LANDSLIDE ASSESSMENT AND STABILIZATION STUDY ALONG THE TARSUS – POZANTI MOTORWAY KM: 21+200 – 21+730 SECTION (TEKİR REGION)

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ECEM CANSU ASAN

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
GEOLOGICAL ENGINEERING

DECEMBER 2019

Approval of the thesis:

LANDSLIDE ASSESSMENT AND STABILIZATION STUDY ALONG THE TARSUS – POZANTI MOTORWAY KM: 21+200 – 21+730 SECTION (TEKİR REGION)

submitted by **ECEM CANSU ASAN** in partial fulfillment of the requirements for the degree of **Master of Science in Geological Engineering Department, Middle East Technical University** by,

Prof. Dr. Halil Kalıpçılar
Dean, Graduate School of **Natural and Applied Sciences** _____

Prof. Dr. Erdin Bozkurt
Head of Department, **Geological Engineering** _____

Prof. Dr. Haluk Akgün
Supervisor, **Geological Engineering, METU** _____

Examining Committee Members:

Prof. Dr. Erdal Çokça
Civil Engineering, METU _____

Prof. Dr. Haluk Akgün
Geological Engineering, METU _____

Prof. Dr. Candan Gökçeoğlu
Geological Engineering, Hacettepe University _____

Assoc. Prof. Dr. Hakan Ahmet Nefeslioğlu
Geological Engineering, Hacettepe University _____

Assoc. Prof. Dr. Mustafa Kerem Koçkar
Civil Engineering, Hacettepe University _____

Date: 04.12.2019

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Surname: Ecem Cansu Asan

Signature:

ABSTRACT

LANDSLIDE ASSESSMENT AND STABILIZATION STUDY ALONG THE TARSUS – POZANTI MOTORWAY KM: 21+200 – 21+730 SECTION (TEKİR REGION)

Asan, Ecem Cansu
Master of Science, Geological Engineering
Supervisor: Prof. Dr. Haluk Akgün

December 2019, 255 pages

A mass movement occurred along Km 21+200 – 21+730 (Tekir Region) of the Tarsus – Pozantı Motorway and vicinity especially due to the geomechanical properties of the units, and surface and groundwater effects. The purposes of this thesis study are to describe the geological-geotechnical characteristics of the landslide, to determine the geometry of the sliding mass and shear strength parameters, and to recommend an appropriate remediation method to provide stability.

For fulfilling these purposes, in-situ site investigations (boreholes, inclinometer measurements, etc.) and laboratory tests were performed on the units of the Çukurbağ Formation (conglomerate, sandstone, siltstone and claystone), which forms the bedrock of the study area.

In the light of the results of these investigations and test results, the shear strength parameters of the sliding mass were estimated at critical sections of the model by using the back analysis method. Furthermore, by applying limit equilibrium methods, slope stability analysis were performed for the static and dynamic (seismic) conditions. As a result of these studies, the most proper stabilization method (i.e., ground water level reduction, rock buttress application and relocation of the existing river) were deemed

necessary the long term stability of the landslide. Four alternatives of rock buttress design were suggested.

In addition, the slope stability analysis of the four alternatives of remediation design by using limit equilibrium were compared with respect to the cost of the construction through evaluating the results.

Keywords: Landslide, Inclinometer, Back analysis, Slope stability, Limit equilibrium analysis, Remediation

ÖZ

POZANTI – TARSUS OTOYOLU KM: 21+200 – 21+730 (TEKİR MEVKİİ) ARALIĞINDAKİ HEYELANIN DEĞERLENDİRİLMESİ VE ÖNLEME ÇALIŞMASI

Asan, Ecem Cansu
Yüksek Lisans, Jeoloji Mühendisliği
Tez Danışmanı: Prof. Dr. Haluk Akgün

Aralık 2019, 255 sayfa

Bu araştırma kapsamında Adana İlinin Pozantı İlçesi'ne bağlı Tekir Kasabası içerisinden geçmekte olan Tarsus – Pozantı Otoyolu Km: 21+200 – 21+730 kesiminde mevcut yol kesitinde ve çevresinde, birimlerin jeomekanik özelliklerine, yüzey ve yeraltı suyu etkilerine bağlı olarak bir kütle hareketinin meydana geldiği arazi gözlemlerinde tespit edilmiştir. Bu heyelana ilişkin jeolojik-jeoteknik değerlendirmeler, hareket eden kütlenin geometrisi, kayma parametreleri ve hareketi durdurmaya yönelik uygun iyileştirme önerileri belirlenecektir.

Bu bağlamda, temel kayası olarak belirlenen Çukurbağ Formasyonuna ait kumtaşı, çakıltaşı, silttaşı ve kiltaşı birimlerinin egemen olduğu bu alanda yerinde-saha (in-situ) çalışmaları (sondajlar, inklinometre ölçümleri, vb.) ve bu çalışmalardan elde edilen örnekler üzerinde gerekli laboratuvar deneyleri gerçekleştirilmiştir.

Çalışma alanından alınan farklı kritik kesitler üzerinde gerçekleştirilen geriye dönük analizler ile hareket eden kütlenin kesme dayanımı (shear strength) parametreleri belirlenerek limit denge yöntemi ile heyelanın statik ve dinamik (deprem) durum analizleri yapılmıştır. Yapılan çalışmalar sonucunda en uygun kazı ve iyileştirme (topuk destekleme, suyun drenajı, mevcut derenin relokasyonu, vb.) önerileri belirlenmiştir. Çalışma kapsamında dört farklı topuk destek tasarımı önerilmiştir.

Ek olarak heyelan için topuk destek tasarımlarının limit denge yöntemi ile çözümlerine ait sonuçlar, yapım maliyetleri bağlamında kıyaslanmış ve değerlendirilmiştir.

Anahtar Kelimeler: Heyelan, İnklinometre, Geriye dönük çözümleme, Şev duraylılığı, Limit denge çözümleri, İyileştirme

To my family…

ACKNOWLEDGEMENTS

First of all, I would like to thank Prof. Dr. Haluk Akgün, P.E. for providing me the opportunity of taking part in Master of Science program. I am deeply grateful for his help, professionalism, and valuable guidance throughout this thesis. I do not have enough words to express my deep and sincere appreciation.

In the name of TEMELSU International Engineering Services Inc., I would like to thank Kadir Yertutanol for sharing his vast experience and his guidance at every stage of my thesis and my engineering career. I am gratefully indebted to him for his very valuable comments on this thesis. I also appreciate the technical support of Batuhan Soyugür, Mustafa Erkan Çağlar, Gaye Damla Oral, H. Berkay Oral, Orçun Yalçınkaya, Ece Dilan Asma, Gökhan Nalçak, and Murat Topbaş.

I would like to thank Yüksel Proje International A.Ş. and Ali Bayram for providing data and help for my study.

In addition, I appreciate the support of METU research assistants Arzu Arslan Kelam and Meryem Dilan İnce. I also appreciate Deniz Maktav, Esra Kaderli, Özge Tuncer, Başak Tezgör, Göksun Güven and Burak Tuncal for their precious time.

Finally, I must express my very profound gratitude to my family and my sister from another mother Deniz Yıldız for their endless support and continuous encouragement throughout the process of researching and writing this thesis. This accomplishment would not have been possible without them.

TABLE OF CONTENTS

LIST OF TABLES

TABLES

LIST OF FIGURES

FIGURES

CHAPTER 1

INTRODUCTION

1.1. Purpose and Scope

Stability problems were determined along the Km 21+200 – 21+730 section (Tekir Region) of the Tarsus – Pozantı Motorway and vicinity especially due to the traffic load imposed by heavy tonnage vehicles along with the contribution of factors such as topographic – atmospheric conditions and the adverse geomechanical properties of the geologic units along the highway area. To describe the geological and geotechnical characteristics of the landslide, to determine the geometry of the sliding mass, the shear strength parameters and the groundwater level, and to recommend an appropriate remediation method(s) to stabilize the landslide, in-situ site investigations were performed. A total of 31 boreholes were drilled in the landslide area of which 12 of them included inclinometer measurements. Laboratory geotechnical tests were performed on the units of the Çukurbağ Formation (conglomerate, sandstone, siltstone and claystone), which forms the bedrock of the study area.

In this thesis study, all of the results obtained have been evaluated and the shear strength parameters of the sliding mass were estimated as based on the critical sections of the model by using the back analysis method. Slope stability analyses have been performed by applying limit equilibrium methods for the static and pseudo-static (dynamic) conditions. Finally, these analyses have been compared and the results have been evaluated.

1.2. Location of the Study Area

The project is located in the Akçatekir district of the Pozantı Town of Adana. The location of the study area is given in Figure 1.1.

Figure 1.1. Location of the study area (Google Earth view)

1.3. Climatic Conditions

The project site contains the Bolkar Mountains and Aladağlar, that start within the borders of the Pozantı district and is located in the transition area of the Mediterranean and Central Anatolian terrestrial temperature regimes. Because of the coastal zone around this mountainous mass, the average temperature during winter does not fall below 10°C. However, in the winter season due to the increase in elevation, the temperature drops to around 5°C. In the summer, the temperature varies between 25-30°C. The average annual temperature of Pozantı is 14.0°C. The hottest month of Pozantı is July with an average temperature of 24.6°C, while the coldest month is January with an average temperature of 3.7°C (Öcal, 2015).

Considering the precipitation characteristics of the Pozantı district, it is observed that the region is in a transition area. The characteristics of the Mediterranean precipitation regime are observed in the coastal regions, while the semi-terrestrial precipitation regime is effective in the inland areas. In the Mediterranean precipitation regime, the wettest months are December and January which implies that the rainiest season is

winter. The summer season is the period with the least rainfall. During the winter, low pressure systems on the Eastern Mediterranean Sea affect the slopes of the Taurus Mountains and plenty of precipitation falls in the area. In addition, the subtropical high pressure conditions affect in the region during the summer and lead to a decrease in the precipitation. Figures 1.2 and 1.3 present the mean annual temperature and mean annual precititation in Pozantı for 2019. The mean annual precipitation of Pozantı for 2019 is 686.0 mm as presented in Figure 1.3.

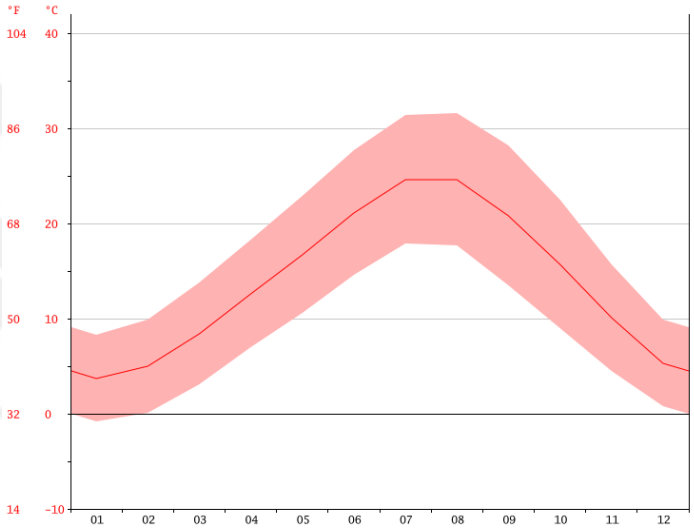


Figure 1.2. Mean temperature values of the Pozantı District (Climate Data, 2019)

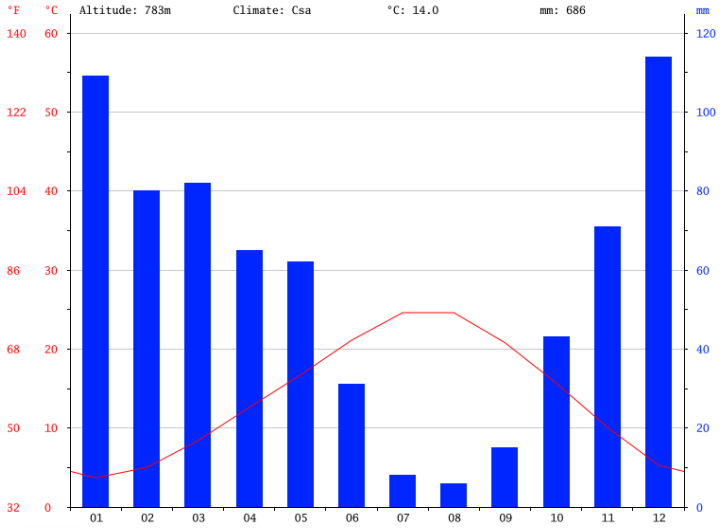


Figure 1.3. Mean precipitation values of the Pozantı District (Climate Data, 2019)

CHAPTER 2

GEOLOGY OF THE STUDY AREA

2.1. Local Geology and Stratigraphy

The study area and its vicinity are located to the east of the Ecemiş Fault Zone, which defines the boundary between Eastern and Central Taurides. At the western part of the Ecemiş Fault Zone, the Bolkardağı Unit and the deposits of the Namrun Tectonic Slice (recrystallized limestone and dolomitic limestone of Upper Permian Karlıyığıntepe Formation) outcrop. At the eastern part of the zone, the deposits of the Aladağ Unit (limestone of the Jurassic-Cretaceous Çamlık Formation), Bozkır Unit (harzburgite, dunite, pyroxenite, gabbro, and diabase dyke metamorphics of the Upper Cretaceous Pozantı - Karsantı Ophiolite Nappe), and the units contained by the Ecemiş Fault Corridor Basin (conglomerate, sandstone, siltstone of the Oligocene – Lower Miocene Çukurbağ Formation and bituminous coal bearing marl, claystone, siltstone of the Lower Miocene Burç Formation) were observed.

The Carboniferous – Upper Cretaceous Bolkardağı Units, overlain by the units of the Carboniferous – Upper Cretaceous Namrun Tectonic Slice (Alan et al., 2004b) with a tectonically unconformable boundary, form the base of the project area. The deposits of the Upper Devonian – Upper Cretaceous Aladağ Unit are also tectonically overlying the units of the tectonic slice. Around the western Pozantı, Oligocene – Lower Miocene deposits are underlain by all of these units unconformably, along the corridor formed by Ecemiş Fault Zone. Figures 2.1, 2.2 and 2.3 present the tectonic relationship between the units at the study area, the regional geological map and stratigraphic section of the study area and the vicinity, respectively.

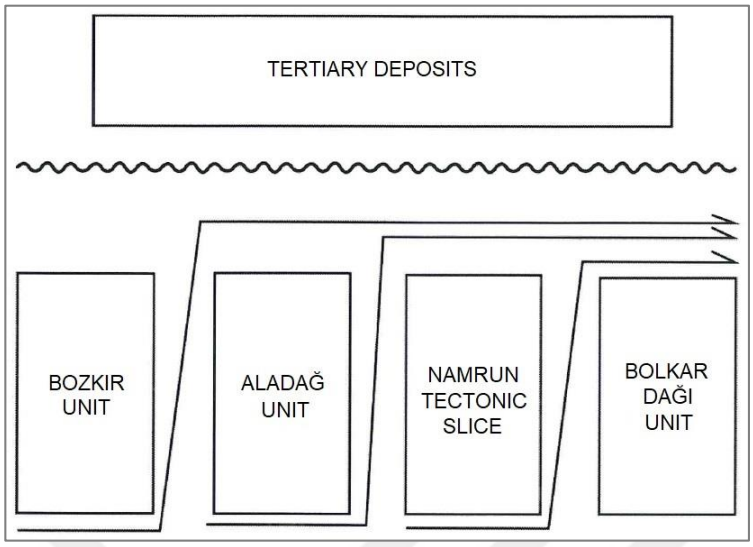


Figure 2.1. Diagram illustrating the tectonic relationship between the units, slice and tertiary deposits at the study area and the vicinity (Alan et al., 2011)

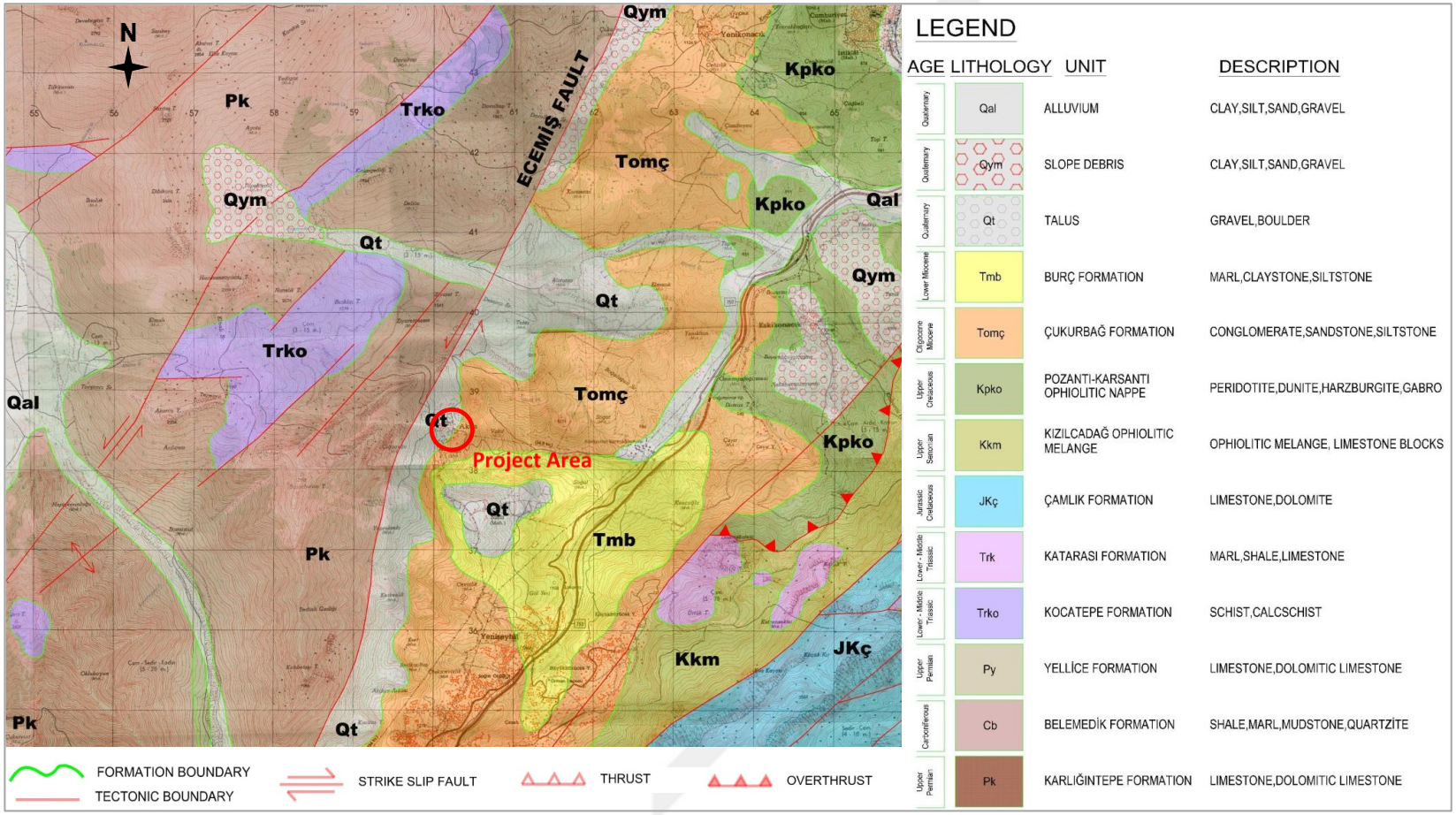


Figure 2.2. Geological map of the study area and the vicinity (Alan et al., 2011)

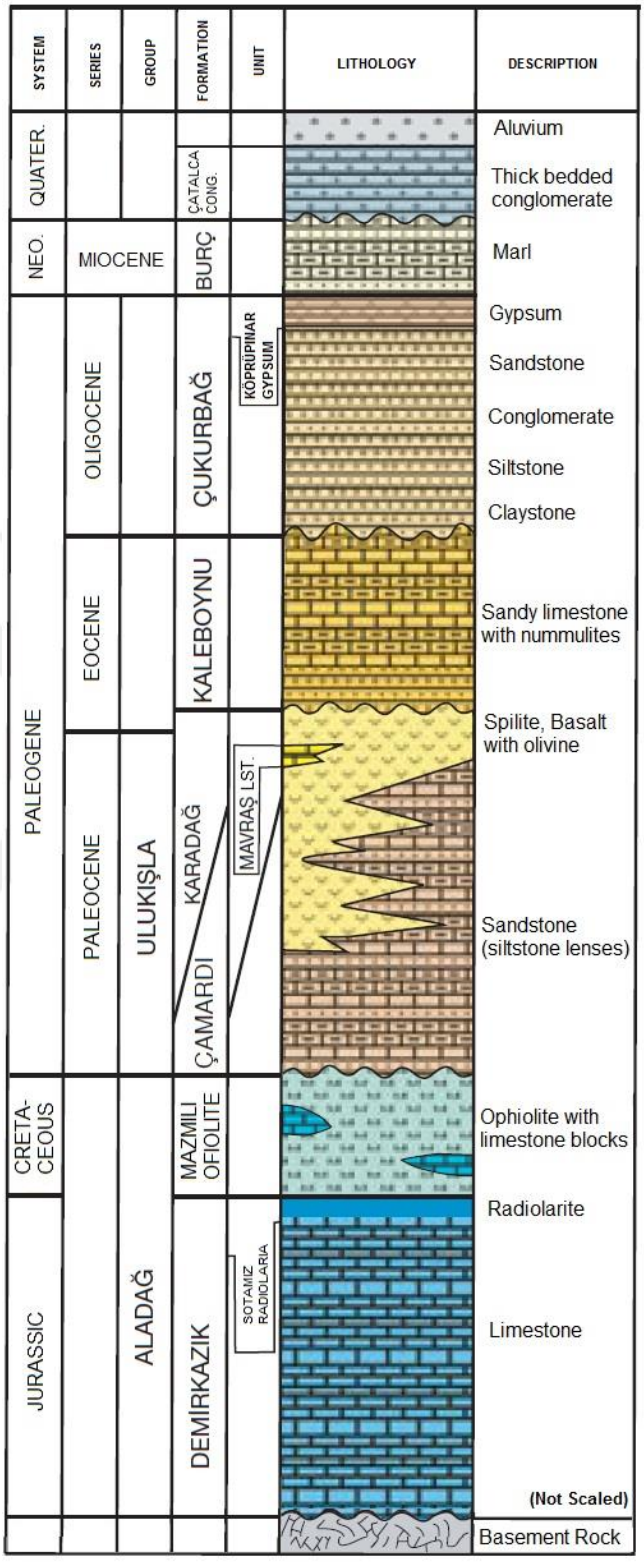


Figure 2.3. The stratigraphic section of the study area and the vicinity (simplified from Yetiş, 1978)

2.1.1. Geology of the Study Area

The Çukurbağ formation (Tomç) forms the base of the study area. Talus (Qym), that has been deposited because of the dislocation of the Ecemiş fault zone, was observed extensively on the top of Çukurbağ formation. Figure 2.4. shows the geological units observed at the vicinity of the study area.

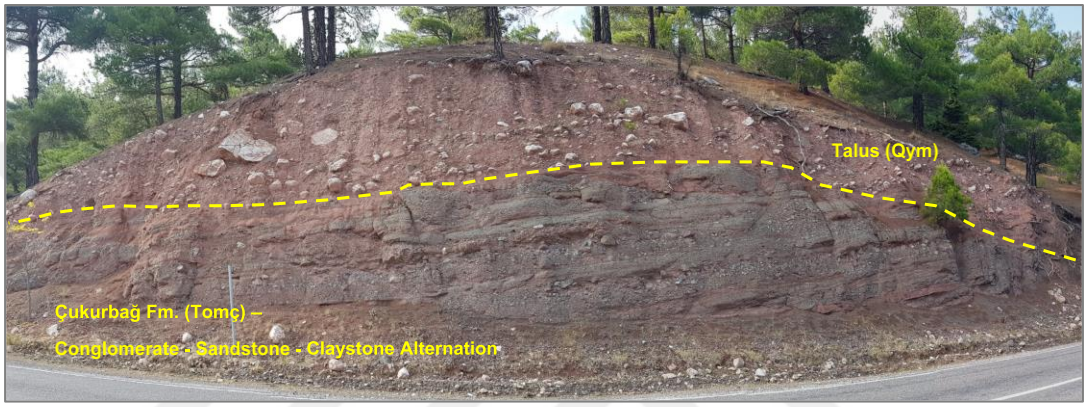


Figure 2.4. A view of the units observed in the project area

2.1.1.1. Çukurbağ formation (Tomç)

Yetiş (1978) named the sandstone, claystone and conglomeratic sandstone units, which fill the Ecemiş Corridor, as Çukurbağ formation. The typical cross-section of the Çukurbağ formation is around the Çukurbağ Village of the Çamardı district of the Niğde Province. The units are widely observed around the Pozantı district and the Tekir plateau.

The major units of the Çukurbağ formation are marl, claystone and conglomeratic sandstone. At the base of the unit, brown, green and dark red colored, medium-thick and cross-bedded, polygenic conglomerate and gravelly sandstone are observed. This section is overlain by green-gray colored, thin-medium bedded sandstone, siltstone and claystone units.

Çukurbağ formation overlies the geological units of the Bolkardağı unit, Aladağ unit, Namrun Tectonic Slice, Kızılcadağ Ophiolitic Melange and Olistostrome and Pozantı - Karsantı Ophiolite unconformably. The formation is transitional with the Early Miocene Burç formation.

The thickness of the Çukurbağ formation is estimated to be about 300-350 m. Since no paleontological evidence that could assign an age to the formation was available, the age of the formation was attempted to be determined stratigraphically. According to the stratigraphic position of the formation, the geological age of the Çukurbağ formation is attributed to the Oligocene – Early Miocene age (Alan et al., 2007). Considering the lithological characteristics, the Çukurbağ formation is indicated be deposited in a stream environment.

The unit could be correlated with the Aktoprak formation (Demirtaşlı et al., 1973), the lower levels of the Karsantı formation (Schmidt, 1961) and the Gildirli formation (Schmidt, 1961 as quoted by Alan et al., 2011).

2.1.1.2. Talus (Qym)

The unit, which is observed extensively on the slopes in front of the steep topographic elevations and faults, consists of poorly sorted, poorly graded, loosely cemented materials (MTA, 2011). The talus is mainly represented by gravelly and clayey levels. Gravels and boulders in some places mostly originate from limestone.

2.2. Tectonics and Structural Geology

The study area and its vicinity are located to the east of the Ecemiş Fault Zone. It defines the boundary between the Eastern and Central Taurides. The Ecemiş Fault Zone which is a right-lateral strike slip fault, cuts the Eastern Taurides and leads to the bordering of different types of rock in Central Anatolia where Upper Triassic, Paleozoic, Mesozoic and Cenozoic units are situated in the study area. The Paleozoic and Mesozoic Era are represented by Upper Paleozoic – Lower Mesozoic Karlıyığıntepe formation and Jurassic – Cretaceous Çamlık limestone, respectively,

and these units constitute the base rock of the area. The Upper Cretaceous Pozantı - Karsantı Ophiolite Nappe represents Mesozoic, which was settled by a tectonic drift.

During the Permian period, the study area was covered by a smooth sea (Paleo-tethys). Since the beginning of the Upper Triassic, the sea became shallower and more turbulent (i.e., due to the closure of the Paleo-tethys) and in this facies, the Paleozoic – Upper Cretaceous siliciclastic intercalated Taurus Carbonate Platform was deposited (Özgül, 1976; Yetiş, 1978; Demirtaşlı et al., 1984; Tekeli et al., 1984). During the Late Cretaceous, the Mesozoic Bolkar and Aladağ carbonate platforms were tectonically overlain by the ophiolitic rocks and the mélange (Yetiş, 1978; Yetiş and Demirkol, 1984; Lytwyn and Casey, 1995, Dilek et al., 1999 a,b; Dilek and Moores, 1990). The Cenozoic Era starts with the Çukurbağ formation, which contains terrestrial sediments of the river facies. The grains of the formation originated from the ophiolite at the base and from limestone towards the upper part of the formation (Jaffey and Robertson, 2005). The Çukurbağ formation is overlain by the Miocene Burç formation, which consists of lacustrine sediments that have originated from limestone in a very limited area.

2.3. Geomorphology

The Pozantı district is geologically located in the Southern Taurus which is formed in the Alpine Himalayan Orogenic Belt. The district is located on the valleys of the graben fields that have formed during the geological formations of the Bolkar mountains and Aladağlar and within the area, bounded by the Ecemiş and Akçatekir faults. The district borders are located on the Bolkar mountains. The boundaries of the district are separated from the border of Niğde with Karınca mountain (2.206 m) in the northwest, while separated with Medetsiz tepe (3.524 m), Aksivri tepe (2.856 m) and Akarca tepe (2.204 m) in the west, and Kesiktaş tepe (2.002 m) in the south from the Mersin Çamlıyayla borders.

The Bolkar mountains of the Middle Taurus lie in the southwest-northeast direction between Mersin and Ereğli, while the western ridges of the Pozantı district lie within

this mountain. The Ecemiş and Tekir grabens separate the Bolkar mountains and Aladağlar that are settled in the Çakıt valley and have caused development of the Pozantı and Akçatekir plateau settlements. The Körkün river flows within the Ecemiş graben on Aladağlar (Öcal, 2015).

2.4. Hydrogeology

The most efficient surface water resources around the project area are Çakıt and Körkün rivers. These two streams supply water to the Seyhan dam reservoir and their regimes are irregular. These streams, which have an increase in flow rate with the melting of snow in the spring, dry up in the summer. Within the scope of the research studies performed around the study area, springs were determined in some parts of the region.

The formations exposed in and around the study area retain groundwater depending on their lithological characteristics. At the same time, these units may allow groundwater circulation along the crack systems, joint sets and faults that they contain.

2.5. Seismicity

Previous of The Hazard Map of Turkey, which was prepared in 1996, was renovated by the AFAD Earthquake Research Department and was published in the Resmi Gazette on March 18, 2018. The new map was published on January 1, 2019. Figure 2.5 shows the project area on the renewed map.

The map is prepared according to the peak ground acceleration (PGA) values of Turkey for the different probabilities of exceedance levels by using probabilistic seismic hazard analysis methods. For this project the return period was selected as 475 years, since the peak ground acceleration that is expected to exceed 10% in 50 years is the standard design earthquake used as the ground motion level (TBDY, 2018). According to this map, the PGA value of the study area was established as 0.186 g.

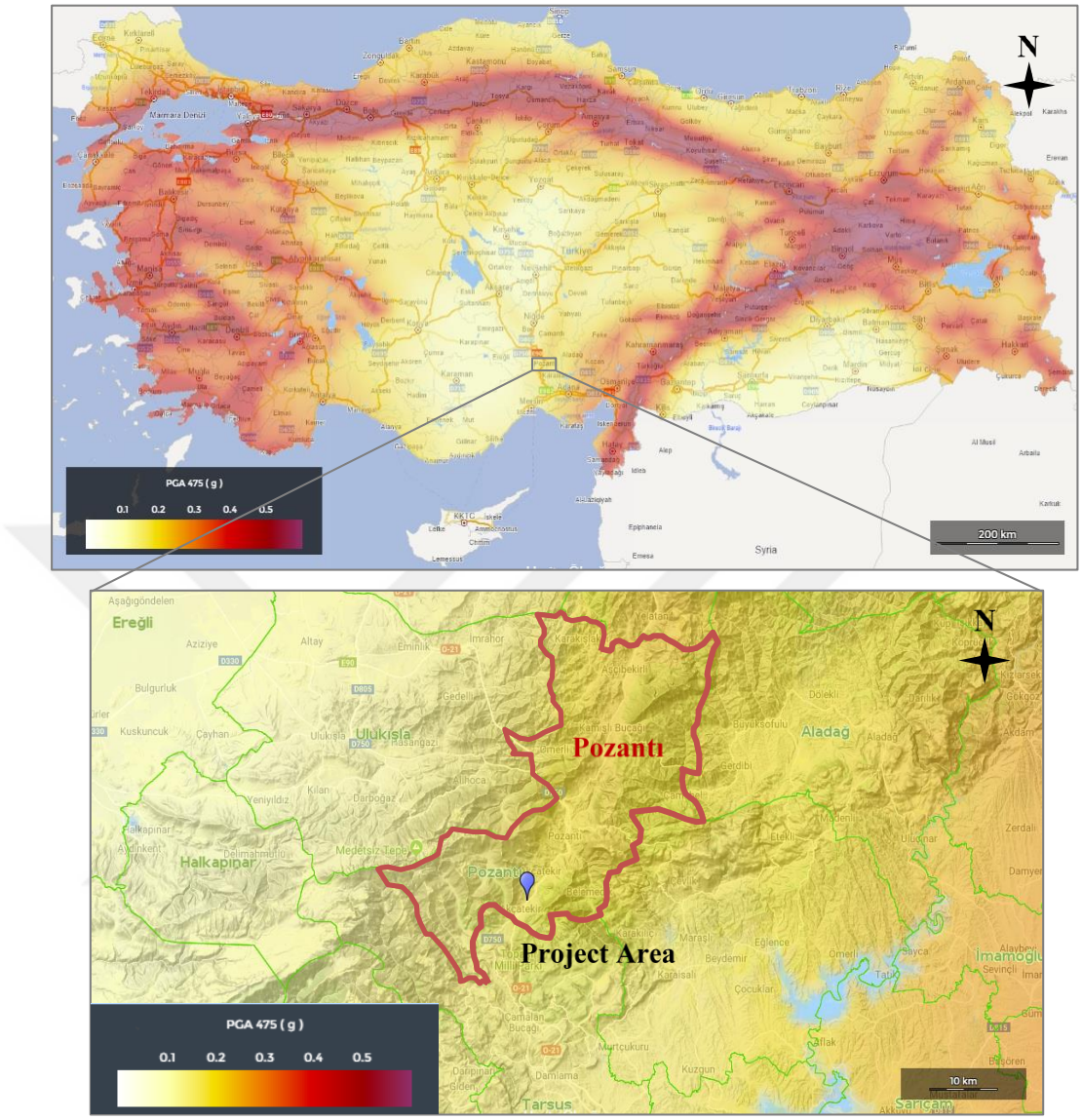


Figure 2.5. Seismicity of the study area and its vicinity (AFAD, 2018)

The Ecemiş Fault Zone is located as an active fault system in the vicinity of the project area. The Ecemiş Fault is a left lateral strike-slip fault, 600 km long and 3-20 km wide. This fault zone is separated from the right lateral strike-slip North Anatolian Fault Zone (KAFZ) near Refahiye. Figure 2.6 presents an Active Fault Map of the study area and its vicinity.

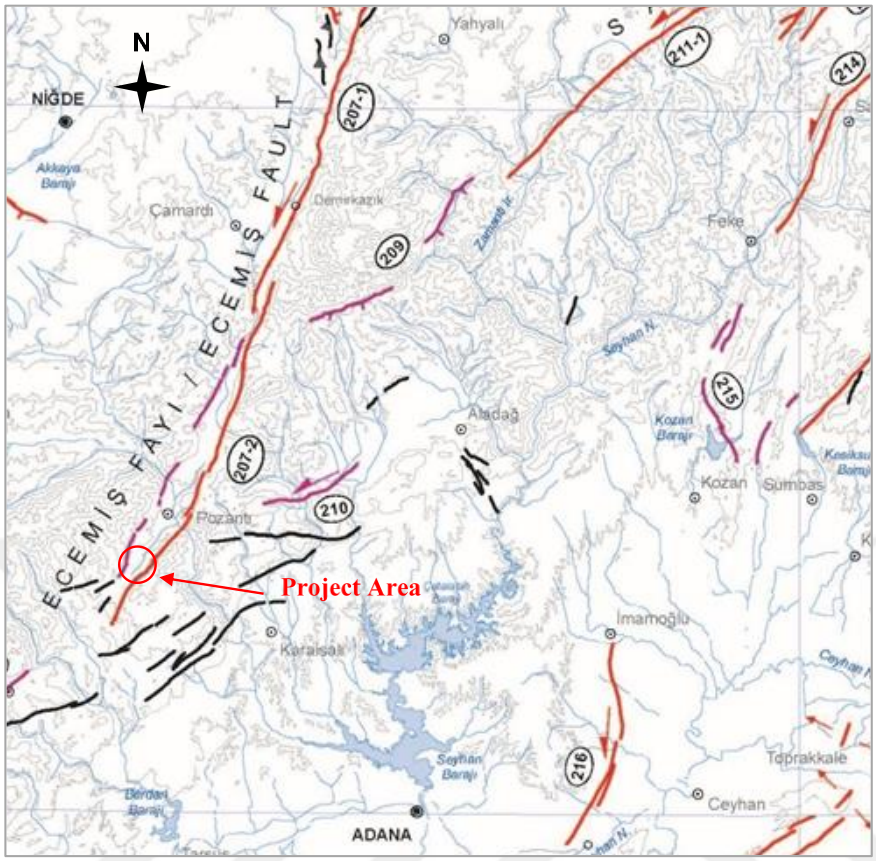


Figure 2.6. Active fault map of the Adana-Pozantı region (Emre et al., 2013)

For the study area, seismic data for earthquakes that have occurred in a 50 years' period with a magnitude of the range of 3.5 – 9.0 within a radius of 100 km of the project site were taken from the Earthquake Query System of Boğaziçi University, Kandilli Observatory and Earthquake Research Institute (KOERI), Regional Earthquake – Tsunami Monitoring and Evaluation Centre. The distributions of these earthquakes are shown in Figure 2.7. Table 2.1. presents a list of these earthquakes. According to the data from KOERI, a major earthquake occurred in Hasanbeyli - Sarıçam (Adana) at the date of 27.06.1998 with a magnitude of 6.3.

