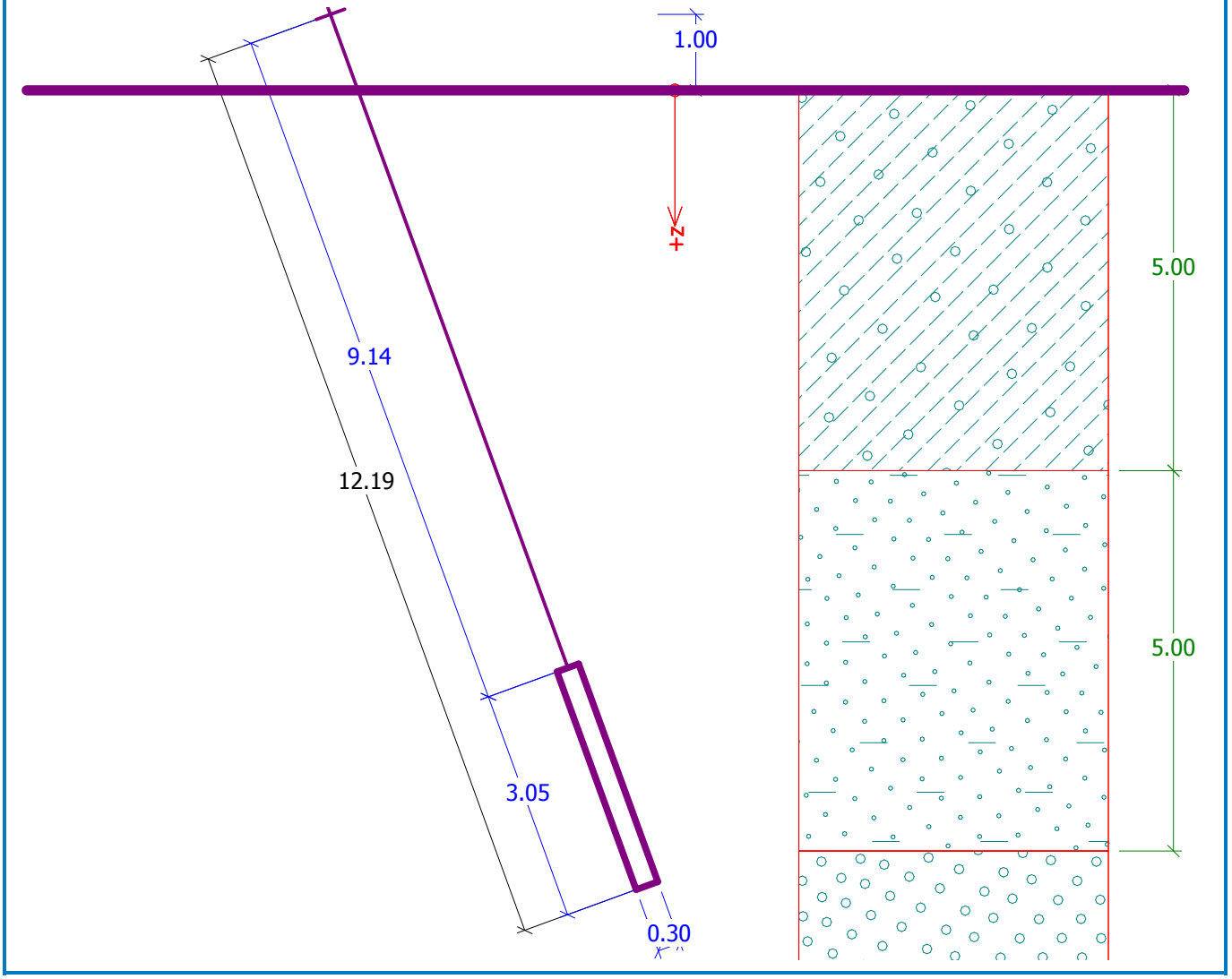
Analysis of micropile

Input data

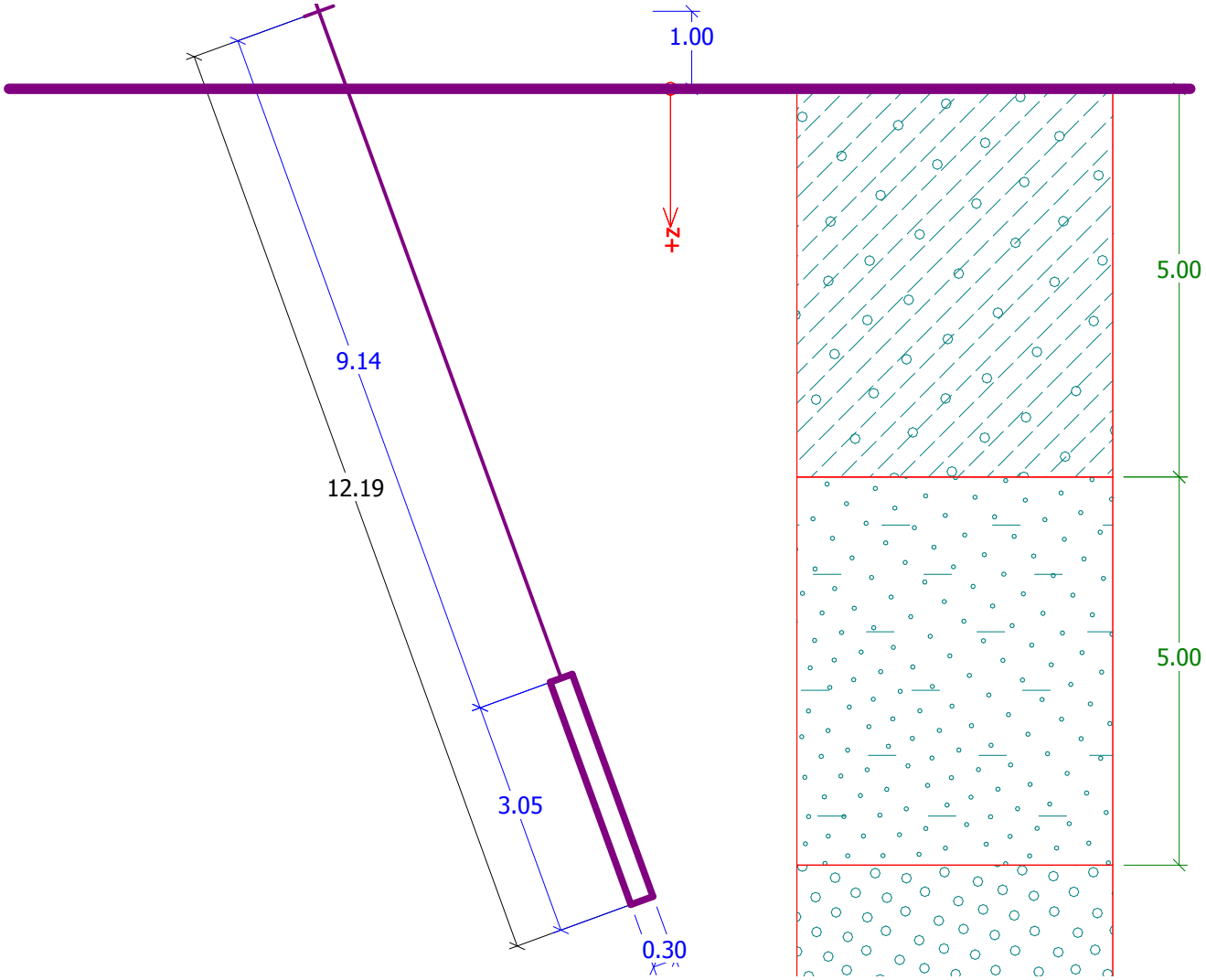
Project

Task : Developer project
Part : 1
Descript. : New fields
Author : Ing. John Marshall
Customer : Revit bulding Ltd.
Date : 1.7.2008

Name : Project **Stage : 1**



Name : Projekt | **Stage : 1**



Soil parameters

Gravelly silt

Unit weight :	γ	=	19,01 kN/m^3
Angle of internal friction :	φ_{ef}	=	29,00 °
Cohesion of soil :	c_{ef}	=	5,99 kPa
Saturated unit weight :	γ_{sat}	=	19,01 kN/m^3

Clayey sand

Unit weight :	γ	=	18,50 kN/m^3
Angle of internal friction :	φ_{ef}	=	29,00 °
Cohesion of soil :	c_{ef}	=	8,00 kPa
Saturated unit weight :	γ_{sat}	=	19,01 kN/m^3

