PŘÍLOHA Č. 3

Posudek stability – armovaný svah 70°

Části tohoto posudku byly použit se souhlasem firmy Metrostav. Posudek pro Metrostav zpracovala firma MACCAFERRI

SOIL PROPERTIES

Soil: F6/CI Description: il tuhy - kvarter

Cohesion Class		: Effective cohesion
Cohesion	[kN/m²]	: 10.00
Friction Angle Class		: Angle of shearing resistance (Tan phi)
Friction Angle	[°]	: 18.00
Ru value		: 0.00
Weight Class		: Weight density
Bulk unit weight - above GWT	[kN/m³]	: 21.00
Bulk unit weight - below GWT	[kN/m³]	: 21.00
Elastic Modulus	[kN/m²]	: 0.00
Poisson's ratio		: 0.30

Soil: F6/CL Description: il pevny - krieda

Cohesion Class		: Effective cohesion
Cohesion	[kN/m²]	: 12.00
Friction Angle Class		: Angle of shearing resistance (Tan phi)
Friction Angle	[°]	: 21.00
Ru value		: 0.00
Weight Class		: Weight density
Bulk unit weight - above GWT	[kN/m³]	: 21.00
Bulk unit weight - below GWT	[kN/m³]	: 21.00
Elastic Modulus	[kN/m²]	: 0.00
Poisson's ratio		: 0.30

Soil: G Description: strk

Cohesion Class		: Effective cohesion
Cohesion	[kN/m²]	: 0.00
Friction Angle Class		: Angle of shearing resistance (Tan phi)
Friction Angle	[°]	: 35.00
Ru value		: 0.00
Weight Class		: Weight density
Bulk unit weight - above GWT	[kN/m³]	: 19.00
Bulk unit weight - below GWT	[kN/m³]	: 19.00
Elastic Modulus	[kN/m²]	: 0.00
Poisson's ratio		: 0.30

Soil: N Description: Nasyp

Cohesion Class		: Effective cohesion
Cohesion	[kN/m²]	: 8.00
Friction Angle Class		: Angle of shearing resistance (Tan phi)
Friction Angle	[°]	: 23.00
Ru value		: 0.00
Weight Class		: Weight density
Bulk unit weight - above GWT	[kN/m³]	: 20.00
Bulk unit weight - below GWT	[kN/m³]	: 20.00
Elastic Modulus	[kN/m²]	: 0.00
Poisson's ratio		: 0.30

Soil: S4 Description: piesok hlinity, stredne ulahnuty

Cohesion Class		: Effective cohesion
Cohesion	[kN/m²]	: 0.00
Friction Angle Class		: Angle of shearing resistance (Tan phi)
Friction Angle	[°]	: 28.00
Ru value		: 0.00

Weight Class: Weight density
Bulk unit weight - above GWT [kN/m³]: 18.00
Bulk unit weight - below GWT [kN/m³]: 18.00

Elastic Modulus [kN/m²]: 0.00
Poisson's ratio: 0.30

Soil: S5 Description: piesok ilovity, ulahnuty
Cohesion Class: Effective cohesion
Cohesion [kN/m²]: 8.00
Friction Angle Class: Angle of shearing resistance (Tan phi)
Friction Angle [°]: 28.00
Ru value: 0.00
Weight Class: Weight density
Bulk unit weight - above GWT [kN/m³]: 19.50
Bulk unit weight - below GWT [kN/m³]: 19.50

Elastic Modulus [kN/m²]: 0.00
Poisson's ratio: 0.30

STRATA PROFILES

Stratum: F6/CI Description: il tuhy, kvarter
Soil : F6/CI

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
0.00	0.94	5.37	0.95	7.74	0.00	8.85	0.44
9.50	-0.21	18.17	-0.21	38.55	-0.62	39.35	0.18
40.86	0.94	41.04	0.93	42.13	0.95	52.51	0.97
60.52	0.93						

Stratum: F6/CL Description: il pevny, krieda
Soil : F6/CL

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
0.00	-8.24	60.52	-8.24				

Stratum: NASYP Description: S2
Soil : N

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
10.13	0.96	16.07	6.70	17.57	6.82	20.83	6.90
29.09	7.11	32.59	7.11	40.85	6.90	44.11	6.82
45.61	6.70	46.77	6.03	50.42	3.95	57.93	0.94

