

# **GEOTECHNICAL STUDY**

**NO. 69 / 2022**

**Regarding the location in Str. Alea Baisoara, no. 2 si no. 4, Cluj - Napoca, Judetul Cluj**

**BENEFICIARY: THEORETICAL HIGH SCHOOL "LUCIAN BLAGA" CLUJ-NAPOCA**, with headquarters in the City of Cluj-Napoca, Cluj County

**GENERAL DESIGNER: -**

**SPECIALTY DESIGNER:**  
**S.C. SOIL TESTING S.R.L. CLUJ NAPOCA**

**SOIL TESTS AND VERIFICATIONS LABORATORY - GRADE II AUTHORIZATION NO. 3150/19.05.16**

**DATE: FEBRUARY 2022**

**Profile test Director**  
**Eng. Ali GHBECH**  
**Eng. geologist Stefan Apopei**

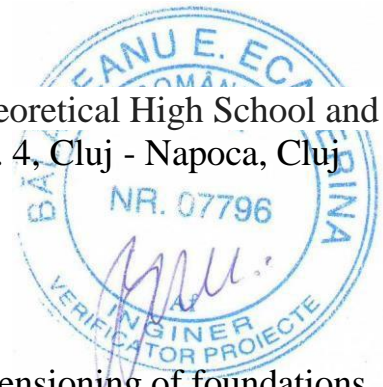


## Geotechnical study for single phase project

### Technical report

#### 1. Name of the objective. Location.

The rehabilitation and modernization of the Lucian Blaga Theoretical High School and the adjacent streets, on the site of Str. Alea Baisoara, no. 2 si no. 4, Cluj - Napoca, Cluj County.



#### 2. The purpose of the work

Construction permit. Calculation of the foundation land. Dimensioning of foundations.

#### 3. Preliminary classification in the geotechnical category

For the preliminary definition of the geotechnical category, the following ground conditions were used:

Factors to consider	Description	Scoring
Ground conditions	Good lands	2
Groundwater	No depletions	1
Construction classification according to the category of importance	Normal	3
Neighborhoods	Without risks	1
Geotechnical risk	<b>Reduced</b>	7
Geotechnical category	<b>1</b>	

According to the calculated score, the work preliminarily falls into geotechnical category 1, with low geotechnical risk. The framing was done according to the *Normative on geotechnical documentation for constructions indicative NP 074/2014*.

#### 4. Research line

In order to determine the lithological succession, 1 geotechnical borehole was executed up to the maximum depth of 5.00 m (compared to the elevation of the natural terrain) and 2 foundation surveys.

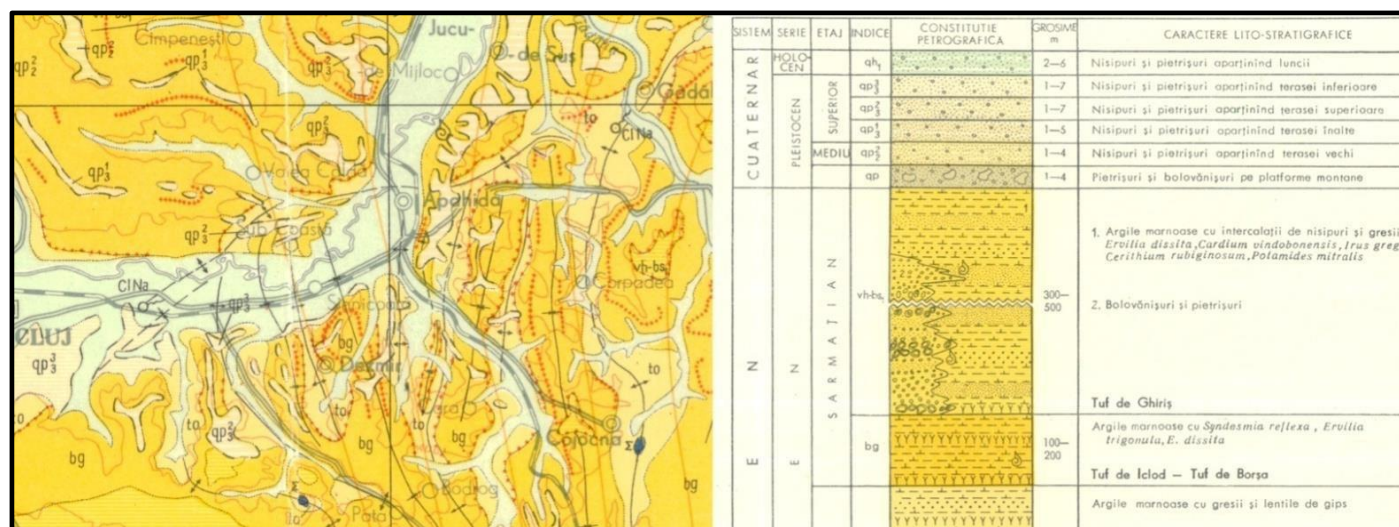
From the works performed, samples were taken for laboratory tests.