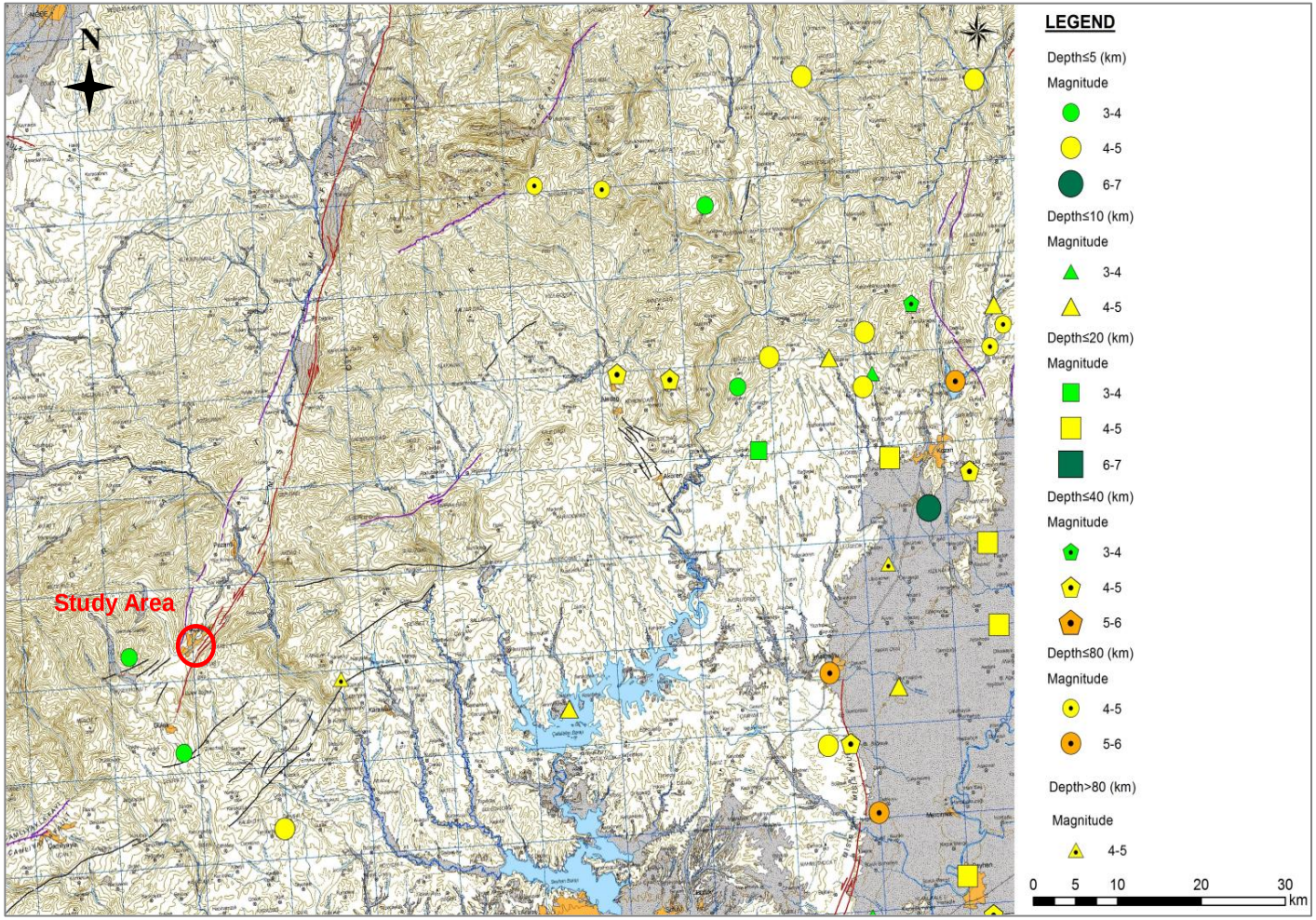


Figure 2.7. Earthquakes with a magnitude greater than 3.5 that have occurred in the study area and its vicinity (The earthquake data is obtained from KOERI (2019) and modified from Emre et al., 2013 on the ArcGIS software)

Table 2.1 *The list of earthquakes with a magnitude greater than 3.5 close to study area (KOERI, 2019)*

No	Date	Depth (km)	Magnitude	No	Date	Depth (km)	Magnitude	No	Date	Depth (km)	Magnitude
1	2019.04.12	15.1	3.5	69	2007.11.22	7.5	3.6	137	1999.02.12	31.0	3.9
2	2019.02.02	14.9	4.6	70	2007.09.25	6.8	3.6	138	1999.01.28	0.0	3.7
3	2019.01.04	1.5	3.6	71	2007.07.15	18.0	3.7	139	1999.01.15	18.0	4.5
4	2018.10.10	20.4	3.9	72	2007.07.01	17.7	3.7	140	1999.01.14	12.0	3.5
5	2018.10.10	13.1	3.7	73	2007.05.14	7.6	4.0	141	1998.12.13	1.0	4.0
6	2018.08.06	13.7	3.7	74	2007.05.06	22.5	3.8	142	1998.12.04	14.0	4.3
7	2017.08.28	22.0	3.7	75	2007.02.22	21.0	4.1	143	1998.11.22	19.0	3.6
8	2017.05.15	2.1	3.6	76	2007.02.03	24.6	3.6	144	1998.10.03	5.0	3.9
9	2017.02.10	5.8	3.9	77	2006.12.24	25.3	3.8	145	1998.10.01	3.0	4.0
10	2016.09.21	5.4	3.7	78	2006.04.06	5.0	3.7	146	1998.09.30	77.0	3.5
11	2016.07.16	5.0	3.8	79	2006.04.06	1.0	4.0	147	1998.09.20	17.0	4.1
12	2016.04.07	5.0	4.1	80	2006.03.08	5.0	3.6	148	1998.09.20	0.0	3.5
13	2016.01.04	22.6	3.9	81	2006.03.01	5.4	3.5	149	1998.08.24	20.0	3.6
14	2015.08.23	2.2	4.0	82	2006.01.22	6.4	4.1	150	1998.08.24	29.0	4.1
15	2015.08.07	10.9	3.5	83	2006.01.22	15.1	3.5	151	1998.08.20	70.0	3.6
16	2015.08.07	5.0	3.6	84	2005.12.12	21.6	3.5	152	1998.08.12	10.0	3.6
17	2015.07.29	20.2	5.2	85	2005.10.28	3.7	3.5	153	1998.08.03	23.0	3.6
18	2015.02.18	21.6	3.6	86	2005.09.30	18.0	3.5	154	1998.07.27	10.0	3.6
19	2015.01.06	5.4	3.9	87	2005.09.02	49.2	3.5	155	1998.07.17	16.0	3.7
20	2014.12.07	5.0	3.6	88	2005.04.05	16.2	3.6	156	1998.07.15	8.0	4.0
21	2014.03.02	12.6	3.5	89	2005.01.25	23.7	4.0	157	1998.07.13	9.0	3.8
22	2014.03.02	7.5	4.1	90	2004.10.12	25.0	3.7	158	1998.07.13	12.0	3.8
23	2013.11.01	5.0	3.5	91	2004.10.05	12.0	3.5	159	1998.07.05	81.0	3.9
24	2013.07.27	20.8	3.7	92	2004.09.28	9.0	4.2	160	1998.07.04	20.0	4.5
25	2012.12.30	10.6	3.9	93	2004.09.06	9.0	3.5	161	1998.07.04	35.0	5.1
26	2012.09.26	10.8	3.6	94	2004.09.04	4.0	3.5	162	1998.07.01	11.0	3.7
27	2012.09.16	17.4	3.6	95	2004.08.18	8.0	4.5	163	1998.06.30	10.0	3.7
28	2012.09.16	18.7	4.7	96	2004.07.06	27.0	3.5	164	1998.06.29	6.0	3.9
29	2012.09.15	8.6	3.8	97	2004.07.04	10.0	3.6	165	1998.06.28	11.0	4.1
30	2012.08.22	5.0	3.8	98	2004.05.09	9.0	3.8	166	1998.06.28	70.0	3.9
31	2011.10.01	3.0	3.5	99	2004.03.23	10.0	3.5	167	1998.06.28	86.0	3.5
32	2011.09.30	5.0	4.5	100	2004.02.23	24.0	3.5	168	1998.06.28	6.0	4.9
33	2011.06.29	16.3	4.5	101	2003.10.09	30.0	3.5	169	1998.06.27	21.0	4.1
34	2011.04.23	11.2	4.0	102	2003.09.22	27.0	3.6	170	1998.06.27	78.0	3.7
35	2010.11.22	5.0	3.6	103	2003.09.02	6.0	3.5	171	1998.06.27	10.0	3.5
36	2010.10.26	8.0	3.9	104	2003.08.12	10.0	3.7	172	1998.06.27	10.0	4.0
37	2010.08.05	2.6	4.4	105	2003.04.07	10.0	3.5	173	1998.06.27	7.0	3.5
38	2010.07.07	7.8	3.7	106	2003.01.06	9.0	3.5	174	1998.06.27	8.0	4.1
39	2010.07.05	4.7	3.6	107	2002.12.09	13.0	3.5	175	1998.06.27	13.0	3.5
40	2010.03.18	5.0	3.5	108	2002.10.22	10.0	3.5	176	1998.06.27	32.0	4.2
41	2010.03.08	5.0	4.0	109	2002.10.20	10.0	3.7	177	1998.06.27	18.0	6.3
42	2010.01.24	2.3	3.6	110	2002.10.04	2.0	3.5	178	1998.03.29	4.0	3.9
43	2009.08.25	4.3	3.6	111	2002.09.30	32.0	3.6	179	1998.01.03	2.0	4.1
44	2009.08.23	4.6	3.5	112	2002.09.29	6.0	3.8	180	1997.10.18	1.0	3.5
45	2009.08.23	10.0	3.6	113	2002.07.23	32.0	3.5	181	1997.09.03	10.0	3.8
46	2009.08.03	7.3	3.7	114	2002.06.27	15.0	3.7	182	1997.05.28	5.0	3.5
47	2009.07.24	6.4	4.7	115	2002.05.25	24.0	3.5	183	1997.01.07	21.0	3.5
48	2009.05.11	5.4	3.6	116	2002.04.30	10.0	4.1	184	1997.01.06	0.0	4.2
49	2009.04.25	12.9	3.5	117	2002.03.29	39.0	3.8	185	1996.09.24	28.0	4.1
50	2009.04.17	5.4	3.5	118	2002.03.27	10.0	3.6	186	1996.09.12	0.0	3.8
51	2009.03.22	10.2	3.6	119	2002.02.13	10.0	3.6	187	1995.10.29	5.0	4.1
52	2009.01.28	2.0	3.5	120	2001.12.11	6.0	3.5	188	1995.06.22	15.0	4.0
53	2008.10.21	7.2	3.7	121	2001.11.12	10.0	4.2	189	1995.04.25	13.0	4.2
54	2008.08.25	26.6	3.6	122	2001.10.18	19.0	4.8	190	1995.04.24	0.0	4.4
55	2008.05.26	7.3	3.5	123	2001.07.31	4.0	3.9	191	1995.04.14	21.0	3.8
56	2008.05.25	5.6	3.6	124	2001.06.20	10.0	4.0	192	1994.02.10	17.0	4.9
57	2008.03.28	8.1	3.6	125	2001.01.27	10.0	3.9	193	1994.01.03	26.0	5.0
58	2008.03.28	6.1	3.5	126	2000.10.13	4.0	3.7	194	1991.10.07	33.0	4.4
59	2008.03.28	7.2	3.6	127	2000.05.30	5.0	4.0	195	1990.10.17	24.0	4.2
60	2008.03.27	6.8	3.6	128	2000.04.03	1.0	3.8	196	1989.10.15	10.0	3.7
61	2008.03.27	6.6	3.6	129	2000.03.08	9.0	3.9	197	1989.07.20	61.0	4.0
62	2008.02.27	19.9	3.5	130	2000.03.06	14.0	3.8	198	1985.12.21	33.0	4.4
63	2008.01.01	5.0	4.1	131	2000.03.06	84.0	3.7	199	1985.12.21	33.0	4.6
64	2007.12.24	5.4	3.8	132	1999.12.06	12.0	3.6	200	1982.08.05	46.0	4.4
65	2007.12.23	4.0	4.1	133	1999.09.27	32.0	3.5	201	1982.05.20	33.0	4.0
66	2007.12.19	6.6	3.6	134	1999.06.10	12.0	4.5	202	1982.04.24	59.0	4.2
67	2007.12.19	5.3	3.6	135	1999.05.05	6.0	4.0	203	1979.12.28	47.0	5.1
68	2007.12.18	8.1	3.5	136	1999.02.14	0.0	3.5	204	1974.06.26	45.0	3.9

CHAPTER 3

ENGINEERING GEOLOGICAL INVESTIGATIONS AND ENGINEERING GEOLOGICAL CHARACTERIZATION

Engineering geological investigations, which consisted of in-situ investigations (i.e., surface observations and engineering geological mapping, boreholes, SPT, inclinometers) and geotechnical laboratory tests, along with the engineering geological characterization of the geo-material in the landslide area are specified in this section.

3.1. Engineering Geological Mapping

Based on the surface observations and previous studies in the study area, an engineering geological map was prepared. The boundaries of the formations (Landslide Material (Hm), Talus (Qym) and Çukurbağ formation (Tomç)), which were observed to be present in the study area, the boundary of the sliding mass and the locations of the boreholes were decided upon as presented in Figure 3.1.

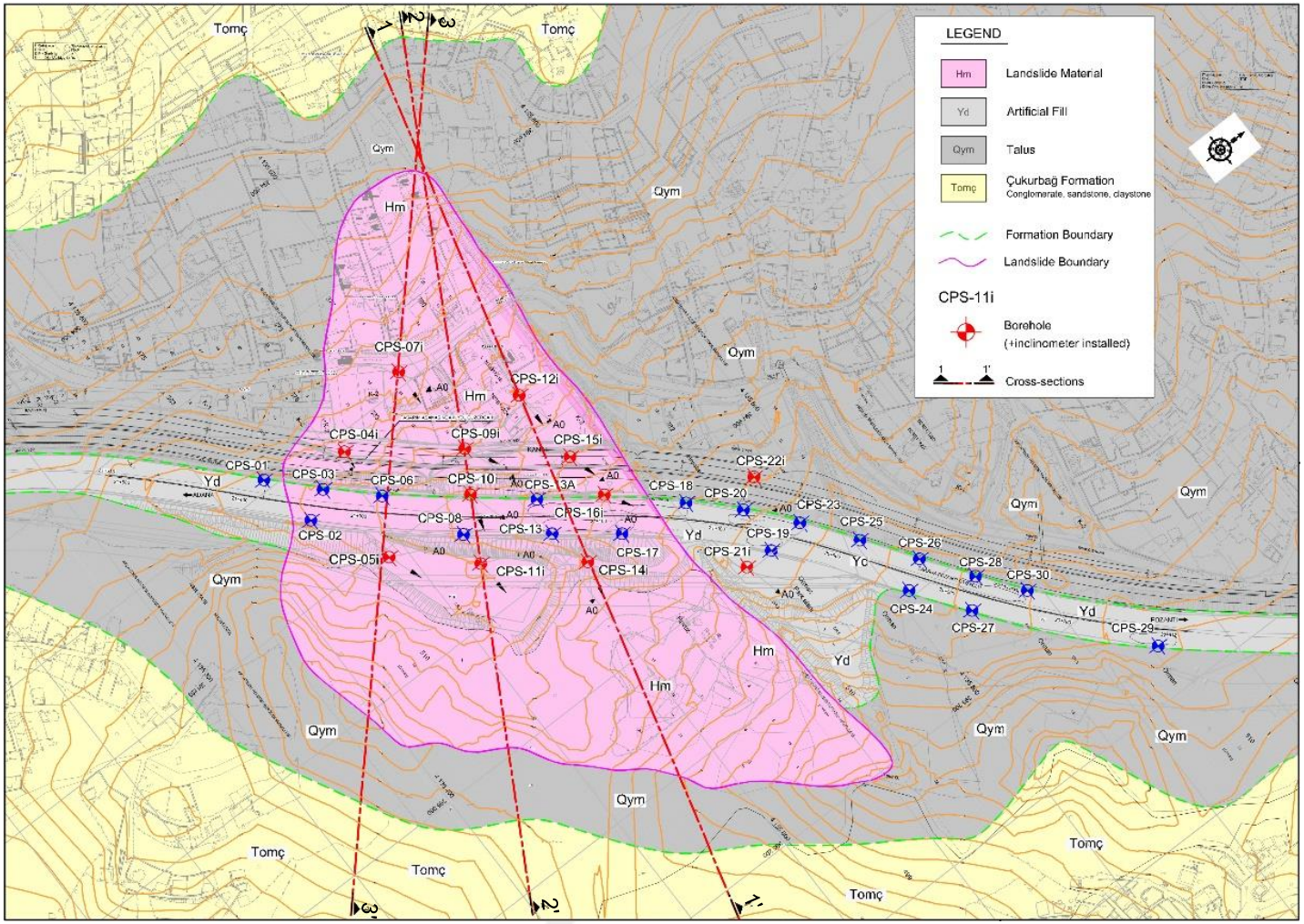


Figure 3.1. Engineering geological map of the study area

3.2. In-Situ Investigations

3.2.1. Boreholes

To study the area geologically and geomechanically, and to investigate the landslide mechanism and to determine the engineering geological properties of the units and the groundwater level, a total of 546 meters of drilling has been carried out in 31 locations. The boreholes and in-situ tests have been performed by taking into consideration Research Engineering Services Technical Specification (2005) prepared by General Directorate of Highways. The soil and rock (core) samples were recovered and were kept in core boxes. In order to determine the groundwater level, the circulation water in the boreholes has been poured with a “bailer” bucket at the end of the shift, and the next day, the water level in the wells has been measured and the depth of groundwater has been recorded.

Table 3.1 presents a summary of the boreholes locations and coordinates. The borehole logs and the photographs of the core boxes are presented in Appendix A and B, respectively.

Table 3.1. *A summary of the boreholes*

Borehole ID	Coordinates (TM36 - ED50)			Depth (m)	Ground Water Level (m)
	X (North)	Y (East)	Elevation (m)		
CPS-01	4 135 442	394 692	1183.16	4.95	Not observed
CPS-02	4 135 295	394 589	1179.76	4.95	-
CPS-03	4 135 476	394 728	1178.60	4.88	-
CPS-04i (*)	4 135 509	394 714	1187.97	42.00	-
CPS-05i	4 135 485	394 807	1176.99	45.00	-
CPS-06	4 135 512	394 763	1174.68	5.15	Not observed
CPS-07i	4 135 586	394 689	1197.17	48.00	-
CPS-08	4 135 546	394 830	1169.22	4.95	-
CPS-09i	4 135 590	394 774	1180.29	36.00	-
CPS-10i	4 135 571	394 807	1168.63	30.00	-
CPS-11i	4 135 542	394 858	1174.68	42.00	-
CPS-12i	4 135 654	394 766	1179.25	42.00	4.50
CPS-13	4 135 605	394 875	1162.48	4.95	-
CPS-13A	4 135 612	394 844	1164.27	4.95	Not observed
CPS-14i	4 135 614	394 911	1164.32	39.00	-
CPS-15i	4 135 656	394 833	1170.51	30.00	-
CPS-16i	4 135 659	394 875	1159.65	24.00	9.25
CPS-17	4 135 651	394 910	1157.74	4.95	-
CPS-18	4 135 709	394 922	1154.87	4.95	Not observed
CPS-19	4 135 741	394 998	1147.39	4.95	-
CPS-20	4 135 743	394 956	1150.67	4.93	Not observed
CPS-21i	4 135 714	395 002	1148.49	24.00	-
CPS-22i	4 135 767	394 940	1155.50	30.00	-
CPS-23	4 135 774	394 994	1147.37	20.00	9.20
CPS-24	4 135 812	395 095	1137.90	4.95	-
CPS-25	4 135 805	395 036	1142.38	10.00	Not observed
CPS-26	4 135 835	395 079	1137.93	4.78	Not observed
CPS-27	4 135 843	395 140	1134.14	4.95	-
CPS-28	4 135 863	395 119	1134.20	4.95	Not observed
CPS-29	4 135 948	395 258	1121.61	4.95	-
CPS-30	4 135 890	395 155	1130.33	4.95	Not observed

(*) "i" means the inclinometer measurements are taken from the borehole.

3.2.2. In-Situ Tests

In - situ experiments, performed within the scope of the project studies, are explained in this section. In this context, standard penetration (SPT) and inclinometer measurements were performed in the boreholes.

3.2.2.1. Standard Penetration Test (SPT)

In order to determine the geotechnical properties, such as the strength and the density of the soil units and the weathered upper levels of the rock units observed in the study

area, Standard Penetration Tests (SPT) have been performed according to ASTM standards (D1586-11) and General Directorate of Highways, Research Engineering Services Technical Specification (2005). A summary of the SPT results along with the detailed records of the SPT results are given in Appendix C.

3.2.2.2. Inclinometer Measurements

Special pipes with a total length of 432 m have been placed in 12 boreholes in order to perform inclinometer measurements. The readings have been carried out by means of a digital probe, installed through these special pipes and the data obtained has been converted into graphics on the computer. The graphical results are presented in Appendix D.

3.3. Laboratory Tests

In order to determine the classification and engineering properties of the soil units and the completely weathered rock units obtained from the boreholes, the following laboratory tests have been performed:

- Natural water content (ASTM, D2216-19)
- Atterberg limits (Liquid Limit, Plastic Limit and Plasticity Index) (ASTM, D4318-17)
- Sieve analyses (ASTM, D6913M-17)
- Unified Soil Classification (USCS)

In addition, on the rock core samples recovered from boreholes for determination of the physical and mechanical properties of the rock units, the following rock mechanics laboratory tests have been performed:

- Uniaxial Compressive Strength (UCS) (ASTM, D2938-95(2002))
- Modulus of Elasticity determination (ASTM, D3148-02)
- Poisson’s ratio (ASTM, D7012-13)
- Unit weight (ASTM, D7263-09(2018))

The results of the laboratory tests are presented in Appendix E.

3.4. Characteristics of the Landslide

Engineering geological characterization studies were performed to assess the slope stability problems that were observed along the Tarsus - Pozantı Motorway where, the presence of a mass movement has been determined by the mobilization of Talus (Qym) and artificial fill material (Yd). In this context, for the determination of the landslide mechanism and causes, sliding plane geometry of the sliding mass, the results of the geological and geotechnical investigation studies are summarized below.

Figure 3.1 presents an engineering geological map of the landslide. The crown of the landslide mass is located at the left side of the road in the direction of kilometer increase, within approximately 300 meters from the road axis. It has been mobilized in the E direction from the crown that has formed on the slope at an elevation of +1200.00. The maximum width of the sliding mass is measured to be 500 meters at the toe of the landslide.

In accordance with the borehole and inclinometer measurements, the location of the sliding plane was determined to be in Talus (Qym). In study area, the landslide material is observed as clayey gravel with sand (GM), sandy clay with gravel (CL) and mostly limestone originated blocks. The characteristics of the landslide material refer to the material type of debris. In addition, the mechanism of the landslide has a major and single non-circular failure surface. Thus, the type of movement could be classified as “Debris Slide”, with respect to the classification of Varnes (1978).

Km: 21 + 200 - 21 + 730 section of the project site consists of artificial fill material (Yd), Talus (Qym) and Çukurbağ formation (Tomç). The sliding mass of the project route in the range of Km: 21 + 200 - 21 + 730, which consists of the sandstone, conglomerate, claystone and siltstone units of the Çukurbağ formation (Tomç) and Talus (Qym), has been developed as a result of the topographic, geomechanical, atmospheric, tectonic, heavy traffic load, surface and groundwater conditions.

As a result of the initiation of mass movement, tension cracks have formed along the road and some deformations in the form of settlement and undulations along the

roadside have occurred, which have adversely affected the flow of traffic on the road. In the study area, it has been determined that some of the drainage ditches on the roadside have been unusable due to damage resulting from the mass movement. In addition, it has been established that due to the lack of drainage (i.e., uncontrolled surface water penetration), the surface waters interacted with the landslide mass, that led to a decrease in the effective stress and hence, increased the chances of slope failure. In the dwellings that are situated in the close vicinity of the study area, especially those that are located at the boundary of the moving mass, cracks and fractures have been observed on the walls and backyards of the houses along with within the retaining walls on the roadside (Figures 3.2 and 3.3).

Figure 3.2. Deformations on the road structures along the mass movement

Figure 3.3. Cracks on the walls of an house that is situated along the mass movement

3.5. Engineering Geological Characterization

A total of 31 boreholes with a total length of 546 m have been drilled in the landslide area. Inclinometers have been installed in 12 of the boreholes, of which 10 were situated in the sliding mass and 2 were outside of the landslide area (CPS-21i, and CPS-22i). The results of the inclinometer measurements are summarized in Table 3.2 and given in detail at Appendix C. According to the inclinometer readings, the displacement of the sliding mass varies from 2.06 mm to 15.49 mm. The depth of the landslide material is in between the range of 5.30 m to 32.80 m. The maximum velocity of the landslide is observed at Borehole CPS-09i to be 0.14 mm/day.

Table 3.2. *The summary of inclinometer readings*

Borehole ID	Borehole Depth (m)	Inclinometer Depth (m)	Sliding Mass					
			Starting Date	Ending Date	Duration of Measurement (day)	Displacement (mm)	Depth (m)	Velocity (mm/day)
CPS-04i	42.00	42.00	5/30/2016	9/16/2016	109	9.66	22.20	0.09
CPS-05i	45.00	45.00	6/8/2016	9/17/2016	101	2.46	32.80	0.02
CPS-07i	48.00	48.00	5/30/2016	9/16/2016	109	10.36	27.80	0.10
CPS-09i	36.00	36.00	5/29/2016	9/16/2016	110	15.49	16.25	0.14
CPS-10i	30.00	30.00	5/22/2016	9/16/2016	117	9.62	11.30	0.08
CPS-11i	42.00	42.00	6/1/2016	9/16/2016	107	6.08	26.75	0.06
CPS-12i	42.00	42.00	5/24/2016	9/16/2016	115	10.20	7.30	0.09
CPS-14i	39.00	39.00	6/5/2016	9/16/2016	103	5.94	5.30	0.06
CPS-15i	30.00	30.00	5/22/2016	9/16/2016	117	3.46	6.30	0.03
CPS-16i	24.00	24.00	5/18/2016	9/16/2016	121	2.06	7.80	0.02
CPS-21i	24.00	24.00	6/5/2016	9/17/2016	104	-	-	-
CPS-22i	30.00	30.00	5/18/2016	9/16/2016	121	-	-	-

3.5.1. Engineering Geological Description of the Units

For the determination of the physical and mechanical properties of the units and for specifying the geotechnical parameters, in-situ and laboratory tests have been performed. The engineering geological description of the Talus (Qym), Artificial Fill (Yd) and Çukurbağ Formation (Tomç) are summarized in this section.

3.5.1.1. Artificial Fill (Yd)

The artificial fill (Yd), which varies in thickness from 0.15 to 10.40 m in the landslide area, generally constitutes the main body of the motorway and the fill area on the side of the road. This unit generally consists of topsoil, tree roots, road asphalt fill and sandy clayey gravel and sandy gravelly clay levels. The sandy clayey gravel portion consists of gray to dark gray colored, wet, fine to coarse grained, angular to semi-angular, fine and fine to coarse sands originated from mostly limestone and occasionally other rocks. The sandy gravelly clay portion consists of brown to grayish brown colored, stiff, moist, medium to highly plastic clays with fine to coarse grained, angular to semi-angular, fine to coarse grained sands and gravels. Traces of rubbles - blocks of limestone origin up to a maximum thickness of 30 cm have been identified within the unit.

The results of the laboratory tests that have been performed on the disturbed samples obtained by Standard Penetration Tests (SPT) on the artificial fill (Yd) levels are as follows:

SPT (N)	$8 \leq$ SPT (N) ≤ 35
Water content (W_n)	4.50 % $\leq W_n \leq$ 17.70 %
Liquid limit (LL)	NP
Plasticity index (PI)	NP
Sieve analysis (+4)	36.00 % $\leq$ + 4 $\leq$ 70.00 %
Sieve analysis (-200)	% 9.20 $\leq$ – 200 $\leq$ % 30.10
Soil classification	(USCS) ML, GM, GW – GM, GP – GM

The artificial Fill (Yd) unit is permeable depending on the amount of granular material it contains.

3.5.1.2. Talus (Qym)

In the study area, Talus (Qym), which has a thickness ranging between 1.95 and 27.40 meters in the boreholes, is mainly represented by gravelly and clayey levels. The sandy clayey gravel portion consists of various colored (gray, dark gray, cream or beige), dense, wet, fine to coarse grained, angular to semi-angular, generally limestone, locally brecciated limestone pebbles and fine to coarse grained sands. 5 to 10% of the unit consists of large limestone blocks with a maximum length of 150 cm. The sandy gravelly clay portion consists of reddish to dark, occasionally light brown colored, moist, medium to high plastic clays with angular to semi-angular, hard to fragile pebbles and fine to coarse grained sands. There are coarse grained recrystallized limestone pebbles with a dimension of up to 10x10 cm. In addition, transported large limestone blocks have been identified in the boreholes.

The results of the laboratory tests that have been performed on the disturbed samples obtained by Standard Penetration Tests (SPT) on the talus (Qym) levels are as follows:

SPT (N)	$8 \leq$ SPT (N) ≤ 35 $10 \leq$ SPT (N) ≤ 60
Water content (W_n)	% 2.00 $\leq W_n \leq$ % 40.90
Liquid limit (LL)	% 25 $\leq$ LL $\leq$ % 70
Plasticity index (PI)	% 6 $\leq$ PI $\leq$ 40
Sieve analysis (+4)	% 3.20 $\leq$ +4 $\leq$ % 69.60
Sieve analysis (-200)	% 6.60 $\leq$ –200 $\leq$ % 89.10
Soil classification	(USCS) CL, CL/CH, GC, GM, GP – GM, GW – GM

Talus (Qym) holds groundwater due to the granular material it contains and is permeable in terms.

3.5.1.3. Çukurbağ Formation (Tomç)

Çukurbağ formation (Tomç), which forms the bedrock in the study area, is observed in varying thicknesses between 3.55 to 17.70 meters in the boreholes and is generally represented by conglomerate, sandstone, sandstone–siltstone alternation and claystone-sandstone alternation units. Conglomerates are gray to beige to dark gray colored, moderately hard (partly friable), moderately weak (partly very weak), moderately weathered (partly very weathered), moderately dense to not cemented. It contains fine to medium grained, semi-rounded to semi-angular pebbles of various origin in the carbonate clay / silt matrix. Siltstones are greenish to light brown colored, moderately weak and moderately weathered. Sandstones in the sandstone-siltstone alternation are greenish light brown to dark gray colored, moderately weak, slightly to moderately weathered, fine to coarse grained, with carbonate / silt matrix. Siltstones are greenish light brown to dark gray colored, weak to medium strong, low to medium weathered. Claystone alternations are gray to dark gray to occasionally yellowish light

brown colored, moderately weak, slightly weathered. Sandstones in the claystone-sandstone are gray to light gray colored, medium strong to weak, slightly weathered, fine to coarse grained, moderately cemented with a carbonate matrix.

The Total Core Recovery (TCR), Rock Quality Designation (RQD) results and the laboratory test results obtained from the drilling operations on the Çukurbağ formation (Tomç) are presented below:

Total Core Recovery (TCR)	% 65 ≤ TCR ≤ % 100
Rock Quality Designation (RQD)	% 0 ≤ RQD ≤ % 70
Pressuremeter limit pressure (P_{ln})	43.00 kgf/cm^2 ≤ P_{ln} ≤ 47.00 kgf/cm^2
Pressuremeter modulus (E_p)	220 MPa ≤ E_p ≤ 4049 MPa
Uniaxial compressive strength (q_u)	5.00 MPa ≤ q_u ≤ 28.00 MPa
Unit weight (γ)	23.54 kN/m^3 ≤ γ ≤ 24.52 kN/m^3
Elasticity modulus (E_i)	1.20 GPa ≤ E_i ≤ 7.30 GPa

The units observed in the study area hold groundwater according to their lithological and structural characteristics. The permeability degree of the sandstone and conglomerate levels of the Çukurbağ formation (Tomç) area are permeable to low permeable, and claystone and siltstone levels are non-permeable. On the other hand, the rocks belonging to this unit allow groundwater circulation due to their discontinuous nature.

3.5.2. Determination of the Geotechnical Parameters

3.5.2.1. Empirical Approaches for Effective Parameters

The geotechnical parameters of the Landslide Material (Hm) and Talus (Qym) were determined based on empirical approaches. The geomaterials that these units constitute were generally classified as CL and GM, and the parameters were determined by considering clayey levels in order to stay on the safe side.

Unit Weight (γ)

For determination of the unit weight of the sandy gravelly, medium to high plastic, firm to stiff clay (CL) portion of Talus (Qym) and Landslide Material (Hm), Table 3.3 was used (Das et al., 2015). According to Table 3.3 the unit weight of these materials could be accepted as:

γ : 18 kN/m^3

Table 3.3. *Typical values for bulk and saturated unit weights (Das, et al., 2015)*

		Bulk unit weight (kN/m^3)		Saturated unit weight (kN/m^3)	
		Loose	Dense	Loose	Dense
Granular soils	Gravel	16.0	18.0	20.0	21.0
	Well graded sand and gravel	19.0	21.0	21.5	23.0
	Coarse or medium sand	16.5	18.5	20.0	21.5
	Well graded sand	18.0	21.0	20.5	22.5
	Fine or silty sand	17.0	19.0	20.0	21.5
	Rock fill	15.0	17.5	19.5	21.0
	Brick hardcore	13.0	17.5	16.5	19.0
	Slag fill	12.0	15.0	18.0	20.0
	Ash fill	6.5	10.0	13.0	15.0
Cohesive soils	Peat (high variability)	12.0		12.0	
	Organic clay	15.0		15.0	
	Soft clay	17.0		17.0	
	Firm clay	18.0		18.0	
	Stiff clay	19.0		19.0	
	Hard clay	20.0		20.0	
	Stiff or hard glacial clay	21.0		21.0	

Long term (effective) shear strength parameters

Effective internal friction angle:

For the determination of the effective internal friction angle of the clayey materials of the Talus unit (Qym), various relations were used.

The suggested range of effective internal friction angle for soils and rocks according to the Australian Standards (AS 4678-2002) is presented in Table 3.4. According to these standards, the effective internal friction angle ranges from 17° to 32°.

Table 3.4. *Effective internal friction angle for some soils and rocks as suggested by AS 4678-2002*

	Material	ϕ'(°)
Soils	Soft and firm clay of medium to high plasticity, silty clays, loose variable clayey fills, loose sandy silts (use $c' = 0$–5 kPa)	17–25
	Stiff sandy clays, gravelly clays, compacted clayey sands and sandy silts, compacted clay fill (use $c' = 0$–10 kPa)	26–32
	Gravelly sands, compacted sands, controlled crushed sandstone and gravel fills, dense well graded sands (use $c' = 0$–5 kPa)	32–37
	Weak weathered rock, controlled fills of roadbase, gravelly and recycled concrete (use $c' = 0$–25 kPa)	36–43
Rocks	Chalk	35
	Weathered granite	33
	Fresh basalt	37
	Weak sandstone	42
	Weak siltstone	35
	Weak mudstone	28

According to Sorenson and Okkels (2013), there is a relation between the plasticity index of the normally consolidated clay materials and the effective internal friction angle (Figure 3.4) and this relation is formulated as:

$$\phi'_{peak} = 43 - 10 log PI \qquad (6.1)$$

where

ϕ'_{peak} : peak effective internal friction angle, and

PI : plasticity index.

The mean PI of the talus material is 26.35 from the laboratory test results. After the calculation was performed, the peak internal friction angle was found as:

ϕ'_{peak}= 28.79°.