Stratum: S4 Description: hlity piesok
Soil : S4

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
0.00	-12.64	60.52	-12.64				

Stratum: S5 Description: piesok ilovity
Soil : S5

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
0.00	-2.14	60.52	-2.14				

Stratum: Z Description: strkovy zaklad
Soil : G

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
8.85	0.44	10.13	0.96	11.75	0.96	13.70	0.96
14.63	0.66	39.35	0.18				

WATER TABLE PROFILES

Water table: HPV Description: HPV

X [m]	Y [m]	Y [m]	P [kN/m²]	X [m]	Y [m]	Y [m]	P [kN/m²]
0.00	-4.94			60.52	-4.94		

REINFORCED BLOCKS

Block : GTM 1
Block dimensions [m] : Base width = 6.00 Height = 2.28
Block Origin [m] : Abscissa = 10.00 Ordinate = 0.59
Face inclination [°] : 20.00

Structural embankment type : Sandy Clay
Structural embankment : N
Backfill soil : N
Covering soil : N
Foundation soil : N

Brinch Hansen, Vesic or Meyerhof bearing capacity parameters
Embedment depth [m] : 0.00
Natural soil slope [°] : 0.00

Reinforcements pattern :
Maccaferri - Green Terramesh - 70° - 8/2.7P - 0.76
Length [m] = 6.00
Vertical spacing [m] = 0.76
Wrapped length [m] = 0.65

Block : GTM 2
Block dimensions [m] : Base width = 4.00 Height = 1.52
Back Shift [m] = 0.00 by GTM 1
Face inclination [°] : 20.00

Structural embankment type : Sandy Clay
Structural embankment : N
Backfill soil : N
Covering soil : N
Foundation soil : N

Brinch Hansen, Vesic or Meyerhof bearing capacity parameters
Embedment depth [m] : 0.00
Natural soil slope [°] : 0.00

Reinforcements pattern :
Maccaferri - Green Terramesh - 70° - 8/2.2P - 0.76
Length [m] = 4.00
Vertical spacing [m] = 0.76
Wrapped length [m] = 0.65

Block covering :

X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]	X [m]	Y [m]
0.00	0.00	4.69	2.31				

SURCHARGE LOADS

Distributed Loads : Q1 Description : pruh 1
Class : Variable unfavourable
Magnitude [kN/m²] = 45.00 Inclination angle [°] = 0.00
Abscissa [m] : from = 17.57 To = 20.57

Distributed Loads : Q2 Description : pruh 2
Class : Variable unfavourable
Magnitude [kN/m²] = 26.50 Inclination angle [°] = 0.00
Abscissa [m] : from = 20.57 To = 23.57

Distributed Loads : Q3 Description : pruh 3
Class : Variable unfavourable
Magnitude [kN/m²] = 14.50 Inclination angle [°] = 0.00
Abscissa [m] : from = 23.57 To = 26.57

