL 99.000 FILL 2.750 m



Cut 0.00 m2 Fill 33.30 m2 Width 18.83 m
Datum 97.50 H 1:200 V 1:100

CH 0/450

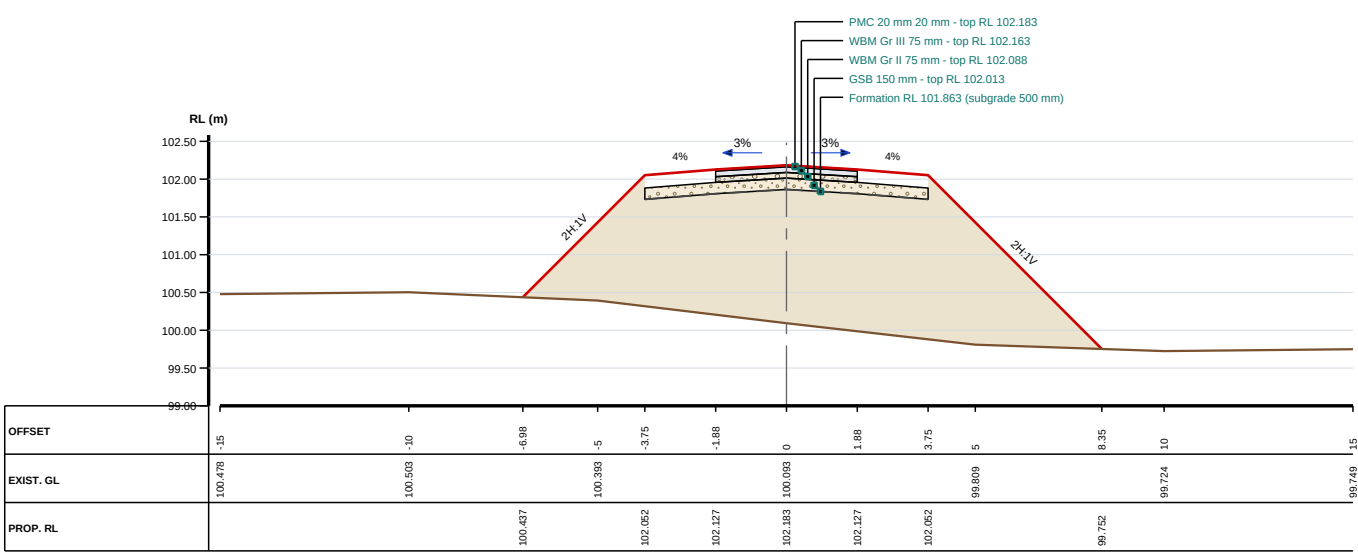
FRL 101.967 GL 99.537 FILL 2.430 m



Cut 0.00 m2 Fill 26.85 m2 Width 17.12 m
Datum 98.50 H 1:200 V 1:100

CH 0/475

FRL 102.183 GL 100.093 FILL 2.090 m



Cut 0.00 m2 Fill 20.63 m2 Width 15.33 m
Datum 99.00 H 1:200 V 1:100

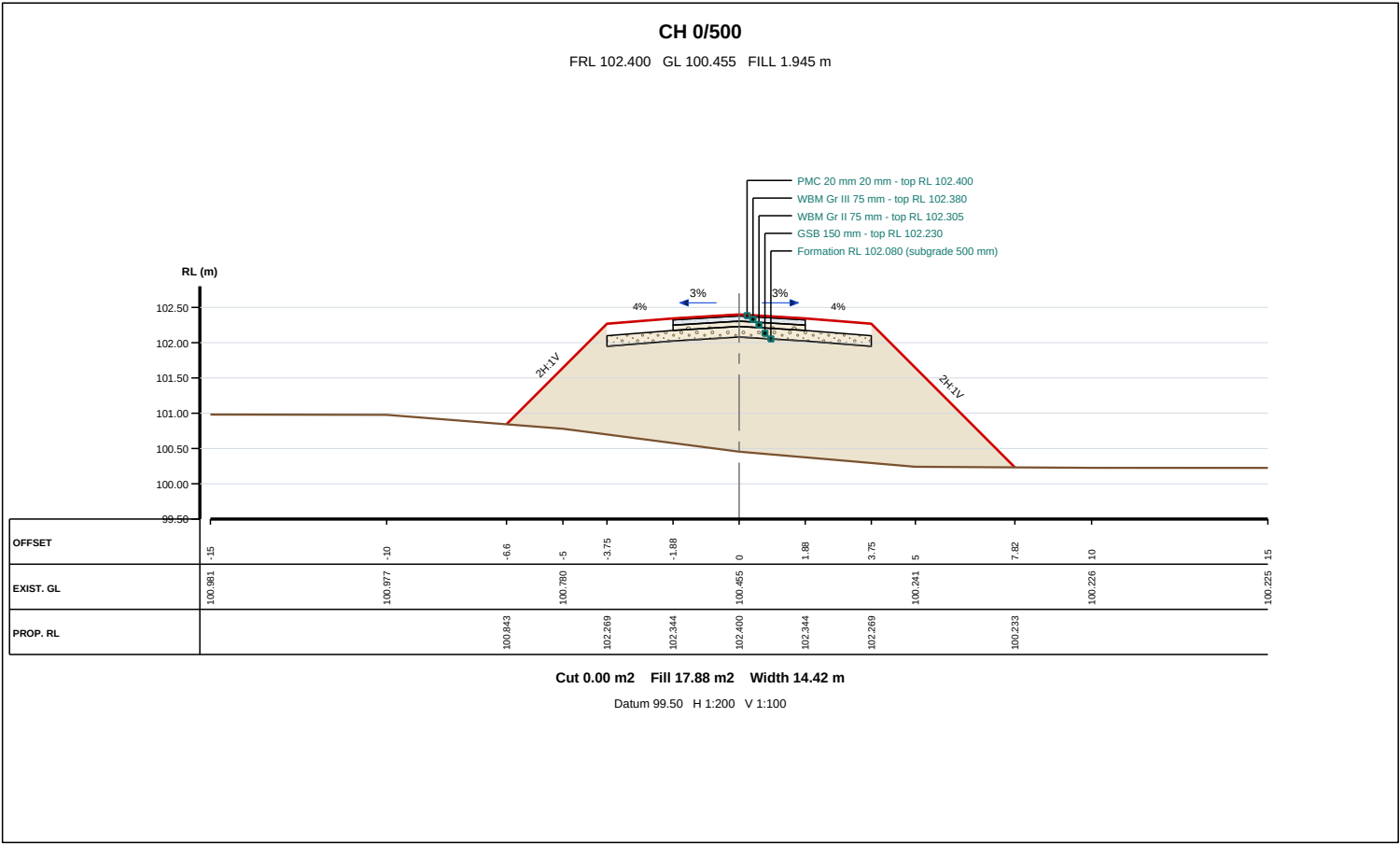
Sample 1

Cross sections ch 0/400 - 0/475

Designed: - Checked: -

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CROSS SECTIONS (sheet 6 of 6)



Sample 1

Cross sections ch 0/500 - 0/500

Designed: - Checked: -

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