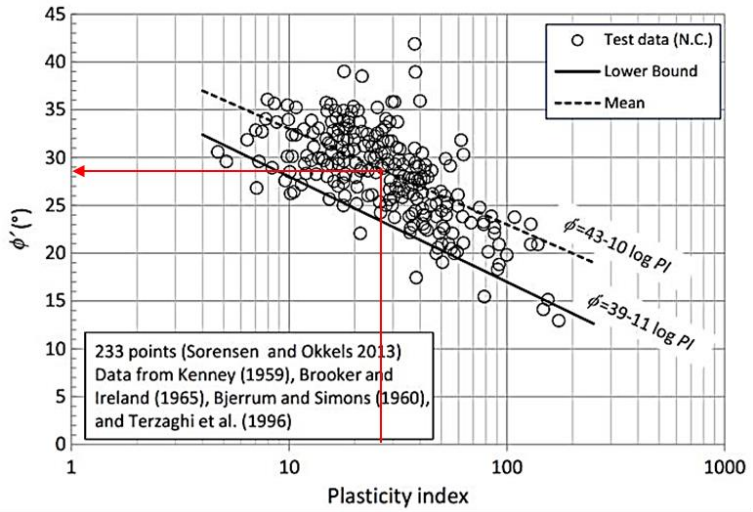


Figure 3.4. Peak effective internal friction angle versus PI for normally consolidated clays (After Sorenson and Okkels, 2013)

Also a correlation between ϕ' and PI was suggested by Bowles (1988) based on data from several resources for normally consolidated clays (Figure 3.5). From the curve for undisturbed clays on the graph, the effective internal friction angle was determined to be:

ϕ'=28°

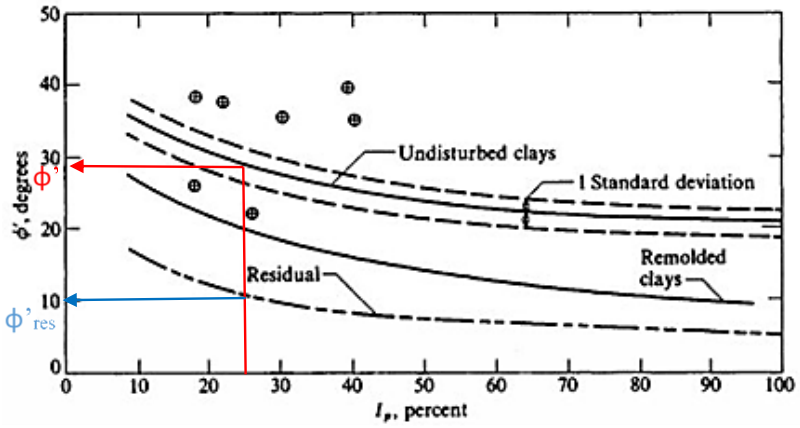


Figure 3.5. Correlation between peak and residual effective internal friction angles and plasticity index PI for normally consolidated clays (Bowles,1988)

As a result, for the Talus (Qym), the effective internal friction angle was determined as:

$\phi' = 28°$

For the Landslide Material (Hm), the peak shear strength parameters should not be used. Because of the failure has already occurred, the material is in residual state. Therefore, the residual shear strength parameters should be determined.

As mentioned above, Bowles (1988) also suggested a correlation between ϕ' and PI for the residual clays. From Figure 3.5, the residual effective internal friction angle is determined as:

$\phi'_{res} = 10°$

In addition, Holtz and Kovacs (1981) have documented the variation of residual and peak effective internal friction angles for normally consolidated clays based on the PI of these materials as presented in Figure 3.6. In accordance with the graph, the residual effective internal friction angle is determined as:

$\phi'_{res} = 19.5°$

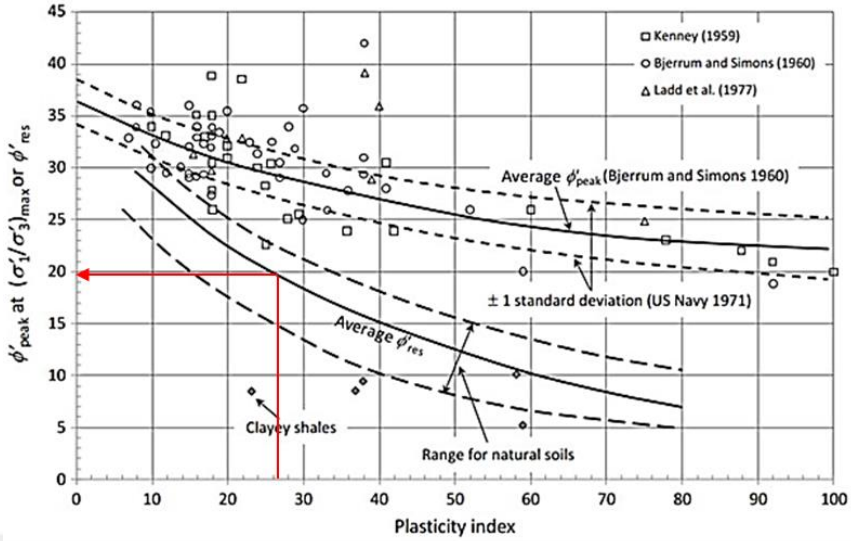


Figure 3.6. Variation of peak and residual effective internal friction angles with plasticity index for normally consolidated clays (Holtz and Kovacs, 1981)

Figure 3.7 presents the study of Kenney (1967) as quoted by Tiwari and Mariu (2000) that presents residual internal friction angle vs. liquid limit. The study represents the results of testing undisturbed soil samples that were recovered from the sliding surfaces of five different landslide areas in Japan to determine the residual shear strength parameters of these materials. The residual internal friction of the Landslide Material (Hm) was determined from Figure 3.7 as:

ϕ_{res}=16.5° (Average LL = 53.56 from the laboratory test results)

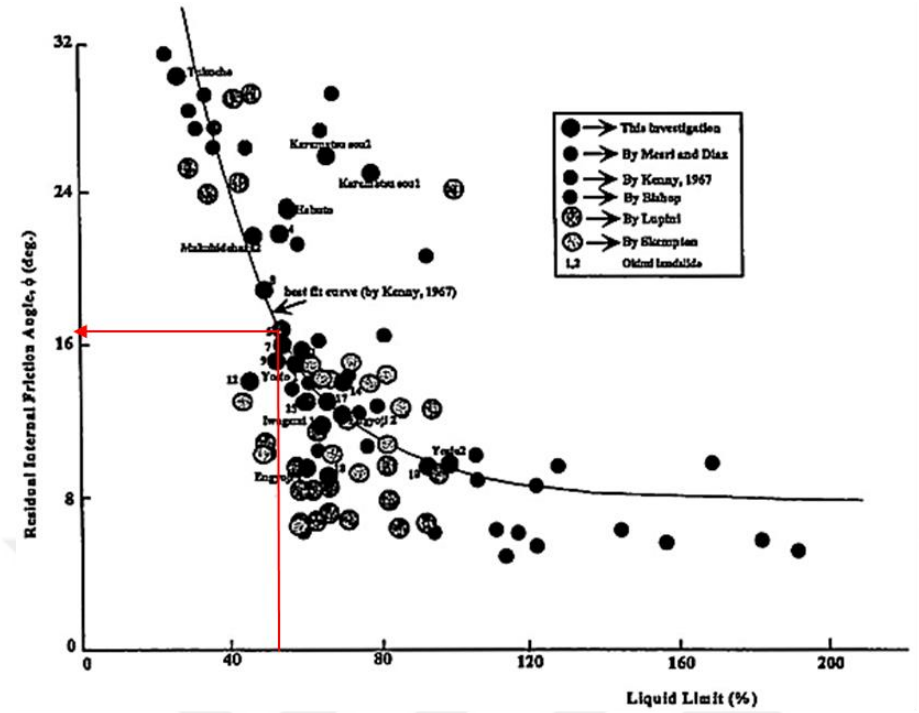


Figure 3.7. Relationship between residual internal friction angle and liquid limit (Kenney, 1967 as quoted by Tiwari and Mariu, 2000)

Stark and Eid (1994) developed a correlation of residual friction angle with liquid limit, clay-size fraction and effective normal stress (Figure 3.8). Assuming that the maximum effective normal stress for the Landslide Material (Hm) is approximately 600 kPa (i.e., since the maximum depth of the sliding mass is 32.80 m and the unit weight of the soil is 18 kN/m^3, this leads to a normal stress of approximately 600 kPa). The approximate clay fraction of the soil is 43.44%. From Figure 3.8, the residual internal friction angle was determined as:

$\phi_{res}=13°$

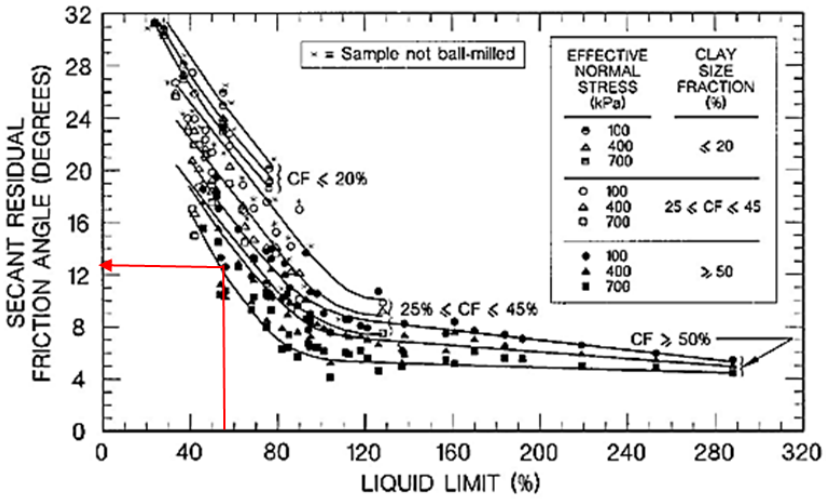


Figure 3.8. Secant residual internal friction angle relationship with liquid limit, clay-size fraction and effective normal stress (Stark and Eid, 1994)

As a result, the mean residual internal friction angle for the Landslide Material (Hm) from the four different assessments presented above is given as:

$\phi' = 14.75° \approx 15°$

Effective cohesion value:

To determine the cohesion value of the Talus (Qym), different tables from different studies were used.

From Australian Standards (AS 4678-2002), for the mentioned range of the effective internal friction angle in Table 3.4, the effective cohesion of the material should be in the range of 0 to 10 kPa.

In addition, Table 3.5 presents soil properties suggested by the National Engineering Handbook of the United States Department of Agriculture (USDA) for undrained and drained conditions. For clays, the drained strength parameters are important for long-term conditions. Therefore, effective cohesion of the soil in study area should be in the range of 0 to 4.75 kPa (0 – 100 lbf/ft^2).

Table 3.5. *Estimated soil properties (USDA, 2007)*

Soil type [1]	Moist unit weight (lb/ft³)	Saturated unit weight (lb/ft³)	Undrained shear strength properties		Drained shear strength properties	
			Cohesion (lb/ft²)	Angle of internal friction, ϕ	Cohesion (lb/ft²)	Angle of internal friction, ϕ
Loose sand	95–125	120–130	0	28	0	28
Medium dense sand	110–130	125–135	0	32	0	32
Dense sand	110–140	130–140	0	38	0	38
Very soft clay	85–100	85–100	0–250	0	0	See note 2
Soft clay	100–120	100–120	250–500	0	0	See note 2
Medium clay	110–125	110–125	500–1,000	0	0	See note 2
Stiff clay	115–130	115–130	1,000–2,000	0	50–100	See note 2
Very stiff clay	120–140	120–140	2,000–4,000	0	100	See note 2
Hard clay	>130	>130	>4,000	0	100	See note 2

As a result, c’ of the Talus is determined as 5 kPa.

In the article of Zydroń and Zawisza (2011), the shear strength investigations of soils in various landslide areas have been performed. For some of the test soils, the residual cohesion values have been obtained as non-zero, but did not exceed 10 kPa. Carrubba and Fabbro (2008), Gullà et al. (2004) and Wen et al. (2007) have been also aqcuired non-zero residual cohesion values for soils of slide zones. According to Lupini et al. (1981), the residual cohesion values that have been provided from ring shear tests on natural soil samples, vary in between 0 and 8 kPa that is unrelated to other soil properties.

On the other hand, for the Landslide Material (Hm), the residual effective cohesion should be taken as 0, because of the presence of a pre-existing shear surface resulting from the movement of the soil mass. The bonding between the particles have been removed because of the movement and the clay particles have oriented parallel to the direction of the shear. The residual internal friction angle controls the frictional resistance. Stark and Eid (1994) recommended that the effective cohesion should be

selected as 0 for the first-time sliding situations. According to Smoltczyk (2002), the residual shear strength has been defined by residual internal friction angle, solely. Also this situation has been defined by Atikson (1993) as the cohesion in the state of previously sheared is zero. In addition, Skepmton (1964), Bishop (1971) and Kimura et al. (2014) have suggested the residual internal friction angle differs with respect to the soil properties and magnitude of normal stress that provided by cohesion value is equal to 0.

The selected long term shear strength parameters for the Talus (Qym) and Landslide Material (Hm) to perform stability analysis are summarized in Table 3.6.

Table 3.6. *The long term shear strength parameters that used for the stability analysis*

Long Term Shear Strength Parameters	**Reference**	**Determined value of parameter**	**Paramter that used for analysis**
ϕ' for Talus (Qym)	AS 4678-2002	17° - 32°	28°
	Sorenson and Okkels (2003)	29.79°	
	Bowles (1988)	28°	
ϕ' for Landslide Material (Hm)	Bowles (1988)	10°	15°
	Holtz and Kovacs (1981)	19.5°	
	Tiwari and Mariu (2000)	16.5°	
	Stark and Eid (1994)	13°	
c' for Talus (Qym)	AS 4678-2002	20° - 30°	5 kPa
	USDA (2007)	31°	
c' for Landslide Material (Hm)	Zydroń and Zawisza (2011)	0 - 10 kPa	0 kPa
	Carrubba and Fabbro (2008)	≠ 0 kPa	
	Gullà et al. (2004)		
	Wen et al. (2007)		
	Lupini et al. (1981)	0 - 8 kPa	
	Stark and Eid (1994)	0 kPa	
	Smoltczyk (2002)		
	Atikson (1993)		
	Skepmton (1964)		
	Bishop (1971)		
	Kimura et al. (2014)		

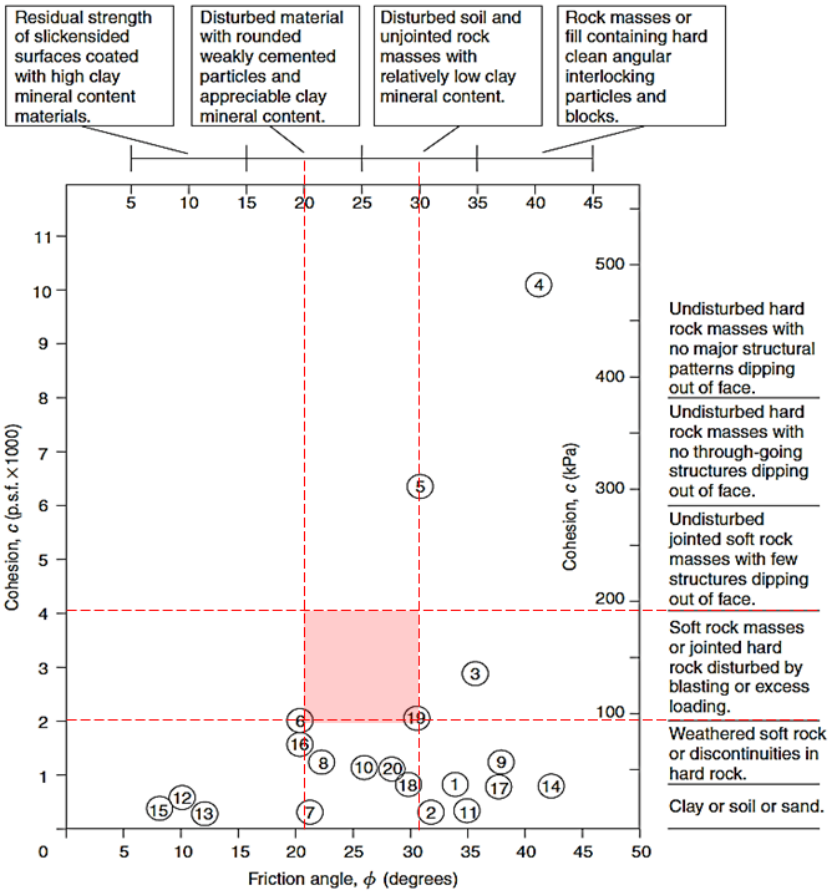
3.5.2.2. Empirical Approaches for Rock Mass Parameters

To estimate the shear strength parameters (c – ϕ) of the Çukurbağ formation (Tomç), some published results of rock mass shear strength were used. Hoek and Bray (1977) suggested a relationship between internal friction angle and cohesion with respect to the geological conditions of the rock mass (Figure 3.9). The points on the figure refer the back calculated shear strength parameters at failure of various locations with local geological conditions.

According to the given figure, the Çukurbağ formation (Tomç) that consists of conglomerate-sandstone and claystone-siltstone units in the study area has similar characteristics with the given shear strength parameters shown at points 16 and 19. The formation consists of soft rock with undisturbed hard rock. The clay content is appreciable at the claystone-siltstone level, though the conglomerate-sandstone levels are partly unjointed and the clay content is low at these levels. Considering all these characteristics of the rock mass, it should be located within the area marked on the graph. The shear strength parameters of rock mass at the study area are suggested as:

c = 100 – 200 kPa

ϕ = 20° – 30°



Point number	*Material*	*Location*	*Slope height (m)*	*Reference*
1	Disturbed slates and quartzite's	Knob Lake, Canada	—	Coates *et al.* (1965)
2	Soil	Any location	—	Whitman and Bailey (1967)
3	Jointed porphyry	Rio Tinto, Spain	50–110	Hoek (1970)
4	Ore body hanging wall in granite rocks	Grangesberg, Sweden	60–240	Hoek (1974)
5	Rock slopes with slope angles of 50–60°	Any location	300	Ross–Brown (1973)
6	Bedding planes in limestone	Somerset, England	60	Roberts and Hoek (1972)
7	London clay, stiff	England	—	Skempton and Hutchinson (1969)
8	Gravelly alluvium	Pima, Arizona	—	Hamel (1970)
9	Faulted rhyolite	Ruth, Nevada	—	Hamel (1971a)
10	Sedimentary series	Pittsburgh, Pennsylvania	—	Hamel (1971b)
11	Kaolinized granite	Cornwall, England	75	Ley (1972)
12	Clay shale	Fort Peck Dam, Montana	—	Middlebrook (1942)
13	Clay shale	Gardiner Dam, Canada	—	Fleming *et al.* (1970)
14	Chalk	Chalk Cliffs, England	15	Hutchinson (1970)
15	Bentonite/clay	Oahe Dam, South Dakota	—	Fleming *et al.* (1970)
16	Clay	Garrison Dam, North Dakota	—	Fleming *et al.* (1970)
17	Weathered granites	Hong Kong	13–30	Hoek and Richards (1974)
18	Weathered volcanics	Hong Kong	30–100	Hoek and Richards (1974)
19	Sandstone, siltstone	Alberta, Canada	240	Wyllie and Munn (1979)
20	Argillite	Yukon, Canada	100	Wyllie (project files)

Figure 3.9. Relationship between friction angle and cohesive strength mobilized at failure for slopes analyzed in the table given below the figure (Hoek and Bray, 1977)

3.6. Rock Mass Classification

The rock mass classification methods utilized were the Rock Mass Rating (RMR) and the Geological Strength Index (GSI).

3.6.1. Rock Mass Rating (RMR)

For the Çukurbağ formation (Tomç), the RMR Classification of Bieniawski (1989) was performed (Table 3.6) and the total RMR value was calculated. The given ratings of each parameter are summarized in Table 3.8.

From results of the UCS tests applied to the core samples, the strength of the intact rock has been in the range of 2 to 35 MPa and the mean result was calculated to be 15.7 MPa. As indicated in Table 3.7, the rating of strength of intact rock material was determined to be 2.

From the field observations, the RQD value has been estimated as 50%. Hence the RQD is in the range of 25% - 75%, and the rating was evaluated to be 10.

Since the mean discontinuity spacing was determined to be 200 mm, the rating of this parameter was assigned a value of 8.

During field studies, water discharges at various locations in the landslide area have been observed and the unit appeared to be wet at certain locations at the ground surface. Therefore, the general condition of groundwater has been assigned wet condition and a rating of 7 has been given for the groundwater condition.

Considering the field observations, there were many bedding plane surfaces, which is the major discontinuity of the rock mass. Hence, the persistence of the discontinuity parameter was selected with respect to the bedding plane, which has a length of > 20 m, and the rating of this parameter should be selected as 0. Since the apertures of the discontinuities were in between 1 – 5 mm, a rating of 1 was used for this parameter. The roughness of the discontinuity surfaces has been determined to range in between rough to slightly rough. As a result of this, the rating of the roughness parameter was assigned a value of 4. Since the infilling material was soft gouge, a rating of 2 was

assigned for the infilling parameter. Finally, since the rock mass has been observed to be slightly to moderately weathered in the study area, the rating of this parameter was selected as 4.

When all these parameters have been evaluated together, the RMR value was determined as 40 for this rock mass.

Table 3.7. *Rock Mass Rating (Bieniawski, 1989) for the Çukurbağ formation (Tomç)*

A. CLASSIFICATION PARAMETERS AND THEIR RATINGS									
Parameter			Range of values						
1	Strength of intact rock material	Point-load strength index	>10 MPa	4 - 10 MPa	2 - 4 MPa	1 - 2 MPa	For this low range - uniaxial compressive test is preferred		
		Uniaxial comp. strength	>250 MPa	100 - 250 MPa	50 - 100 MPa	25 - 50 MPa	5 - 25 MPa	1 - 5 MPa	< 1 MPa
	Rating		15	12	7	4	2	1	0
2	Drill core Quality RQD		90% - 100%	75% - 90%	50% - 75%	25% - 50%	< 25%		
	Rating		20	17	13	8	3		
3	Spacing of discontinuities		> 2 m	0.6 - 2 . m	200 - 600 mm	60 - 200 mm	< 60 mm		
	Rating		20	15	10	8	5		
4	Condition of discontinuities (See E)		Very rough surfaces Not continuous No separation Unweathered wall rock	Slightly rough surfaces Separation < 1 mm Slightly weathered walls	Slightly rough surfaces Separation < 1 mm Highly weathered walls	Slickensided surfaces or Gouge < 5 mm thick or Separation 1-5 mm Continuous	Soft gouge >5 mm thick or Separation > 5 mm Continuous		
	Rating		30	25	20	10	0		
5	Ground water	Inflow per 10 m tunnel length (l/m)	None	< 10	10 - 25	25 - 125	> 125		
		(Joint water press)/ (Major principal σ)	0	< 0.1	0.1, - 0.2	0.2 - 0.5	> 0.5		
		General conditions	Completely dry	Damp	Wet	Dripping	Flowing		
	Rating		15	10	7	4	0		

B. RATING ADJUSTMENT FOR DISCONTINUITY ORIENTATIONS (See F)						
Strike and dip orientations		Very favourable	Favourable	Fair	Unfavourable	Very Unfavourable
Ratings	Tunnels & mines	0	-2	-5	-10	-12
	Foundations	0	-2	-7	-15	-25
	Slopes	0	-5	-25	-50	

C. ROCK MASS CLASSES DETERMINED FROM TOTAL RATINGS					
Rating	100 <= 81	80 <= 61	60 <= 41	40 <= 21	< 21
Class number	I	II	III	IV	V
Description	Very good rock	Good rock	Fair rock	Poor rock	Very poor rock

D. MEANING OF ROCK CLASSES					
Class number	I	II	III	IV	V
Average stand-up time	20 yrs for 15 m span	1 year for 10 m span	1 week for 5 m span	10 hrs for 2.5 m span	30 min for 1 m span
Cohesion of rock mass (kPa)	> 400	300 - 400	200 - 300	100 - 200	< 100
Friction angle of rock mass (deg)	> 45	35 - 45	25 - 35	15 - 25	< 15

E. GUIDELINES FOR CLASSIFICATION OF DISCONTINUITY conditions					
Discontinuity length (persistence) Rating	< 1 m 6	1 - 3 m 4	3 - 10 m 2	10 - 20 m 1	> 20 m 0
Separation (aperture) Rating	None 6	< 0.1 mm 5	0.1 - 1.0 mm 4	1 - 5 mm 1	> 5 mm 0
Roughness Rating	Very rough 6	Rough 5	Slightly rough 3	Smooth 1	Slickensided 0
Infilling (gouge) Rating	None 6	Hard filing < 5 mm 4	Hard filling > 5 mm 2	Soft filling < 5 mm 2	Soft filling > 5 mm 0
Weathering Ratings	Unweathered 6	Slightly weathered 5	Moderately weathered 3	Highly weathered 1	Decomposed 0

F. EFFECT OF DISCONTINUITY STRIKE AND DIP ORIENTATION IN TUNNELLING**			
Strike perpendicular to tunnel axis		Strike parallel to tunnel axis	
Drive with dip - Dip 45 - 90°	Drive with dip - Dip 20 - 45°	Dip 45 - 90°	Dip 20 - 45°
Very favourable	Favourable	Very unfavourable	Fair
Drive against dip - Dip 45-90°	Drive against dip - Dip 20-45°	Dip 0-20 - Irrespective of strike*	
Fair	Unfavourable	Fair	

* Some conditions are mutually exclusive . For example, if infilling is present, the roughness of the surface will be overshadowed by the influence of the gouge. In such cases use A.4 directly.
** Modified after Wickham et al (1972).

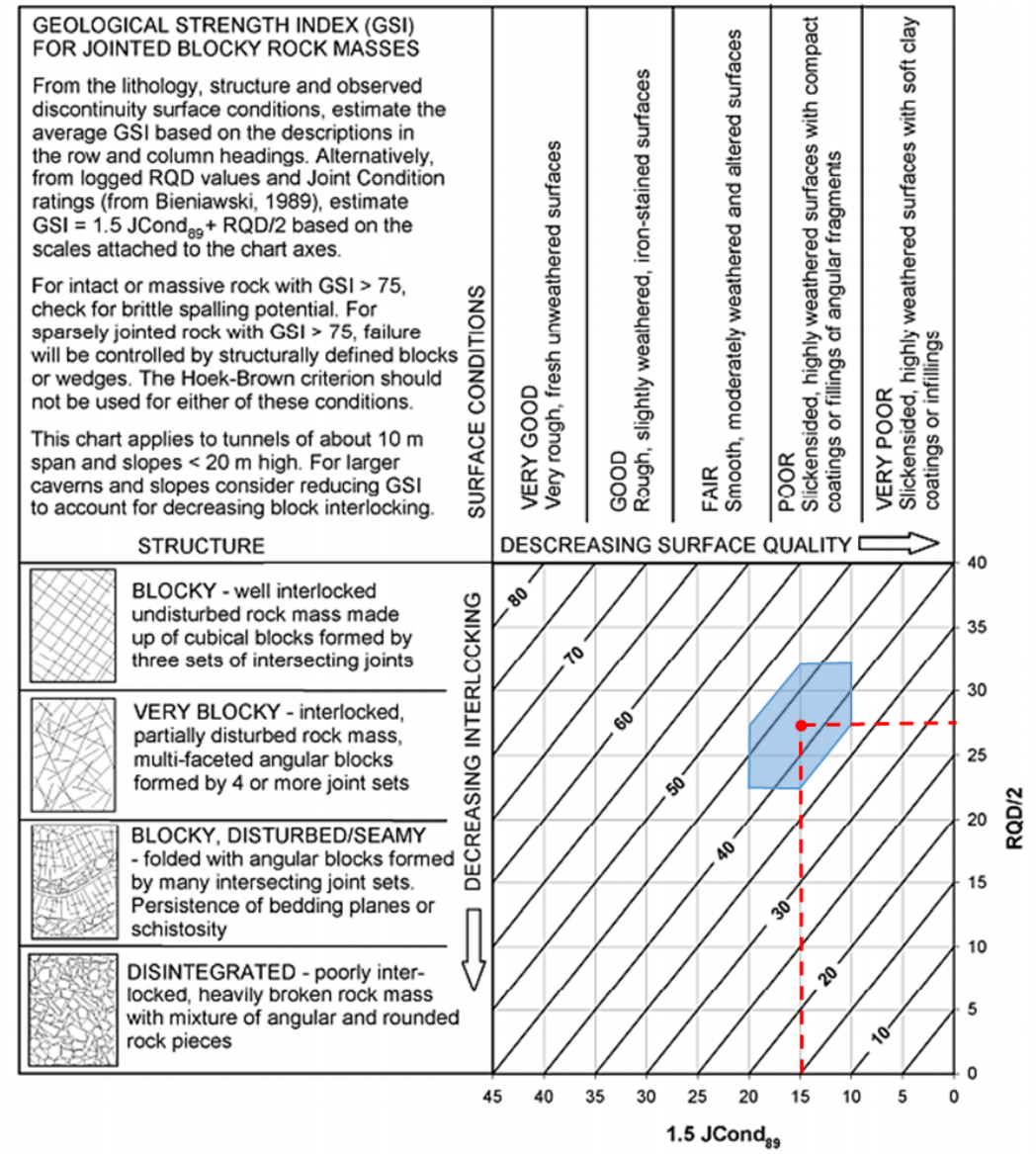
Table 3.8. *The assigned ratings of the parameters of the RMR System for the Çukurağ formation (Tomç)*

Parameter		**Field Observation**	**Range of Value**	**Rating**
Strength of intact rock material		15.7 MPa	1 - 50 MPa	2
RQD		50%	25% - 75%	10
Spacing of discontinuities		200 mm	60 mm - 600 mm	8
Groundwater		Wet		7
Discontinuity Conditions	Discontinuity length (Persistence)	> 20 m		0
	Separation (Aperture)	1 - 5 mm		1
	Roughness	Rough - Slightly rough		4
	Infilling (Gauge)	Soft filling < 5 mm		2
	Weathering	Slightly - Moderately weathered		4
TOTAL :				40±5

According to the total rating, the rock mass has been classified as “poor rock” and the cohesion and internal friction angle values for this rock mass is in between the range of 100 – 200 kPa and 15° – 25°, respectively.

3.6.2. Geological Strength Index (GSI)

The GSI table proposed by Hoek et al. (2013) was applied to the rock mass that was observed at study area and vicinity. The RQD of the rock mass has been estimated as 50% in the field. For this version of the GSI, the joint conditions, proposed by Bieniawski (1979) were used and since the total rating for the joint conditions was determined to be 11, the GSI was approximately determined to be 41 for this rock mass unit (Figure 3.10).



Discontinuity length (persistence) Rating	< 1 m 6	1 to 3 m 4	3 to10 m 2	10 to 20 m 1	More than 20 m 0
Separation (aperture) Rating	None 6	< 0.1 mm 5	0.1 – 1.0 mm 4	1 – 5 mm 1	More than 5 mm 0
Roughness Rating	Very rough 6	Rough 5	Slightly rough 3	Smooth 1	Slickensided 0
Infilling (gouge) Rating	None 6	Hard infilling < 5 mm 4	Hard filling > 5 mm 2	Soft infilling < 5 mm 2	Soft infilling > 5 mm 0
Weathering Rating	Unweathered 6	Slightly weathered 5	Moderate weathering 3	Highly weathered 1	Decomposed 0

Figure 3.10. Geological Strength Index (Hoek et al. 2013) for the sandstone-conglomerate unit of the Çukurbağ formation (Tomç)

3.7. Rock Strength Analysis

For the determination of the strength parameters of the rock masses, the RocData sofware was used. This software provides the shear strength parameters based on the Hoek-Brown failure criterion (2002). With the obtained data from study area and the laboratory test results, the parameters given below were used for the estimation of the shear strength parameters:

- Uniaxial compressive strength (σ_{ci}),
- Geological Strength Index (GSI),
- Intact rock parameter (m_i),
- Disturbance factor (D),
- Intact modulus (E_i),
- Unit weight (γ).

The mean uniaxial compressive strength of the intact rock (UCS) was determined to be 15.7 MPa. As described above, the GSI has been determined to be 40. The intact rock parameter (m_i) was selected as 7, which indicate the mean value of the intact rock parameters of claystone and sandstone. For the undisturbed in-situ rock masses, the disturbance factor was assigned as 0. The intact modulus was used as mean value of the elastic modulus results from laboratory tests, namely, 3100 MPa. Finally, the unit weight of the rock mass, as obtained from laboratory testing, was used as 24 kN/m^3. The parameters used for the shear strength parameters of the rock mass are presented in Table 3.9.

Table 3.9 *Input rock mass parameters*

UCS of intact rock (σ_{ci}) (MPa)	**GSI**	**Intact rock parameter (m_i)**	**Disturbance factor (D)**	**Intact modulus (E_i) (MPa)**	**Unit weight (γ) (kN/m^3)**
15.7	40	7	0	3100	24

The representative graphs and the results are given in Figure 3.11.

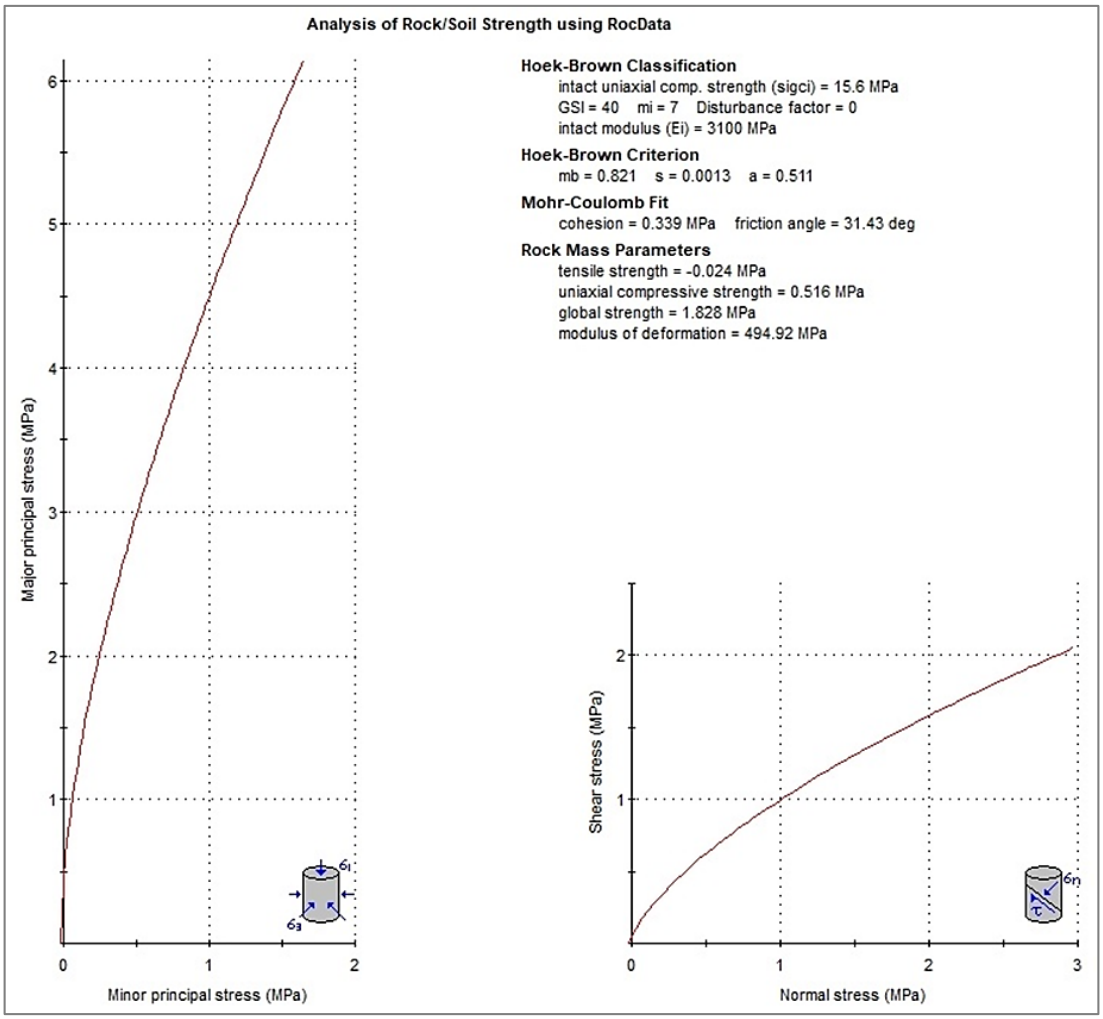


Figure 3.11. RocData results for the claystone-sandstone unit of the Çukurbağ formation (Tomç)

As a result, the shear strength parameters of the rock mass were estimated as:

c = 334 kPa

$\phi = 31°$

The selected shear strength parameters for the Çukurbağ Formation (Tomç) to perform stability analysis are summarized in Table 3.10.