Tuff

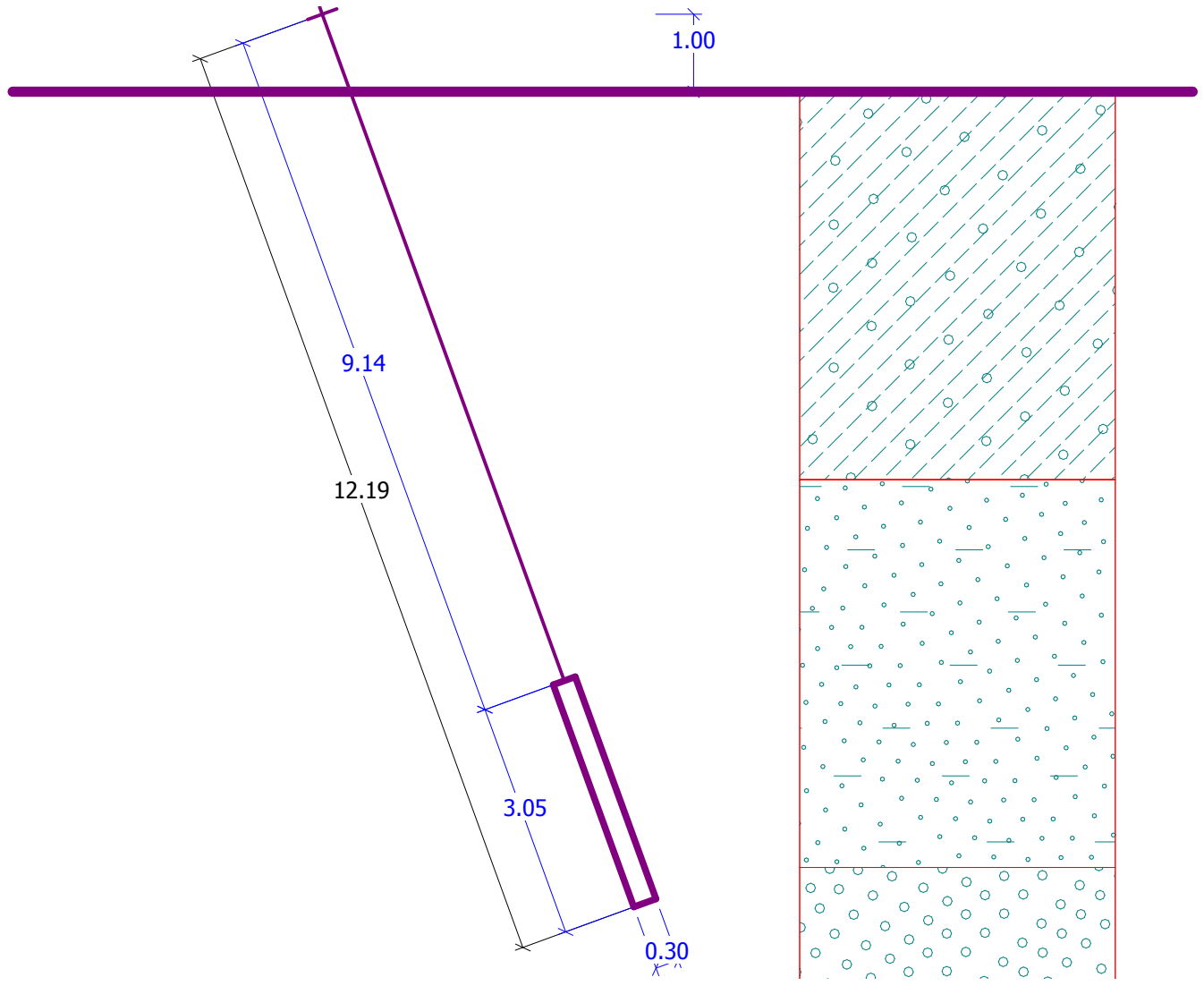
Unit weight :	γ	=	19,50 kN/m^3
Angle of internal friction :	φ_{ef}	=	29,00 °
Cohesion of soil :	c_{ef}	=	9,00 kPa
Saturated unit weight :	γ_{sat}	=	19,50 kN/m^3

