The Geo-Institute

of the American Society of Civil Engineers

Presents

The Competition Rules for the 12th *Annual* National

GeoPREDICTION at

2021 Geo-Congress Dallas, TX

Important Dates

GeoPrediction Reports Due……February 25, 2021 5:00PM EST

Invitation to GeoPrediction Finale……. March 19, 2021

2021 Geo-Congress……..……..……May 10-14, 2021

Geo-Congress 2021 Information……..……..……http://ifceexpo.com/

GeoPrediction Presentations Due……May 3, 2021

12th Annual National GeoPrediction Rules – 2021 Geo-Congress

1. Objective: The objective of the GeoPrediction competition is to develop an accurate prediction of geotechnical behavior given information regarding subsurface, boundary, and initial conditions, as well as the geotechnical/ structural/hydraulic loading. The GeoPrediction competition may involve using available geotechnical software, empirical correlations, or developing a simple but accurate computer code for making this prediction.

For the 2021 GeoPrediction, the competing teams will develop the estimated settlement of a building due to nearby dewatering activities. This is a virtual competition. Teams invited to present will pre-record their presentation. Presentations will be uploaded to YouTube for viewing by conference attendees.

2. Geotech data: Input data for the problem including problem description, boring logs, and test data are found on the following sheets.

3. Eligibility: A GeoPrediction team will consist of one or two students. Each team MUST include at least one undergraduate student. Graduate students can not submit a prediction without mentoring an undergraduate student. However, a team may consist of one or two undergraduate students. Students must be enrolled during the Spring 2021 Semester or Quarter. Up to two teams per school may compete.

4. Submittal: Each GeoPrediction team will submit a GeoPrediction Report that will, at a minimum, contain the following information.

a. The Report shall be no more than three (3) pages long (not including any references and title page). One inch margins, single spacing, and 12 point Time New Roman font are required.
b. Include the provided Table 5 (completed) in your report.
c. Include the cross section provided with your estimated failure surface location.
d. The Report shall contain the methods (assumptions, correlations, analytical procedures, numerical procedures, computers software, etc.) that the team employed to develop the GeoPrediction. Methods must be referenced properly.
e. The cover page must include the name of the institution; names, email addresses, and status (i.e., graduate or undergraduate) of each team member; as well as the name and contact information of the faculty that advised the team in developing their prediction.
f. Submit your report electronically in PDF format to Dr. Matthew Sleep (matthew.sleep@uky.edu) by 5pm Eastern Standard Time on February 25, 2021 with the subject line "2021 Geo-Congress GeoPrediction

Submittal – *School Name*". Sender will receive confirmation of receipt by email. Late submissions are not accepted. If you do not receive a confirmation email within 24 hours of submission, please re-send the information.

5. Judging: The submitted GeoPrediciton reports will be judged and ranked by an anonymous panel of geotechnical faculty and engineers. Initial judging will be based on criterial (a) through (d) below.

a.	Format, length, grammar, English usage	15%
b.	Clarity of technical presentation	15%
c.	Logical and concise use of appropriate geotechnical methods and principles	20%
d.	Accuracy of GeoPrediction	20%
e.	Presentation of results	30%

6. Selection: The winning team will receive the prestigious Mohr's Circle Award. Up to fifteen (15) teams may be invited to submit a GeoPrediction Presentation based on the ranking of their GeoPrediction reports. The selected teams will be notified by March 19, 2021. The top teams (based total score of items a-d listed in section #5) will receive complementary student registration for up to two team members.

7. Presentations: Teams invited to present their GeoPrediction Results will prepare a 10-minute (maximum) presentation that describes their methods and GeoPrediction for viewing by judges and the public. Teams invited to present will be given a link to a Google Drive to upload their video by 5PM EST on May 3, 2021. These videos will be uploaded to YouTube for viewing by conference attendees.

As noted in Item 5, the Presentation will constitute the final 30% of each invited team's final GeoPrediction score.