Table 3.10. *The shear strength parameters of the Çukurbağ Formation (Tomç) that used for the stability analysis*

Shear Strength Parameter	**Reference**	**Determined value of parameter**	**Paramter that used for analysis**
c	Hoek and Bray (1977)	100 - 200 kPa	200 kPa
	Bieniawski (1989)	200 kPa	
	Hoek et al. (1995)	339 kPa	
ϕ	Hoek and Bray (1977)	20° - 30°	31°
	Bieniawski (1989)	25°	
	Hoek et al. (1995)	31°	

CHAPTER 4

GEOTECNICAL ASSESSMENT AND STABILIZATION OF THE LANDSLIDE

4.1. Slope Stability Analysis Methods

4.1.1 Limit Equilibrium Analysis

Slope stability analysis is one of the fundamental topics of geotechnical engineering. The movements in both naturally and artificially formed slopes affect human life directly. The primary goals of geotechnical engineers is revealing the causes and consequences of slope movements, taking necessary precautions and determination of the slope safety numerically for the purpose of preventing/minimizing fatalities and financial losses.

The factor of safety of the slopes is calculated based on the balance of the driving and resisting forces. When the factor of safety is equal to or greater than the 1.00, the slope is accepted as stable. That implies that the driving forces acting on the slope are equal to or smaller than the resisting forces (Eqn 4.1).

$$FS = \frac{\Sigma \text{resisting forces}}{\Sigma \text{driving forces}} = \frac{shear\ strength}{shear\ strength\ required\ for\ equilibrium} \geq 1.00 \qquad (4.1)$$

To perform an analytical solution of the stability of a slope, some information, which are given below, are required (Hunt, 2005):

- The location and geometry of a potential or existing failure surface which is controlled by material type and structural features.
- Distribution of the materials within and underneath the slope:
    - homogeneous (the properties are more or less similar in all directions)

    - non-homogeneous (soils are stratified and rock masses contain major discontinuities).
- Material types and representative shear strength parameters:
    - granular, cohesionless soils and clean rock joints (c=0);
    - soils or rock joints with cohesion (c,ϕ);
    - fissured clays, soils and rock masses with preexisting failure surfaces (ϕ_r); and
    - soft clays with undrained conditions (ϕ=0).
- Drainage conditions: drained or undrained conditions in short-term (construction) or long-term (post-construction or natural slope) (total versus effective stress analysis).
- Distribution of piezometric levels along the potential failure surface and an estimation of the maximum value that may be effective.
- Geometry of the slope.

Slope stability analysis was examined for the first time following the researches on cohesion and internal friction angle defined by Coulomb (1773). Although a number of methods are available for slope stability analysis, the two most commonly used methods are the limit equilibrium analysis and the finite element method (FEM). Limit equilibrium analysis which is based on the determination of the failure surface with the minimum factor of safety among countless calculations of possible failure surfaces is the most preferred method. A simple shaped sliding surface is accepted in this analysis and it is assumed that the remaining surface moves on this surface.

A number of developed methods that are based on limit equilibrium analysis are summarized in Table 4.1.

Table 4.1. *A number of developed methods that are based on limit equilibrium analysis (Abramson et al., 2002)*

Method	Force Equilibrium		Moment Equilibrium	Shape of Failure Surface	Assumptions about Interclice Forces	Practical	
	x	y				Hand Calculation	Computer Calculation
Ordinary Method of Slices (OMS)	No	No	Yes	Circular	Resultant parallel to base	Yes	Yes
Bishop's Simplified Method	No	Yes	Yes	Circular	Horizontal	Yes	Yes
Janbu's Simplified Method	Yes	Yes	No	Circular Non-circular	Horizontal correction factor	Yes	Yes
Spencer's Method	Yes	Yes	Yes	Circular Non-circular	Constant inclination	No	Yes
Morgenstern-Price Method	Yes	Yes	Yes	Circular Non-circular	$X/E=\lambda f(x)$	No	Yes

The difference between these methods, which are based on the division of the shearing mass into slices, is in difference in the assumptions they employ in regards to the static and moment equilibrium equations.

4.1.1.1. Ordinary Method of Slices

The “Ordinary Method of Slices” method, which is also known as the “Swedish Slice Method”, is the oldest slice method used. As the method is simple, it provides convenience for hand calculations. The shear force is applied by the slices to each other and the normal forces are neglected. The existing forces are the weight of the slice, the normal force perpendicular to the base of the slice and shear forces parallel to the base. A central O-point is determined and the safety factor is calculated from the moment equation written relative to the O-point.

For the application of this method, the sliding mass is divided into n number of vertical slices (Fig. 4.1). To obtain a single safety factor, the force of the sliding surface is moved slightly by the boundary conditions for the sliding body. To determine the

problem, assumptions for inter-slice forces are used. The safety factor calculation is based on the force and/or moment equilibrium (Zhu, 2003).

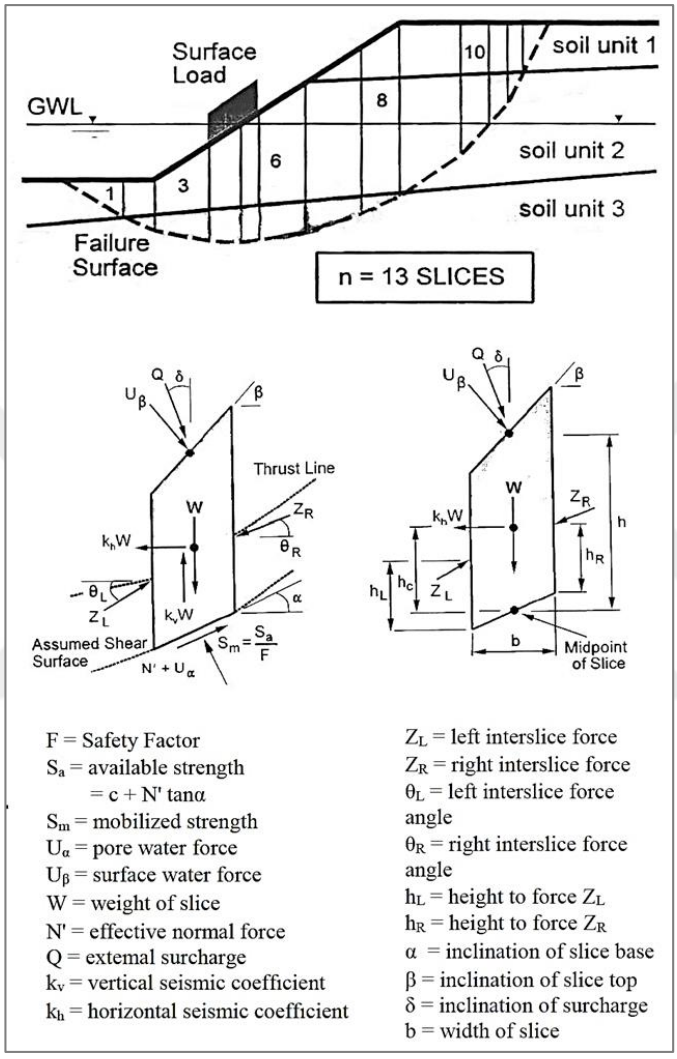


Figure 4.1. Forces acting on slice (Abramson, 2002)

In this method, if the pore water pressure in the environment is too high or if the slope is shallow, the errors increase extremely. However, it has the advantage over other methods that it can be applied to variable layered slopes with different internal friction angles.

4.1.1.2. Bishop's Simplified Method

This method was developed by Bishop at Imperial College, London, in 1955. For each of the slices, moment equilibrium is ensured around the center of the circle with force equilibrium in the vertical direction. While this method takes the normal forces between the slices into account, it neglects the shear forces between slices. For non - homogeneous slopes with a circular slip surface, this method is suitable (Abramson, 2002). With the simplifications made afterwards, the method emerged as the Simplified Janbu Method. Figure 4.2 represents the forces acting on a slice.

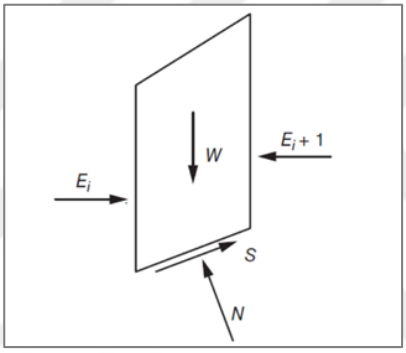


Figure 4.2. Slice with forces for the Simplified Bishop method

The following equation expresses the forces in the vertical direction (Duncan, 2014) (Eqn 4.2):

$$N\cos\alpha + S\sin\alpha - W = 0 \tag{4.2}$$

From this equilibrium, the normal force can be calculated by Eqn 4.3:

$$N = \frac{W - (1/F)(c'\Delta l - u\Delta l\tan\phi')\sin\alpha}{\cos\alpha + (\sin\alpha\tan\phi')/F} \tag{4.3}$$

Finally, the factor of safety can be determined from Eqn 4.4:

$$F = \frac{\Sigma\left[\frac{c'\Delta l\cos\alpha + (W - u\Delta l\cos\alpha)\tan\varphi'}{\cos\alpha + (\sin\alpha\tan\varphi')/F}\right]}{\Sigma W\sin\alpha} \quad (4.4)$$

4.1.1.3. Janbu's Simplified Method

This method, developed by Janbu in 1956, provides a solution that can be applied to the sliding surface for any case and provides the conditions of force equilibrium. The method was later reviewed by discarding some details and was named as "Janbu's Simplified Method". "Janbu's Simplified Method" obtains a factor of safety by assuming the equilibrium of the horizontal forces instead of moment equilibrium. This method, which neglects the shear force between the slices, considers the effect of the slices on each other and accounts for it by considering horizontal force equilibrium. Figure 4.3 shows the forces acting on a slice for the Janbu's simplified method.

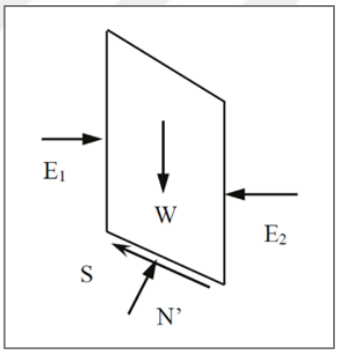


Figure 4.3. Slice with forces for the Simplified Janbu Method

The factor of safety can be calculated from Eqn 4.5:

$$F = \frac{\Sigma(c'l + (N - ul)\tan\varphi)\sec\alpha}{\Sigma W\tan\alpha + \Sigma\Delta E} \quad (4.5)$$

4.1.1.4. Spencer's Method

In 1967, Spencer proposed a system of two equations based on moment and horizontal force equilibrium. This method which assumes that the ratio of the normal and shear forces between the slices as constant is an iterative approach that computes the ratio which provides moment and horizontal force equilibrium simultaneously (Spencer, 1967). The Spencer's method, which assumes that the ratio of the normal (E) and shear (T) forces between slices as constant, asserts that the equations that provide moment and horizontal force equilibriums are satisfied. In other words, the same factor of safety is obtained from both. Equation 4.6 shows the interslice shear force. Figure 4.4 shows the forces acting on a slice.

$$T = E\tan\theta \tag{4.6}$$

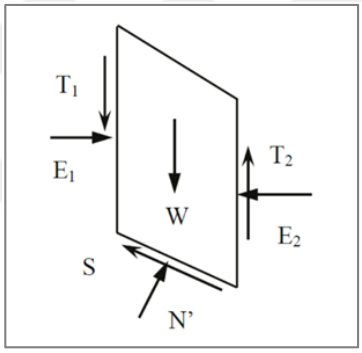


Figure 4.4. Slice with forces for the Spencer's method

4.1.1.5. Morgenstern-Price Method

In this method, which is developed by Morgenstern and Price in 1965, similar to the Spencer method, shear and normal forces between the slices are defined by different functions. It is possible to define the force function as a constant for half-sine, trapezoid and or functions produced by the user. For this force function, computation of the interslice forces is performed by using iteration, until the moment (F_m) and force (F_f) equations are equal to each other (Eqns 4.7 and 4.8; Figure 4.5). The constant

chosen function makes this method equivalent to the Spencer method and the same safety numbers are obtained.

$$F_f = \frac{[(c'l + (N - ul)\tan\phi')\sec\alpha]}{\Sigma(W - (T_2 - T_1))\tan\alpha + \Sigma(E_2 - E_1)} \quad (4.7)$$

$$F_m = \frac{\Sigma(c'l + (N - ul)\tan\phi')}{\Sigma W \sin\alpha} \quad (4.8)$$

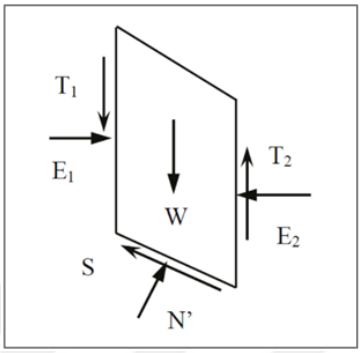


Figure 4.5. Slice with forces for the Morgensten – Price method

As a summary, the Morgenstern-Price method:

- Takes inter-slice shear and normal forces into account.
- Obtains equations based on both moment equation and force equation.
- Uses force function based on user preference for the interslice forces, especially in computer programs.

4.1.2. Selection of the Appropriate Slice Method

Although the principles of the slope stability methods are similar, they use different assumptions, and give different results of safety factor.

Table 4.2 gives a summary of the slope stability analysis methods and their usefulness by Duncan et al. (2005).

Table 4.2. *Summary of the procedures for limit equilibrium slope stability analysis and their usefulness (modified from Duncan et al. 2005)*

Procedure	Use
Ordinary Method of Slices	Applicable to nonhomogeneous slopes and $c-\phi$ soils where slip surface can be approximated by a circle. Very convenient for hand calculations. Inaccurate for effective stress analyses with high pore water pressures. Has been applied to noncircular surfaces in some commercial software but is inappropriate and inaccurate for noncircular slip surfaces.
Simplified Bishop procedure	Applicable to nonhomogeneous slopes and $c-\phi$ soils where slip surface can be approximated by a circle. More accurate than Ordinary Method of Slices, especially for analyses with high pore water pressures. Calculations feasible by hand or spreadsheet. Has been applied to noncircular surfaces in some commercial software but is inappropriate and inaccurate for noncircular slip surfaces.
Force Equilibrium (Simplified Janbu procedure)	Applicable to virtually all slope geometries and soil profiles. The only procedures suitable for hand calculations with noncircular slip surfaces. Less accurate than complete equilibrium procedures and results are sensitive to assumed inclinations for interslice forces.
Spencer's procedure.	An accurate procedure applicable to virtually all slope geometries and soil profiles. The simplest complete equilibrium procedure.
Morgenstern and Price's procedure	An accurate procedure applicable to virtually all slope geometries and soil profiles. Rigorous, well-established complete equilibrium procedure.

Since the shear surface was determined as non-circular, the Ordinary method of slices and the Bishop's simplified method are suitable for the landslide that occurred in study area. Since the Janbu's Simplified Method ignores the interslice forces, the accuracy of this method is less than Spencer's and Morgenstern-Price's methods. In addition, these two methods use moment equilibrium with force equilibrium to obtain safety factor equations.

On the other hand, The Morgenstern-Price method is the most extensive and adaptable method since the force function could be defined by user, while the Spencer's method uses this function as constant.

As a result, the Morgenstern-Price method was preferred for the slope stability analysis of the study area for more realistic and rigorous results (Duncan et al., 2005).

4.2. Pseudo-Static Analysis

Earthquakes create dynamic normal and shear stresses on potential failure surfaces in a slope. Dynamic stresses, combined with existing static shear stresses, may exceed the existing shear strength in the ground and create inertial instability in the slope.

Numerous methods have been proposed for the analysis of inertial instability. The main difference between these methods is the degree of accuracy in representing earthquake motion and dynamic response of the slope. The safety factor of seismic slope calculated by pseudo-static analysis is similar in many respects to the safety factor found in limit equilibrium analysis for a static slope.

The seismic stability, used primarily for the soil structures, is analyzed by the pseudo-static approach, which began in the 1920s, where the effects of the earthquake were represented by constant horizontal and/or vertical accelerations. Pseudo-static approach was used by Terzaghi (1950) for the first time to apply seismic slope stability. In pseudo-static analyses, the effects of earthquake shaking are usually represented by pseudo-static accelerations that produce inertial forces. The magnitude of the pseudo-static forces of the horizontal (F_h) and vertical (F_v) components are calculated by the following equations (Eqn 4.8 and 4.9).

$$F_h = \frac{a_h W}{g} = k_h W \tag{4.8}$$

$$F_v = \frac{a_v W}{g} = k_v W \tag{4.9}$$

where:

F_h : horizontal force,

F_v : vertical force,

a_h : horizontal peak ground acceleration,

a_v : vertical peak ground acceleration,

k_h : horizontal seismic coefficient,

k_v : vertical seismic coefficient,

W : total weight of the landslide material, and

g : gravitational acceleration.

Since the vertical component of the pseudo-static force has an effect on both the driving and resisting forces, its effect on the safety coefficient is very low. Thus, the vertical component of the pseudo-static force is neglected.

The results of the pseudo-static analysis are critically dependent on the value of the seismic coefficient k_h. The most important and difficult part of the pseudo-static stability analysis is the selection of an appropriate pseudo-static coefficient. The seismic coefficient controls the pseudo-static force on the sliding mass; therefore, the value of the seismic coefficient should be related to the magnitude of the force developing within the potentially unstable material. Peak accelerations are effective only in a short time. Therefore, in practice, pseudo-static coefficients are generally used far below the a_{max} value. Table 4.3 summarizes the methods suggested by various authors for pseudo-static analysis.

Table 4.3. *Suggested methods for performing pseudo - static screening analyses (Duncan et al., 2014)*

Reference	Reference Acceleration, a_{ref}	Acceleration Multipller, a/a_{ref}	Strength Reduction Factor	Minimum Factor of Safety	Tolerable Displacement
Seed (1979)	$0.75g\left(M \approx 6\frac{1}{2}\right)$	0.133	0.85	1.15	Approx. 1 m
Seed (1979)	$0.75g\left(M \approx 8\frac{1}{4}\right)$	0.167	0.85	1.15	Approx. 1 m
Hynes-Griffin and Franklin (1984)	$PGA_{rock}(M \leq 8.3)$	0.5	0.8	1.0	1 m
Bray et al. (1998)	PGA_{rock}	0.75	Recommend using conservative (e.g., residual) strengths	1.0	0.30 m for landfill covers; 0.15 m for landfill base sliding
Kavazanjian et al. (1997)	PGA_{soil}	0.17 if PGA accounts for amplification	0.8[a]	1.0	1 m
Kavazanjian et al. (1997)	PGA_{soil}	0.5 for free-field PGA determined	0.8[a]	1.0	1 m
NCHRP 12-70 (2008) FHWA (2011)	PGA_{soil}	0.2–0.5 (PGA includes site amplification effects)	0.8	1.0	5 cm or less
Bray and Travasarou (2009)	Spectral accel., S_a (5% damped at specified period)	Depends on slope height and displacement	1.0 Median or "best estimate"	Varies	Varies

[a]For fully saturated or sensitive clays.

An evaluation of the landslide area in terms of seismicity revealed that a major earthquake occurred in the Hasanbeyli-Sarıçam region with a magnitude of 6.3 in 1998. From the Earthquake Hazard Map of Turkey, the PGA value is estimated as 0.186 g.

According to Seed (1979), the reference acceleration is 0.75g for the earthquakes with a magnitude of approximately 6.5. The maximum peak ground acceleration (a_{max}) is calculated as 0.099 by multiplying the reference acceleration (0.75 g) and acceleration multiplier (0.133).

Kavazanjian (1997) has suggested a a_{max} value which is half of the PGA value for soils, which leads to a value of a_{max} being equal to 0.093.

The Earthquake Building Regulations of Turkey that have been revised in 2018 state that the a_{max} value is dependent on the Short Period Design Spectral Acceleration Coefficient (SDS) and Topographic Amplification Coefficient (ST). The SDS value has been determined from the interactive Earthquake Hazard Map as 0.622. The ST value has been ignored, since the suggestions of regulations for this coefficient have not been satisfied (the slope is not located on a side of a steep valley or the sliding surface is not close of the top of the hill). From the relation that is proposed by regulations, the a_{max} value has been determined as 0.124.

The estimated a_{max} values from the approaches are very close to each other (approximately 0.1 g). As a result, for the pseudo-static analysis, the a_{max} value could be used as 0.1g for this study.

4.3. Back Analysis

Determination of the shear strength parameters of the landslide material at equilibrium can be performed by using the back-analysis method. To perform this method, initially the subsurface conditions (type of materials, thickness and shear strength of various layers, ground water surface, slope geometry, etc.) should be determined. Secondly, representative cross-sections should be located and oriented parallel as much as

possible to the direction of the maximum movement and include all relevant materials and structures. After that, the type and location of the failure surface based on ground surface observations, slope inclinometer data and subsurface features should be defined followed by performing the appropriate stabilization method. To determine the back-calculated shear strength parameters of the problematic layer, the shear strength parameters should be varied until the factor of safety equals approximately 1. The back-calculated shear strength parameters (ϕ') and the results of the laboratory strength testing on representative samples should be compared to ensure agreement.

Also, comparing the back-calculated shear strength parameter (ϕ') with empirical correlations could be performed. If the landslide is not a paleo-landslide, empirical correlations for the residual shear strength should be used to verify the back-calculated shear strength depending on the level of progressive failure that has contributed to the landslide. The back-calculated residual shear strength should be in agreement with the measured or estimated residual shear strength.

A back analysis has been performed for three different cross-sections at the study area (Figure 3.1) in order to determine the shear strength parameters of the landslide material that provide a Factor of Safety equal to 1.00.

The back analysis was performed for the three cross-sections, which represent and include the landslide area, to determine the shear strength parameters (c - ϕ) at the equilibrium state by using Slide 6.0 software. Table 4.4 and Figure 4.6 represent the results of the c - ϕ pairs that satisfy a Factor of Safety equal to 1.00. Figures 4.7 - 4.12 show a graphical presentations of the results for each section.

The centroid of triangle in Fig. 4.6, that is shaped by the trendlines of the results of these three cross-sections, on the graph implies the shear strength parameters of the landslide material:

c = 2.25 kPa, ϕ = 9.75°

Table 4.4. *c – ϕ pairs that satisfy a F.S. = 1.0 for each section*

Section 1 - 1'		**Section 2 - 2'**		**Section 3 - 3'**	
c (kPa)	ϕ (°)	c (kPa)	ϕ (°)	c (kPa)	ϕ (°)
0.10	10.79	0.10	10.21	0.10	10.20
1.00	10.40	1.00	9.99	1.00	10.04
5.00	8.63	5.00	9.00	5.00	9.34
8.00	7.30	8.00	8.25	8.00	8.80

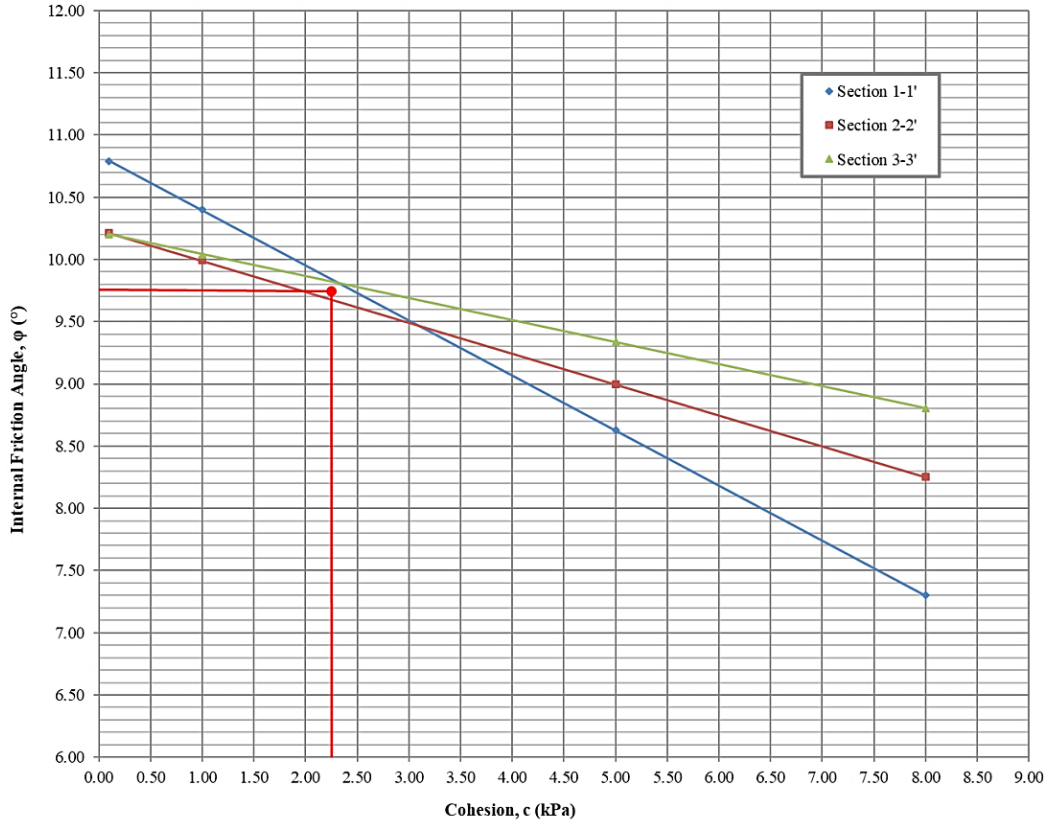


Figure 4.6. c-ϕ pairs obtained from back analysis for the three cross sections 1-1', 2-2' and 3-3' in Figure 3.1

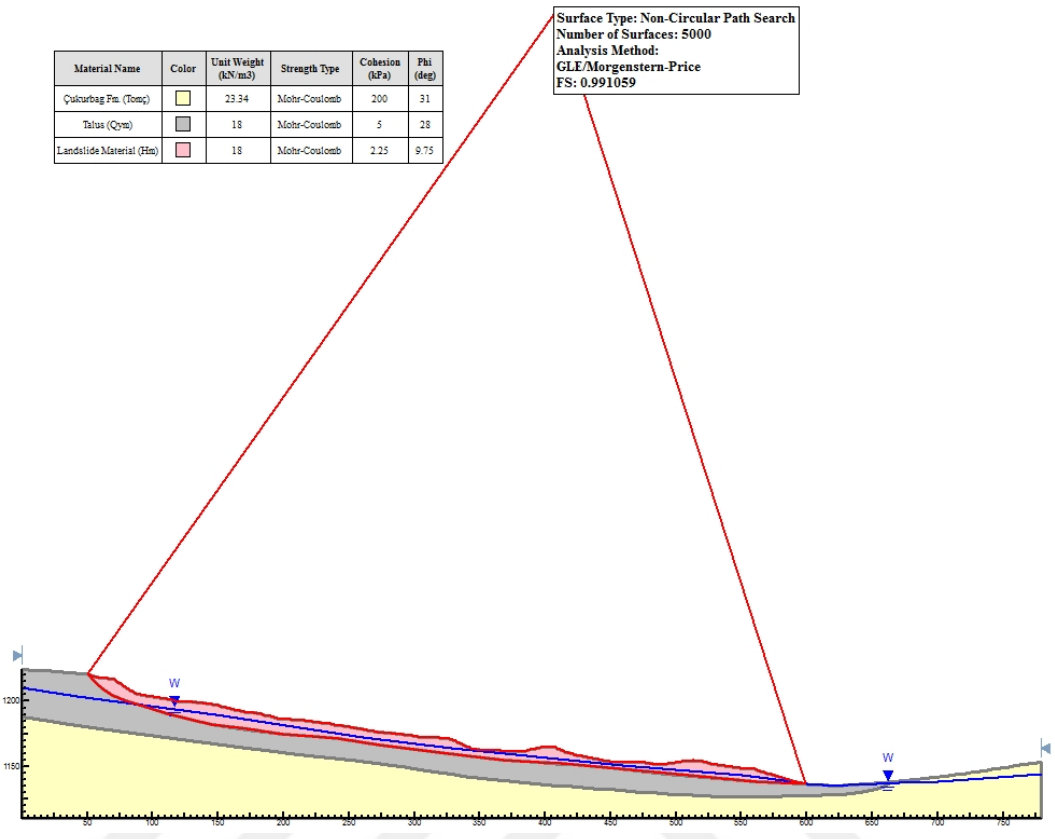


Figure 4.7. Back Analysis of Cross Section 1-1' (Exported from Slide 6.0)

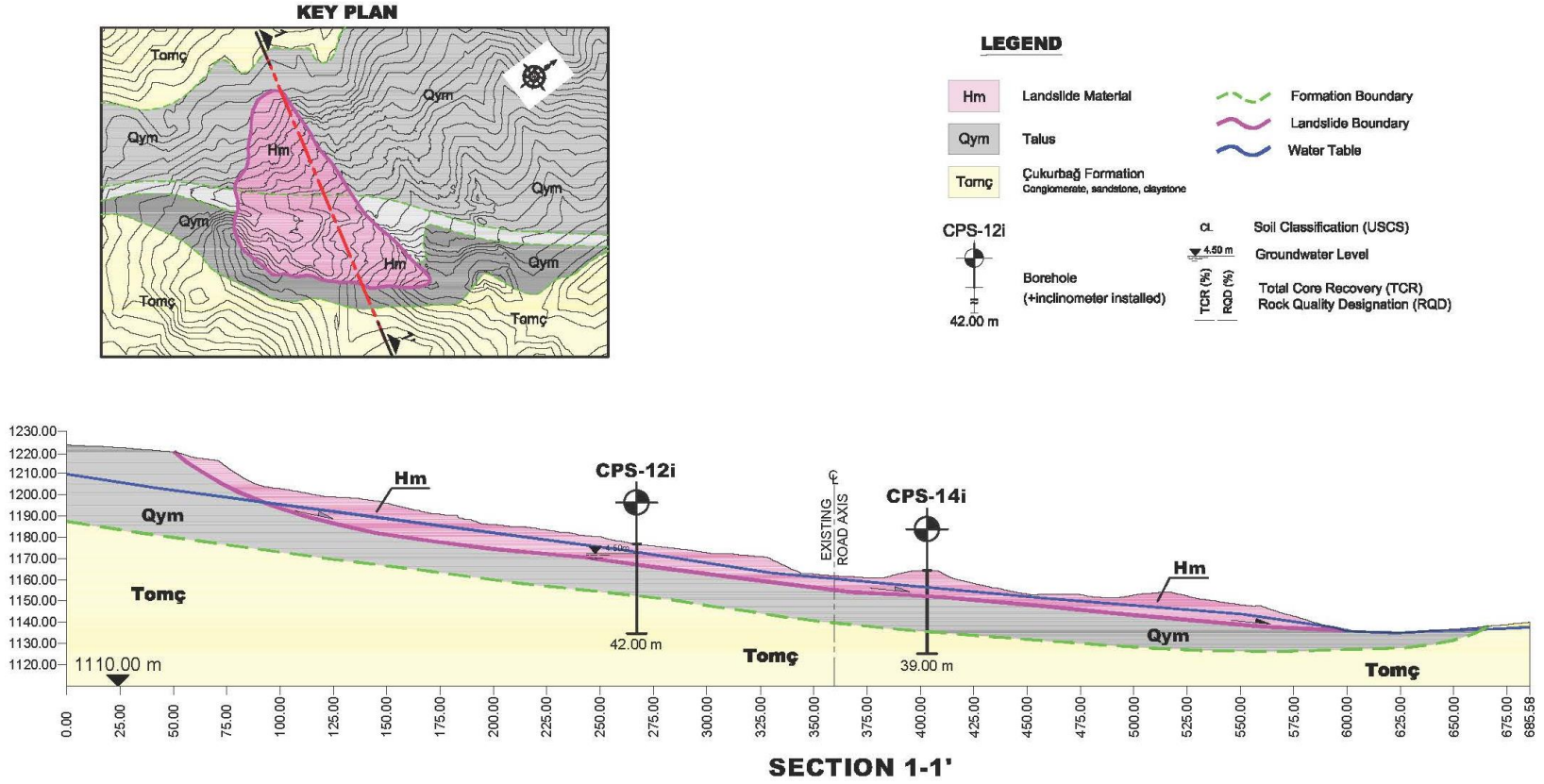


Figure 4.8. Detailed view of Cross Section 1-1’

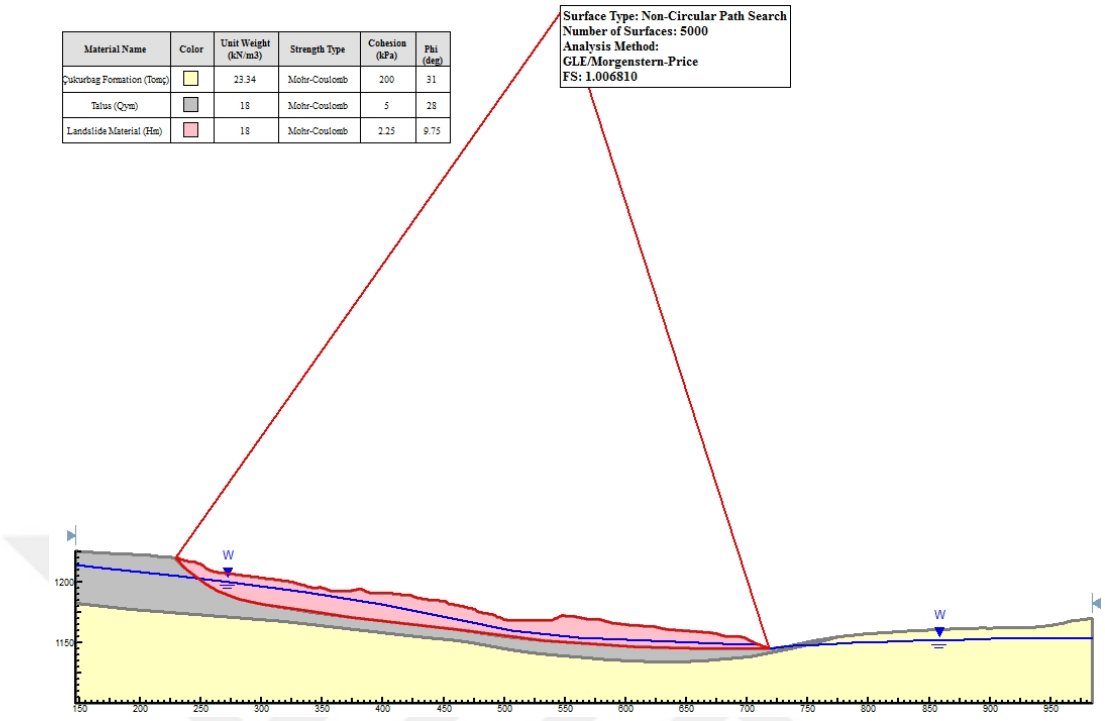


Figure 4.9. Back Analysis of Cross Section 2-2’ (Exported from Slide 6.0)

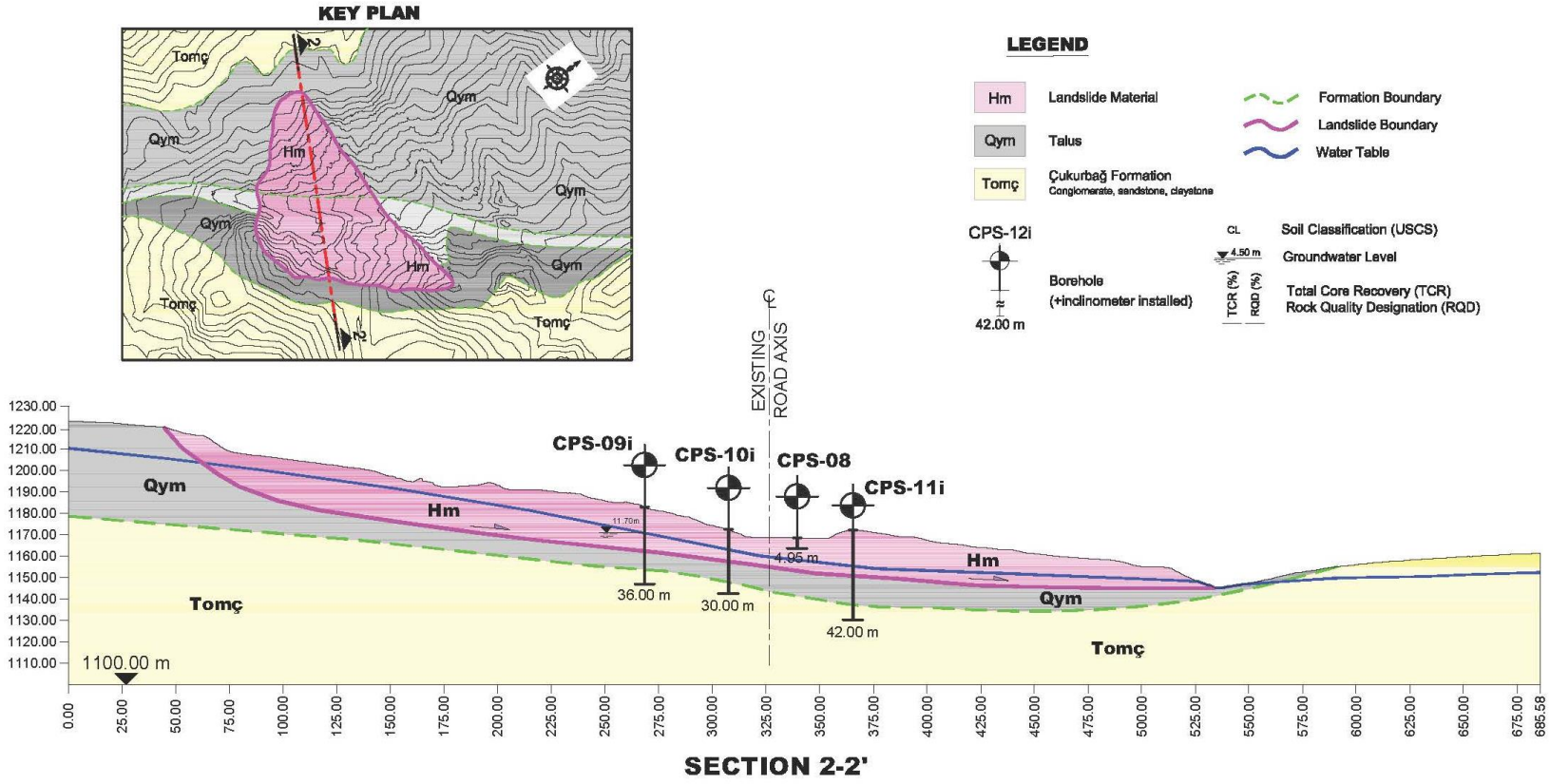


Figure 4.10. Detailed view of Cross Section 2-2'