The geotechnical study as a synthesis of the field research analyzes and details the particularities of the location through the prism of the following aspects:

- Stratification of the foundation land;
- The hydrogeological regime of the area;
- Physical-mechanical characteristics of the land;
- Presentation of the calculation of the bearing capacity at the level of the base of the foundation;
- Estimation of probable absolute deformations;
- Assessments on the overall stability of the site.

#### 5. Geology and morphology

From a geomorphological point of view, the perimeter of the structural unit belongs to the Transylvanian Depression, having as a foundation metamorphic crystalline schists and sedimentary deposits up to the Upper Cretaceous (Senonian), which supports the stratigraphic succession of the depression itself, within which Paleogene age deposits are delimited, of continental-lacustrine facies, and neogene, normal or brackish facies.



**Fig. 1** Geological map of the area

The following granulometric categories were identified: dusty sandy clay. **On the date of carrying out the prospecting works, no active dynamic phenomena were highlighted.**

## 6. Land stratification

The lithological column identified by the geotechnical works is presented as follows:

Drilling I:

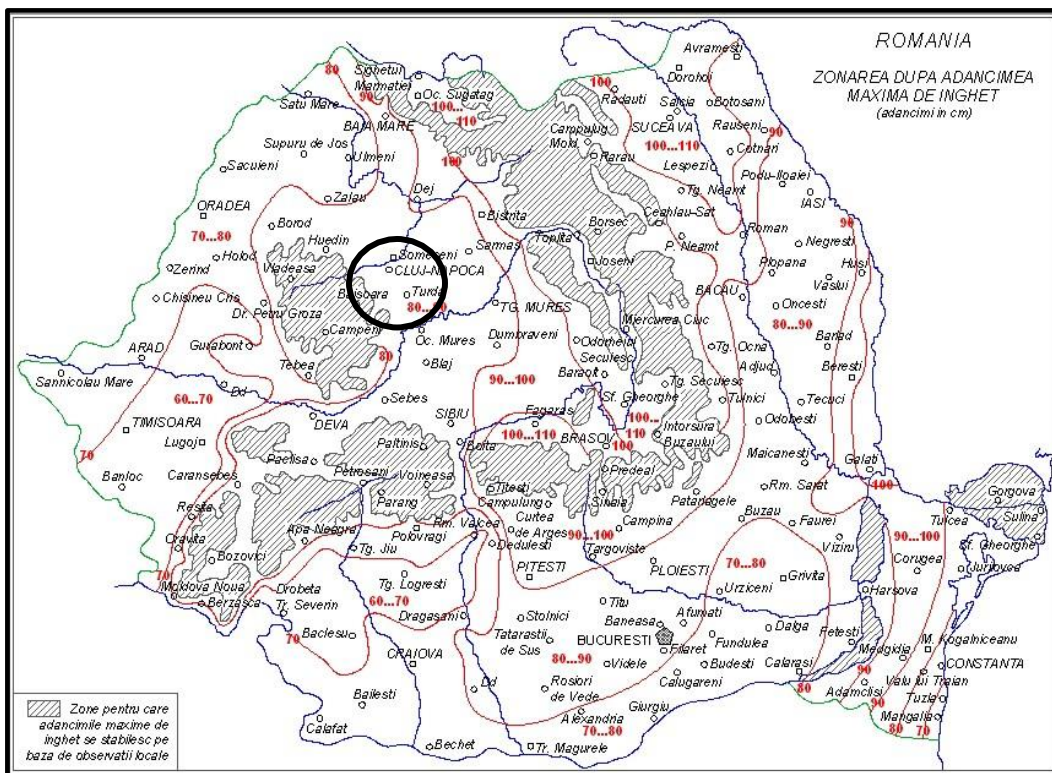
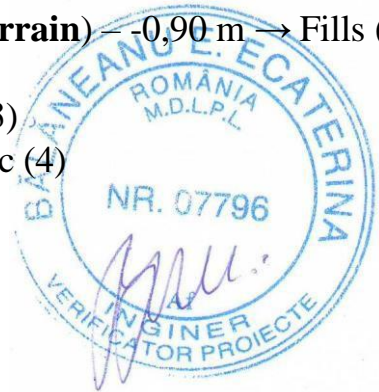
- 0,00 (compared to the elevation of the natural terrain) – -0,90 m → Fills (1)
- -0,90 – -1,30 m → Sandy clay, brown - blackish (2)
- -1,30 – -2,20 m → Sandy clay, brown, silty plastic (3)
- -2,20 – -5,00 m → Sandy clay, yellowish, silty plastic (4)

## 7. Groundwater

The water was not intercepted during the drilling works.

## 8. The depth of the frost zone

The moderate continental climate of the area requires, according to STAS 6054/77, to lower the base of the foundation below the maximum frost depth. For the location studied, this is ~0.80 -0.90 m.