Geometry

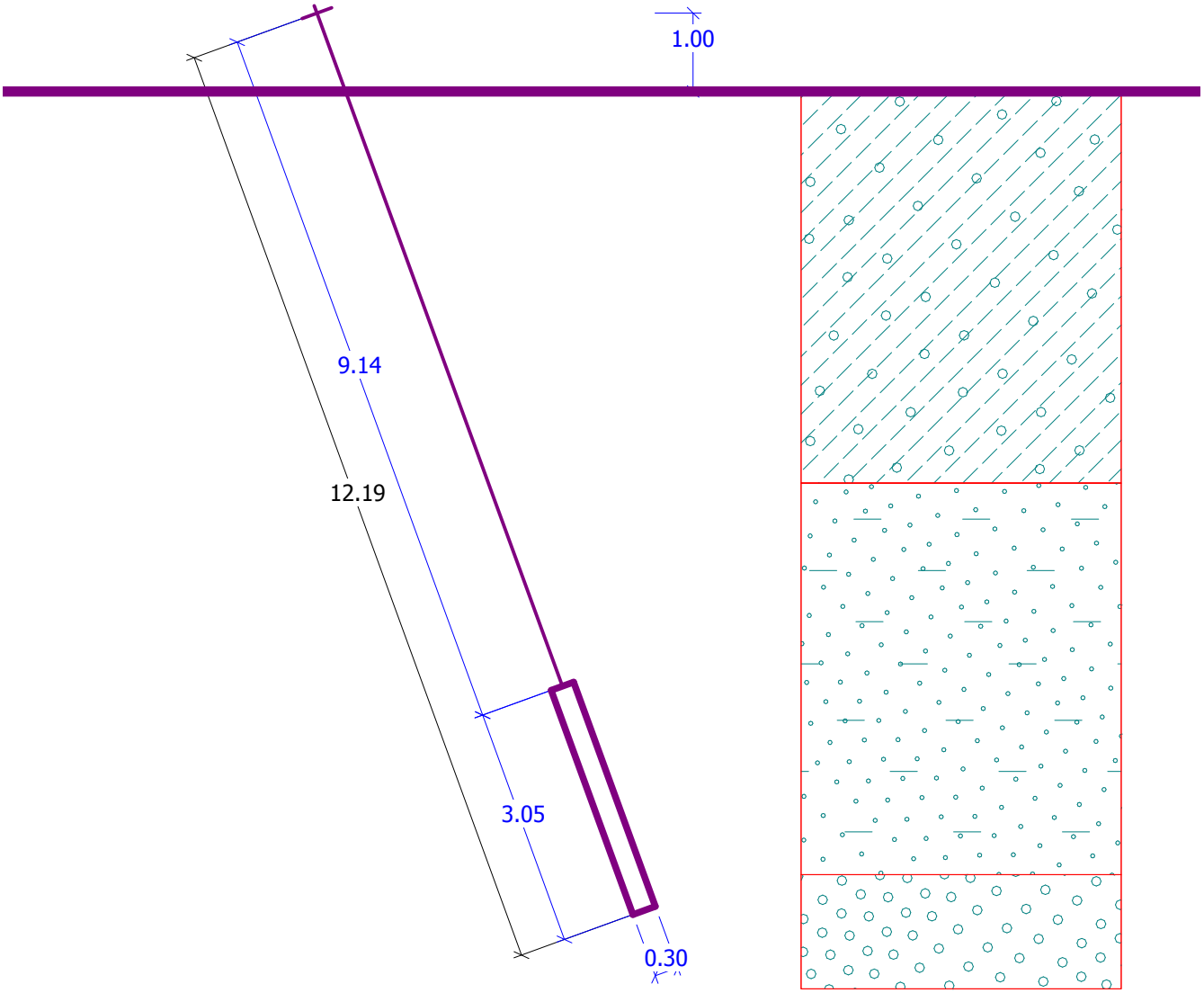
Diameter = 177.8 mm
Thickness of web-section = 12.7 mm

Free length of pile	l	=	9.14 m
Root length	l_r	=	3.05 m
Diameter of root	d_r	=	0.30 m
Pile inclination from vertical	α	=	20.00 °
Pile head offset	l_a	=	1.00 m