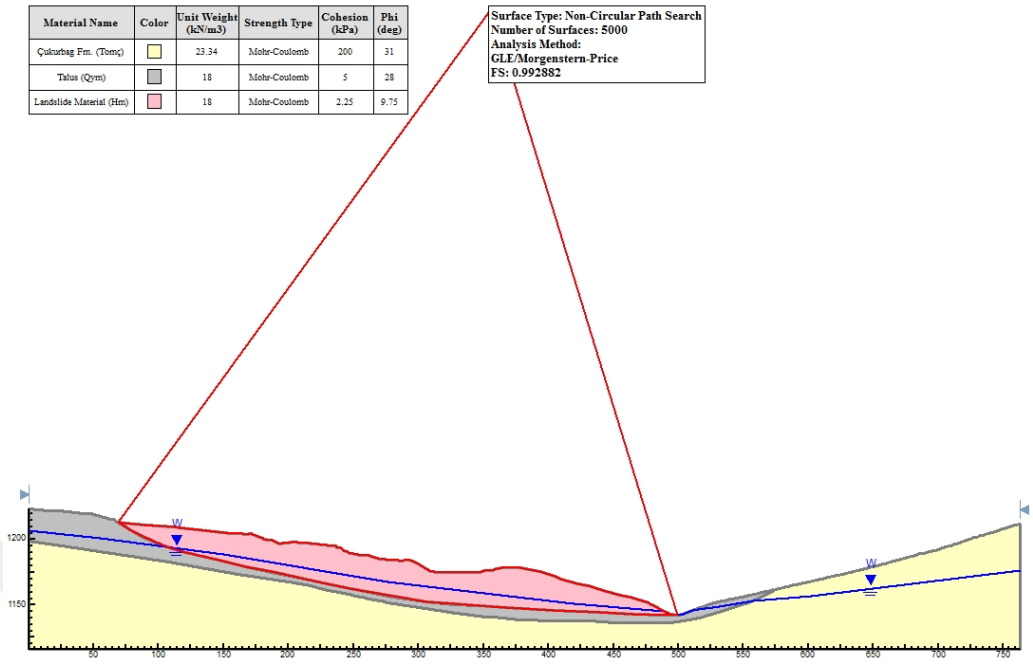


Figure 4.11. Back Analysis of Cross Section 3-3' (Exported from Slide 6.0)

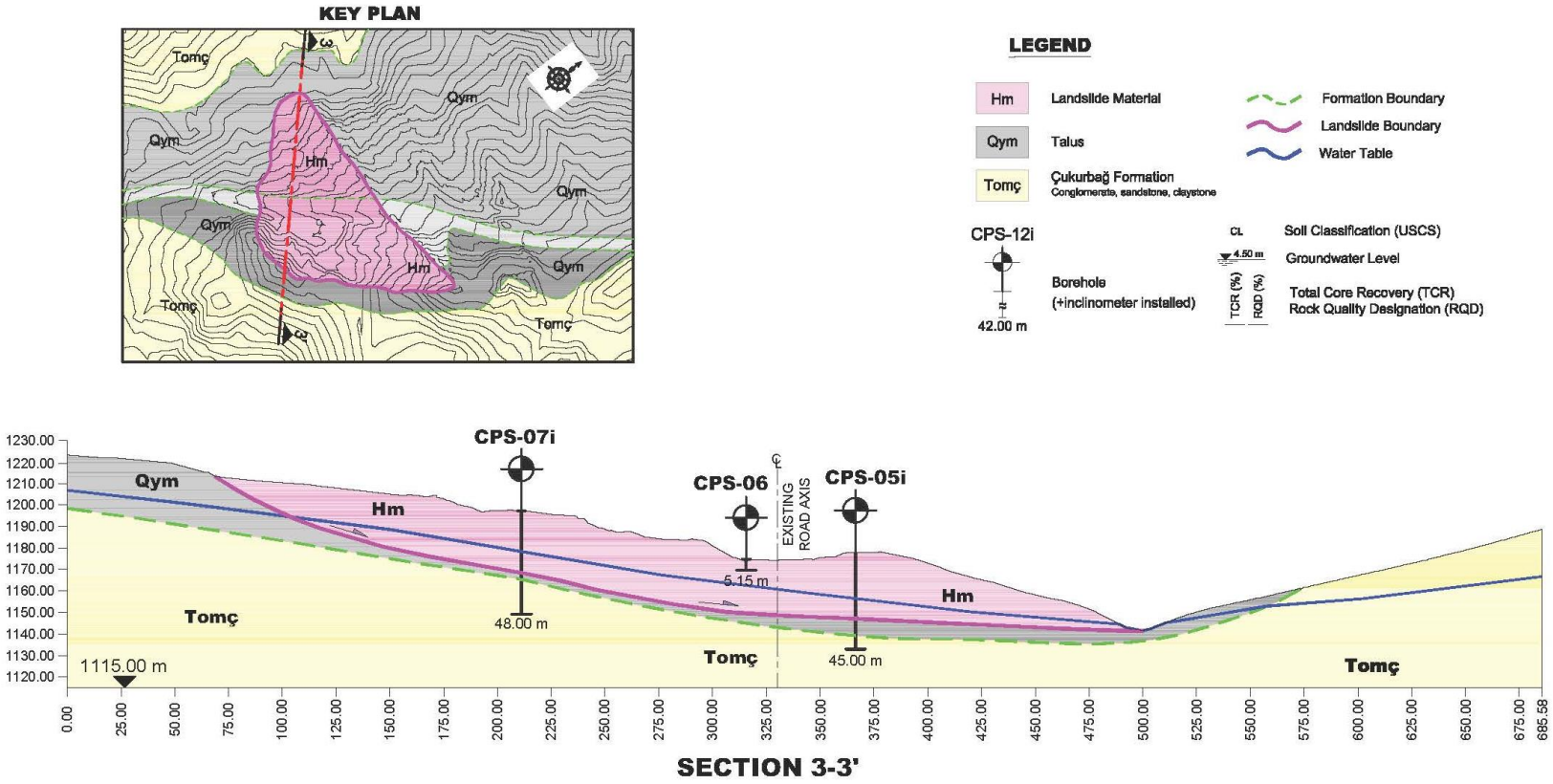


Figure 4.12. Detailed view of Cross Section 3-3'

4.4. Remediation Methods for the Landslide

The most practical solution to avoid driving forces and to reduce their effects is to prevent the movement with placing a load at the toe of the slope. The easiest way to avoid movement is the construction of a rock buttress to the toe, which depends on the size of the moving mass. Constructing a reinforced concrete protective wall or placing concrete or steel piles from surface to the bedrock are more permanent solutions.

On slopes with a critical angle, the inclination should be reduced to eliminate the impact of additional loads and excavations that would unbalance the equilibrium. The additional load on the upper part of the slope should be removed; the slope surface should be flattened or terraced. In addition, the excavation along the slope to reduce the effect of the sliding force will result in a reduced shear stress on the sliding mass.

Since most of the landslides are caused by the effect of water, a well designed and built surface and subsurface drainage system need to be established. When the surface water and groundwater are detracted from the slope, the pore water pressure decreases and the cohesion increases. Thus, the regulation of the drainage system is the most important solution for the remediation of the landslides.

To protect the slope surfaces, steep slopes should be protected from external influences and from the infiltration of surface water. Terraces should be formed on slope surfaces and these terraces should be afforested to prevent abrasion. In addition, slope surfaces should be germinated, cobbled, smeared with shotcrete.

By hardening the material on the slope that tends to slide, the internal resistance of the mass can be increased. This method is more effective in flow type mass movement. The aim of the method is preventing the movement by bonding the grains to each other with cementing or using chemicals (Öztürk, 2002).

4.5. Slope Stability Assessments

With respect to the geometry and the velocity of the landslide, the topographic conditions of the region, the construction of a rock buttress, which is the most widely

used method to prevent landslide, was preferred for long term stability. An excavation to reduce the sliding force was not deemed applicable due to the presence of the settlement in the Tekir district.

Rock buttress construction is a method that is applied for increasing the resisting forces acting on the sliding surface. For preventing the movement, the buttress provides a dead weight near the toe of the sliding mass (Figure 4.13; Abramson et al, 2002).

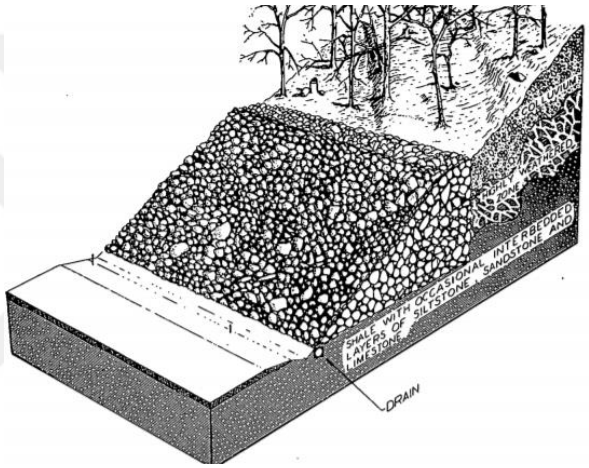


Figure 4.13. Rock buttress used to control an unstable slope (Schuster and Krizek, 1978)

Rock buttresses may contain benching or shear keys to provide additional resisting forces for buttresses (Figure 4.14). The aim of this structure is to shift the critical slip surface to deeper and stronger material. The construction of the shear key is a very practical method for the cases that the stronger material is only a few meters under the soft material. On the other hand, the construction of this structure should be carefully performed since the excavation of a trench should be performed at the toe of the sliding mass. The trench should be excavated in small sections as possible at a time.

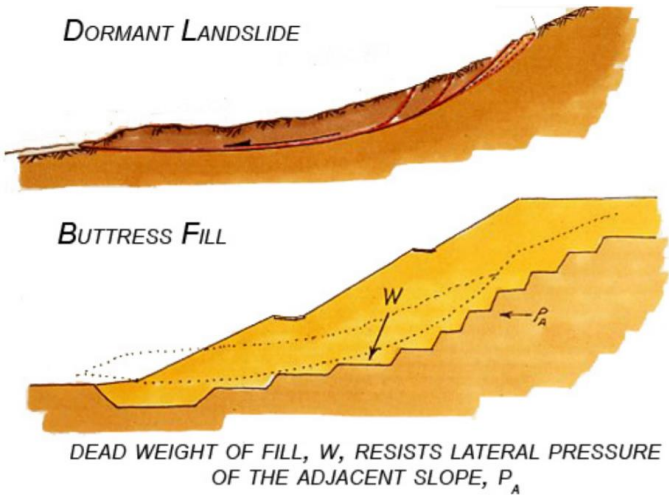


Figure 4.14. Sketch of buttress fill and a shear key for remediation of a landslide (Rogers, 1992)

For all stabilization methods, a proper drainage design should be considered to prevent landslides. The drainage study should be applied at the surface and in the subsurface carefully to reduce the effect of water on the sliding material. To divert the surface waters, generally v shaped, concrete lined ditches placed at strategic locations such as at the crown of the sliding mass, are used. The subsurface drainage methods are more variable. To decrease the effect of the groundwater on the slipping surface, drain blanket placement, usage of cut off drains or horizontal drains, and boring relief wells could be used. Subsurface drainage blankets are thin well-draining soil layers with a perforated pipe between the layers and they are proper methods to stabilize poor quality saturated soils underlain by better quality soils. Cut-off drains are suitable for the sites where the groundwater is very close to the surface. The aim of this method is catching the runoff from the upper slope and collecting it in channels. Horizontal drains are applicable methods when the groundwater level is deep. To reduce the seepage pressure in the slope, the horizontal drains can be used in variable lengths that are related to the geometry of the slope. Relief wells are suitable methods where the groundwater level has a great depth and excavation methods and horizontal drains are not applicable due to high costs or construction difficulties. The disposal of the water is performed by surface pumping and discharge channels from these wells. The relief

wells can be used with horizontal drains at the top of these wells to dispose water (Abramson et al., 2002).

In the light of this information, firstly, a channel design study was performed for relocation of the existing river located at the toe of the sliding mass. Subsequently, 4 different rock buttress designs were studied in order to stabilize the sliding mass. It was aimed to establish the effect of this geometry on the factor of safety by changing the geometry of the excavation at the toe of the sliding mass for the construction of the determined rock buttress design. In this study, a standard slope angle (1Y/2D) and total slope height (40 m) were selected for the buttress. In order to increase the stability of a structure this high and to facilitate the construction activities, benches were designed on the slope of the buttress at a height of 20 m and the width of these benches were determined to be 3 m.

All excavations were designed as stages to ensure the stability of both the buttress and the excavation. The alternatives specified for the excavation are as follows:

For the 1st alternative, the excavation stages of the landslide material from the toe was designed as 4 m bench and 4 m wall excavations with a slope of 1H/1V. In addition, the shear key structure was planned for an 8 m depth (Figures 4.16 - 4.18).

For the 2nd alternative, the excavation stages of the landslide material from the toe was designed as 4 m bench and 4 m wall excavations with a slope of 1H/1V. This alternative was planned without a shear key structure (Figures 4.19 - 4.21).

For the 3rd alternative, the excavation stages of the landslide material from the toe was designed as 4 m bench and 2 m wall excavation, that were perpendicular to each other. In addition, the shear key structure was planned for an 8 m depth (Figures 4.22 - 4.24).

For the 4th alternative, the excavation stages of the landslide material from the toe was designed as 4 m bench and 2 m wall excavation, that were perpendicular to each other. This alternative was planned without a shear key structure (Figures 4.25 and 4.27).

In addition, Figure 4.15 represents the schematic view of the suggested drainage method on the benches that are planned for the excavation at the toe.

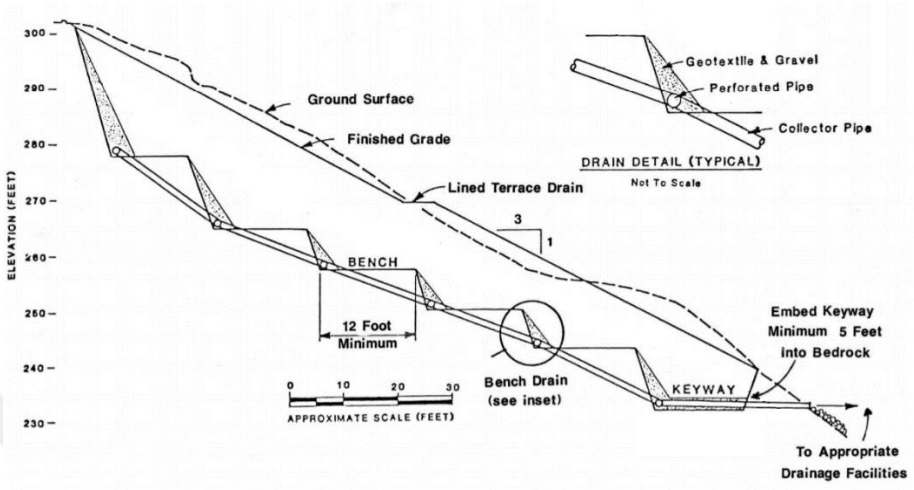


Figure 4.15. Drainage system could be used on benches that designed for the excavation (modified from Rogers, n.d.)

4.6. Slope Stability Analyses and Results

The stability analysis was performed for Section 3-3' (Figure 3.1) which was also used for the back analysis for the landslide. To perform limit equilibrium analysis, RocScience Slide 6.0 software was used, with application of Morgenstern and Price method. The failure surface, which has been obtained from the inclinometer data, was used for all stages of the limit equilibrium analysis. Figures 4.17-4.28 show the slope stability analysis results of the 4 different buttress design alternatives.

For performing the stability analysis, a minimum factor of safety value of 1.50 and 1.10 were used for the static and pseudo-static conditions, respectively. These values have been provided by the Research Engineering Services Technical Specification (2014) of General Directorate of Highways (KGM). In addition, it should be noted that, Seed (1979) was suggested the minimum factor of safety value as 1.15 for the

magnitude of the earthquake is approximately 6.5, though the value of 1.0 was suggested by Kavazanjian (1997) (Table 4.3).

The material parameters that are used for the limit equilibrium analysis are given at Table 4.5. The determination of the shear strength parameters of the units have been explained in Chapter 3 in detail. For the strength parameters of the fill material, several approaches of different researches were considered. According to Long and George (1966), a buttress design was selected for the analysis of the sections at Anchorage, that was affected by the Great Alaska Earthquake, and the internal friction angle and unit weight of the gravel buttress have been selected as 40° and 22 kN/m^3 (140 lb/ft^3). Mejia, Sun and Leung (2005) used the unit weight, effective cohesion and effective internal friction angle parameters of the rock fill layer of the Butt Valley Dam as 21.2 kN/m^3, 0 kPa and 40°, respectively, for limit equilibrium analysis. Similarly, Yıldız and Gürdil (2012) suggested these parameters for the design of Kairakkum Dam as 22.5 kN/m^3, 0 kPa and 42°, respectively. Brian et al. (2006) have used buttress parameters after assessing the approaches of different researchers (i.e., Saboya & Byrne, 1993 Barton and Kjaernsli, 1981; Charles and Watts, 1980; Marsal, 1973; Marachi et al., 1973; Leps, 1970) and selected the internal friction angle as 46.8° and the unit weight as 17.8 kN/m^3. Avşar et al. (2014) assigned unit weight, cohesion and internal friction angle values for a landslide remediation study in Giresun through rock buttressing as 20.86 kN/m^3, 0 kPa and 35°, respectively. When all these results were evaluated together, the parameters were chosen as follows: γ=22.5 kN/m^3, c=0 kPa and ϕ=40°.

Table 4.5. *The material parameters that were used for the limit equilibrium analysis*

Material Name	Color	Unit Weight (kN/m^3)	Strength Type	Cohesion (kPa)	ϕ (deg)
Çukurbag Fm (Tomç)		24	Mohr-Coulomb	200	31
Talus (Qym)		18	Mohr-Coulomb	5	28
Landslide Material (Hm)		18	Mohr-Coulomb	2.25	9.75
Rock Fill Material		22.5	Mohr-Coulomb	0	40

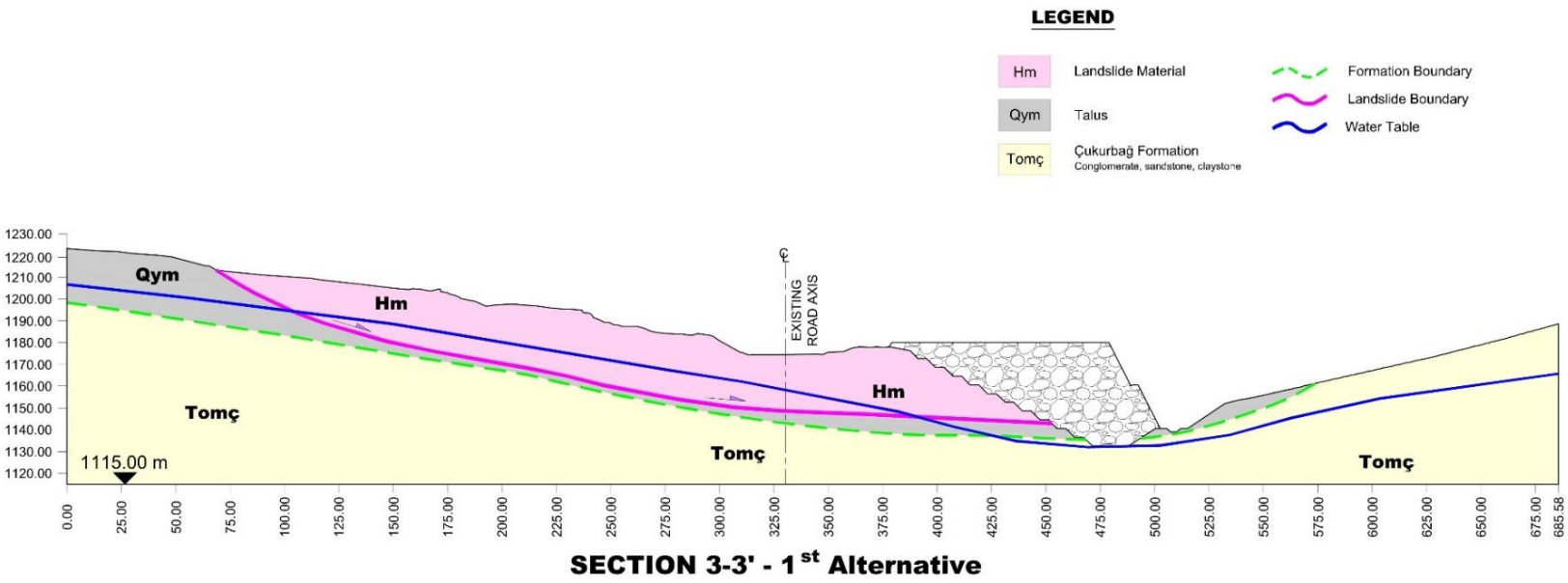


Figure 4.16. Section 3-3’ for the 1st alternative of buttress design

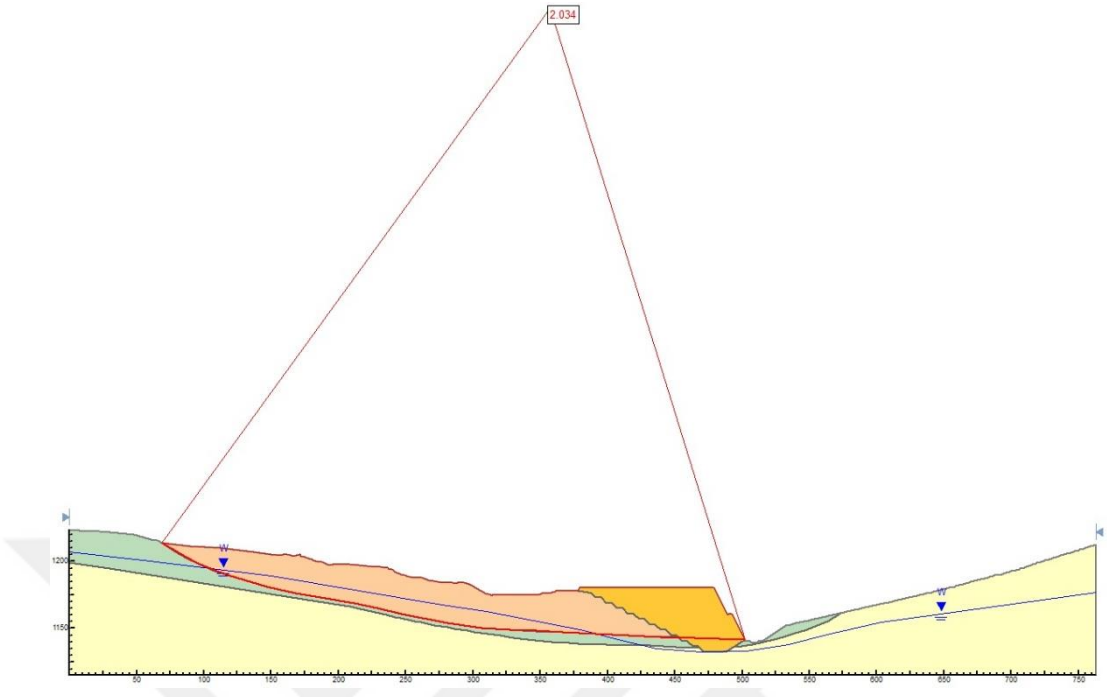


Figure 4.17. Limit equilibrium analysis results of Section 3-3' for the 1st alternative of buttress design – static condition (Exported from Slide 6.0)

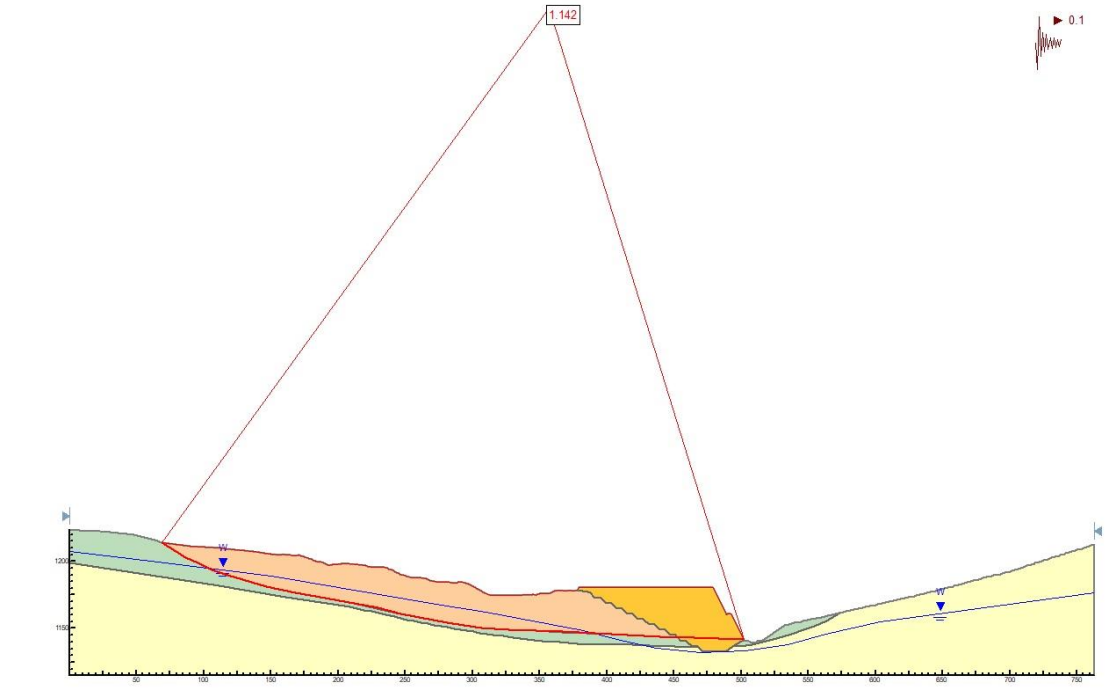


Figure 4.18. Limit equilibrium analysis results of Section 3-3' for the 1st alternative of buttress design – pseudo-static condition (Exported from Slide 6.0)

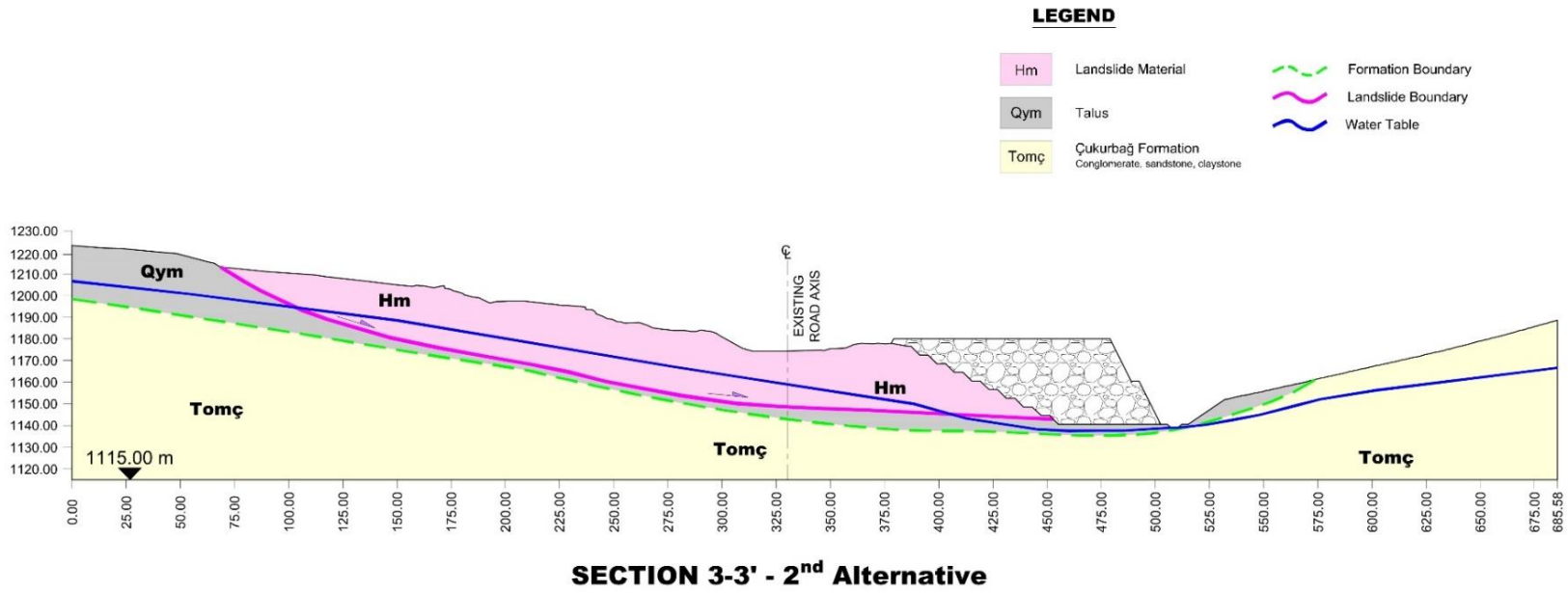


Figure 4.19. Section 3-3’ for the 2nd alternative of buttress design

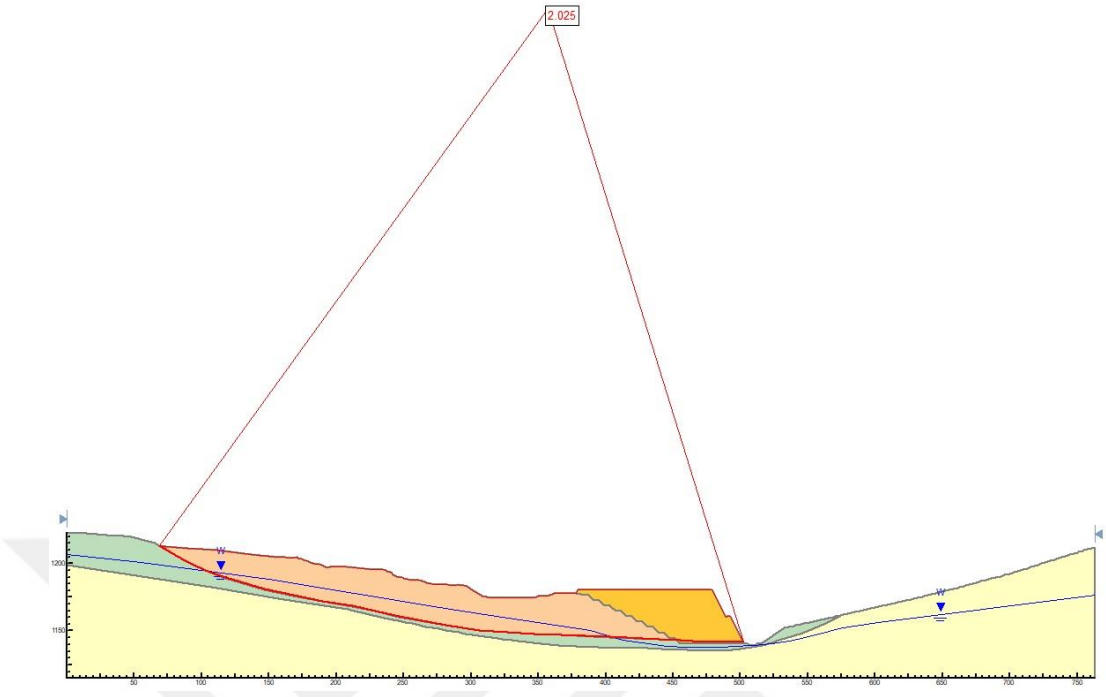


Figure 4.20. Limit equilibrium analysis results of Section 3-3' for the 2nd alternative of buttress design – static condition (Exported from Slide 6.0)

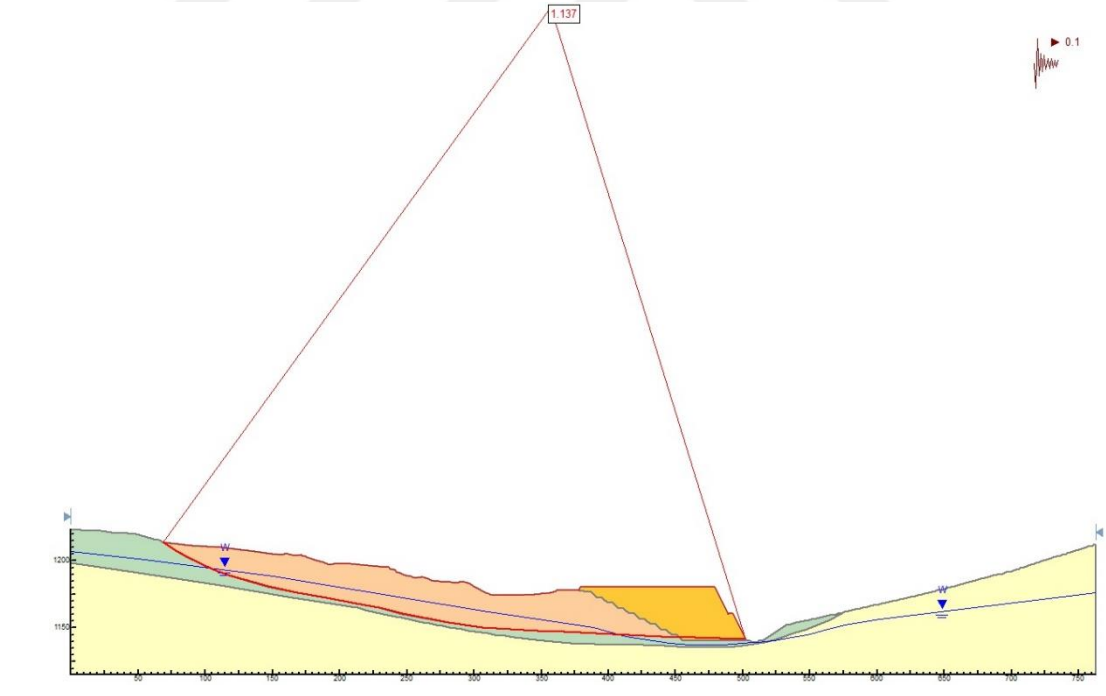


Figure 4.21. Limit equilibrium analysis results of Section 3-3' for the 2nd alternative of buttress design – pseudo-static condition (Exported from Slide 6.0)