PROPERTIES OF THE USED REINFORCEMENTS

Maccaferri - Green Terramesh - 70° - 8/2.2P - 0.76

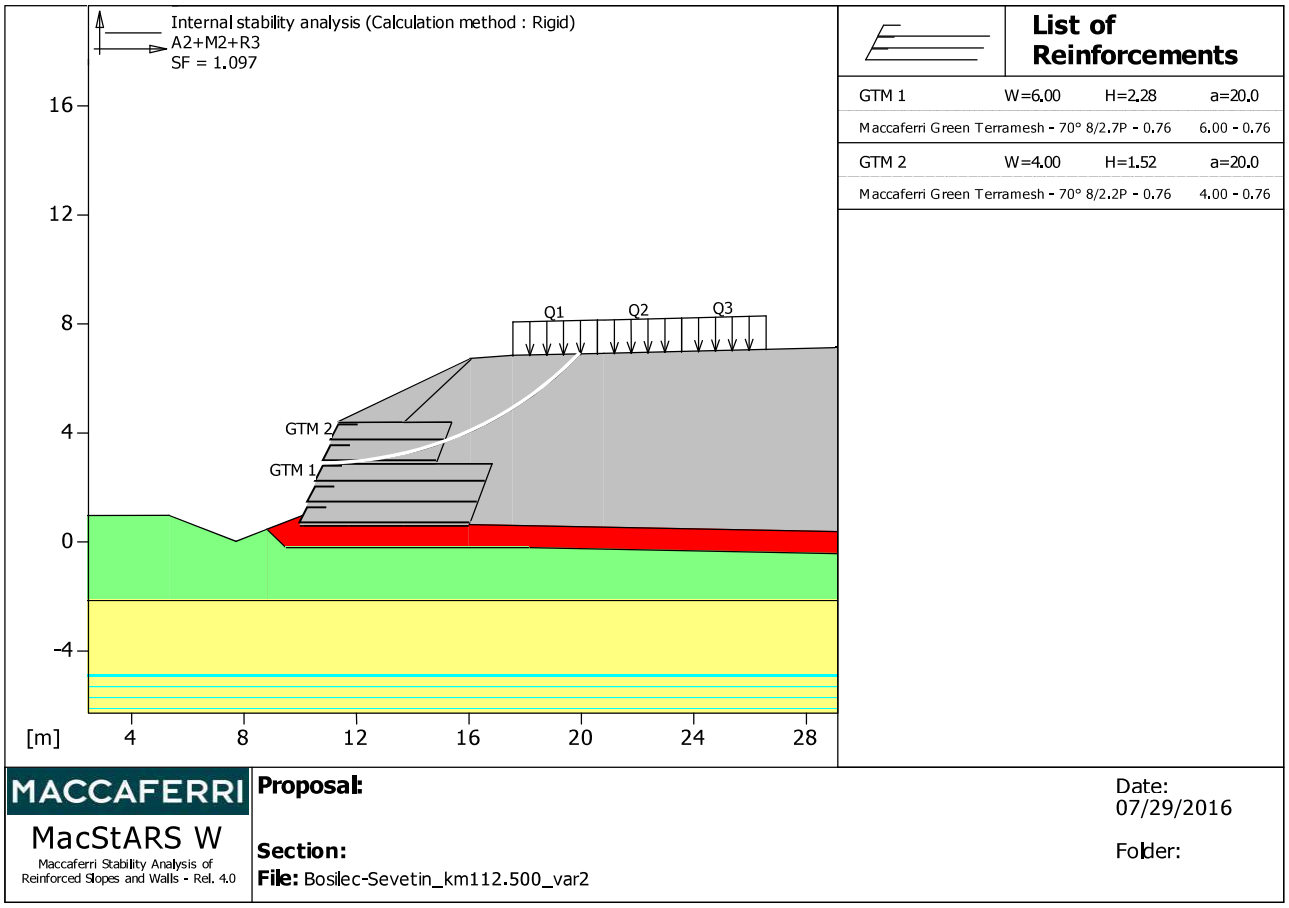
Tensile strength UTS	[kN/m]	35.00
Plastic extension ratio		2.00
Elastic extension coefficient	[m³/kN]	1.10e-04
Reinforcement Stiffness	[kN/m]	330.00
Minimum anchorage length	[m]	0.15
Breakage Safety Factor (gravel)		1.28
Pull-out Safety Factor		1.00
Breakage Safety Factor (sand)		1.11
Pull-out Safety Factor		1.00
Breakage Safety Factor (silty sand)		1.11
Pull-out Safety Factor		1.00
Breakage Safety Factor (sandy clay)		1.11
Pull-out Safety Factor		1.00
Interaction factor reinforcement/reinforcement		0.30
Pullout coefficient reinforcement-gravel		0.90
Pullout coefficient reinforcement-sand		0.65
Pullout coefficient reinforcement-silt		0.50
Pullout coefficient reinforcement-clay		0.30

Maccaferri - Green Terramesh - 70° - 8/2.7P - 0.76

Tensile strength UTS	[kN/m]	50.00
Plastic extension ratio		2.00
Elastic extension coefficient	[m³/kN]	1.10e-04
Reinforcement Stiffness	[kN/m]	500.00
Minimum anchorage length	[m]	0.15
Breakage Safety Factor (gravel)		1.26
Pull-out Safety Factor		1.00
Breakage Safety Factor (sand)		1.09
Pull-out Safety Factor		1.00
Breakage Safety Factor (silty sand)		1.09
Pull-out Safety Factor		1.00
Breakage Safety Factor (sandy clay)		1.09
Pull-out Safety Factor		1.00
Interaction factor reinforcement/reinforcement		0.30
Pullout coefficient reinforcement-gravel		0.90