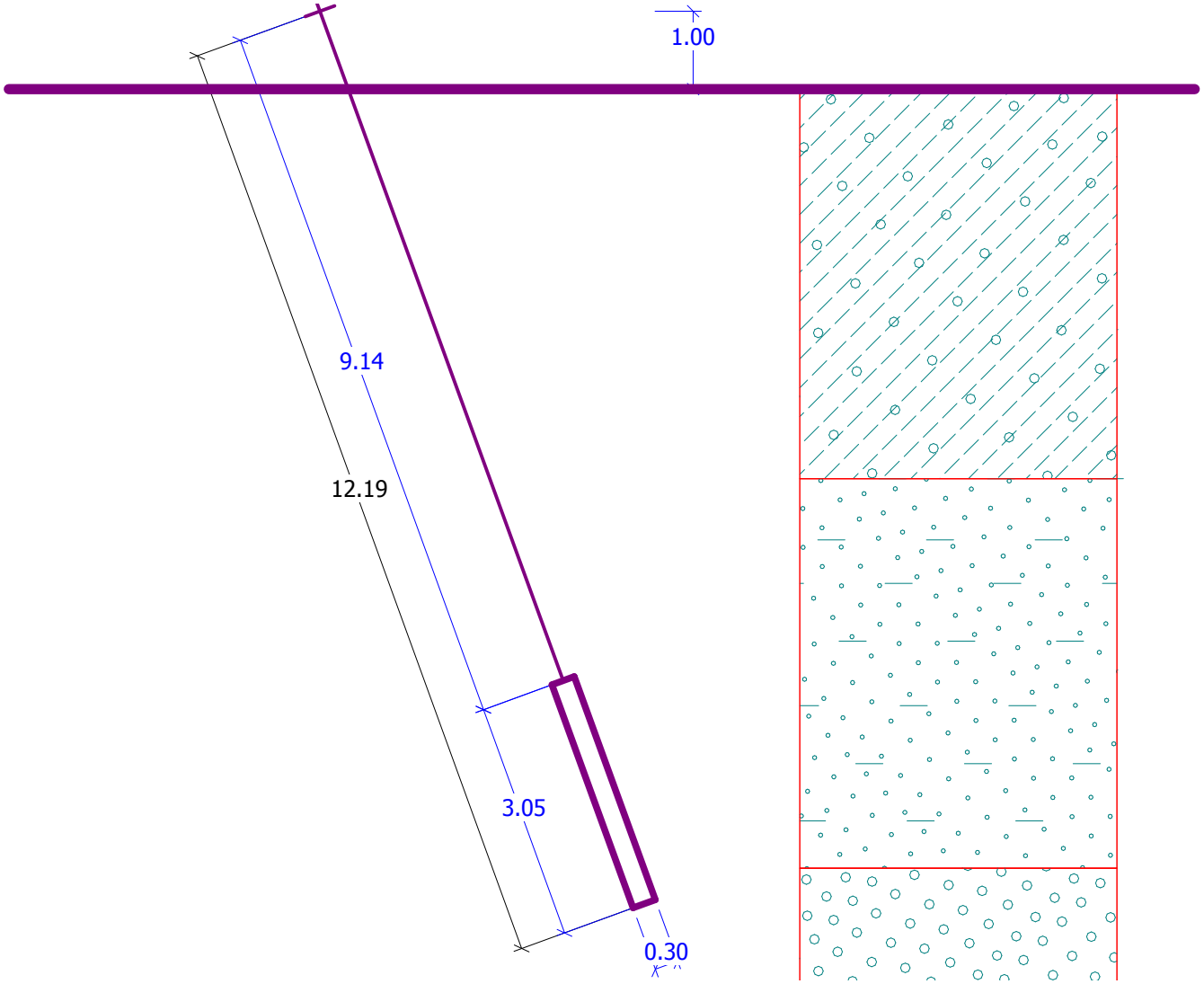
Name : Geometrie **Stage : 1**



Name : Geometrie **Stage : 1**



Name : Geometry | **Stage : 1**



Material parameters of structure:

Concrete

Specified characteristic compression strength R_{bd} = 20.68 MPa
Elastic modulus E_b = 28957.97 MPa

Steel

Specified characteristic strength of steel R_{sd} = 275.79 MPa
Elastic modulus E_s = 206842.65 MPa

Geological profile and assigned soils

No.	Layer [m]	Assigned soil	Pattern
1	5.00	Gravelly silt	
2	5.00	Clayey sand	
3	-	Tuff	

Load

No.	Force new	Force change	Name	Force N [kN]	Moment M [kNm]
1	YES		Force No. 1	120.10	9.49

Analysis settings

Masonry friction reduction factor base-soil μ = 0.90
Verification analysis according to the factor of safety
Safety factor for critical force SF_1 = 1.50
Safety factor for cross-section bearing capacity SF_2 = 1.50
Safety factor for root bearing capacity FS_3 = 1.50

Verification No. 1

Cross-section check -calculation no. 1

Calculation with corrosion effect
Intended durability t = 50 [y]
Soil type: native soils

Internal stability checking: geometric method (Euler)
calculation of section effective length - bearing (hinged-hinged).