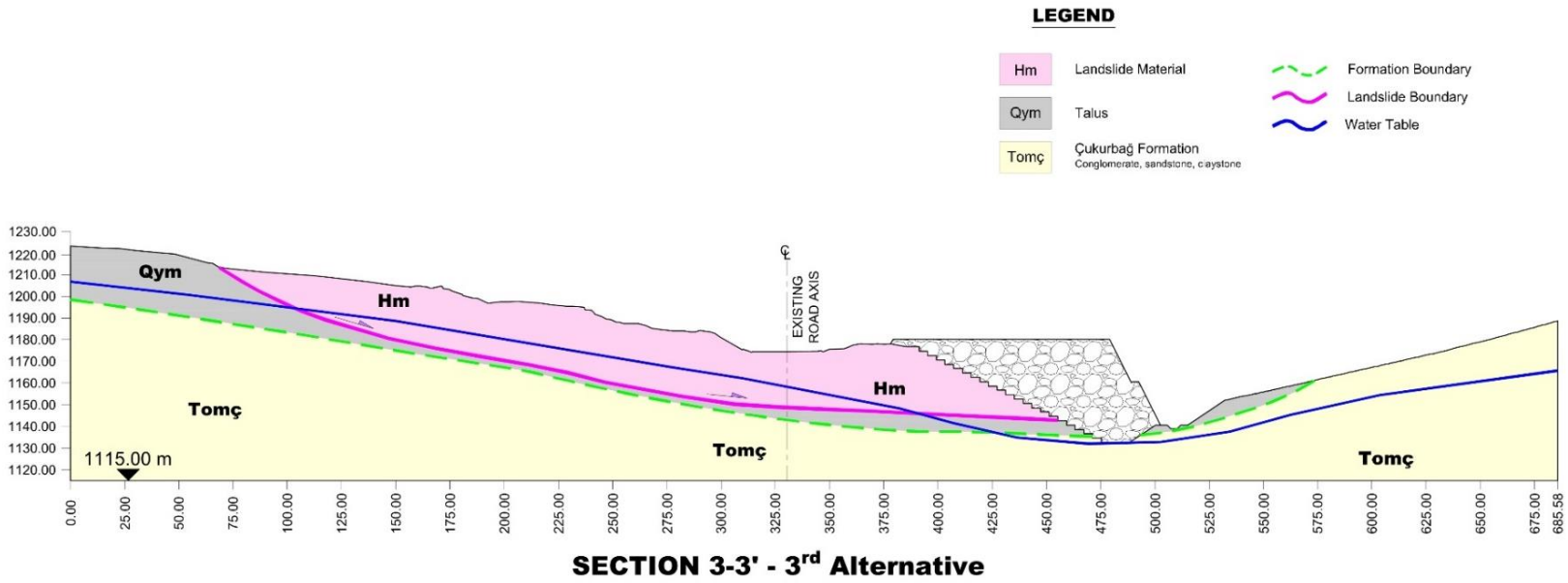


Figure 4.22. Section 3-3’ for the 3rd alternative of buttress design

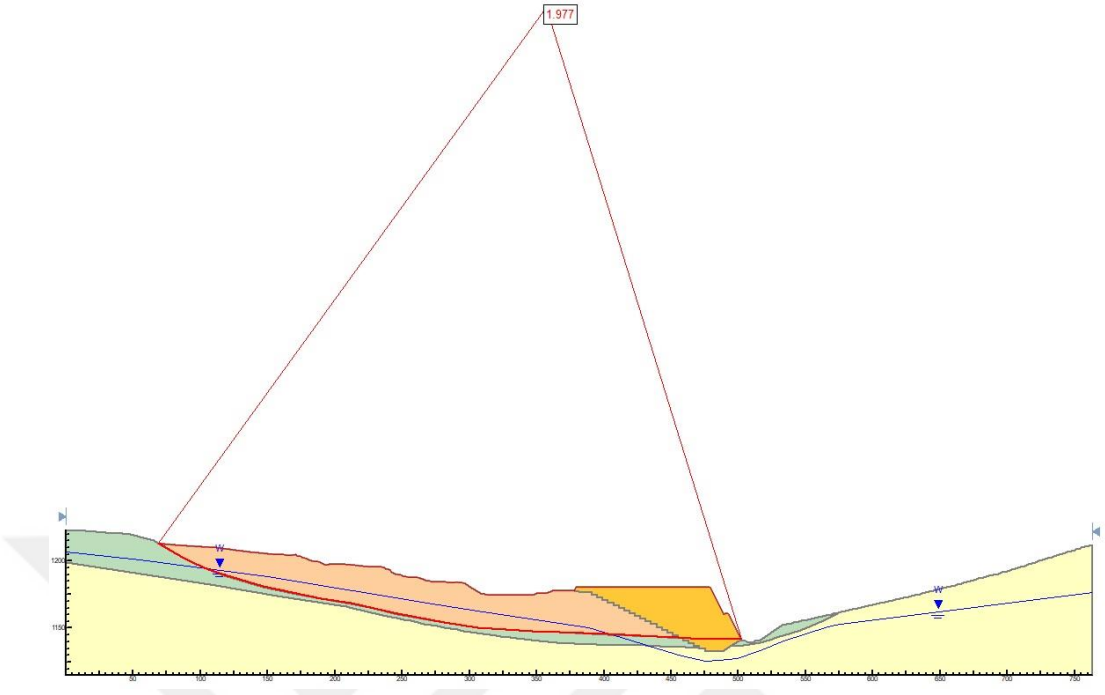


Figure 4.23. Limit equilibrium analysis results of Section 3-3' for the 3rd alternative of buttress design – static condition (Exported from Slide 6.0)

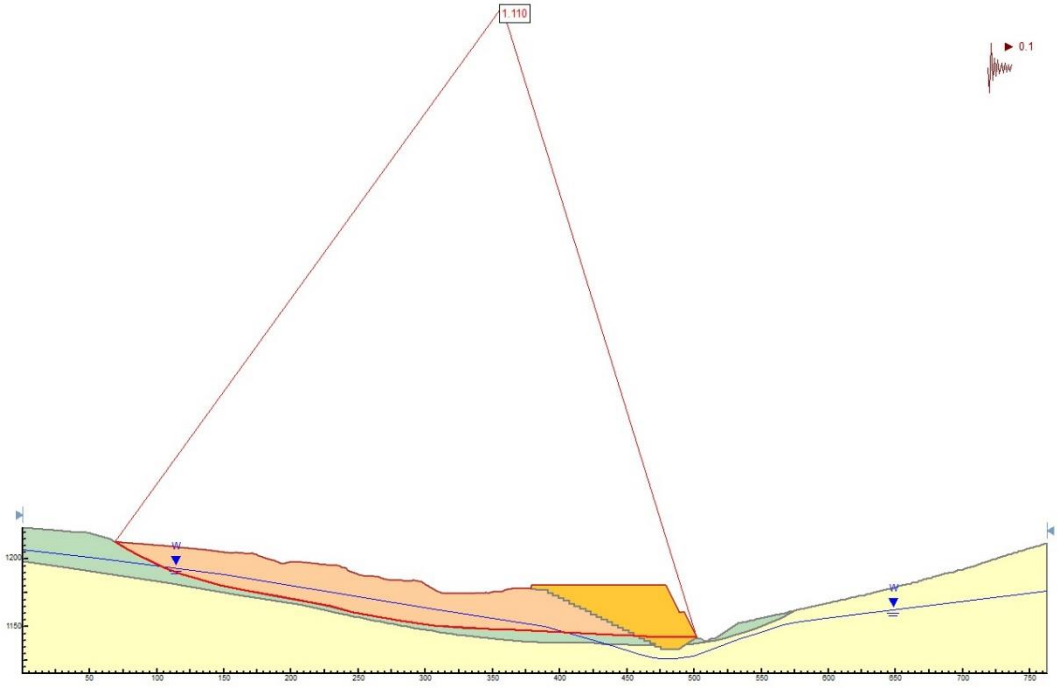


Figure 4.24. Limit equilibrium analysis results of Section 3-3' for the 3rd alternative of buttress design – pseudo-static condition (Exported from Slide 6.0)

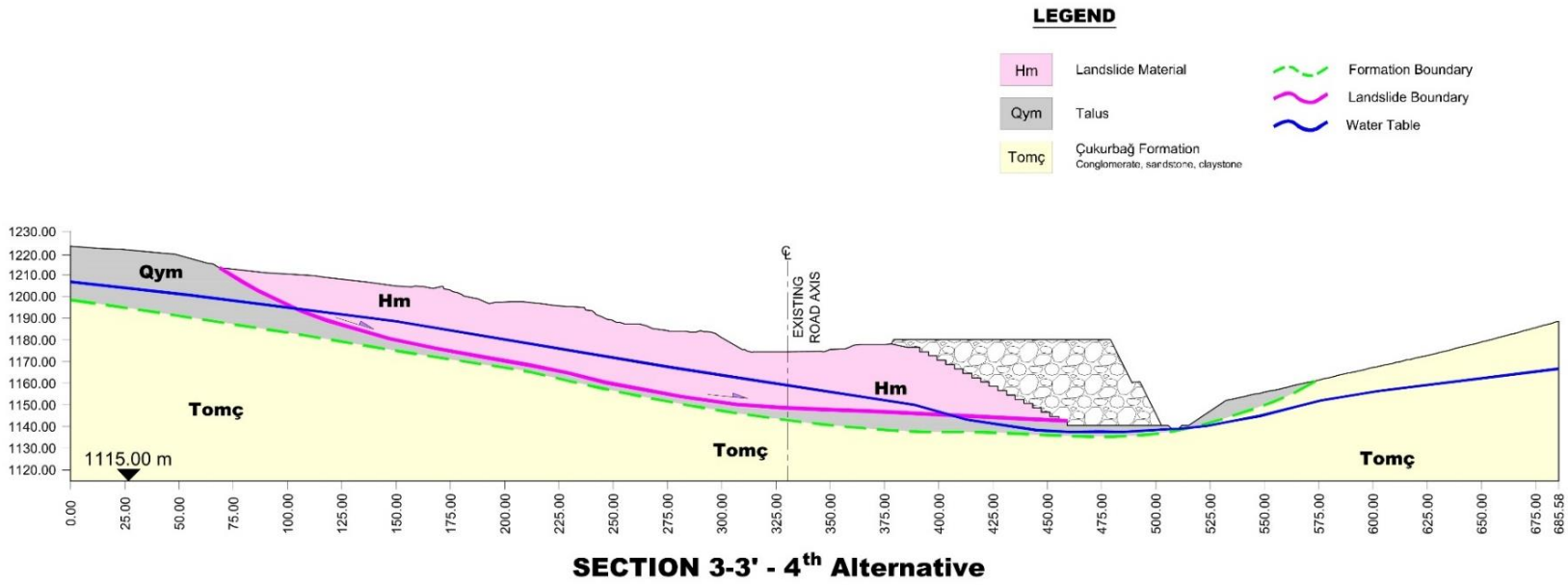


Figure 4.25. Section 3-3’ for the 4th alternative of buttress design

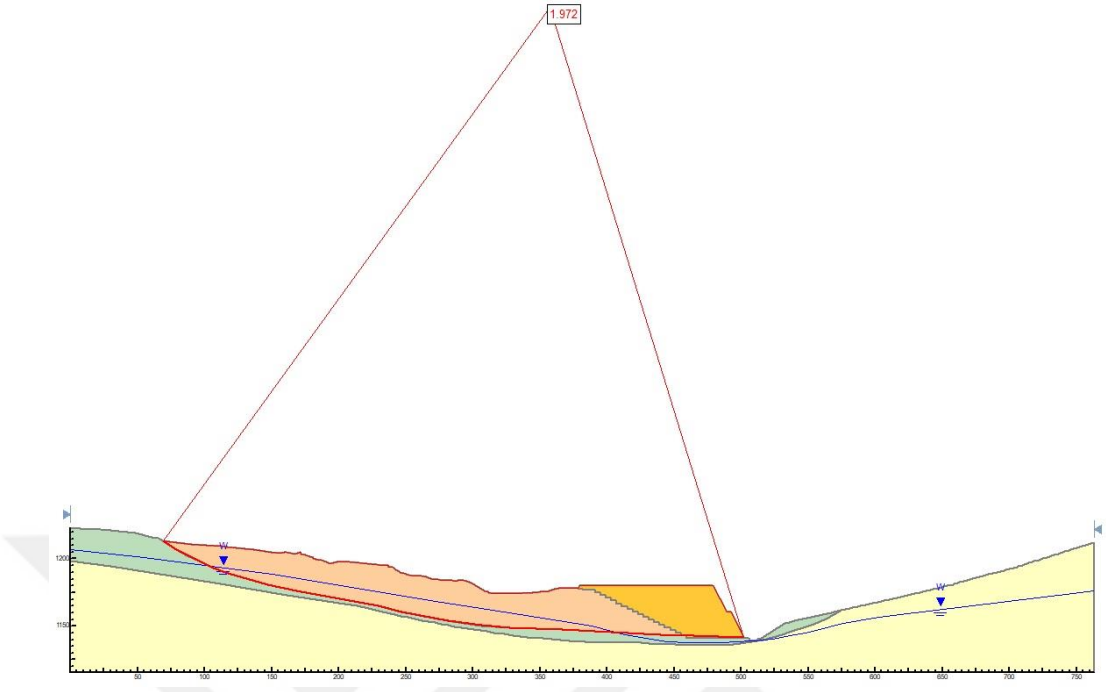


Figure 4.26. Limit equilibrium analysis results of Section 3-3' for the 4th alternative of buttress design – static condition (Exported from Slide 6.0)

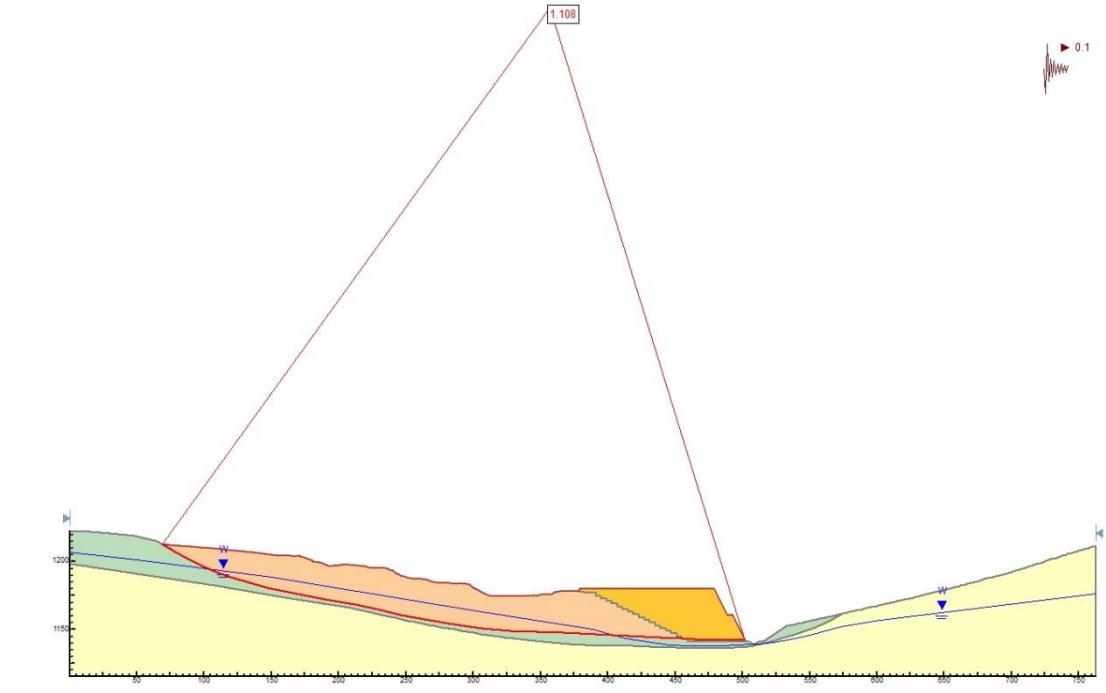


Figure 4.27. Limit equilibrium analysis results of Section 3-3' for the 4th alternative of buttress design – pseudo-static condition (Exported from Slide 6.0)

The results of these 4 alternatives are summarized in Table 4.6. There are no major differences between the excavation design alternatives with or without shear key construction.

Table 4.6. *The limit equilibrium analysis results of the buttress design alternatives*

Alternative	Factor of Safety	
	Static Condition	Pseudo-Static Condition
1	2.034	1.142
2	2.025	1.137
3	1.977	1.110
4	1.972	1.108

4.7. Discussion of the Design Alternatives for the Rock Buttress

The alternatives that were recommended for the toe excavation of the landslide material for the rock buttress was compared with respect to the costs of the excavation and required fill material for construction in order to decide which alternative is more convenient. The volume calculations of excavation and required fill material for the construction were performed for the 4 alternatives. For the calculation of the cost, the unit price list of the General Directorate of State Hydraulic Works (DSI), Dams and HEPP Department (2019) was utilized. B-15.301 and B-15.312 items were preferred for the excavation, transportation and deposition of soils and excavation, transportation and replacement of rock fill material, respectively. The unit price of the item of B-15.301 is 3.83 TL, while the item of B-15.312 is 22.99 TL.

Table 4.7 summarizes the calculated volumes and costs of the excavation and required fill material for the buttress alternatives.

Table 4.7. *Calculated volumes and costs of the excavation and required fill material for rock buttress*

Alternative	Factor of Safety		Calculated Volume		Calculated Cost		
	Static Condition	Pseudo-Static Condition	Excavation (m^3)	Required fill material for buttress (m^3)	Excavation (TL)	Required fill material for buttress (TL)	TOTAL
1	2.034	1.142	837,088	2,132,475	3,206,045	49,025,600	52,231,645
2	2.025	1.137	680,838	1,953,650	2,607,608	44,914,414	47,522,021
3	1.977	1.110	840,388	2,116,450	3,218,684	48,657,186	51,875,870
4	1.972	1.108	707,150	1,981,463	2,708,385	45,553,823	48,262,207

According to these results, the design alternatives without shear key structure have lower cost than the construction with shear key ones, because the volume of excavation and the hence, required fill material volume is less. However, the excavation and construction elevation in the valley cannot be planned to be decreased to further lower elevations due to certain restrictions (i.e., presence of the Adana-Pozantı Motorway, proper drainage design and relocation design of the existing river controlled by the settlement above the valley) leading to the fact that the buttress structure will be placed directly on the talus (Qym) unit. In long term, the non-homogeneous distribution of the units contained in talus (Qym) may cause differential settlement and hence, deformation on the buttress structure. For this reason, it is important to situate the structure on strong rock. In this context, although the cost of construction of shear key is higher, it is deemed to be more appropriate to choose the design with shear key considering long-term stability.

As a conclusion, the 3rd alternative with a shear key structure is deemed to be more proper to select, considering the long-term stability of the rock buttress and the total cost of the entire construction process (excavation of landslide material and construction of rock buttress).

CHAPTER 5

SUMMARY AND CONCLUSIONS

Stability problems were determined along the Km 21+200 – 21+730 section (Tekir Region) of the Tarsus – Pozantı Motorway and vicinity, especially due to the traffic load imposed by heavy tonnage vehicles along with the contribution of factors such as topographic, atmospheric conditions and the adverse geomechanical properties of the geologic units in the highway area.

In the context of determining the engineering geological properties of the geological units and the groundwater level and investigation of the geotechnical problems, geological observations have been performed and a detailed engineering geological map of the study area has been prepared. 31 boreholes with total length of 549.09 meters of which 12 of them contained inclinometers have been drilled. A total of 352 standard penetration tests (SPT) have been performed as in-situ tests. Laboratory geotechnical tests have been performed on 42 rock and 342 soil samples. With respect to the in-situ observations and in-situ and laboratory tests, the landslide material (Hm), artificial fill (Yd), talus (Qym) and Çukurbağ formation (Tomç) have been established to represent the units of the landslide area. The geometry, sliding surface, velocity and mechanism of the landslide have been established in the light of these investigation studies. The geotechnical parameters of the units have been determined by using laboratory test results, empirical approaches from literature, rock mass classifications and RocData 4.0 Software. The back analysis method has been performed for the determination of the shear strength parameters of the landslide material (Hm) by using three sections that represent the sliding mass. As a result of the back analysis performed by using the Morgensten-Price method, the shear strength parameters of the landslide material have been obtained as $c = 2.25$ kPa and $\phi = 9.75°$, respectively.

In consideration of the remediation of the landslide, 4 different alternatives of excavation stage design for rock buttress construction with a proper drainage system have been analyzed. The limit equilibrium analysis of these alternatives has been compared with respect to the cost of excavation of the landslide material and construction of the rock buttress. In addition, the effect of the shear key structure has been considered. The 3rd rock buttress alternative with 4 m bench and 2 m wall excavations perpendicular to each other and an 8 m deep shear key structure has been selected.

In conclusion, the long-term stability of the landslide, that occurred at the Pozantı – Tekir region, has been provided in the light of these investigation and stability analyses.

REFERENCES

Abramson, L., W., Lee, T., S., Sharma, S., and Boyce, G., M., 2002, Slope Stability and Stabilization Methods, John Wiley & Sons, Inc., New York, 712 pp.

AFAD, 2018. "Türkiye Deprem Bölgeleri Haritası", Deprem Dairesi Başkanlığı, Ankara.

Alan, İ., Şahin, Ş., Kop, A., Bakırhan, B. and Böke, N., 2004a. Belemedik İstifi'nin jeolojik özellikleri ve Toroslarda tanımlanan birlikler içerisindeki konumu, 57th Geological Congress of Turkey 08-12 March, Abstracts, p. 269, Ankara.

Alan, İ., Kop, A., Keskin, H., Altun, İ. and Balcı, V., 2004b. Namrun ve kuzeyindeki metamorfik istifin Toroslarda tanımlanan birlikler içerisindeki yeri. 57th Geological Congress of Turkey 08-12 March, Abstracts, p. 273, Ankara.

AS 4678-2002. Earth retaining structures, Australian Standard

ASTM, 1995. D2938-95(2002), Standard Test Method for Unconfined Compressive Strength of Intact Rock Core Specimens (Withdrawn 2005), ASTM International, West Conshohocken, PA.

ASTM, 2002. D3148-02, Standard Test Method for Elastic Moduli of Intact Rock Core Specimens in Uniaxial Compression (Withdrawn 2005), ASTM International, West Conshohocken, PA.

ASTM, 2007. D4719 – 07, Standard Test Methods for Prebored Pressuremeter Testing in Soils (Withdrawn 2016), ASTM International, West Conshohocken, PA.

ASTM, 2011. D1586 – 11, Standard Test Method for Standard Penetration Test (SPT) and Split – Barrel Sampling of Soils, ASTM International, West Conshohocken, PA.

ASTM, 2013. D7012 – 13, Standard Test Methods for Compressive Strength and Elastic Moduli of Intact Rock Core Specimens under Varying States of Stress and Temperatures, ASTM International, West Conshohocken, PA.

ASTM, 2009. D7263 - 09(2018), Standard Test Methods for Laboratory Determination of Density (Unit Weight) of Soil Specimens, ASTM International, West Conshohocken, PA.

ASTM, 2013. D6230 – 13, Standard Test Method for Monitoring Ground Movement Using Probe – Type Inclinometers, ASTM International, West Conshohocken, PA

ASTM, 2017. D4318 – 17, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils, ASTM International, West Conshohocken, PA

ASTM, 2017. D6913M – 17, Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis, ASTM International, West Conshohocken, PA.

ASTM, 2019. D2216 – 19, Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass, ASTM International, West Conshohocken, PA

Atkinson, J., 1993. An Introduction to the Mechanics of Soils and Foundations. Through Critical State Soil Mechanics. McGraw-Hill Book Company, London.

Avşar, Ö., Akgün, H. and Koçkar, M. K., 2014. Investigation of the failure mechanism and stabilization of a landslide in weathered tuffite, Giresun, northeastern Turkey. Environmental earth sciences, 72(9), 3723-3740.

Barton, N. and Kjaernsli, B., 1981. Shear strength of rockfill. Journal of Geotechnical Engineering Division, ASCE, Vol. 107, NoGT7, pp. 873-891.

Brian, L. J., Upul, D. and Trevor, P., 2006. A risk and deformation-based design approach for MSE walls on rock fill slopes along the Sea to Sky Highway test section.

Bieniawski, Z.T., 1989. Engineering Rock Mass Classifications. New York: Wiley.

Bieniawski, Z.T., 1996. Milestones in Rock Engineering. Balkema / Rotterdam p.19.

Bieniawski, Z.T., 1973. Engineering Classification of Jointed Rock Masses. Trans S. Afr. Inst. Civ. Engrs. 15, pp. 335-344.

Bieniawski, Z.T., 1976. Rock Mass Classification in Rock Engineering, in Exploration for Rock Engineering. Proc. of the Symp. 1, Cape Town, Balkema, pp. 97-106.

Bishop, A.W. and Morgenstern, N.R., 1960. Stability coefficients for earth slopes, Geotechnique, 10: 129-150.

Bowles, J.E., 1988. Foundation analysis and design, 4th edn. McGraw-Hill, New York

Bowles, J.E., 1997. Foundation analysis and design, 5th edn. McGraw-Hill, New York

Carrubba P. and Del Fabbro, M., 2008. Laboratory investigation on reactivated residual strength. Journal of Geotechnical and Geoenvironmental Engineering, 134, 3, pp. 302–315.

Charles, J.A. and Watts, K.S., 1980. The influence of confining pressure on the shear strength of compacted rockfill. Geotechnique, Vol. 30, No. 4, pp. 353-367.

Climate Data, 2019. “Climate: Pozantı, Adana, Turkey”.

Cruden, D. M. And Varnes, D. J., 1996. Landslides: investigation and mitigation. Chapter 3-Landslide types and processes. Transportation research board special report, p. 247.

Das, B. M., 2007. Fundamentals of geotechnical engineering. Cengage Learning.

Das, B. M., 2013. Advanced soil mechanics. Crc Press.

Das, B. M., Ameratunga, J. and Sivakugan, N., 2015. Correlations of soil and rock properties in geotechnical engineering. Springer.

Demirkol, C., 1989. Pozantı-Karsantı-Karaisalı (Doğu Toros) Arasında Yer Alan Karbonat Platformunun Stratigrafisi ve Jeolojik Gelişimi. M.T.A. Publ, 109, 33-44.

Demirtaşlı, E., Turhan, N.,Bilgin, A.Z. and Selim, M., 1984. Geology of the Bolkardağ Mountains. In: Tekeli, O. ve Göncüoğlu, M.C.(Eds) Int. Symposium on the Geology of the Taurus Belt, MTA Publ., 125-142.

Demirtaşlı, E., 1967. Pınarbaşı-Sarız-Mağara ilçeleri arasında kalan sahanın stratigrafik birimleri ve petrol imkânları: MTA Rap., 4389 (yayımlanmamış), Ankara.

Dinçer, F. and Avşar, N., 2004. Çamardı (Niğde) yöresi Tersiyer (Lütesiyen) sedimanlarının bentik foraminifer biyostratigrafisi. Yerbilimleri Dergisi, 25(30), 35-48.

Dilek Y., Thy P., Hacker B. and Grundvig S., 1999a. Structure and petrology of Tauride ophiolites and mafic dike intrusions (Turkey): implications for the Neotethyan Ocean. Geol Soc Am Bull 111: 1192–1216.

Dilek, Y., Whitney, D.L., and Tekeli, O., 1999b. Links between tectonic processes and landscape morphology in an Alpine Collision Zone, South-Central Turkey. Annals of Geomorphology, 118, p. 147–164.

Dilek, Y. and Moores, E., 1990. Regional tectonics of the eastern Mediterranean ophiolites. In: Malpas, J., Moores, E., Panayiotou, A. & Xenophontos, C. (eds), Proceedings of International Troodos Ophiolite Symposium on Ophiolites-oceanic Crustal Analogues, 295–309.

DSI, 2019. "Birim Fiyat Cetveli", Ankara

Duncan, J.M. and Wright, S.G., 2005. Soil Strength and Slope Stability, John Wiley & Sons, Inc, New York.

Emre, Ö., Duman, T. Y., Özalp, S., Elmacı, H., Olgun, Ş. and Şaroğlu F., 2013. "1:250,000 Scale Active Fault Map of Turkey".

Fellenius, W., 1936. Calculation of the stability of earth dams, Trans. 2nd Cong. On Large Dams, 4, Washington DC.

Genç, D., 2008. Zemin Mekaniği ve Temeller Jeoloji Mühendisleri Odası yayını, Yayın no: 110, Ankara.

Gerçek, H., 2006. Poisson's Ratio Values for Rocks. International Journal of Rock Mechanics and Mining Sciences, 44 (I), pp. 1-13.

Gullà G., Aceto L. and Niceforo D., 2004. Geotechnical characterisation of fine-grained soils affected by soil slips. Proceedings of the Ninth International Symposium on Landslides. A. A.Balkema Publishers, Rio de Janeiro, 2 June to 2 July, 1: 663–668.

Gökçeoğlu, C., Sönmez, H. and Kayabaşı, A., 2003. Predicting the Deformation Modulii of Rock Masses. International Journal of Rock Mechanics and Mining Sciences, 40 (5), 703-12.

Göncüoğlu, M.C., 2010. Introduction to the geology of Turkey: geodynamic evolution of the pre-alpine and alpine terranes. General Directorate of Mineral Research Exploration, Monography series 5, pp 1–66

Hoek, E. and Bray, J.W., 1977. Rock Slope Engineering, 2nd. Edn., The Institute of Mining and Metallurgy, London, 527.

Hoek, E., and Bray, J.W., 1981. Rock Slope Engineering, 3rd edn., London, Institution of Mining and Metallurgy.

Hoek, E. and Bray, J., 1981. Rock slope engineering, Revised 3"1 Ed., The Inst. Of Min. London, Stephen and Austin and Sons Ltd., 358 p.

Hoek, E. and Brown, E.T., 1997. Practical Estimation of Rock Mass Strength. International Journal of Rock Mechanics and Mining Sciences, 34 (8), 1165 1186.

Hoek, E., 1999a. Putting Numbers to Geology an Engineer's Viewport. Quarterly Journal of Engineering Geology, 32, 1-19.

Hoek, E. and Marinos, P., 2000. Estimating the Mechanical Properties of Heterogeneous Rock Masses such as Flysch. Bulletin of the Int. Assoc. of Engineering Geologists, V. 60, pp. 85-92.

Hoek, E., Torres, C.C. and Corkum, B., 2002. Hoek-Brown Failure Criterion – 2002 Edition.

Hoek, E. and Diederichs, M.S., 2006. Empirical Estimation of Rock Mass Modulus. International Journal of Rock Mechanics and Mining Sciences, 43, 203-215.

Hoek, E. and Brown, E.T., 2019. The Hoek–Brown failure criterion and GSI–2018 edition. Journal of Rock Mechanics and Geotechnical Engineering, 11(3), 445-463.

Holtz, R.D. and Kovacs, W.D., 1981. An introduction to geotechnical engineering. Prentice Hall, Englewood Cliffs

Hudson, J.A., 1989. Rock Mechanics Principles in Engineering Practice. Butterworths, London, 72 p.

Hunt, R.E., 1986. Geotechnical engineering analysis and evaluation, McGraw-Hill Book Co_, 729 p.

Hunt, R.E., 2005. Geotechnical Engineering Investigation Handbook, Second Edition, Taylor & Francis Group, Boca Raton, FL, 1066 pp.

Highland, L. and Bobrowsky, P.T., 2008. The landslide handbook: a guide to understanding landslides (p. 129). Reston: US Geological Survey.

ISRM, 2007. The Complete ISRM Suggested Methods for Rock Characterization, Testing and Monitoring. 1974-2006.

ISRM, 2014. The ISRM Suggested Methods for Rock Characterization, Testing and Monitoring. 2007-2014.

Janbu, N., 1954. Stability analysis of slopes with dimensionless parameters, Harvard Soil Mech. Ser No. 46, Harvard University, Cambridge, Mass.

Janbu, N., Bjerrum, L. and Kjaemsli, B., 1956. Veiledning ved lesning av fondamenterings appgaver (in Norwegian with English summary: Soil mechanics applied to some engineering problems), Norwegian Geotechnical Institute, Publ. No. 16.

Jaffey N. and Robertson A.H.F., 2005. Non-marine sedimentation associated with Oligocene-Recent exhumation and uplift of the Central Taurus Mountains, S Turkey. Sediment Geol 173: 53–89.

Kalkan, Y., Alkan, R. M., Baykal, O., Yanalak, M., Erden, T. and Yildirim, H., 2003. Heyelanlarin jeodezik ve geoteknik yöntemlerle izlenmesi: ambarli liman bölgesinde bir uygulama.

Karayolları Genel Müdürlüğü, 2005. Teknik Araştırma Dairesi Başkanlığı, "Araştırma Mühendislik Hizmetleri Teknik Şartnamesi", Ankara.

Kenney T.C., 1959. Discussion of Geotechnical properties of glacial lake clays, by T.H. Wu. J Soil Mech Found Div ASCE 85(SM3):67–79

Leps, T. M., 1970. Review of the shearing strength of rockfill. Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 96, pp. 1159-1170.

Long, E. and George, W., 1967. Buttress design earthquake-induced slides. Journal of Soil Mechanics & Foundations Div.

Lupini, J.F., Skinner, A.E., and Vaughan, P.R., 1981. The drained residual strength of cohesive soils, Geotechnique, 31, 181-213, 10.1680/geot.1981.31.2.181.

Lytwyn, J.N. and Casey, J.F., 1995. Geochemistry of Postkinematic Mafic dike and Subophiolitic metabasites, Pozantı-Karsantı Ophiolite, Turkey: Evidence for Ridge Subduction. GSA Bulletion; v:107; no: 7. P: 830-850.

Marachi, N.D., Chan, C.K. and Seed, H.B., 1972. Evaluation of properties of rockfill materials. Journal of the Soil Mechanics and Foundation Division, ASCE, Vol. 98, pp. 95-114.

Marsal, R.J, 1973. Mechanical properties of rockfill. Embankment dam engineering. Casagrande Volume. Edited by Hirschfeld & Poulos, John Wiley & Sons, New York, pp. 109-200.

Mejia, L.H., Sun, J.I. and Leung, K.K., 2005. Seismic upgrade of hydraulic fill dam by buttressing. Soil Dynamics and Earthquake Engineering, 25(7-10), 571-579.

Menard L. ve Rousseau J.L., 1962. Evaluation des Tassaments Tendances Nouvelles Soils-Soi Menard l. (1963) "Calcul de la force portante des fondations sur la

base des resultats des essais presiometriques" Sols-Soils, Vol.2 No.5 ve 6. ls, Vol.1, No1

Morgenstem, N.R. and Price, V.E., 1965. The analysis of the stability of generalized slip surfaces, Geotechnique, 15: 79-93.

Murthy, V.N.S., 2002. Geotechnical engineering: principles and practices of soil mechanics and foundation engineering. CRC press.

Nash, D., 1987. A comparative review of limit equilibrium methods of stability analysis, Chapter 2, Slope stability (M.G. Anderson and K.S. Richards, Eds.), John Wiley and Sons, Ltd., pp. 11-75.

Nash, D., 1992. A Comparative Review of Limit Equilibrium Methods of Stability Analysis, Slope Stability, Anderson, M., G., Richards, K., S., (editors), John Wiley & Sons, Chichester, pp. 11-77.

Okay, A.I. and Tüysüz, O., 1999. Tethyan sutures of northern Turkey. In "The Mediterranean Basins: Tertiary extension within the Alpine orogen" (eds. B. Durand, L. Jolivet, F. Horváth and M. Séranne), Geological Society, London, Special Publication 156, 475-515.

Okay, A.I., 2008. Geology of Turkey: A synopsis. Anschnitt, 21, 19-42.

Öcal, T., 2015. Pozantı'da Sayfiye Yaylacılığı ve Turizm Potansiyeli, Adana: Akademisyen Yayinevi

Özgül, N., 1976. Torosların bazı temel jeolojik özellikleri. Geol. Soc. Turkey, Bull., 19, 75-87.

Öztürk, K., 2002. Heyelanlar ve Türkiyeye Etkileri. Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi, 22(2).

Pantelidis, L., 2009. Rock slope stability assessment through rock mass classification systems. International Journal of Rock Mechanics and Mining Sciences, 46(2), 315-325.

Reeves, G.M., Sims,I. and Cripps, J.C. (Eds.), 2006. Clay materials used in construction. Geological Society of London.

Rogers, D., n.d.. Overview of Landslide Mitigation Techniques. Retrieved November 22, 2019, from www.web.mst.edu/~rogersda/hazard_mitigation_techniques/Rogers-Overview Landslide Mitigation.pdf.

Rogers, J.D., 1992. Recent developments in landslide mitigation techniques. Reviews in Engineering Geology, 9, 95-118.

Saboya Jr.,F. and Byrne, P.M., 1993. Parameters for stress and deformation analysis of rockfill dams. Canadian Geotechnical Journal, Vol. 30, pp. 690-701.

Schmidt, G. C., 1961. Stratigraphic Nomenclature for the Adana Region, Petroleum District 7. Petroleum Administration Bull., 6: 47 – 63, Ankara.

Schuster, R.L. and Krizek, R.J., 1978. Landslides analysis and control. Washington Transportation Research Board, special report 176. National Academy of Sciences, WA, 234.

Schuster, R.L. and Highland, L.M., 2007. Overview of the Effects of Mass Wasting on the Natural Environment. Environmental and Engineering Geoscience, 13, 25-44.

Skempton, A.W. and Delory, F.A., 1957. Stability of natural slopes in London clay, Proc. 4th Int. Conf. SMFE, London, pp. 378-381.

Smoltczyk U., 2002. Geotechnical Engineering Handbook. Volume 1: Fundamentals. Berlin, Ernst & Sohn Verlag.

Soeters, R. and Van Westen, C.J., 1996. Slope instability recognition, analysis and zonation. Landslides: investigation and mitigation, 247, 129-177.

Sorensen, K.K. and Okkels N., 2013. Correlation between drained shear strength and plasticity index of undisturbed over consolidated clays. In: Proceedings of the 18th international conference on soil mechanics and geotechnical engineering, Paris, Presses des Ponts, 1, pp 423–428

Spencer, E., 1967. A method of analysis of the stability of embankments assuming parallel interslice forces, Geotechnique, 17: 11-26.