*Zoning of the territory of Romania according to frost depth, according to STAS 6054/77  
"Maximum frost depths"*



## 9. Seismic zone

In accordance with the technical regulations „**Seismic design code - Part 1 - Design provisions for buildings**” indicative **P100-1/2013**, the zoning of the ground acceleration for design, for seismic events with the average recurrence interval  $IMR = 225$  years and 20% probability of exceeding in 50 years, the studied area has: - coefficient  $a_g$  equal to **0.10 g**;

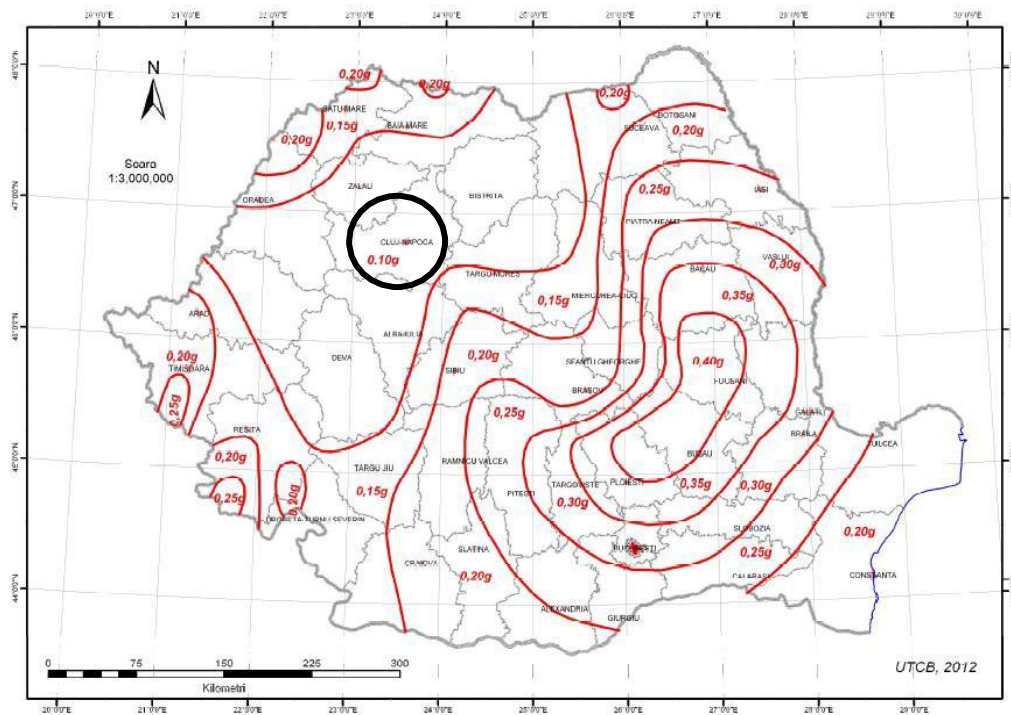


Figure 2. Zoning of peak ground acceleration values for  $a_g$  design with  $IMR = 225$  years and 20% probability of exceedance in 50 years

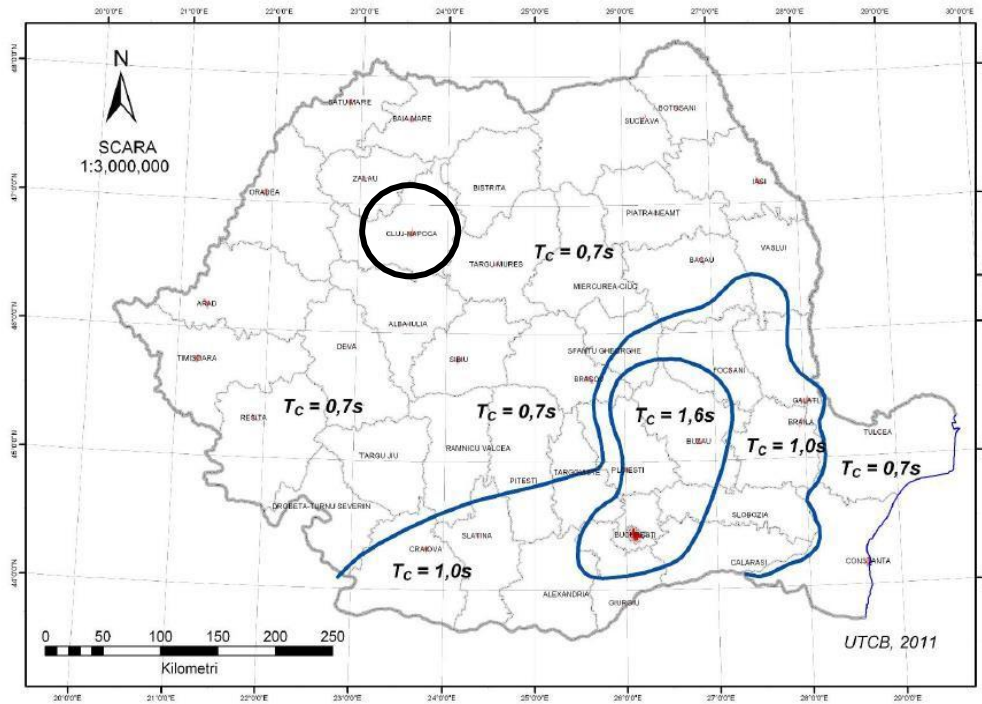


Figure 3. The zoning of Romania's territory in terms of the control period (corner),  $T_c$  of the response spectrum

The control period (corner)  $T_c$  of the response spectrum represents the border between the area (level) of maximum values in the spectrum of absolute accelerations and the area (level) of maximum values in the spectrum of relative speeds and is expressed in seconds. For the studied area it is:

-  $T_c$  (corner period) is equal to **0.7 sec**.