Pullout coefficient reinforcement-sand	:	0.65
Pullout coefficient reinforcement-silt	:	0.50
Pullout coefficient reinforcement-clay	:	0.30

CHECKS RESULTS



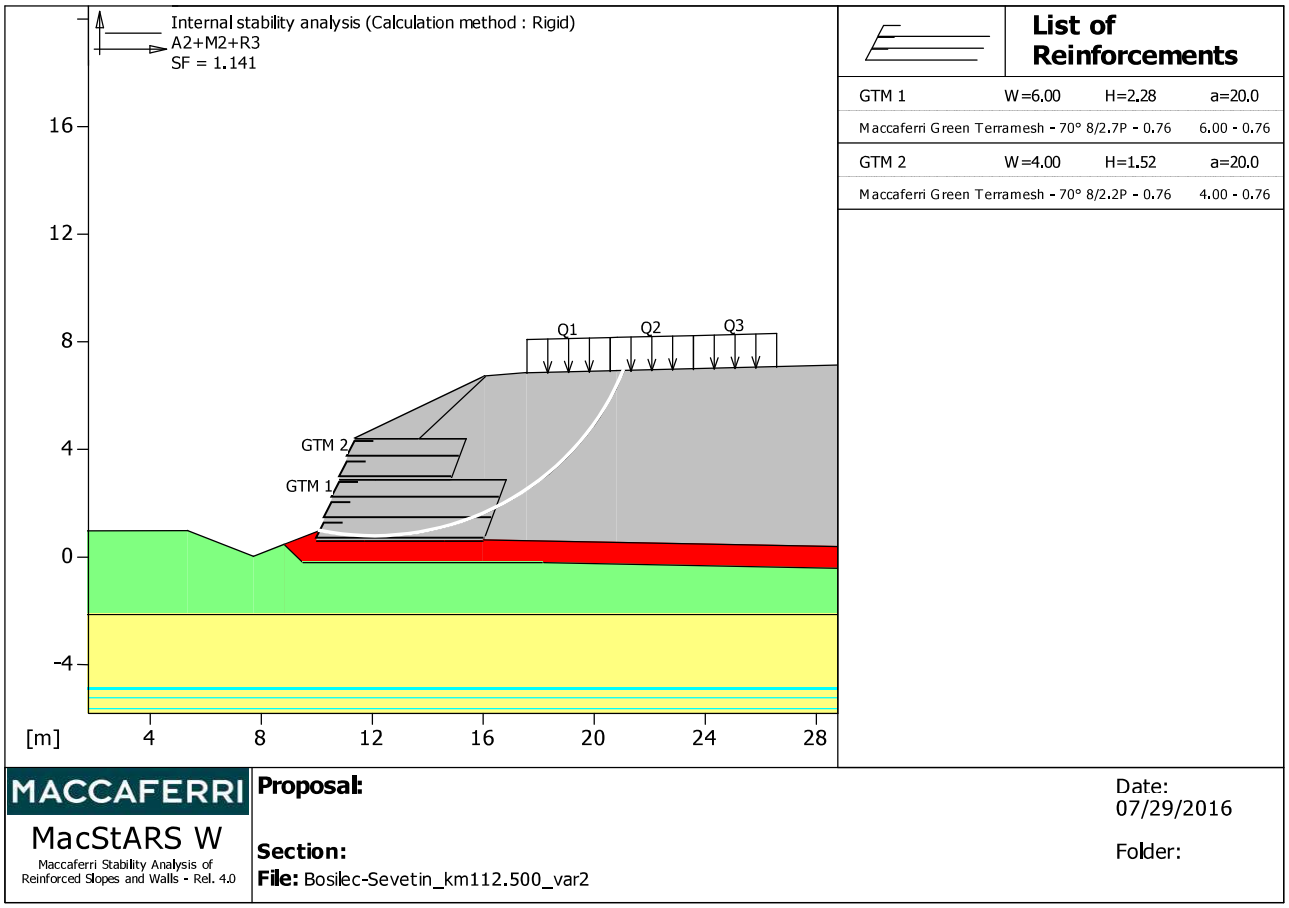
Internal Stability :