Stark, T. and Eid, H., 1994. Drained Residual Strength of Cohesive Soils. Journal of Geotechnical Engineering. 120. 856-871

Şengör, A.M.C. and Yılmaz, Y., 1981.Tethyan evolution of Turkey: a plate tectonic approach, Tectonophysics, 75, 181-241.

Taylor, D.W., 1948. Fundamentals of soil mechanics, John Wiley and Sons, New York.

TBDY, 2018. Türkiye Bina Deprem Yönetmeliği. Ankara: Afet ve Acil Durum Yönetimi Başkanlığı.

Tekeli, O., Aksay, A., Ürgün, B.M. and Işık, A., 1984. Geology of the Aladağ Mountains. Geology of the Taurus Belt: Procedings Int. Sym., 26-29. September., 143-149. Ankara. Turkey.

Terzaghi, K., 1950. Mechanism of landslides, İn: Geology Applied to Engineering Practice (Berkey Volume), The Geological Society of America, pp. 83-123.

Terzaghi, K. and Peck R., 1948. Soil mechanics in engineering practice. Wiley, New York

Terzaghi, K. and Peck R., 1967. Soil mechanics in engineering practice, 2nd edn. Wiley, New York

Tezaghi, K. and Peck, R. and Mesri, G., 1996. Soil mechanics in engineering practice, 3rd edn. Wiley, New York

Tiwari, B. and Marui, H., 2005. A New Method for the Correlation of Residual Shear Strength of the Soil with Mineralogical Composition. Journal of Geotechnical and Geoenvironmental Engineering

U.S. Army Corps of Engineers, 1970. Engineering and Design: Stability of Earth and Rock-fill Dams,

Ulusay, R., 2007. Heyelanlar ve Mühendislik Şevlerindeki Duraysızlıklar: Türleri, Etkileri ve Zararların Azaltılması. Flood-Landslide-Avalanche Symposium, Samsun, 157-185.

Ulusay, R. and Sönmez, H., 2007. Kaya Kütlelerinin Mühendislik Özellikleri. Published by Chamber of Geological Engineers, Ankara.

Varnes, D.J., 1978. Slope movement types and processes. Special report, 176, 11-33.

Vásárhelyi, B., 2009. A possible method for estimating the Poisson's rate values of the rock masses. Acta Geodaetica et Geophysica Hungarica, 44(3), 313-322.

Wen B.P., Aydın, A., Düzgören-Aydın N. S., Li Y.R., Chen H.Y. and Xiao S.D., 2007. Residual strength of slip zones of large landslides in the Three Gorges area, China. Engineering Geology 93: 82–98.

Yetiş, C., 1978 (a). Çamardı (Niğde) Yakın ve Uzak Dolayının Jeoloji İncelenmesi ve Ecemiş Yarılım Kuşağı'nın Maden Boğazı-kamışlı Arasındaki Özellikleri. Ç:Ü. Fen Fakültesi, PhD Thesis. (Unreleased).

Yetiş, C., 1978 (b). Geology of the Çamardı (Niğde) Region and the Characterics of the Ecemiş Fault Zone Between Maden Bogazı and Kamışlı. İstanbul Ünv. Fen Fak. Mecm. Seri E. 43, 41-61

Yetiş, C., 1984. New Observation on the Age of The Ecemiş Fault: International Symposium On The Geology of Taurus Belt, Proceeding, Ankara, 159-164.

Yetiş, C. and Demirkol, 1984. Adana Baseni Kuzey-Kuzeybatı Kesiminin Temel Stratigrafisine İlişkin Bazı Gözlemler: TJK. 38th. Scientific and Technical Congress Abstracts, 59-61.

Yıldız, E., and Gürdil, A. F., 2012. Seismic Design of a Hydraulic Fill Dam by Nonlinear Time History Method.

Zydroń, T. and Zawisza, E., 2011. Shear strength investigation of soils in landslide areas. Geologija, 53(3).

APPENDICES

A. Borehole Logs

YP-9110-FRM-0081

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Cadde No:23
06810 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsis@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-04İ
SAYFA Page No: 1 / 5

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 20.05.2016 - 27.05.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 19.50 m (HW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 42.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 42.00 m (HW)	KOORDİNAT / Coordinate (N-S) X	: 4 135 509.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-04 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 714.00
SONDÖR / Driller	: Necati AŞKIN	SONDAJ KOTU / Elevation (m)	: 1187.97

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) Net Limit Pressure	PRES. DENEYİ Elastik Modül Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test — Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph (10 20 30 40 50 60)	Jeoteknik Tanımlama Geotechnical Description	Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / $IS_{(50)}$ (MPa)
0		0.00																
1	K-1										YAMAÇ MOLOZU Kahve - koyu - kırmızımsı kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 10-15, ince-çok ince taneli, köşeli-yarı köşeli, muhtelif kökenli, sert, çakıllı; % 5-10, ince-iri taneli kumlu.					87	-	
		1.50																
	SPT-1		SPT-1			13	12	20	32	32								
2		1.95																
	K-2	2.40	P-1	31.60	345											24	-	
											2.30 m							
3		3.00																
	SPT-2		SPT-2			22	18	17	35	35								
		3.45									YAMAÇ MOLOZU Muhtelif (Gri-koyu gri-krem-bej) renkli, orta sıkı-sıkı, kumlu killi ÇAKIL. Islak, ince-iri, köşeli-yarı köşeli, genel olarak kireçtaşı-yer yer breşik kireçtaşı kökenli, sert, çakıllı; % 35-40, ince malzemeli; % 10-15, ince-iri taneli kumlu.							
4	K-3															50	-	
		4.50																
	SPT-3		SPT-3			14	13	12	25	25								
5		4.95																
	K-4	5.40	P-2	15.60	135											72	-	
6		6.00																

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering			İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh	N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.	N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.	N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.	N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.	N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
						N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions			ORANLAR / Proportions		
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample	SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
BST	Basınçlı Su Testi Water Pressure Test	K	Karot Numunesi / Core Sample	İSİM Name: Emrah AKGÜÇ Jeoloji Mühendisi	
UD	Örselenmemiş Numune Undisturbed Sample	P	Pressiyometre Deneyi Pressuremeter Test	İMZA Signature:	
		k	Permeabilite Deneyi Permeability Test		

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

Rev. No: 01 — Bu döküman YP IT grubunun programları kullanılarak otomatik olarak çizilmiştir. — Rev. Tar: 13.07.2011

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-04İ

SAYFA Page No: 2 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
6	SPT-4	6.00	SPT-4			12	20	24	44	44
		6.45								
7	K-5									
		7.50								
	SPT-5		SPT-5			19	22	23	45	45
8		7.95								
	K-6	8.40	P-3	40.40	329					
		9.00								
9	SPT-6		SPT-6			23	39	36	75	75
		9.45								
10	K-7									
		10.50								
	SPT-7		SPT-7			17	31	39	70	70
11		10.95								
	K-8									
12		12.00								
	SPT-8		SPT-8			8	9	13	22	22
		12.45								
	K-9	12.90	P-4	27.60	266					
13		13.50								
	SPT-9		SPT-9			17	16	22	38	38
14		13.95								
	K-10									
15		15.00								
	SPT-10		SPT-10			40	50/14	-	R	R
		15.29								
	K-11									
16		15.90	P-5	43.80	4268					

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, orta sıkı-sıkı, kumlu killi ÇAKIL. Islak, ince-iri, köşeli-yarı köşeli, genel olarak kireçtaşı-yer yer breşik kireçtaşı kökenli, sert, çakıllı; % 35-40, ince malzemeli; % 10-15, ince-iri taneli kumlu.

8.70 m

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı-yer yer breşik kireçtaşı kökenli, sert, çakıllı; % 30-35, ince malzemeli; % 20-25, ince-iri taneli kumlu. Birim içerisinde % 5-10 oranında maksimum 20 cm.ye varan sert, kireçtaşı kökenli moloz-bloklar bulunmaktadır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				74	-	
				71	-	
				54	-	
				71	-	
				76	-	
				56	-	
				31	-	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi

İMZA Signature

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsjc@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-04İ
SAYFA Page No: 3 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
16	K-11															31	-	
	SPT-11	16.50 16.56	SPT-11			50/6	-	-	R	R								
17	K-12															50	-	
18	SPT-12	18.00 18.13	SPT-12			50/13	-	-	R	R	YAMAÇ MOLOZU Muhtelif (Gri-koyu gri-krem-bej) renkli, çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı-yer yer breşik kireçtaşı kökenli, sert, çakıllı; % 30-35, ince malzemeli; % 20-25, ince-iri taneli kumlu. Birim içerisinde % 5-10 oranında maksimum 20 cm.ye varan sert, kireçtaşı kökenli moloz-bloklar bulunmaktadır.							
	K-13															47	-	
19		19.50																
	SPT-13	19.90 19.93	SPT-13 P-6	28.30	324	31	34	50/13	R	R								
20	K-14															64	-	
21		21.00																
	K-15															17	-	
22											22.40 m							
		22.50																
	SPT-14	22.95	SPT-14			16	15	20	35	35	YAMAÇ MOLOZU Kırmızımsı-koyu-yer yer açık kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 15-20, ince-çok ince taneli, köşeli-yarı köşeli, sert-dağılgan, çakıllı; % 5-10, ince-iri taneli kumlu. Birim içerisinde yer yer karbonat konkresyonları bulunmaktadır.							
23	K-16															95	-	
24		24.00																
	SPT-15	24.45	SPT-15			30	28	35	63	63								
25	K-17															100	-	
		25.50																
	SPT-16		SPT-16			10	24	28	52	52								
26	K-18	25.95														100	-	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ, Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyinje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-04İ
SAYFA Page No: 4 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
26																		
	K-18	26.40	P-7	31.90	315											100	-	
27	SPT-17	27.00	SPT-17			24	44	50/6	R	R	YAMAÇ MOLOZU Kırmızımsı-koyu-yer yer açık kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 15-20, ince-çok ince taneli, köşeli-yarı köşeli, sert-dağılgan, çakıllı; % 5-10, ince-iri taneli kumlu.						
		27.36																
28	K-19															100	-	
		28.50																
	SPT-18		SPT-18			19	22	33	55	55	Birim içerisinde yer yer karbonat konkresyonları bulunmaktadır.							
29		28.95																
	K-20	29.40	P-8	31.60	412											100	-	
30		30.00									**29.90 m**							
	SPT-19		SPT-19			25	29	40	69	69								
		30.45									YAMAÇ MOLOZU Sarımsı açık kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, sert, köşeli-yarı köşeli, kireçtaşı kökenli,% 20-25, ince-iri taneli kumlu. Birim içerisinde % 5-10, maksimum 10 cm.ye varan sert, kireçtaşı kökenli moloz-bloklar gözlenmektedir.						
31	K-21															70	-	
		31.50																
32	K-22															47	-	
		32.50																
33	K-23															67	-	
34		34.00									**34.10 m**							
	K-24										ÇAKILTAŞI Açık kahve-gri renkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış, çok gevşek tutturulmuş/tutturulmamış, karbonatlı kil/silt matriks içerisinde; % 40-45, ince-iri taneli, yarı yuvarlak-yarı köşeli, muhtelif kökenli, sert-dağılgan, çakıllar içermektedir.		V	IV/V	>20	67	18	
35																		
		35.50																
	K-25										Süreksizlikler yoğun ayrışma nedeniyle net izlenememektedir.		IV	III/IV	1-2	79	13	
36													V	IV/V	>20			

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyorgo@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-04İ

SAYFA Page No: 5 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
36											ÇAKILTAŞI Açık kahve-gri renkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış, çok gevşek tutturulmuş/tutturulmamış, karbonatlı kil/silt matriks içerisinde; % 40-45, ince-iri taneli, yarı yuvarlak-yarı köşeli, muhtelif kökenli, sert-dağılgan, çakıllar içermektedir. Süreksizlikler yoğun ayrışma nedeniyle net izlenememektedir.		V	IV/V	>20	79	13	
37	K-25	37.00									**37.00 m** ÇAKILTAŞI Açık kahve-gri renkli, az-orta sert, zayıf-orta zayıf dayanımlı, orta-yer yer çok ayrışmış, orta sıkı-gevşek tutturulmuş, karbonatlı kil/silt matriks içerisinde; % 40-45, ince-iri taneli, yarı yuvarlak-yarı köşeli, muhtelif kökenli, sert-dağılgan, çakıllar içermektedir. Süreksizlikler; 20°, açık, mat, pürüzlü.		III/IV	III	0-1 1-2	100	70	
38	K-26										**38.40 m** KUMTAŞI SİLTTAŞI ARDALANMASI KUMTAŞI: Gri-koyu gri renkli, orta sert-sert, orta-orta zayıf dayanımlı, az ayrışmış, orta sıkı tuturulmuş, ince-iri taneli, kil/silt matriksli. SİLTTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış. 41,50-41,80 metreler arasında orta sıkı tutturulmuş, çakıltaşı seviyesi ayırtlanmıştır. Süreksizlikler; 30°, 45°, açık, mat, pürüzlü, parlak, kaygan, kil-silt dolgulu.		II/III	II	0-1	100	92	
39		39.00																
40																		
41	K-27																	
42		42.00									**KUYU SONU: 42.00 m** Sandık - 1/7 (0.00 - 7.50) m Sandık - 2/7 (7.50 - 15.80) m Sandık - 3/7 (15.80 - 24.45) m Sandık - 4/7 (24.45 - 29.30) m Sandık - 5/7 (29.30 - 32.50) m Sandık - 6/7 (32.50 - 38.80) m Sandık - 7/7 (38.80 - 42.00) m							
43																		
44																		
45																		
46																		

Not : Kuyuya 42.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name: Emrah AKGÜÇ, Jeoloji Mühendisi	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel. (312) 495 70 00 FAX. (312) 495 70 24
yonqip@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-05İ
SAYFA Page No: 1 / 5

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 26.05.2016 - 03.06.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 40.50 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 45.00 m	KOOR. SİSTEMİ / Coor. System	: TM39 ITRF96
DELİK ÇAPI / Hole Diameter	: 45.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 485.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-08 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 807.00
SONDÖR / Driller	: Ahmet KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1176.99

Boring Depth (m)	Sample Type	Run	In-Situ Test	Net Limit Pressure (kg/cm²)	Modulus of Elasticity	0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Graph (10 20 30 40 50 60)	Geotechnical Description	Profile	Strength	Weathering	Fracture (30 cm)	CoreR. KAROT % (TCR)	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00																
1	K-1										YAPAY DOLGU Gri-koyu gri renkli, kumlu killi ÇAKIL. Islak, ince-iri, köşeli-yarı köşeli, muhtelif kökenli, sert; % 20-25, ince malzemeli; % 10-15, ince-iri taneli kumlu. Birim içerisinde eser orandan maksimum 30 cm.'ye varan kireçtaşı kökenli moloz-bloklar ayırtlanmıştır.					45	-	
	SPT-1	1.50	SPT-1			10	50/12	-	R	R								
2	K-2	1.77														54	-	
											2.80 m							
3	SPT-2	3.00	SPT-2			7	8	10	18	18	YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, orta sıkı - çok sıkı, kumlu killi ÇAKIL. Nemli, ince-iri taneli, köşeli-yarı köşeli, genel olarak, kireçtaşı kökenli, sert; % 25-30, orta-yüksek plastisiteli; % 20-30, ince-iri taneli kumlu.							
		3.45																
4	K-3	3.90	P-1	11.60	130											73	-	
	SPT-3	4.50	SPT-3			25	20	40	60	60								
5	K-4	4.95														60	-	
6		6.00									5.80 m (Tanımı Sonraki Sayfadadır.)							

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures		
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions					
% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
% 5-15	AZ	Little	%5-20	AZ	Little
% 15-35	ÇOK	Very	%20-50	ÇOK	Very
% 35	VE	And			

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
		K	Karot Numunesi / Core Sample
BST	Basınçlı Su Testi Water Pressure Test	P	Pressiyometre Deneyi Pressuremeter Test
UD	Örselenmemiş Numune Undisturbed Sample	k	Permeabilite Deneyi Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM / Name: Emrah AKGÜÇ Jeoloji Mühendisi	
İMZA / Signature:	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-05İ

SAYFA Page No: 2 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60
6	SPT-4	6.10	SPT-4			50/10	-	-	R	R
7	K-5	6.90	P-2	50.70	810					
	SPT-5	7.50 / 7.64	SPT-5			50/14	-	-	R	R
8	K-6									
9	SPT-6	9.00 / 9.02	SPT-6			50/2	-	-	R	R
10		9.90	P-3	43.80	10711					
	K-7									
11										
12		12.00								
	K-8									
13		12.90	P-4	13.80	3125					
	SPT-7	13.50 / 13.60	SPT-7			50/10	-	-	R	R
14	K-9									
15		15.00								
	K-10									
16		15.90	P-5	60.80	876					

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, çok sıkı, molozlu bloklu kumlu killi ÇAKIL. Islak, ince-iri-yer yer moloz-blok boyutlu, köşeli, yarı köşeli, genel olarak breşik kireçtaşı ve kireçtaşı kökenli, sert; % 25-30, ince malzemeli; % 10-15, ince-iri taneli kumlu.

9.00-11.90 ve 19.40-20.10 metreler arasında moloz-bloklu seviye ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
				50	-	
				43	-	
				38	-	
				40	-	
				47	-	
				33	-	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi

İMZA Signature

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-05İ**
SAYFA Page No: **3 / 5**

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	Pres. Deneyi Press. Test (kg / cm²) Net Limit Basınç Net Limit Pressure	Elastik Modül Modulus of Elasticity	Standart Penetrasyon Deneyi Standart Penetration Test Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph 10 20 30 40 50 60	Jeoteknik Tanımlama Geotechnical Description	Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / IS_{50} (MPa)
16	K-10	16.50														33	-	
17	K-11															43	-	
18	K-12	18.00														75	-	
19																		
	K-13	19.50														59	-	
20																		
21		21.00																
	SPT-8		SPT-8			7	10	12	22	22								
		21.45																
22	K-14	21.90	P-6	18.10	312											57	-	
		22.50																
	SPT-9		SPT-9			5	5	10	15	15								
23		22.95																
	K-15															98	-	
24		24.00																
	SPT-10		SPT-10			7	13	14	27	27								
		24.45																
25	K-16	24.90	P-7	29.10	250											48	-	
	SPT-11	25.50	SPT-11			50/5	-	-	R	R								
	K-17	25.55														76	-	
26																		

20.90 m

22.95 m

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, çok sıkı, molozlu bloklu kumlu killi ÇAKIL. Islak, ince-iri-yer yer moloz-blok boyutlu, köşeli, yarı köşeli, genel olarak breşik kireçtaşı ve kireçtaşı kökenli, sert; % 25-30, ince malzemeli; % 10-15, ince-iri taneli kumlu.

9.00-11.90 ve 19.40-20.10 metreler arasında moloz-bloklu seviye ayırtlanmıştır.

YAMAÇ MOLOZU

Yeşilimsi gri renkli, orta sıkı, çakıllı killi KUM. Islak, ince-iri taneli; % 25-30, ince malzemeli; % 10-15, ince-iri taneli, çakıllı.

YAMAÇ MOLOZU

Açık kahve-sarımsı kahve renkli, katı-çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri taneli-eser bloklu, köşeli-yarı köşeli, genel olarak, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu.

25.40-26.60 metre ve 26.80-27.00 metreler arasında çakıllı seviye ayırtlanmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name: Emrah AKGÜÇ, Jeoloji Mühendisi	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Bilnik Mahallesi 450. Caddesi No:23
06810 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-05İ**

SAYFA Page No: **4 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
26	K-17										YAMAÇ MOLOZU Açık kahve-sarımsı kahve renkli, katı-çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri taneli-eser bloklu, köşeli-yarı köşeli, genel olarak, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu. 25.40-26.60 metre ve 26.80-27.00 metreler arasında çakıllı seviye ayırtlanmıştır.					76	-	
27		27.00																
28	K-18	27.90	P-8	21.40	156											73	-	
		28.50									**28.10 m**							
	SPT-12		SPT-12			17	28	34	62	62								
29		28.95									YAMAÇ MOLOZU Gri-yeşilimsi gri renkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 15-20, ince-iri taneli, köşeli-yarı köşeli, genel olarak, silttaşı-kumtaşı, kökenli, orta sert-dağılgan, çakıllı; % 5-10, ince-iri taneli kumlu. 30.50-30.70 metreler arasında kum oranı % 25-30 artmaktadır.							
	K-19															35	-	
30		30.00																
	SPT-13		SPT-13			12	19	26	45	45								
		30.45																
31	K-20	30.90	P-9	30.20	374											27	-	
		31.50																
	SPT-14		SPT-14			14	22	33	55	55								
32		31.95																
	K-21															100	-	
											32.80 m							
33		33.00																
	SPT-15		SPT-15			10	14	17	31	31	YAMAÇ MOLOZU Açık-sarımsı kahverenkli-yer yer kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri-blok boyutlu, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu. 35,50-36,00 metreler arasında bloklu seviye ayırtlanmıştır.							
		33.45																
34	K-22	33.90	P-10	16.40	277											100	-	
		34.45																
	SPT-16	34.50	SPT-16			8	14	15	29	29								
		34.90																
35		34.95																
	K-23															78	-	
36		36.00																

SONDAJ MÜHENDİSİ Drilling Engineer

İSİM Name: Emrah AKGÜÇ, Jeoloji Mühendisi

İMZA Signature:

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-05İ**
SAYFA Page No: **5 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
36	SPT-17	36.00	SPT-17			20	26	26	52	52
		36.45								
37	K-24									
	SPT-18	37.50	SPT-18			25	50/5	-	R	R
		37.70								
38	K-25									
39	SPT-19	39.00	SPT-19			16	15	50/10	R	R
	K-26	39.40								
40	K-27	40.00								
41										
	K-28	41.50								
42										
43	K-29	43.00								
44										
	K-30	44.50								
45		45.00								
46										

Sandık - 1/8 (0.00 - 8.15) m
Sandık - 2/8 (8.15 - 15.00) m
Sandık - 3/8 (15.00 - 23.10) m
Sandık - 4/8 (23.10 - 29.80) m
Sandık - 5/8 (29.80 - 36.60) m
Sandık - 6/8 (36.60 - 39.40) m
Sandık - 7/8 (39.40 - 44.50) m
Sandık - 8/8 (44.50 - 45.00) m

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Açık-sarımsı kahverenkli-yer yer kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL, Nemli, orta-yüksek plastisiteli, % 20-30, ince-iri-blok boyutlu, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu.

35,50-36,00 metreler arasında bloklu seviye ayırtlanmıştır.

37.20 m

YAMAÇ MOLOZU

Muhtelif (Gri - koyu gri - krem - bej) renkli, çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli, yarı köşeli, genel olarak kireçtaşı kökenli, sert; % 25-30, ince malzemeli; % 10-15, ince-iri taneli kumlu.

39.70 m

KUMTAŞI - SİLTTAŞI ARDALANMASI

KUMTAŞI: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış, sıkı-orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil/silt matriksli.

SİLTTAŞI: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış.

42.20-42.90 metreler arası ince taneli, 43.50-44.00 metreler arasında ince-iri taneli, çakıltaşı seviyeleri ayırtlanmıştır.

Süreksizlikler; 10°, 45°, açık, mat, pürüzlü.

KUYU SONU: 45.00 m

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				95	-	
				50	-	
				83	0	
	IV/V	IV	>20			
				100	77	
				100	100	
	II/III	I/II	0-1			
				100	73	
				100	100	

Not : Kuyuya 45.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dörtlük Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No:	CPS-07İ
SAYFA Page No:	1 / 6

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 20.05.2016 - 26.05.2016
SONDAJ YERİ / Boring Location	: Pozantı / Tekir Mevki / HEYELAN	MUH.BOR.DER. / Casing Depth	: 28.50 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 48.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 48.00 m (NW)	KOORDİNAT / Coordinate (N-S) X	: 4 135 586.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-02 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 689.00
SONDÖR / Driller	: Ramazan KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1197.17

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test — DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00																
1	K-1										YAPAY DOLGU Kahve-grimsi kahverenkli, katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, köşeli-yarı köşeli, muhtelif kökenli, sert, çakıllı; % 15-20, ince-iri taneli, kumlu.					37	-
	SPT-1	1.50	SPT-1			6	8	6	14	14								
2		1.95																
	K-2	2.40	P-1	4.90	155											47	-	
3											2.80 m							
	SPT-2	3.00	SPT-2			3	4	3	7	7								
		3.45									YAMAÇ MOLOZU Kahve-koyu kahverenkli, orta katı, kumlu çakıllı SİLT. Nemli, orta-yüksek plastisiteli; % 10-15, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli, çakıllı; % 5-10, ince-iri taneli, kumlu.						
4	K-3															95	-	
	SPT-3	4.50	SPT-3			3	4	5	9	9								
5		4.95																
	K-4	5.40	P-2	4.70	79											90	-	
6		6.00																

DAYANIMLILIK / Strength (ISRM)

I	DAYANIMLI	Strong (R5)
II	ORTA DAYANIMLI	M.Strong (R4)
III	ORTA ZAYIF	M.Weak (R3)
IV	ZAYIF	Weak (R2)
V	ÇOK ZAYIF	Very to Extremely Weak (R1)

AYRIŞMA / Weathering

I	TAZE	Fresh
II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ÇOK AYRIŞMIŞ	Highly W.
V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained

N : 0-2	ÇOK YUMUŞAK	V.Soft
N : 3-4	YUMUŞAK	Soft
N : 5-8	ORTA KATI	M.Stiff
N : 9-15	KATI	Stiff
N : 16-30	ÇOK KATI	V.Stiff
N : >30	SERT	Hard

İRİ TANELİ / Coarse Grained

N : 0-4	Ç. GEVŞEK	V.Loose
N : 5-10	GEVŞEK	Loose
N : 11-30	ORTA SIKI	M.Dense
N : 31-50	SIKI	Dense
N : >50	ÇOK SIKI	V.Dense

KAYA KALİTESİ TANIMI / RQD

%0-25	ÇOK ZAYIF	V.Poor
%25-50	ZAYIF	Poor
%50-75	ORTA	Fair
%75-90	İYİ	Good
%90-100	ÇOK İYİ	Excellent

KIRIKLAR - 30 cm / Fractures

1	SEYREK	Wide (W)
1-2	ORTA	Monderate (M)
2-10	SIK	Close (Cl)
10-20	ÇOK SIK	Intense (I)
>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions

% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
% 5-15	AZ	Little	%5-20	AZ	Little
% 15-35	ÇOK	Very	%20-50	ÇOK	Very
% 35	VE	And			

SPT	Standart Penetrasyon Testi / Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
		K	Karot Numunesi / Core Sample
BST	Basınçlı Su Testi / Water Pressure Test	P	Pressiyometre Deneyi / Pressuremeter Test
UD	Örselenmemiş Numune / Undisturbed Sample	k	Permeabilite Deneyi / Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-07İ**

SAYFA Page No: **2 / 6**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60
6	SPT-4	6.00 6.02	SPT-4			2			R	
7	K-5									
8	K-6	7.50								
9	K-7	9.00								
10		10.50								
11	SPT-5		SPT-5			9	16	19	35	35
	K-8	10.95 11.40	P-3	23.20	264					
12	SPT-6	12.00 12.10	SPT-6			50/10	-	-	R	R
13	K-9									
		13.50								
14	SPT-7		SPT-7			20	14	11	25	25
	K-10	13.95 14.40	P-4	14.40	115					
15		15.00								
	K-11									
16										

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Kahve-kırmızımsı kahve renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, kireçtaşı kökenli, çakıllı; % 30-40, ince malzemeli; % 10-15, ince-iri taneli, dağılgan, kumlu. Birim içerisinde % 5-10 oranında maksimum 40 cm.'ye varan gri renkli, sert, kireçtaşı kökenli moloz-bloklu seviyeler ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				53	-	
				43	-	
				36	-	
				57	-	
				40	-	
				52	-	
				79	-	

SONDAJ MÜHENDİSİ Drilling Engineer

İSİM Name

İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ortlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonqk@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-07İ
SAYFA Page No: 3 / 6

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
16	K-11	16.50								
	SPT-8		SPT-8			25	21	24	45	45
17		16.95								
	K-12									
18	SPT-9	18.00	SPT-9			50	-	-	R	R
		18.05				5				
	K-13									
19		18.90	P-5	43.50	3966					
		19.50								
20	K-14									
21		21.00								
	K-15									
22										
		22.50								
23	K-16									
24		24.00								
	K-17									
25										
		25.50								
26	K-18									

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Kahve-kırmızımsı kahve renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, kireçtaşı kökenli, çakıllı; % 30-40, ince malzemeli; % 10-15, ince-iri taneli, dağılgan, kumlu. Birim içerisinde % 5-10 oranında maksimum 40 cm.'ye varan gri renkli, sert, kireçtaşı kökenli moloz-bloklu seviyeler ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				79	-	
				67	-	
				62	-	
				79	-	
				70	-	
				83	-	
				37	-	
				81	-	

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-07İ**

SAYFA Page No: **4 / 6**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
26										
	K-18									
27		27.00								
	K-19									
28										
		28.75								
29	SPT-10		SPT-10			14	20	22	42	42
		29.20								
	K-20									
30										
		30.50								
	K-21									
31		31.00								
	SPT-11		SPT-11			12	17	25	42	42
		31.45								
	K-22									
32										
		32.40	P-6	54.60	709					
33		33.00								
	SPT-12		SPT-12			25	31	50/10	R	R
		33.40								
	K-23									
34										
		34.50								
35	K-24									
		35.40	P-7	42.70	1672					
36		36.00								

(Tanımlı Önceki Sayfadadır.) — **26.10 m**

YAMAÇ MOLOZU

Muhtelif renkli (yeşilimsi gri-koyu kahve-açık kahverenkli), sert, çakıllı kumlu KİL. Nemli, orta-yüksek plastisiteli; % 15-20, ince-iri taneli, kumlu; % 5-10, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli, çakıllı.

Birim içerisinde yer yer karbonat konkresyonlu seviyeler ayırtlanmıştır.

31.60 m

KUMTAŞI-SİLTTAŞI ARDALANMASI

Silttaşı: Sarımsı açık kahverenkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış.

Kumtaşı: Sarımsı açık kahverenkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış, gevşek tutturulmuş-tutturulmamış, karbonatlı kil-silt matriksli.

Süreksizlikler; yoğun ayrışma nedeniyle gözlenememektedir.

34.50 m

ÇAKILTAŞI

Gri-krem-bej renkli, ufalanabilir-az sert, çok zayıf dayanımlı, çok-tümüyle ayrışmış, çok gevşek tutturulmuş-tutturulmamış, karbonatlı kil-silt matriks içerisinde; % 40-45, ince-orta taneli, yarı yuvarlak-yarı köşeli, sert, muhtelif kökenli çakıllar içermektedir.

Süreksizlikler; yoğun ayrışma nedeniyle gözlenememektedir.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				81	-	
				98	-	
				45	-	
				0	-	
				79	0	
	V	IV/V	>20	98	0	
				87	20	

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi: 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-07İ
SAYFA Page No: 5 / 6

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
36		36.00																
	K-25															50	0	
37																		
		37.50																
	K-26															0	0	
38		38.00																
	K-27										ÇAKILTAŞI Gri-krem-bej renkli, ufalanabilir-az sert, çok zayıf dayanımlı, çok-tümüyle ayrışmış, çok gevşek tutturulmuş-tutturulmamış, karbonatlı kil-silt matriks içerisinde; % 40-45, ince-orta taneli, yarı yuvarlak-yarı köşeli, sert, muhtelif kökenli çakıllar içermektedir. Süreksizlikler; yoğun ayrışma nedeniyle gözlenememektedir.					25	0	
39		39.00																
	K-28												V	IV/V	>20	77	0	
40																		
		40.50																
41																		
	K-29															83	0	
42		42.00																
	K-30																	
											42.70 m					87	27	
43											ÇAKILTAŞI Gri-koyu gri renkli, orta sert-yer yer ufalanabilir, orta zayıf-yer yer çok zayıf dayanımlı, orta derecede ayrışmış-yer yer çok ayrışmış, orta sıkı tutturulmuş-yer yer gevşek tuturulmuş-tutturulmamış, karbonatlı kil-silt matriks içerisinde; % 40-45, ince-orta taneli, yarı yuvarlak-yarı köşeli, sert, muhtelif kökenli çakıllar içermektedir. Süreksizlikler; 10°, 30°, 45°, açık, mat, pürüzlü, kil-silt dolgulu.		III	III	1-2			
		43.50											V	IV	>20			
44															0-1			
															2-10			
	K-31														>20	83	43	
45													III	II				
															0-1			
46																		

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-07İ**
SAYFA Page No: **6 / 6**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
46	K-31	46.50									(Tanımlı Önceki Sayfadadır.) **46.10 m** SİLTTAŞI Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, az ayrışmış. Süreksizlikler; 30°, 45°, 60°, açık, parlak, kaygan; 30°, 45°, 80°, kapalı, maksimum 3 mm. 'ye varan, seyrek, kalsit dolgulu.		III II/III	II	2-10	83 100	43 47	
47	K-32																	
48		48.00									**KUYU SONU: 48.00 m** Sancık - 1/7 (0.00 - 6.70) m Sancık - 2/7 (6.70 - 15.75) m Sancık - 3/7 (15.75 - 21.70) m Sancık - 4/7 (21.70 - 28.30) m Sancık - 5/7 (28.30 - 36.00) m Sancık - 6/7 (36.00 - 43.80) m Sancık - 7/7 (43.80 - 48.00) m							
49																		
50																		
51																		
52																		
53																		
54																		
55																		
56																		

Not : Kuyuya 48.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirinlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-09İ**

SAYFA Page No: **1 / 4**

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 20.05.2016 - 25.05.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 27.00 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 36.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 36.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 590.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-06 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 774.00
SONDÖR / Driller	: Murat AYDIN	SONDAJ KOTU / Elevation (m)	: 1180.29

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	Pres. Deneyi Press. Test (kg / cm²) Net Limit Basınç Net Limit Pressure	Elastik Modül Modulus of Elasticity	Standart Penetrasyon Deneyi Standart Penetration Test — Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph 10 20 30 40 50 60	Jeoteknik Tanımlama Geotechnical Description
0		0.00									
1	K-1										YAMAÇ MOLOZU Krem-bej renkli, orta sıkı, killi çakıllı KUM. Islak, ince-iri taneli; % 30-35, ince-çok ince taneli, köşeli-yarı köşeli, muhtelif kökenli, sert-dağılgan çakıllı; % 20-25, ince malzemeli.
		1.50	SPT-1			4	6	5	11	11	
2		1.95									2.10 m
	K-2										YAMAÇ MOLOZU Muhtelif (Gri-koyu gri-krem-bej) renkli, orta sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 30-35, ince malzemeli; % 10-15, ince-iri taneli kumlu. 4.40-5.70 metreler arasında killi çakıllı kum seviyesi ayırtlanmıştır.
3		3.00	SPT-2			6	5	6	11	11	
	SPT-2	3.45									
4	K-3	3.90	P-1	14.80	143						
	SPT-3	4.50	SPT-3			50/12	-	-	R	R	
		4.62									
5	K-4										
6		6.00									

Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / IS_{50} (MPa)
				37	-	
				46	-	
				70	-	
				29	-	

DAYANIMLILIK / Strength (ISRM)

I	DAYANIMLI	Strong (R5)
II	ORTA DAYANIMLI	M.Strong (R4)
III	ORTA ZAYIF	M.Weak (R3)
IV	ZAYIF	Weak (R2)
V	ÇOK ZAYIF	Very to Extremely Weak (R1)

AYRIŞMA / Weathering

I	TAZE	Fresh
II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ÇOK AYRIŞMIŞ	Highly W.
V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained

N : 0-2	ÇOK YUMUŞAK	V.Soft
N : 3-4	YUMUŞAK	Soft
N : 5-8	ORTA KATI	M.Stiff
N : 9-15	KATI	Stiff
N : 16-30	ÇOK KATI	V.Stiff
N : >30	SERT	Hard

İRİ TANELİ / Coarse Grained

N : 0-4	Ç. GEVŞEK	V.Loose
N : 5-10	GEVŞEK	Loose
N : 11-30	ORTA SIKI	M.Dense
N : 31-50	SIKI	Dense
N : >50	ÇOK SIKI	V.Dense

KAYA KALİTESİ TANIMI / RQD

%0-25	ÇOK ZAYIF	V.Poor
%25-50	ZAYIF	Poor
%50-75	ORTA	Fair
%75-90	İYİ	Good
%90-100	ÇOK İYİ	Excellent

KIRIKLAR - 30 cm / Fractures

1	SEYREK	Wide (W)
1-2	ORTA	Monderate (M)
2-10	SIK	Close (Cl)
10-20	ÇOK SIK	Intense (I)
>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions

% 5	PEK AZ	Slightly
% 5-15	AZ	Little
% 15-35	ÇOK	Very
% 35	VE	And

%5	PEK AZ	Slightly
%5-20	AZ	Little
%20-50	ÇOK	Very

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
		K	Karot Numunesi / Core Sample
BST	Basınçlı Su Testi Water Pressure Test	P	Pressiyometre Deneyi Pressuremeter Test
UD	Örselenmemiş Numune Undisturbed Sample	k	Permeabilite Deneyi Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name: Emrah AKGÜÇ Jeoloji Mühendisi	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-09İ**
SAYFA Page No: **2 / 4**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
6	SPT-4	6.00	SPT-4			6	5	6	11	11
		6.45								
7	K-5	6.90	P-2	9.60	110					
		7.50								
	SPT-5		SPT-5			7	5	4	9	9
8		7.95								
	K-6									
9		9.00								
	SPT-6		SPT-6			16	14	11	25	25
		9.45								
10	K-7									
		10.50								
	SPT-7		SPT-7			13	17	20	37	37
11		10.95								
	K-8									
12	SPT-8	12.00	SPT-8			50/3	-	-	R	R
		12.03								
	K-9									
		12.90	P-3	41.90	372					
13	SPT-9	13.50	SPT-9			50/8	-	-	R	R
		13.58								
14	K-10									
15		15.00								
	SPT-10		SPT-10			18	24	35	59	59
	K-11	15.45								
16		15.90	P-4	25.00	238					

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, orta sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 30-35, ince malzemeli; % 10-15, ince-iri taneli kumlu.