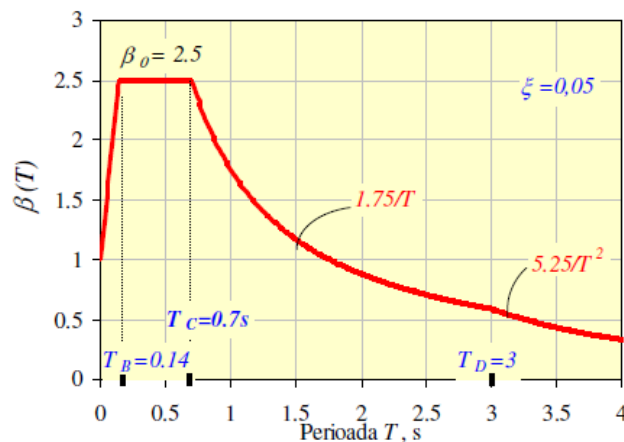


Figure 4. Normalized elastic response spectra of absolute acceleration for the critical damping fraction  $\xi = 5\%$  in seismic and terrain conditions in Romania

## 10. Placing the objective in "risk areas" (earthquake, landslides, floods) which form the "national land development plan - SECTION V - RISK ZONES ,,

The inclusion of the area in P.A.T.N. - the plan for the development of the national territory

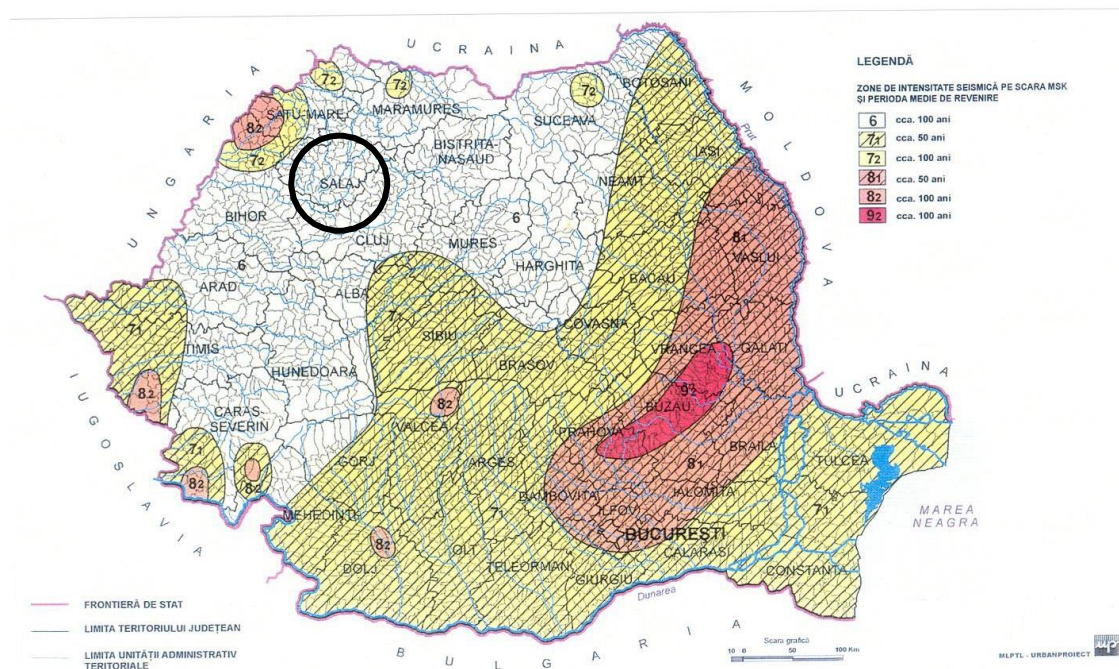
In accordance with LAW No. 575 of October 22, 2001 regarding the approval of the National Land Development Plan - Section V - Natural Risk Areas, Published in: Official Gazette No. 726 of November 14, 2001, the areas that have the potential to produce destructive natural phenomena are analyzed and classified.

Within the meaning of this law, natural risk areas are geographically delimited areas, within which there is a potential for the production of destructive natural phenomena, which can affect the population, human activities, the natural and the built environment and can cause damage and human casualties .