Modulus of subsoil reaction E_p = 0.11 MN/m^3
Calculate number of halfwavws n = 0.00
Effective length l_{cr} = 8.72 m

Critical normal force N_{cr} = 670.58 kN
Maximal normal force N_{max} = 120.10 kN

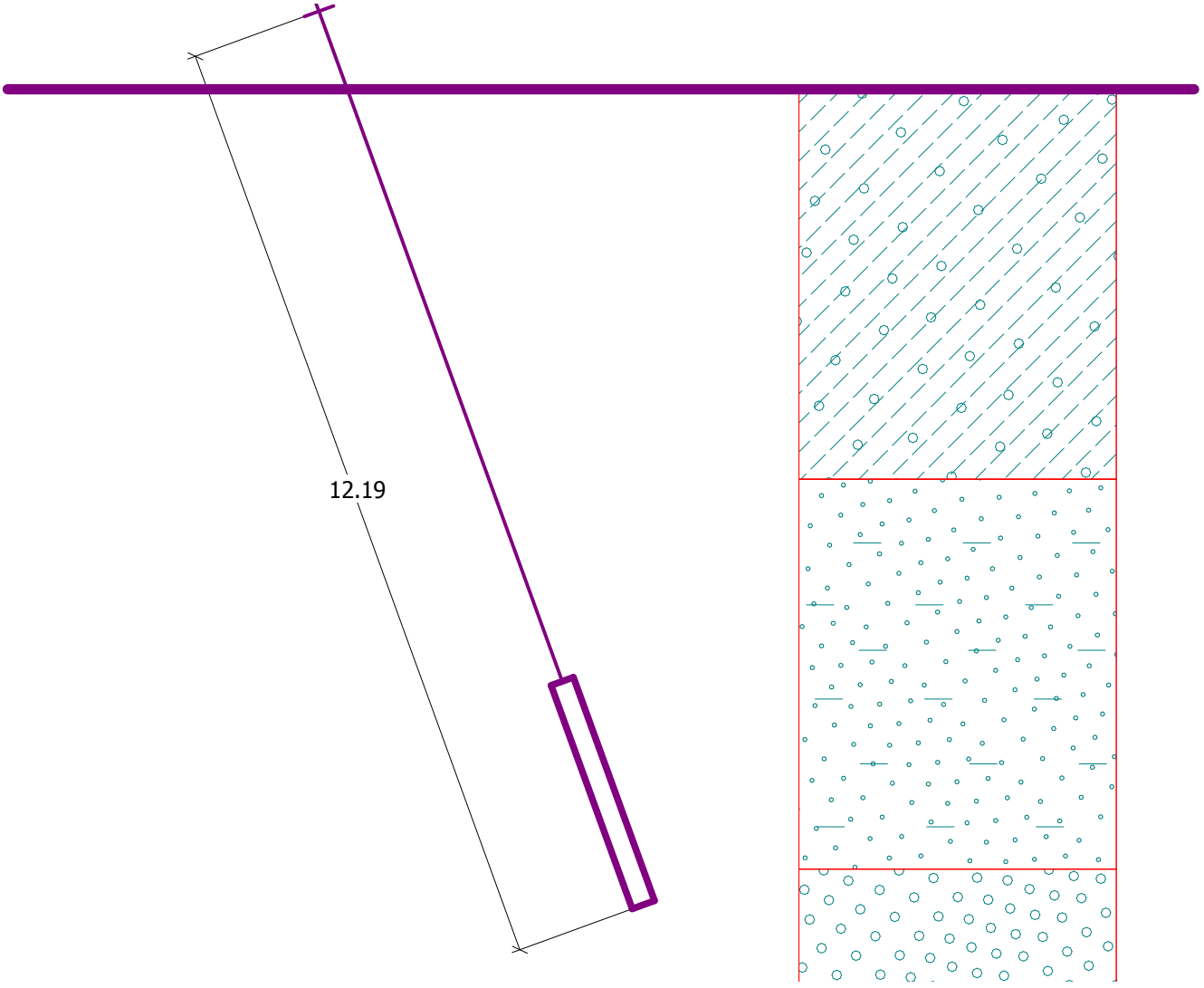
Safety factor = 5.58 > 1.50
Internal stability of micropile section is SATISFACTORY