8. Questions: Questions should be emailed to Matthew Sleep (matthew.sleep@uky.edu). It is anticipated that these questions will be uploaded for all to review at the GeoWorld Website (TBD)

Project Description

Existing Conditions

An existing six-story building (existing building 1) is located at a site shown in Figure 1. This building is founded on a mat foundation. Construction of this building proceeded as follows:

1. First, approximately 5 feet of gravely fill was placed at the site extending significantly in all directions from the building footprint.
2. An approximately 10-foot excavation was made for the building.
3. The mat foundation and building was constructed.
4. The bearing pressure from the building at the mat foundation is approximately 1520 psf.
5. Settlement was measured over several decades at the edge of the building (shown in Figure 1).
6. At end of primary consolidation, 29.5 inches of settlement had occurred.
7. The current elevation of the mat foundation of the building is 228.0 feet.

New Construction

A new building (many years after the construction of the existing building) is constructed adjacent to the existing building (Figure 1). The sequence of construction is as follows:

1. Borings B1, B2 and B3 were completed. Soil tests were completed on samples and are presented in Tables 2, 3 and 4.
2. A stable groundwater table was observed in borings B1, B2 and B3.
3. Excavation for the building began. Groundwater pumping (at the location shown in Figure 1) was started as the excavation progressed. It took 59 days for the excavation to reach the final level of the new building foundation at 220.0 feet.
4. For a period of time, the pumping lowered the groundwater table at the excavation a few feet below the excavation as shown in Table 4 and Figure 5.
5. The existing building was monitored for settlement as excavation and groundwater pumping took place.
6. At day ‘0’ shown in Table 4, the existing building had already settled 29.5 inches and end of primary settlement had occurred.

Your task is to estimate how much settlement occurred at the measurement location in Figure 1 after 150 and 285 days of groundwater pumping at the adjacent site. Three borings are provided for your reference along with laboratory testing. High precision instruments placed along the excavation wall and between the excavation and building showed that vertical settlement of the existing building was not influenced by excavation activities and only resulted from a lowering of the water table.