### A. Earthquakes:

In accordance with annex no. 1, the studied area falls within the area with The seismic intensity on the MSK scale is with a return period of approx. 100 years. (conf.SR 11100/1-92)

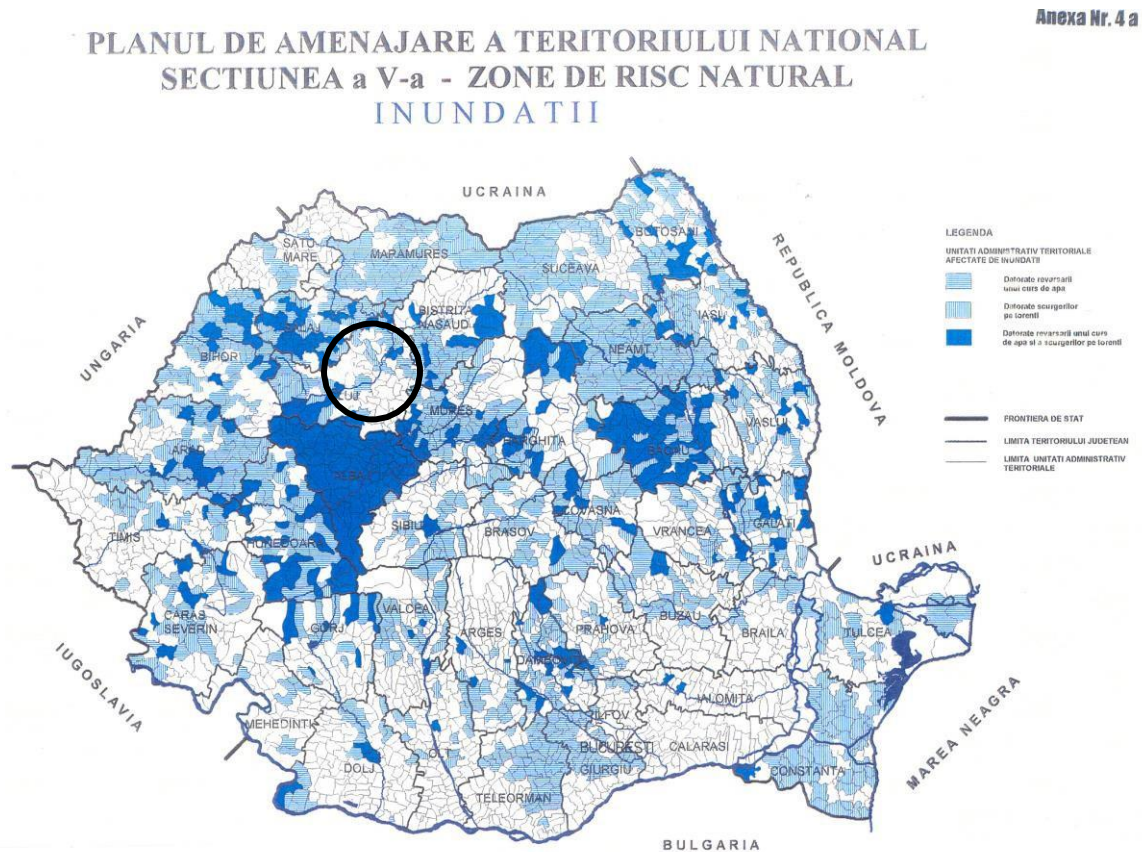
### C. CUTREMURE DE PAMANT





## B. Floods:

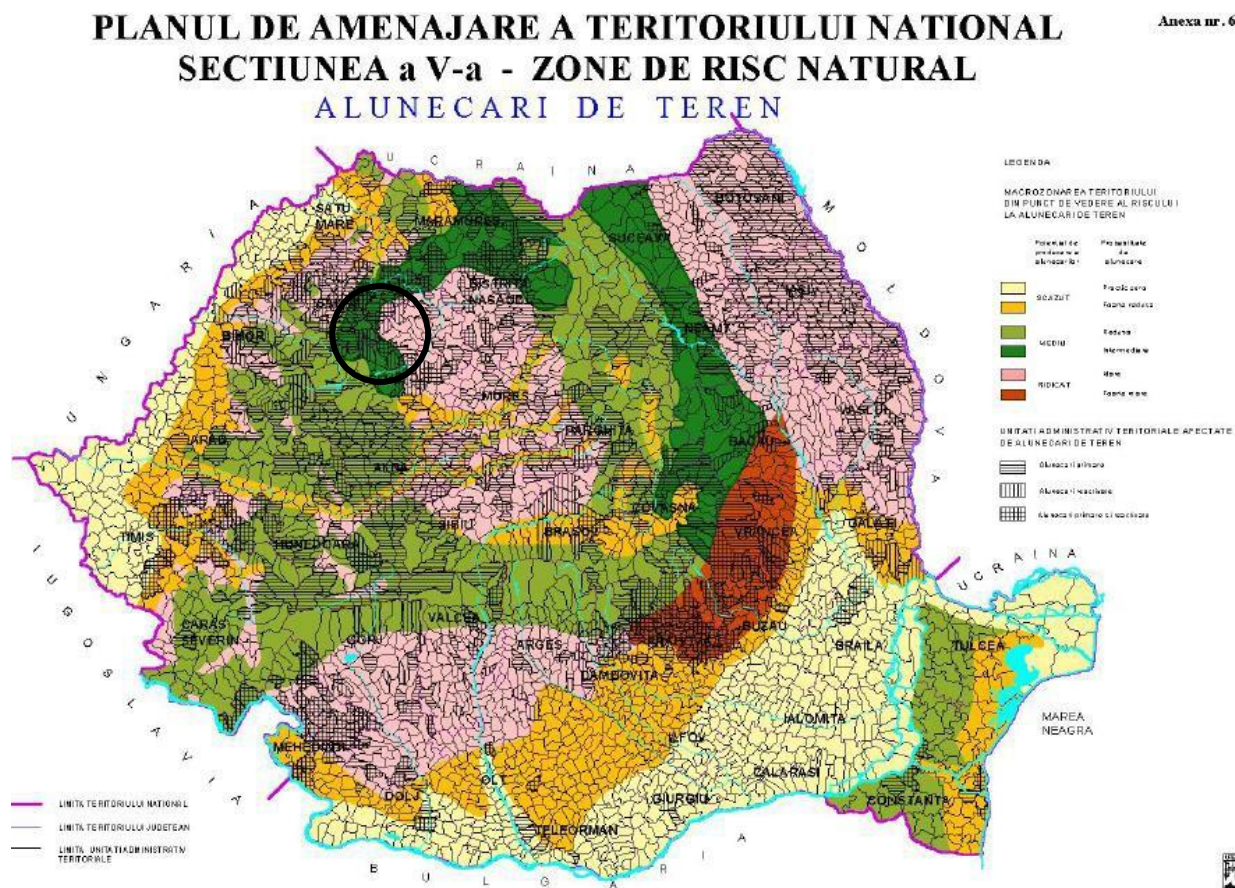
According to annex no. 4 a, the area is part of the area with the potential to produce floods due to a water course and discharges on torrents.