Multiplier combination : A2+M2+R3
Reinforcements active Forces according to Rigid Method
Stability analysis with circular surfaces according to Bishop's Method
Evaluated Safety Factor ..... : 1.097

Block	Surfaces searching range Arrival range, abscises [m]	
GTM 2	First point 14.00	Second point 24.00

Number of starting point on the starting segment ..... : 1
Total number of trial surfaces ..... : 500
Minimum base length of slices ..... [m] .... : 0.50
Superior limit search angle ..... [°] .... : 0.00
Inferior limit search angle ..... [°] .... : 0.00

Multiplier	Class
1.30	Variable unfavourable
1.25	Angle of shearing resistance (Tan phi)
1.25	Effective cohesion
1.00	Weight density
1.00	Tensile strength of reinforcement
1.00	Pullout resistance of reinforcement
1.00	Ground resistance for overall stability



Internal Stability :

Multiplier combination : A2+M2+R3
Reinforcements active Forces according to Rigid Method
Stability analysis with circular surfaces according to Bishop's Method
Evaluated Safety Factor ..... : 1.141

Block	Surfaces searching range Arrival range, abscises [m]	
GTM 1	First point 14.00	Second point 24.00

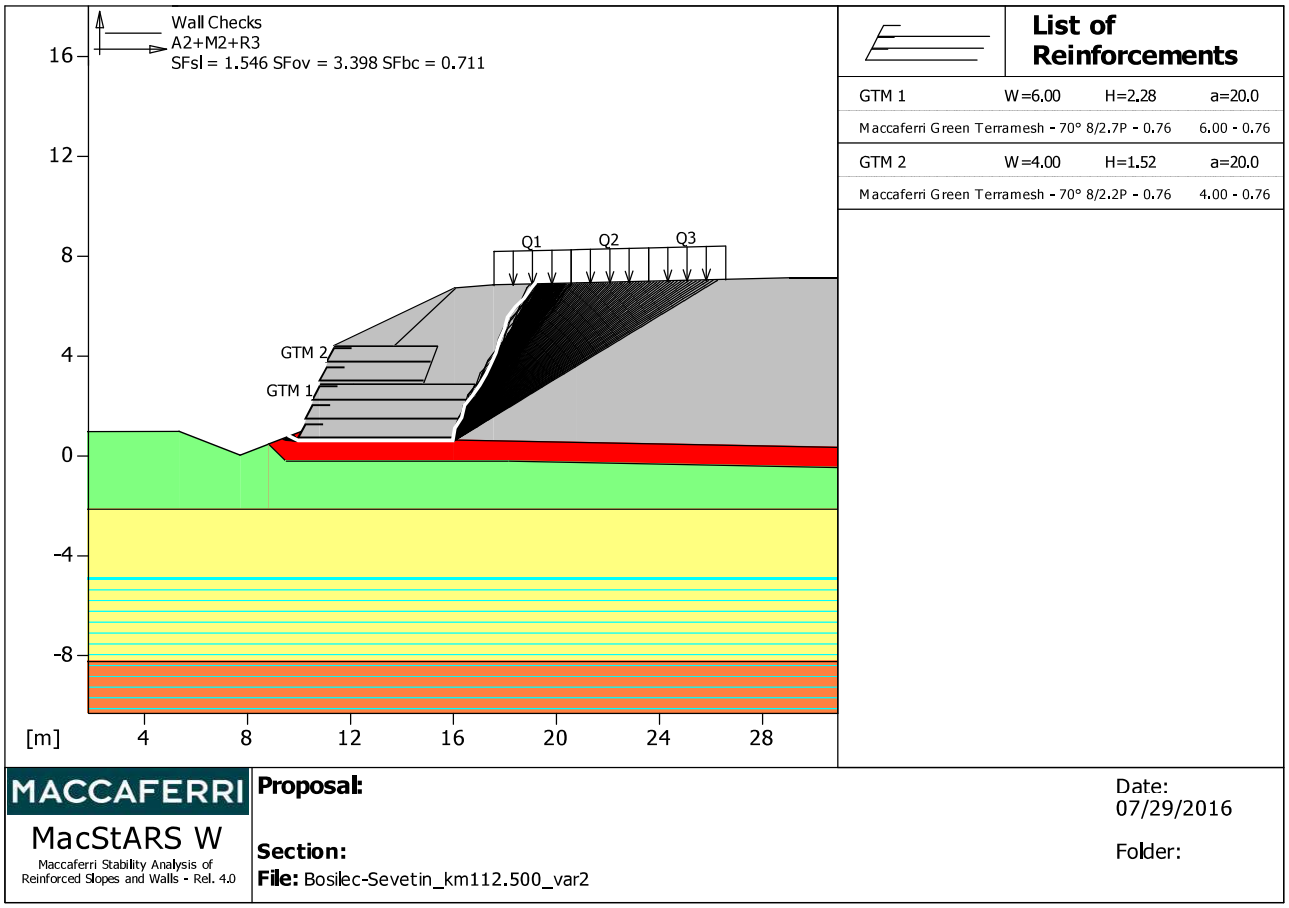
Number of starting point on the starting segment ..... : 1
Total number of trial surfaces ..... : 500
Minimum base length of slices ..... [m] ..... : 0.40
Superior limit search angle ..... [°] ..... : 0.00
Inferior limit search angle ..... [°] ..... : 0.00