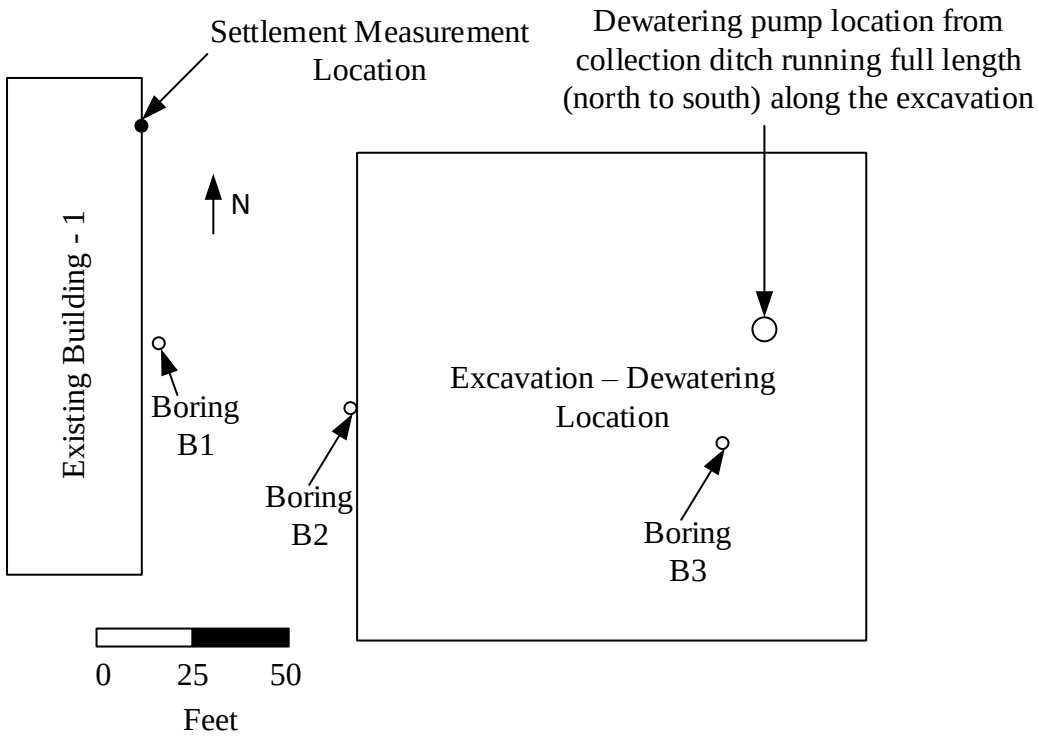

Figure 1. Site overview

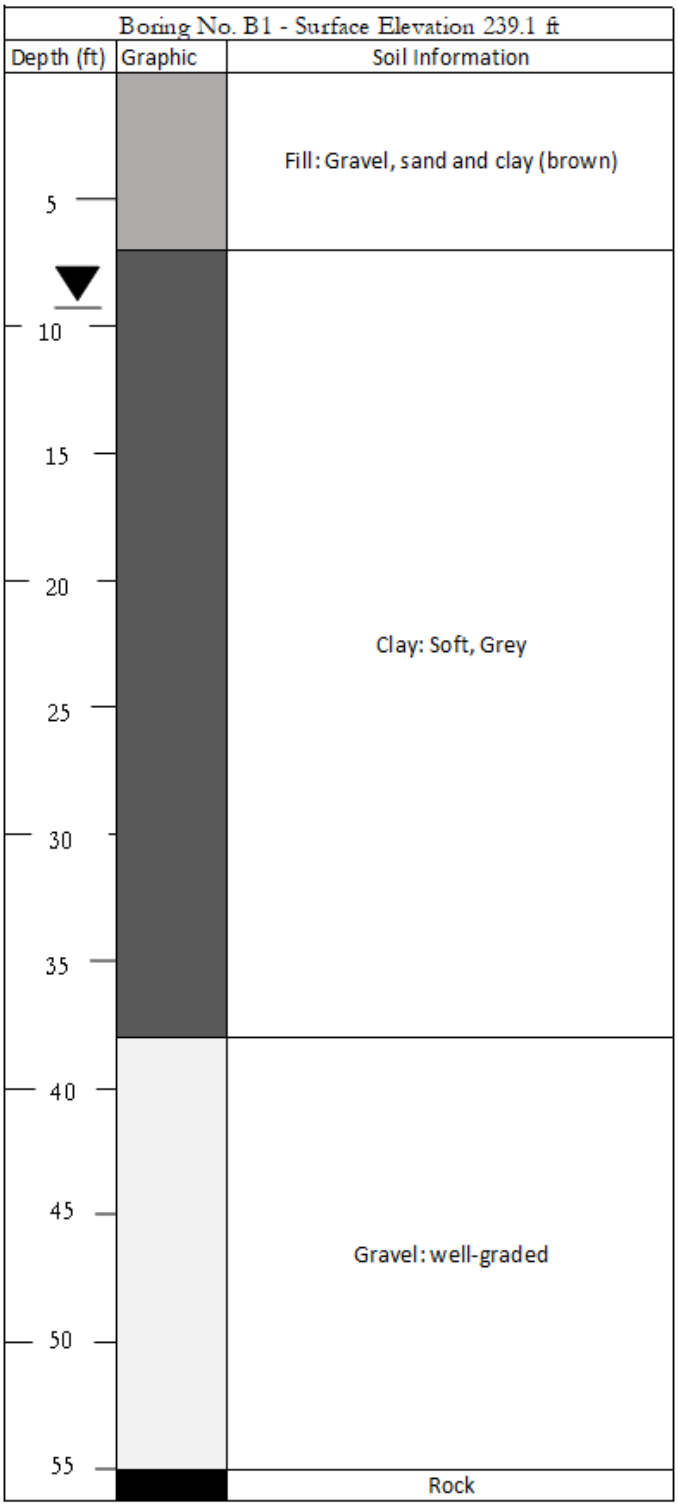

Figure 2. Boring B-1 (note surface elevation and groundwater table elevation(prior to pumping))