## C. Landslides

In accordance with annex no. 6, the area falls into the zone with the potential for landslides - medium - high and the probability of a landslide is medium.



## Geotechnical evaluation

### 1. Definitive classification in the geotechnical category

As a result of investigations and laboratory tests, it was found that the foundation land changes its preliminary framing conditions.

Factors to consider	Description	Scoring
Ground conditions	Good lands	2
Groundwater	No depletions	1
Construction classification according to the category of importance	Normal	3
Neighborhoods	Without risks	1
Seismic zone	$A_g = 0.10 g$	1
Geotechnical risk	<b>Reduced</b>	<b>8</b>
Geotechnical category	<b>1</b>	

According to the calculated score, the work definitely falls into geotechnical category 1, with low geotechnical risk. The framing was done according to the *Normative on geotechnical documentation for constructions, indicative NP 074 – 2014*.

### 2. Foundation conditions

A foundation depth of  $> 1.30$  m (compared to the current land elevation)

o The good foundation layer is the layer of sandy, brown, silty plastic clay (3), intercepted at the depth of the borehole.

o Using the conventional calculation pressure to estimate the bearing capacity of the foundation soil, the conventional pressure  $p_{conv}$  [kPa] for the foundation layer **Sandy clay, brown, silty plastic (3)**, was determined to be **260 kPa**.

o The method of determining the conventional pressure values is presented in Annex D, from the reference NP 112 - 2014 - "Regulations on the design of surface foundations" For any other dimensions of the foundation width and other depth of embedment, the application of methodological calculation corrections is required prescribed by the provisions of NP 112:2014, point D2.

o To perform the calculation of the foundation land, at the limit state of bearing capacity, the values of the geotechnical characteristics for the intercepted soils and reproduced in the attached drilling sheet will be taken into account.

### **3. Recommendations and conclusions:**

One will opt for a system of continuous or isolated foundations;

- The deformations that the land can cause must not exceed the admissible limit for the type of construction;
- The foundation must be made in such a way that it has the ability to transmit and distribute uniformly and in complete safety the effort to which it is subjected by the superstructure part (superstructure); the foundation depth must correspond to the norms, that is, the foundation must not be affected of frost, swelling or contraction of the soil or its loosening.
- Water will not be allowed to stagnate on the site and in the foundation excavations, drainage works will be considered to ensure as much as possible the execution of the excavations on land and the pouring of concrete;
- Special attention will be paid to the management of meteoric waters and those originating from the damage of urban networks;
- Non-concrete areas will be grassed;
- The presence of the geologist will be requested in order to draw up the minutes regarding the nature of the foundation land.

**Eng. Ali Ghbech**





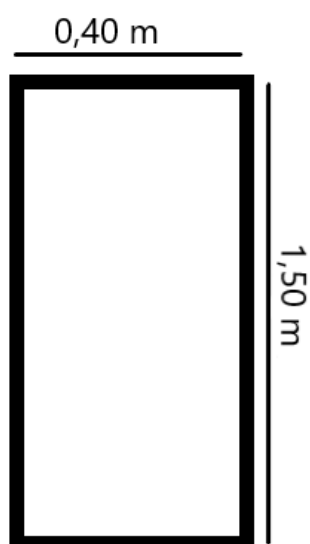


## SURVEY 1



**S.C. Soil Testing SRL Cluj Napoca Str. Donath no. 114 Phone 0758655552  
Fax 0264-307205 / Laboratory Str. Donath no. 114**

- Foundation made of concrete with a depth of 1.50 m and a width of 0.40 m;
- The foundation soil is made of sandy clay.