Block : GTM 1
Maccaferri - Green Terramesh - 70° - 8/2.7P - 0.76

Y	Tb breakage	Tp pullout	Td design	Tb/Td 1/Fmax	Tp/Td
[m]	[kN/m]	[kN/m]	[kN/m]		
0.760	50.0	23.6	23.6	2.12	1.00

Multiplier	Class
1.30	Variable unfavourable
1.25	Angle of shearing resistance (Tan phi)
1.25	Effective cohesion
1.00	Weight density

1.00	Tensile strength of reinforcement
1.00	Pullout resistance of reinforcement
1.00	Ground resistance for overall stability



Wall Checks :

Multiplier combination : A2+M2+R3
Considered block : GTM 1

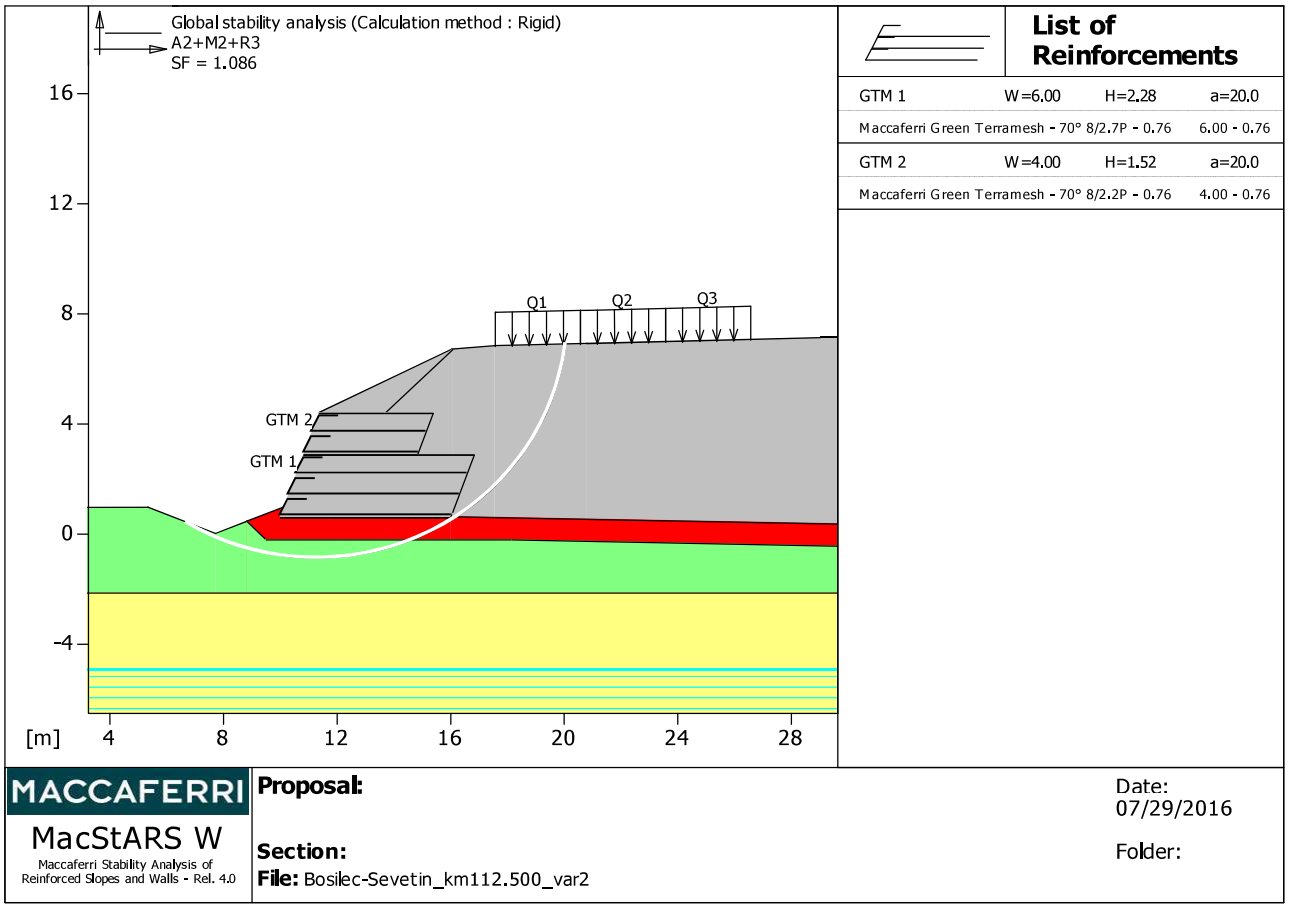
Resisting force	[kN/m]	: 331.58
Active force	[kN/m]	: 214.45
Sliding class	: Sliding resistance	
Sliding safety factor		: 1.546
Restoring moment	[kN*m/m]	: 2337.90
Overturning moment	[kN*m/m]	: 688.09
Overturning class	: Overturning	
Overturning safety factor		: 3.398

Ultimate bearing pressure computed with Limit Equilibrium method

Ultimate bearing pressure	[kN/m²]	: 80.30
Active pressure	[kN/m²]	: 112.94
Pressure class	: Bearing capacity	
Bearing capacity safety factor		: 0.711
Equivalent bearing area	[m]	: 5.57
Eccentricity of normal force	[m]	: 0.21
Lever arm of overturning force	[m]	: 3.21
Normal force on the base	[kN]	: 591.94
Outer edge stress	[kN/m²]	: 119.65