Figure 3. Boring B-2 (note surface elevation and groundwater table elevation(prior to pumping))

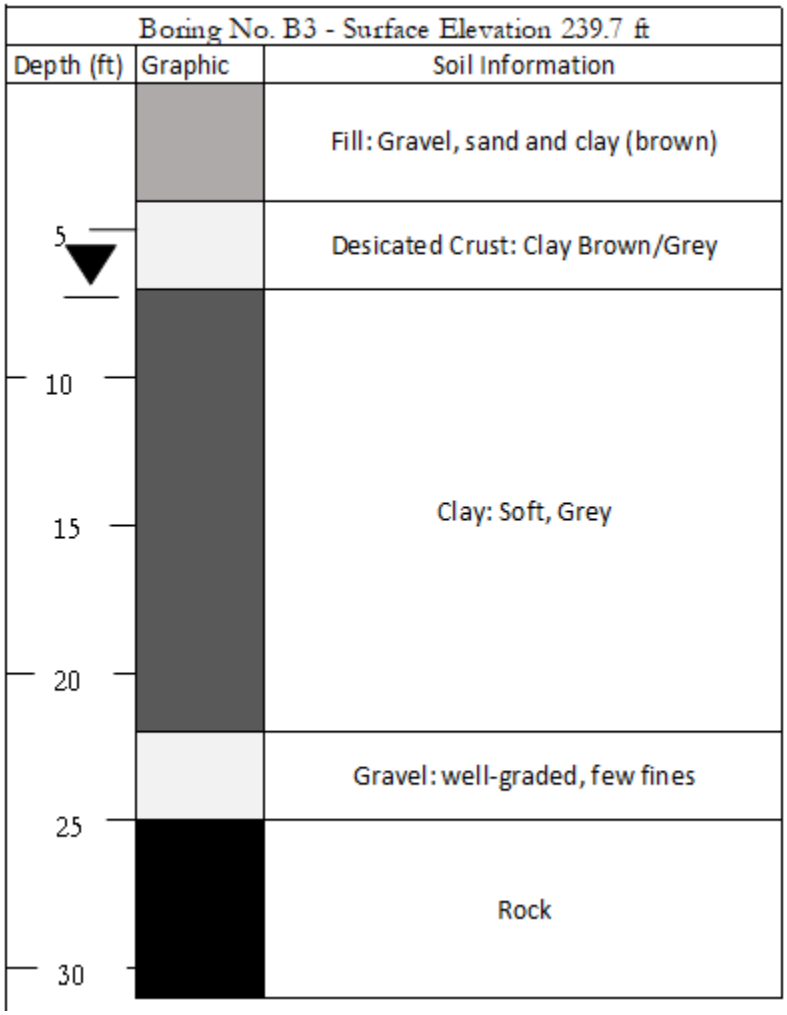

Figure 4. Boring B-3 (note surface elevation and groundwater table elevation (prior to pumping))

Table 1. Laboratory testing of samples from Boring B-1

Sample Depth (ft)	In Situ w(%)	Plastic Limit	Liquid Limit
10	32	22	40
15	41	28	40
20	39	23	41
25	37	21	38
35	38	21	38

Table 2. Shear strength testing of samples from Boring B-1

Sample Depth (ft)	Undrained Shear Strength (psf)
10	870
13	676
16	430
28	287

Table 3. Permeability testing of samples from Boring B-1

Sample Depth (ft)	Permeability (cm/sec) $*10^{-8}$
10	1
20	5.8
35	3.2

Table 4. Dewatering activities occurring at the excavation (location of pumping in Figure 1)

Start of Excavation, groundwater pumping (days)	Water Pumping Elevation (ft)
0	231.8
59	219.7
87	219.7
115	213.1
227	213.1
235	219.7
408	219.7