S.C. SoilTesting SRL, Cluj Napoca, Str. Donath, nr. 114, Tel. 0758655552  
Laborator Str. Donath, nr. 114

## SURVEY 2

Regarding the location in Str. Alea Baisoara, no. 2 si no. 4, Cluj - Napoca, Judetul Cluj

**BENEFICIARY: THEORETICAL HIGH SCHOOL "LUCIAN BLAGA" CLUJ-NAPOCA,**  
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**DATE: FEBRUARY 2022**

**Profile test Director**

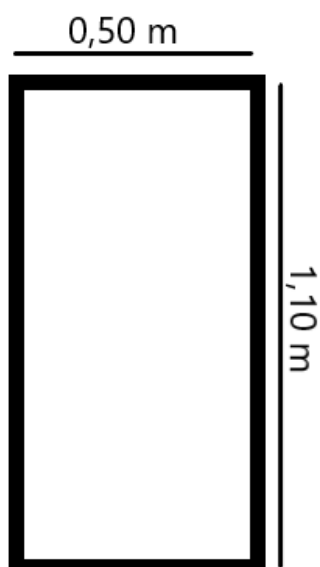
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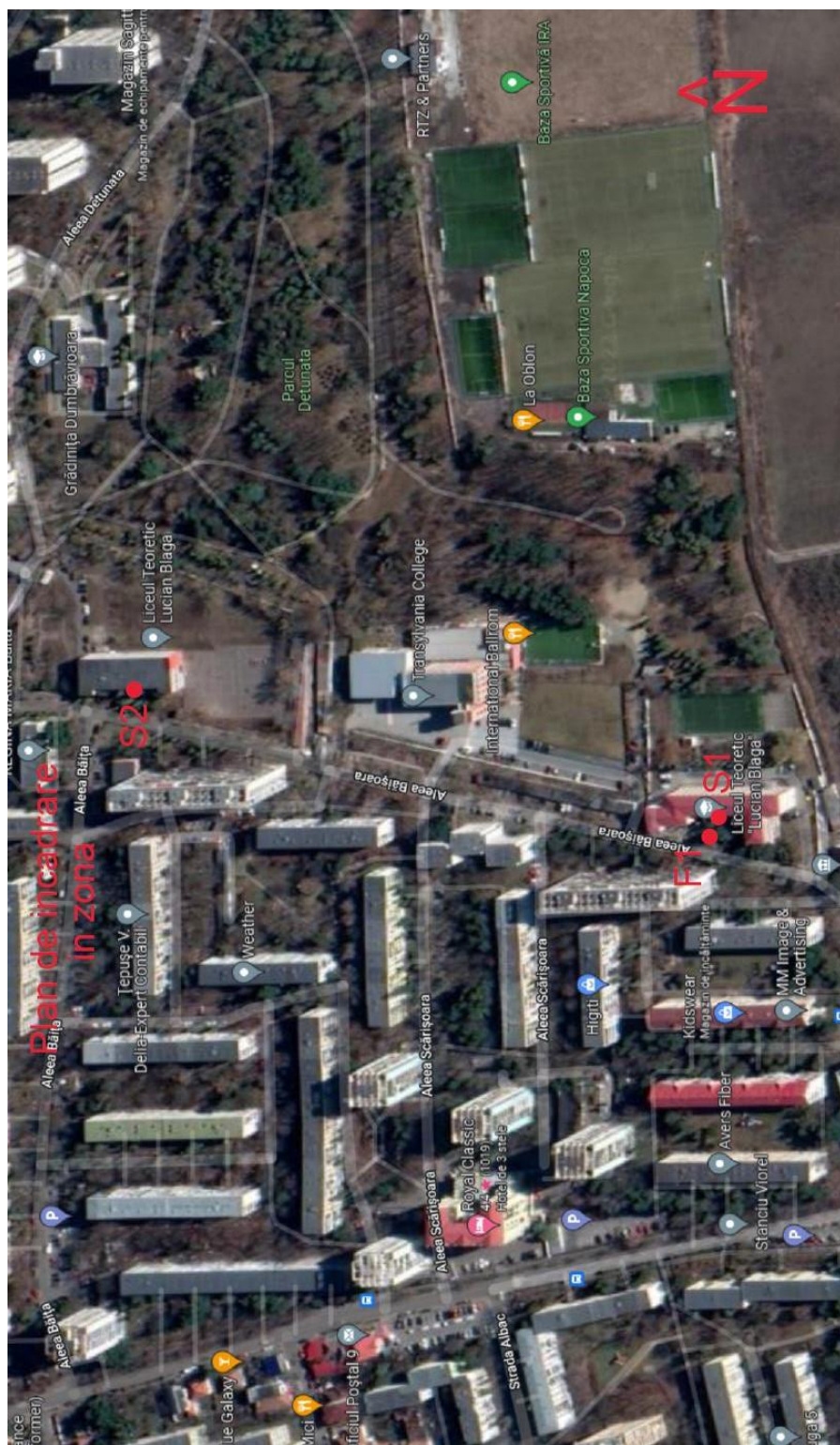


S.C. Soil Testing SRL Cluj Napoca Str. Donath no. 114 Phone 0758655552  
Fax 0264-307205 / Laboratory Str. Donath no. 114

- Foundation made of concrete with a depth of 1.10 m and a width of 0.50 m;
- The foundation soil is made of sandy clay.