Inner edge stress	[kN/m²]	: 77.66

Multiplier	Class
1.30	Variable unfavourable
1.25	Angle of shearing resistance (Tan phi)
1.25	Effective cohesion
1.00	Weight density
1.00	Tensile strength of reinforcement

1.00	Pullout resistance of reinforcement
1.00	Sliding resistance
1.00	Bearing capacity
1.00	Overturning



Global Stability Check :

Multiplier combination : A2+M2+R3
Reinforcements active Forces according to Rigid Method
Stability analysis with circular surfaces according to Bishop's Method
Evaluated Safety Factor ..... : 1.086

Surfaces searching range

Starting range, abscises [m]		Arrival range, abscises [m]	
First point	Second point	First point	Second point
0.00	9.00	13.50	30.00

Number of starting point on the starting segment ..... : 100
Total number of trial surfaces ..... : 1000
Minimum base length of slices ..... [m] ..... : 0.50
Superior limit search angle ..... [°] ..... : 0.00
Inferior limit search angle ..... [°] ..... : 0.00

Multiplier	Class
1.30	Variable unfavourable
1.25	Angle of shearing resistance (Tan phi)
1.25	Effective cohesion
1.00	Weight density
1.00	Tensile strength of reinforcement
1.00	Pullout resistance of reinforcement
1.00	Ground resistance for overall stability