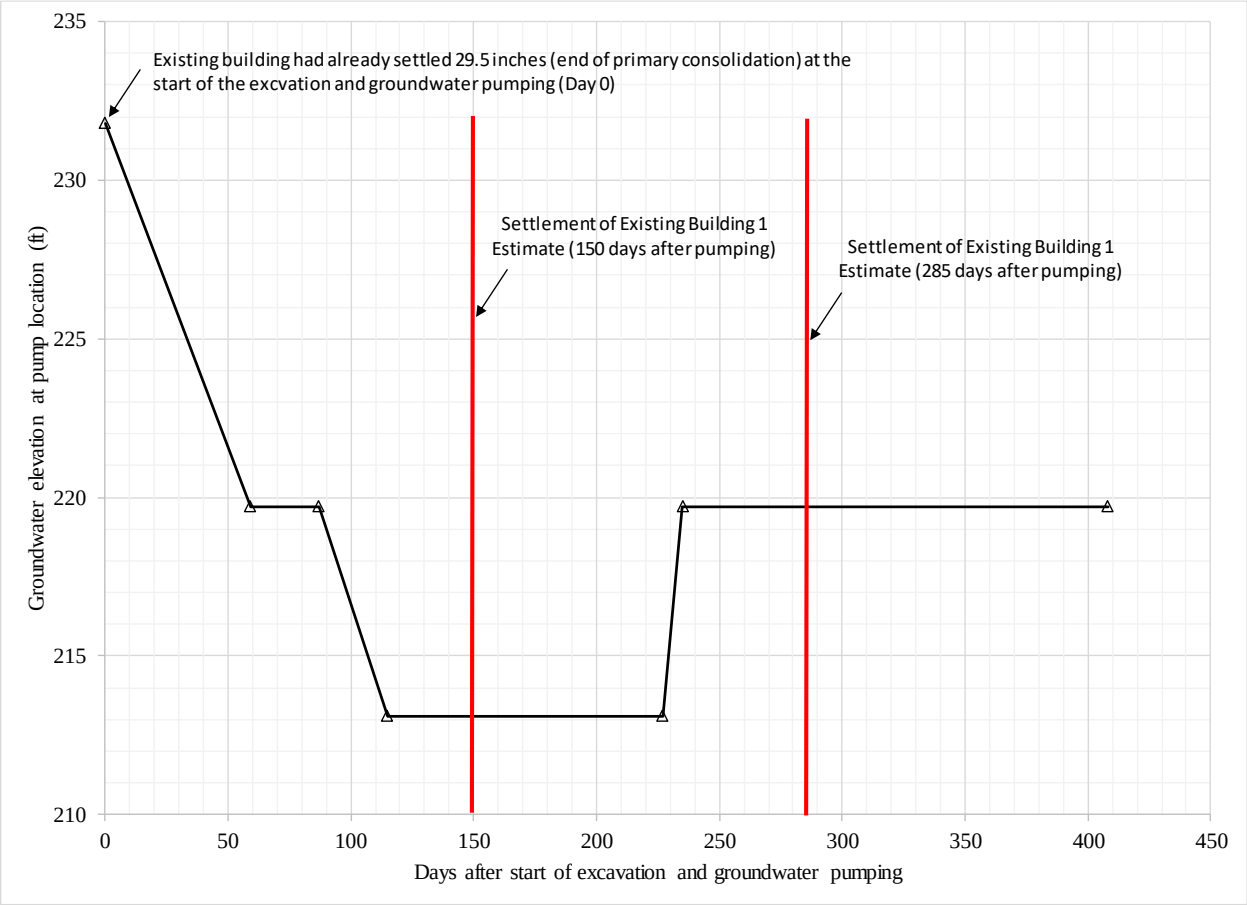

Figure 5. Dewatering timeline at the start of excavation for the new building

Table 5. Table to be completed for your design report

Days after start of excavation, groundwater pumping and existing building 1 settlement Monitoring (days)	Settlement Prediction (in)
150	
285	