**Testing report no. 313 / 28.02.2022****Beneficiary: THEORETICAL HIGH SCHOOL "LUCIAN BLAGA" CLUJ-NAPOCA****Location: Str. Alea Baisoara, no. 2 si no. 4, Cluj - Napoca, Cluj County Drilling: F1****Depth: 1.70 m Sample number: P1****Order no.: 119****Name of the sample (according to SR EN 14 688-2:2005): Sandy clay, silty plastic Date of sampling: February 22, 2022****Date of receipt of samples: February 22, 2022****Testing period: February 23, 2022 – February 24, 2022 Test taker: S.C. SOIL TESTING S.R.L.**

N o.	Analysis name	Determined value	STAS	Procedure
1.	Natural humidity W (%)	25.45	1913/1-82	P.S.-FMP-15
2.	Apparent volumetric weight $\gamma$ (kN/m <sup>3</sup> )	18.89	1913/3-76	P.S.-FMP-22
3.	Absolute specific weight $\gamma_s$ (kN/m <sup>3</sup> )	26.68	1913/2-76	P.S.-FMP-21
4.	Granularity % - clay $d < 0.002$ mm - dust $0.002 < d < 0.0063$ mm - sand $0.0063 < d < 2$ mm - gravel $2 < d < 63$ mm - degree of non-uniformity $U_n = d_{60}/d_{10}$	45.11 24.75 29.10 1.04 -	1913/5-85	P.S.-FMP-16
5.	Plasticity - plasticity index $I_p$ - consistency index $I_c$ - lower limit of plasticity $W_p$ % - upper limit of plasticity $W_L$ % - liquidity index $I_L$	26.47 0.99 25.16 51.62 0.01	1913/4-86	P.S.-FMP-23
6.	Free swelling $U_L$ %	90	1913/12-88	P.S.-FMP-26
7.	Humus content (%)	-	7107/1-76	
8.	Dry volumetric weight $\gamma_d$ (kN/m <sup>3</sup> )	15.06	1913/3-76	P.S.-FMP28
9.	Porosity $n$ (%)	43	1913/3-76	P.S.-FMP28
10.	The pore index is	0.77	1913/3-76	P.S.-FMP28
11.	Degree of humidity $S_r$ (%)	0.88	1913/1-82	P.S.-FMP28
12.	Friction angle $\phi$ (degrees)	15	NP 122:2010	Table A.6.2
13.	Cohesion $c$ (kPa)	35	NP 122:2010	Table A.6.2

Profile test Director  
Eng. Geolog Stefan

Eng. Ali Ghbech

## Testing report no. 314 / 28.02.2022

Beneficiary: THEORETICAL HIGH SCHOOL "LUCIAN BLAGA" CLUJ-NAPOCA

Location: Str. Aleea Baisoara, no. 2 si no. 4, Cluj - Napoca, Cluj County Drilling: F1

Depth: 3.30 m Sample number: P2

Order no.: 119

Name of the sample (according to SR EN 14 688-2:2005): Sandy clay, silty plastic Date of sampling: February 22, 2022

Date of receipt of samples: February 22, 2022

Testing period: February 23, 2022 – February 24, 2022 Test taker: S.C. SOIL TESTING S.R.L.

N o.	Analysis name	Determined value	STAS	Procedure
1.	Natural humidity W (%)	25.39	1913/1-82	P.S.-FMP-15
2.	Apparent volumetric weight $\gamma$ (kN/m <sup>3</sup> )	19.07	1913/3-76	P.S.-FMP-22
3.	Absolute specific weight $\gamma_s$ (kN/m <sup>3</sup> )	26.68	1913/2-76	P.S.-FMP-21
4.	Granularity %		1913/5-85	P.S.-FMP-16
	- clay $d < 0.002$ mm	27.99		
	- dust $0.002 < d < 0.0063$ mm	29.37		
	- sand $0.0063 < d < 2$ mm	42.63		
	- gravel $2 < d < 63$ mm	0.00		
	- degree of non-uniformity $U_n = d_{60}/d_{10}$	-		
5.	Plasticity		1913/4-86	P.S.-FMP-23
	- plasticity index $I_p$	19.69		
	- consistency index $I_c$	0.97		
	- lower limit of plasticity $W_p$ %	24.85		
	- upper limit of plasticity $W_L$ %	44.54		
	- liquidity index $I_L$	0.03		
6.	Free swelling $U_L$ %	90	1913/12-88	P.S.-FMP-26
7.	Humus content (%)	-	7107/1-76	
8.	Dry volumetric weight $\gamma_d$ (kN/m <sup>3</sup> )	15.21	1913/3-76	P.S.-FMP28
9.	Porosity $n$ (%)	43	1913/3-76	P.S.-FMP28
10.	The pore index is	0.75	1913/3-76	P.S.-FMP28
11.	Degree of humidity $S_r$ (%)	0.90	1913/1-82	P.S.-FMP28
12.	Friction angle $\phi$ (degrees)	19	NP 122:2010	Table A.6.2
13.	Cohesion $c$ (kPa)	16	NP 122:2010	Table A.6.2

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