Evaluation of coupled section bearing capacity:
Area of ideal cross-section A_i = 8.807E+03 mm^2
Moment of inertia of ideal cross-section J_i = 2.497E+07 mm^4
Beam slenderness λ = 163.742
Buckling coefficient κ = 0.186
Location of neutral axis = -78.0 mm

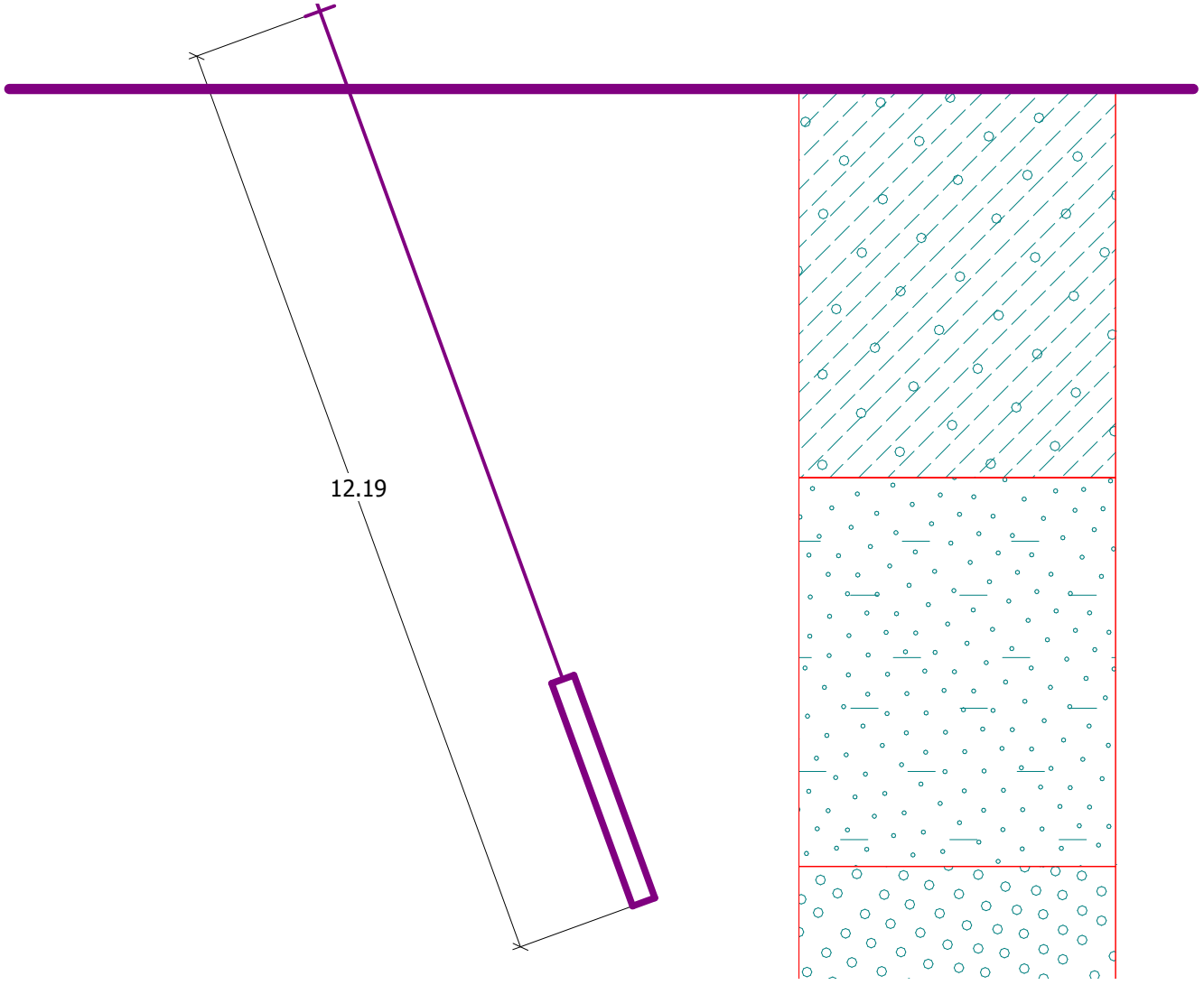
Stress in steel σ = 99.82 MPa
Steel strenght σ_{rd} = 275.79 MPa

Safety factor = 2.76 > 1.50
Coupled section of micropile is SATISFACTORY

Name : Section calculation | **Stage : 1; Verification : 1**



Name : Výpoèet prùøez | **Stage : 1; Verification : 1**



Verification No. 1

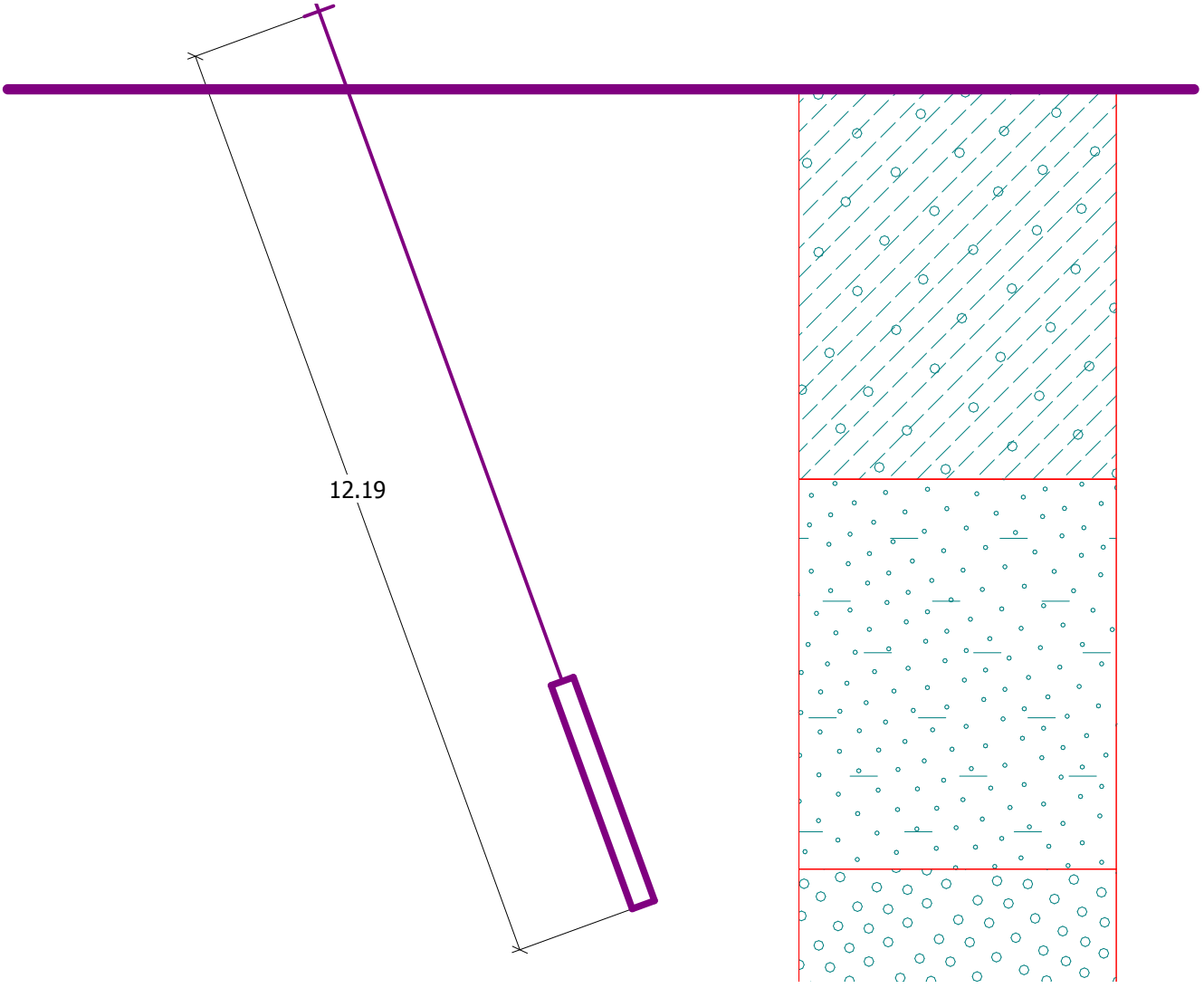
Root evaluation - calculation number 1

Calculation method - Lizzi theory.
Coefficient of root diameter influence = 0.80
Average limit skon friction q_{sav} = 95.76 kPa
Total bearing capacity of micropile root = 223.59 kN

Bearing capacity of the micropile Q = 223.59 kN
Maximal normal force N_{max} = 120.10 kN

Safety factor = 1.86 > 1.50
Bearing capacity of the root is SATISFACTORY

Name : Calculation root **Stage : 1; Verification : 1**



Name : Výpoèet koøen **Stage : 1; Verification : 1**