4.40-5.70 metreler arasında killi çakıllı kum seviyesi ayırtlanmıştır.

9.60 m

YAMAÇ MOLOZU

Muhtelif (Gri-koyu gri-krem-bej) renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri-yer yer blok boyutlu, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 35-40, ince malzemeli; % 10-15, ince-iri taneli kumlu.

4.40-5.70 metreler arasında killi çakıllı kum seviyesi ayırtlanmıştır.

13.70 m

YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 10-15, ince-çok ince taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert-dağılgan, çakıllı; % 5-10, ince-iri taneli kumlu.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				48	-	
				53	-	
				58	-	
				19	-	
				78	-	
				100	-	
				50	-	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsjc@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-09İ
SAYFA Page No: 3 / 4

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
16	K-11	16.50									YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 10-15, ince-çok ince taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert-dağılgan, çakıllı; % 5-10, ince-iri taneli kumlu.					50	-
	SPT-11		SPT-11			9	12	14	26	26								
17	K-12	16.95														100	-	
18	SPT-12	18.00	SPT-12			16	17	40	57	57								
	K-13	18.45	P-5	23.90	215													
19	SPT-13	18.90 19.50	SPT-13			18	50/7	-	R	R	YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 25-30, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu. 19.90-20.90 metreler arasında kumlu killi çakıl seviyesi ayırtlanmıştır.					80	-
20	K-14	19.72														56	-	
21	SPT-14	21.00	SPT-14			13	25	33	58	58								
	K-15	21.45	P-6	18.70	224													
22	SPT-15	21.90 22.50	SPT-15			24	32	40	72	72	22.40 m							
23	K-16	22.95									YAMAÇ MOLOZU Açık kahverenkli,sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu. 28.00-28.80 metreler arasında kumlu killi çakıl seviyesi ayırtlanmıştır.					100	-
24	SPT-16	24.00	SPT-16			18	20	24	44	44								
	K-17	24.45	P-7	29.10	227													
25	SPT-17	24.90 25.50	SPT-17			17	18	24	42	42						100	-	
26	K-18	25.95														67	-	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ, Jeoloji Mühendisi
İMZA Signature:

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyinsan@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-09İ
SAYFA Page No: 4 / 4

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
26	K-18										YAMAÇ MOLOZU Açık kahverenkli,sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli kumlu.					67	-	
27	SPT-18	27.00 27.42	SPT-18			7	12	50/12	R	R								
28	K-19										28.00-28.80 metreler arasında kumlu killi çakıl seviyesi ayırtlanmıştır.					74	-	
	SPT-19	28.50 28.60	SPT-19			50/10	-	-	R	R								
29	K-20	29.40	P-8	49.00	695						**28.80 m** KUMTAŞI SİLTTAŞI ARDALANMASI KUMTAŞI: Yeşilimsi açık kahverenkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış, çok gevşek tutturulmuş/tutturulmamış, ince-iri taneli, karbonatlı kil/silt matriksli. SİLTTAŞI: Yeşilimsi açık kahverenkli, ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış. 29.80-30.80 metreler arasında çakıltaşı seviyesi ayırtlanmıştır. Süreksizlikler yoğun ayrışma nedeniyle net izlenememektedir.		V	IV/V	>20	39	0	
30	K-21	30.00														21	0	
31	SPT-20	31.00 31.29	SPT-20			45	50/14	-	R	R	**31.30 m** KUMTAŞI SİLTTAŞI ARDALANMASI KUMTAŞI: Yeşilimsi açık kahve-alt seviyeler koyu gri renkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış, orta sıkı tutturulmuş ince-iri taneli, karbonatlı kil/silt matriksli. SİLTTAŞI: Yeşilimsi açık kahve-alt seviyeler koyu gri renkli, az-orta sert, zayıf-orta zayıf dayanımlı, az-orta derecede ayrışmış. 33.50-33.80 metreler arasında çakıltaşı seviyesi ayırtlanmıştır. Süreksizlikler; 10°, 30°, 45°, açık, mat, pürüzlü, MnO boyalı; 0°, 30°, 45°, kapalı, 1-5 mm kalsit dolgulu.							
32	K-22	32.50											IV	III/IV	2-10	60	0	
33	K-23												III/IV	III	0-1	100	71	
34		33.90 34.00	P-9	42.30	994										1-2			
35	K-24	35.50											III	II/III	0-1	65	48	
36		36.00														90	80	

Sandık - 5/6 (34.45 - 36.00) m
Sandık - 1/6 (0.00 - 9.95) m
Sandık - 2/6 (9.95 - 16.35) m
Sandık - 3/6 (16.35 - 22.20) m
Sandık - 4/6 (22.20 - 28.00) m
Sandık - 5/6 (28.00 - 34.45) m

Not : Kuyuya 36.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Emrah AKGÜÇ
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

Rev. No: 01

Bu döküman YP IT grubunun programları kullanılarak otomatik olarak çizilmiştir.

Rev. Tar: 13.07.2011

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No:	CPS-10İ
SAYFA Page No:	1 / 4

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 16.05.2016 - 19.05.2016
SONDAJ YERİ / Boring Location	: POZANTI-TEKİR MEVKİİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 21.00 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 30.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 30.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 571.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-04 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 807.00
SONDÖR / Driller	: Necati AŞKIN	SONDAJ KOTU / Elevation (m)	: 1168.63

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ Press. Test (kg / cm²) ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00																
1	K-1										YAPAY DOLGU (YOL DOLGUSU) Muhtelif renkli (Krem-bej-açık gri renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli, % 20-25, orta-yüksek plastisiteli, ince malzemeli; % 15-20, ince-iri taneli, kumlu.					29	-
		1.50	SPT-1			18	32	22	54	54								
2	K-2	1.95																
		2.40	P-1	32.60	397													
											2.40 m							
3		3.00	SPT-2			16	15	19	34	34								
	K-3	3.45									YAMAÇ MOLOZU Muhtelif renkli (Gri-krem-bej renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli-köşeli-yarı köşeli, sert, kireçtaşı kökenli; % 25-30, ince malzemeli; % 10-15, ince-iri taneli, kumlu. Birim yer yer maksimum 10 cm.ye varan gri renkli, kireçtaşı kökenli bloklar içermektedir.					57	-
4		4.50	SPT-3			11	14	30	44	44								
5	K-4	4.95															71	-
6		6.00																

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions					
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample	SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
BST	Basınçlı Su Testi Water Pressure Test	K	Karot Numunesi / Core Sample	İSİM Name	
UD	Örselenmemiş Numune Undisturbed Sample	P	Pressiyometre Deneyi Pressuremeter Test	İMZA Signature	
		k	Permeabilite Deneyi Permeability Test		

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-10İ**
SAYFA Page No: **2 / 4**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KAMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph
6	SPT-4	6.00	SPT-4			13	20	23	43	
		6.45								
7	K-5									
		7.50								
	SPT-5		SPT-5			23	24	14	38	
8		7.95								
	K-6									
9		9.00								
	SPT-6		SPT-6			23	23	22	45	
		9.45								
10	K-7									
	SPT-7	10.50	SPT-7			50/12	-	-	R	
		10.62								
11	K-8									
		12.00								
12	SPT-8		SPT-8			3	4	5	9	
		12.45								
13	K-9	12.90	P-2	5.40	81					
		13.50								
	SPT-9		SPT-9			11	10	22	32	
14		13.95								
	K-10									
15	SPT-10	15.00	SPT-10			50/11	-	-	R	
		15.11								
	K-11									
16										

10 20 30 40 50 60

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Muhtelif renkli (Gri-krem-bej renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli-köşeli-yarı köşeli, sert, kireçtaşı kökenli; % 25-30, ince malzemeli; % 10-15, ince-iri taneli, kumlu. Birim yer yer maksimum 10 cm.ye varan gri renkli, kireçtaşı kökenli bloklar içermektedir.

10.80 m

YAMAÇ MOLOZU

Kahve-koyu kahverenkli, katı, kumlu çakıllı SİLT. Nemli, orta-yüksek plastisiteli; % 10-15, ince taneli, köşeli-yarı köşeli, sert, kireçtaşı kökenli, çakıllı; % 5-10, ince-iri taneli, kumlu.

13.40 m

YAMAÇ MOLOZU

Sarımsı açık kahverenkli, sert, kumlu çakıllı SİLT. Nemli, orta-yüksek plastisiteli; % 15-20, ince-iri taneli, köşeli-yarı köşeli, sert, kireçtaşı kökenli, çakıllı; % 10-15, ince-iri taneli, kumlu.

Birim içerisinde yer yer karbonat konkresyonlu seviyeler gözlenmektedir.

15.10 m

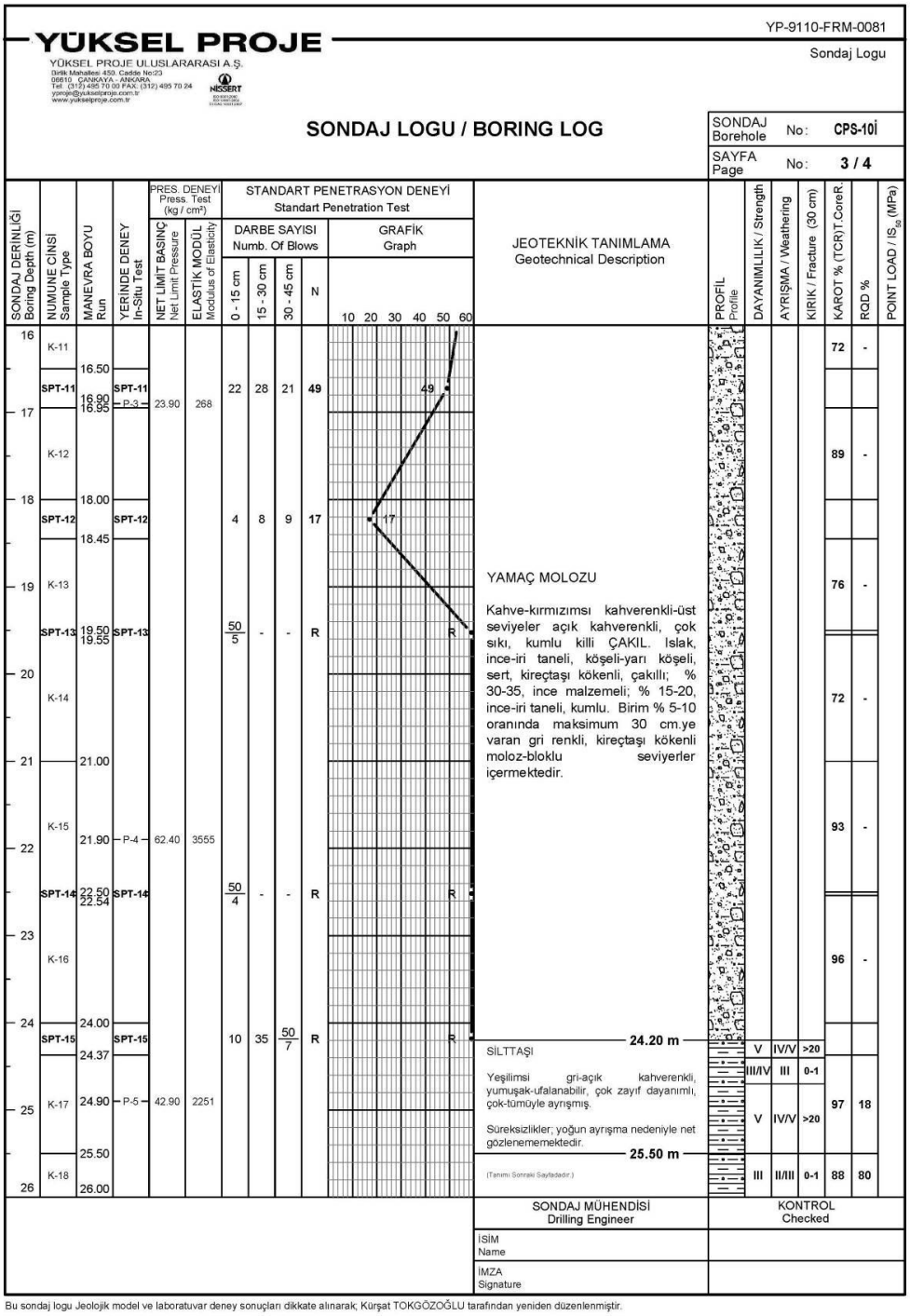
YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli-üst seviyeler açık kahverenkli, çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, kireçtaşı kökenli, çakıllı; % 30-35, ince malzemeli; % 15-20, ince-iri taneli, kumlu. Birim % 5-10 oranında maksimum 30 cm.ye varan gri renkli, kireçtaşı kökenli moloz-bloklu seviyeler içermektedir.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				24	-	
				29	-	
				43	-	
				23	-	
				90	-	
				100	-	
				72	-	

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.



Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

Rev. No: 01

Bu döküman YP IT grubunun programları kullanılarak otomatik olarak çizilmiştir.

Rev. Tar: 13.07.2011

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Bilnik Mahallesi 450. Caddesi No:23
06810 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-10İ**
SAYFA Page No: **4 / 4**

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	Pres. Deneyi Press. Test (kg / cm²) Net Limit Basınç Net Limit Pressure	Elastik Modül Modulus of Elasticity	Standart Penetrasyon Deneyi Standart Penetration Test: Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph 10 20 30 40 50 60	Jeoteknik Tanımlama Geotechnical Description	Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / IS_{50} (MPa)
26		26.00									SİLTTAŞI		III	II/III	0-1			
	K-19										Yeşilimsi-açık kahverenkli, orta sert, orta zayıf dayanımlı, orta derecede ayrışmış.		V	IV/V	>20	97	40	
27		26.90	P-6	43.20	4201						Süreksizlikler; 0°, 20°, açık, mat, pürüzlü; 10°, 30°, 45°, kapalı, 1-5 mm kalsit dolgulu.		III/IV	III	2-10			
		27.40									**27.60 m**							
28	K-20										SİLTTAŞI-KUMTAŞI ARDALANMASI Silttaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, az ayrışmış,		III		0-1	96	19	
													III/IV		2-10			
		28.80									Kumtaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, az ayrışmış, orta-sıkı tutturulmuş, ince-iri taneli, karbonatlı kil-silt matriksli.			II				
29	K-21	29.40	P-7	47.00	9520						Süreksizlikler; 30°, 45°, 90°, açık, mat, pürüzlü.		II/III		0-1	100	100	
30		30.00									**KUYU SONU: 30.00 m** Sandık - 1/5 (0.00 - 10.85) m Sandık - 2/5 (10.85 - 17.60) m Sandık - 3/5 (17.60 - 22.54) m Sandık - 4/5 (22.54 - 25.50) m Sandık - 5/5 (25.50 - 30.00) m							
31																		
32																		
33																		
34																		
35																		
36																		

Not : Kuyuya 30.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole	No:	CPS-11İ
SAYFA Page	No:	1 / 5

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 21.05.2016 - 27.05.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 30.00 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 42.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 42.00 m (NW)	KOORDİNAT / Coordinate (N-S) X	: 4 135 542.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-08 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 858.00
SONDÖR / Driller	: Ahmet KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1174.68

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test — DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $I_{S_{50}}$ (MPa)
0		0.00																
1	K-1															31	-	
	SPT-1	1.50	SPT-1			3	4	4	8	8								
2		1.95																
	K-2															38	-	
3	SPT-2	3.00	SPT-2			5	6	6	12	12								
		3.45																
4	K-3															28	-	
	SPT-3	4.50	SPT-3			8	26	7	33	33								
5		4.95																
	K-4															16	-	
6		6.00																

YAPAY DOLGU (Dolgu Sahası)

Açık kahve-açık gri renkli, orta sıkı-sıkı-yer yer gevşek, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli; % 30-35, ince malzemeli; % 20-25, ince-iri taneli kumlu.

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering			İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh	N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.	N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.	N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.	N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.	N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
						N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions					
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample	SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
		K	Karot Numunesi / Core Sample		
BST	Basınçlı Su Testi Water Pressure Test	P	Pressiyometre Deneyi Pressuremeter Test	İSİM Name: Hüseyin Eren KUŞÇU Jeoloji Mühendisi	
UD	Örselenmemiş Numune Undisturbed Sample	k	Permeabilite Deneyi Permeability Test	İMZA Signature:	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-11İ
SAYFA Page No: 2 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph
6	SPT-4	6.00	SPT-4			7	3	9	12	12
		6.45								
7	K-5	6.90	P-1	20.20	324					
		7.50								
	SPT-5		SPT-5			14	18	17	35	35
8		7.95								
	K-6									
9		9.00								
	SPT-6		SPT-6			9	10	12	22	22
		9.45								
10	K-7	9.90	P-2	5.80	62					
	SPT-7	10.50	SPT-7			50/10	-	-	R	R
		10.60								
11	K-8									
12		12.00								
	SPT-8		SPT-8			5	5	9	14	14
		12.45								
13	K-9	12.90	P-3	3.80	35					
	SPT-9	13.50	SPT-9			11	12	12	24	24
14		13.95								
	K-10									
15		15.00								
	K-11									
16										

10 20 30 40 50 60

JEOTEKNİK TANIMLAMA
Geotechnical Description

(Tanımı Önceki Sayfadadır.) — 6.10 m

YAPAY DOLGU (Dolgu Sahası)

Muhtelif renkli, sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, yarı yuvarlak-yarı köşeli, sert, muhtelif kökenli; % 35-40, ince malzemeli; % 10-15, ince-iri taneli kumlu.

6.10-7.40 metreler arasında kumlu çakıllı kil seviyesi ayırtlanmıştır.

10.40 m

YAMAÇ MOLOZU

Muhtelif (Kahve - koyu kahve - gri - krem - bej) renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli; % 30-35, orta-yüksek plastisiteli, ince malzemeli; % 15-20, ince-iri taneli kumlu

14.50-17.00 ve 20.00-24.00 metreler arasında maksimum boyutu 45.00 cm'ye varan bloklu seviyeler ayırtlanmıştır.

8.60-9.90 ve 26.20-28.10 metreler arasında kumlu çakıllı kil seviyeleri ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				98	-	
				91	-	
				68	-	
				33	-	
				33	-	
				90	-	
				70	-	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi

İMZA Signature:

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-11İ
SAYFA Page No: 3 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
16	K-11									
	SPT-10	16.50 / 16.75	SPT-10			12	50/10	-	R	R
17	K-12									
18	SPT-11	18.00 / 18.45	SPT-11			11	11	14	25	25
19	K-13									
	SPT-12	19.50 / 19.78	SPT-12			12	50/13	-	R	R
20	K-14									
21	K-15	21.00								
22		21.90	P-4	43.90	13586					
	SPT-13	22.50 / 22.67	SPT-13			35	50/2	-	R	R
23	K-16									
24	SPT-14	24.00 / 24.45	SPT-14			39	47	40	87	87
25	K-17	24.90	P-5	24.30	200					
	SPT-15	25.50	SPT-15			26	23	28	51	51
26	K-18	25.95								

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Muhtelif (Kahve - koyu kahve - gri - krem - bej) renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli; % 30-35, orta-yüksek plastisiteli, ince malzemeli; % 15-20, ince-iri taneli kumlu

14.50-17.00 ve 20.00-24.00 metreler arasında maksimum boyutu 45.00 cm'ye varan bloklu seviyeler ayırtlanmıştır.

8.60-9.90 ve 26.20-28.10 metreler arasında kumlu çakıllı kil seviyeleri ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
				70	-	
				53	-	
				81	-	
				100	-	
				48	-	
				50	-	
				95	-	
				83	-	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU, Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyinje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-11İ

SAYFA Page No: 4 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
26	K-18									
27	SPT-16	27.00	SPT-16			15	21	18	39	39
		27.45								
28	K-19	27.90	P-6	47.20	958					
	SPT-17	28.50	SPT-17			20	23	50/5	R	R
29	K-20	28.85								
30	SPT-18	30.00	SPT-18			5	8	9	17	17
		30.45								
31	K-21	30.90	P-7	15.90	293					
	SPT-19	31.50	SPT-19			6	9	39	48	48
32	K-22	31.95								
33	SPT-20	33.00 33.05	SPT-20			50/5	-	-	R	R
	K-23									
34		33.90	P-8	45.20	13955					
	SPT-21	34.50 34.55	SPT-21			50/5	-	-	R	R
35	K-24									35.00 m
36		36.00								

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Muhtelif (Kahve - koyu kahve - gri - krem - bej) renkli, sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli; % 30-35, orta-yüksek plastisiteli, ince malzemeli; % 15-20, ince-iri taneli kumlu

14.50-17.00 ve 20.00-24.00 metreler arasında maksimum boyutu 45.00 cm'ye varan bloklu seviyeler ayırtlanmıştır.

8.60-9.90 ve 26.20-28.10 metreler arasında kumlu çakıllı kil seviyeleri ayırtlanmıştır.

(Tanımı Sonraki Seyfedadır.)

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				63	-	
				67	-	
				70	-	
				95	-	
				71	-	
				34	-	
	V	V	>20	80	0	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi

İMZA Signature

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi: 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyorgo@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-11İ
SAYFA Page No: 5 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60 R
36	SPT-22	36.00	SPT-22			50/5	-	-	R	
37	K-25	36.05								
38	K-26	37.50								
39										
40	K-27	39.50								
41										
42	K-28	41.50								
43		42.00								
44										
45										
46										

JEOTEKNİK TANIMLAMA
Geotechnical Description

KUMTAŞI - SİLTTAŞI ARDALANMASI

KUMTAŞI: Açık kahverenkli, ufalanabilir-yer yer orta sert, çok zayıf-yer yer orta zayıf dayanımlı, tümüyle-yer yer orta derecede ayrışmış.
SİLTTAŞI: Kahve-açık kahverenkli, ufalanabilir-yer yer orta sert, çok zayıf dayanımlı-yer yer orta zayıf dayanımlı, tümüyle-yer yer orta derecede ayrışmış.
Süreksizlikler: 5°, 10°, açık, parlak, kaygan-pürüzlü, MnO boyalı, 5°, kapalı, maksimum 2 cm 'ye varan kalsit dolgulu.

37.10 m

KUMTAŞI-KİLTAŞI ARDALANMASI

KUMTAŞI: Gri, açık gri renkli, sert-orta sert, orta-orta zayıf dayanımlı, az ayrışmış, sıkı-orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil-silt matriksli.

SİLTTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış.

Süreksizlikler; 10°, açık, mat, pürüzlü.

Birim içerisinde 37.20-37.30 m.'ler arasında çakıltaşı seviyesi ayırtlanmıştır.

KUYU SONU: 42.00 m

Sandık - 1/7 (0.00 - 9.75) m
Sandık - 2/7 (9.75 - 17.15) m
Sandık - 3/7 (17.15 - 23.20) m
Sandık - 4/7 (23.20 - 30.80) m
Sandık - 5/7 (30.80 - 36.05) m
Sandık - 6/7 (36.05 - 41.50) m
Sandık - 7/7 (41.50 - 42.00) m

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
	V	V	>20			
	III/IV	III				
	IV	IV	2-10			
	III/IV	III		69	30	
				100	96	
	II	II	0-1			
				100	100	
				100	100	

Not : Kuyuya 42.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ
Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature:

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonqa@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-12İ
SAYFA Page No: 1 / 5

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 16.05.2016 - 19.05.2016
SONDAJ YERİ / Boring Location	: Pozantı / Tekir Mevkii / HEYELAN	MUH.BOR.DER. / Casing Depth	: 24.00 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	: 4.50 m - 18.05.2016
SONDAJ DER. / Boring Depth	: 42.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 42.00 m (NW)	KOORDİNAT / Coordinate (N-S) X	: 4 135 654.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-02 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 766.00
SONDÖR / Driller	: Ramazan KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1179.25

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00									YAPAY DOLGU — 0.20 m							
1	K-1										YAMAÇ MOLOZU Kahve-koyu kahverenkli, orta katı, çakılı kumlu KİL. Nemli, orta-yüksek plastisiteli; % 10-15, ince-iri taneli, kumlu; % 5-10, ince-iri taneli, kireçtaşı kökenli, sert, çakıllı.					67	-
		1.50																
	SPT-1		SPT-1			2	3	4	7	7								
2		1.95																
	K-2	2.40	P-1	2.70	72											48	-	
3		3.00																
	SPT-2		SPT-2			3	2	3	5	5								
		3.45									— 3.60 m							
4	K-3										YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, çok katı, çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 10-15, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı.					67	-
		4.50																
	SPT-3		SPT-3			0	10	7	17	17								
5		4.95									— 5.10 m							
	K-4	5.40	P-2	6.90	163						YAMAÇ MOLOZU Açık kahve-grimsi açık kahverenkli, katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu. Birim yer yer karbonat kongresyonludur. 6.00-6.50 m'ler arasında çakıllı seviye ayırtlanmıştır.					100	-
6		6.00																

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering			İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh	N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.	N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.	N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.	N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.	N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
						N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions					
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample	SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
BST	Basınçlı Su Testi Water Pressure Test	K	Karot Numunesi / Core Sample	İSİM Name: Hüseyin Eren KUŞÇU Jeoloji Mühendisi	
UD	Örselenmemiş Numune Undisturbed Sample	P	Pressiyometre Deneyi Pressuremeter Test	İMZA Signature:	
		k	Permeabilite Deneyi Permeability Test		

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-12İ
SAYFA Page No: 2 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
6	SPT-4	6.00	SPT-4			6	5	10	15	15
		6.45								
7	K-5									
		7.50								
	SPT-5		SPT-5			5	7	11	18	18
8		7.95								
	K-6	8.40	P-3	14.10	364					
9		9.00								
	SPT-6		SPT-6			47	14	15	29	29
		9.45								
10	K-7									
		10.50								
	SPT-7		SPT-7			9	12	14	26	26
11		10.95								
	K-8	11.40	P-4	26.20	320					
12		12.00								
	SPT-8		SPT-8			13	29	24	53	53
		12.45								
13	K-9									
		13.50								
	SPT-9		SPT-9			23	30	47	77	77
14		13.95								
	K-10	14.40	P-5	30.80	587					
15		15.00								
	SPT-10		SPT-10			10	32	37	69	69
		15.45								
16	K-11									

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Açık kahve-grimsi açık kahverenkli, katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu.
Birim yer yer karbonat kongresyonludur.
6.00-6.50 m'ler arasında çakıllı seviye ayırtlanmıştır.

7.60 m

YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta yüksek plastisiteli; % 15-20, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu.

Birim içerisinde 9.00-10.00 m. ile 21.85-22.50 m. 'ler arasında çakıl oranının % 10-20 oranında arttığı gözlenmektedir.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
				56	-	
				100	-	
				77	-	
				100	-	
				89	-	
				100	-	
				100	-	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi

İMZA Signature:

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-12İ**
SAYFA Page No: **3 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
16	K-11	16.50								
	SPT-11		SPT-11			18	20	24	44	44
17	K-12	16.95								
		18.00								
18	SPT-12		SPT-12			10	12	23	35	35
	K-13	18.45	P-6	33.50	535					
19		18.90								
	SPT-13	19.50	SPT-13			10	30	21	51	51
20	K-14	19.95								
	SPT-14	21.00	SPT-14			8	31	50/0	R	R
21		21.30								
	K-15	21.33								
	K-16	21.85								
22		22.50								
	SPT-15		SPT-15			10	12	26	38	38
23		22.95								
	K-17	23.40	P-7	34.60	711					
24	SPT-16	24.00	SPT-16			18	29	40	69	69
		24.45								
	K-18									
25		25.50								
	K-19									
26										

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta yüksek plastisiteli; % 15-20, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu.

Birim içerisinde 9.00-10.00 m. ile 21.85-22.50 m. 'ler arasında çakıl oranının % 10-20 oranında arttığı gözlenmektedir.

22.60 m

SİLTTAŞI

Yeşilimsi açık kahverenkli, yumuşak-ufalanabilir çok zayıf dayanımlı, tümüyle ayrışmış (killeşmiş).

Süreksizlikler yoğun ayrışma nedeniyle gözlenememektedir.

24.30 m

ÇAKILTAŞI

Açık kahverenkli, az-orta sert, orta zayıf-zayıf dayanımlı, orta derecede-yer yer çok ayrışmış, orta sıkı-yer yer gevşek tutturulmuş, karbonat matriks içerisinde; % 40-45 ince-iri taneli, yarı yuvarlak-yarı köşeli, maksimum 5 cm.ye varan muhtelif kökenli, sert, çakıllar içermektedir.

Süreksizlikler; 10°, 20°, açık, mat, pürüzlü, kil/silt dolgulu; 45°, 60°, 80°, kapalı, 1-10 mm kalsit dolgulu.

25.60 m

(Tanımı Sonraki Sayfadadır.)

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				100	-	
				67	-	
				100	-	
				100	-	
				0	-	
				37	-	
	V	V	>20	100	0	
	III/IV	III/IV	2-10	95	38	
	III			73	51	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Bilnik Mahallesi 450. Caddesi No:23
06810 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-12İ
SAYFA Page No: 4 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
26													III/IV					
	K-19	26.40	P-8	44.80	14201										0-1	73	51	
27		27.00													2-10			
	K-20															88	47	
28		28.50													0-1			
29	K-21										SİLTTAŞI-KUMTAŞI ARDALANMASI SİLTTAŞI: Gri-koyu gri renkli, üst seviyeler açık kahve renkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış.					100	100	
		29.40	P-9	44.90	7533													
30		30.00													>20			
	K-22										KUMTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, ince-iri taneli, karbonat matriksli, sıkı-orta sıkı tutturulmuş.				2-10	100	70	
31		31.00											III		0-1			
														II	2-10			
32	K-23										Birimde ince-orta tabakalıdır. Birim içerisinde; 27.00-27.60, 37.65-37.80 metreler arasında, sıkı-orta sıkı tutturulmuş, çakıltaşı seviyeleri ayırtlanmıştır. Süreksizlikler; 30°, 45°, açık, mat, pürüzlü, yer yer parlak, kaygan.					100	94	
33																		
34		34.00													0-1			
	K-24	34.40	P-10	44.80	19000											100	100	
35		35.00																
	K-25															100	90	
36		36.00																

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU, Jeoloji Mühendisi
İMZA Signature:

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-12İ**
SAYFA Page No: **5 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
36		36.00									SİLTTAŞI-KUMTAŞI ARDALANMASI SİLTTAŞI: Gri-koyu gri renkli, üst seviyeler açık kahve renkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış. KUMTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, ince-iri taneli, karbonat matriksli, sıkı-orta sıkı tutturulmuş.							
37																		
	K-26															100	77	
38											Birimde ince-orta tabakalıdır. Birim içerisinde; 27.00-27.60, 37.65-37.80 metreler arasında, sıkı-orta sıkı tutturulmuş, çakıltaşı seviyeleri ayırtlanmıştır. Süreksizlikler; 30°, 45°, açık, mat, pürüzlü, yer yer parlak, kaygan.							
39		39.00											III	II	0-1			
	K-27										**39.40 m** ÇAKILTAŞI Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış, , sıkı-orta sıkı tutturulmuş, karbonatlı kil-silt matriks içerisinde; % 40-45, ince-iri taneli, yarı köşeli-yarı yuvarlak, maksimum 3 cm.'ye varan muhtelif kökenli, sert çakıllar içermektedir.					100	96	
40		40.00									**40.70 m** SİLTTAŞI-KUMTAŞI ARDALANMASI SİLTTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış. KUMTAŞI: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, kil-silt matriksli, ince-iri taneli, sıkı-orta sıkı tutturulmuş. Süreksizlikler; 10°, 30°, açık, mat, pürüzlü, yer yer parlak, kaygan.							
41	K-28															100	78	
42		42.00									**KUYU SONU: 42.00 m** Sandık - 1/8 (0.00 - 7.95) m Sandık - 2/8 (7.95 - 13.25) m Sandık - 3/8 (13.25 - 19.20) m Sandık - 4/8 (19.20 - 24.45) m Sandık - 5/8 (24.45 - 30.00) m Sandık - 6/8 (30.00 - 35.00) m Sandık - 7/8 (35.00 - 40.00) m Sandık - 8/8 (40.00 - 42.00) m							
43																		
44																		
45																		
46																		

Not : Kuyuya 42.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature:

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-14İ**

SAYFA Page No: **1 / 5**

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 28.05.2016 - 03.06.2016
SONDAJ YERİ / Boring Location	: Pozantı / Tekir Mevki / HEYELAN	MUH.BOR.DER. / Casing Depth	: 28.50 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 39.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 39.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 614.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-02 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 911.00
SONDÖR / Driller	: Ramazan KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1164.32

Boring Depth (m)	Sample Type	Run	In-Situ Test	Net Limit Pressure	Modulus of Elasticity	0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Graph (10 20 30 40 50 60)	Geotechnical Description	Profile	Strength	Weathering	Fracture (30 cm)	CoreR. (TCR)T %	RQD %	POINT LOAD / $I_{s_{50}}$ (MPa)
0		0.00									BİTKİSEL TOPRAK/AĞAÇ KÖKÜ							
											0.45 m							
1	K-1										YAPAY DOLGU Muhtelif renkli (Gri-açık gri, kahverenkli-açık kahverenkli), orta sıkı, kumlu killi ÇAKIL, Nemli, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli; % 15-35 orta-yüksek plastisiteli, ince malzemeli; % 15-20, ince-iri taneli, kumlu.							
											1.20 m							
	SPT-1	1.50	SPT-1			40	50/10	-	R	R								
2	K-2	1.75									YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli,çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu.							
		2.40	P-1	13.30	61											58	-	
3	SPT-2	3.00	SPT-2			6	5	21	26	26								
	K-3	3.45														42	-	
4		4.50									**4.50 m**							
5	K-4	5.40	P-2	43.70	5287						YAMAÇ MOLOZU Muhtelif renkli (Kahve-kırmızımsı kahve-koyu gri, krem, bej renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri-blok boyutlu, köşeli-yarı köşeli, kireçtaşı kökenli, sert; % 30-35, ince malzemeli; % 10-15, kumlu. 4.50-5.20, 16.50-17.00 m'ler arasında, maksimum boyutu 60 cm'ye varan, molozlu/bloklu zemin ayırtlanmıştır. 11.10-13.30, 15.30-16.40 m'ler arasında, kumlu çakıllı KİL seviyesi ayırtlanmıştır.					67	-	
6		6.00																

DAYANIMLILIK / Strength (ISRM)

I	DAYANIMLI	Strong (R5)
II	ORTA DAYANIMLI	M.Strong (R4)
III	ORTA ZAYIF	M.Weak (R3)
IV	ZAYIF	Weak (R2)
V	ÇOK ZAYIF	Very to Extremely Weak (R1)

AYRIŞMA / Weathering

I	TAZE	Fresh
II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ÇOK AYRIŞMIŞ	Highly W.
V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained

N : 0-2	ÇOK YUMUŞAK	V.Soft
N : 3-4	YUMUŞAK	Soft
N : 5-8	ORTA KATI	M.Stiff
N : 9-15	KATI	Stiff
N : 16-30	ÇOK KATI	V.Stiff
N : >30	SERT	Hard

İRİ TANELİ / Coarse Grained

N : 0-4	Ç. GEVŞEK	V.Loose
N : 5-10	GEVŞEK	Loose
N : 11-30	ORTA SIKI	M.Dense
N : 31-50	SIKI	Dense
N : >50	ÇOK SIKI	V.Dense

KAYA KALİTESİ TANIMI / RQD

%0-25	ÇOK ZAYIF	V.Poor
%25-50	ZAYIF	Poor
%50-75	ORTA	Fair
%75-90	İYİ	Good
%90-100	ÇOK İYİ	Excellent

KIRIKLAR - 30 cm / Fractures

1	SEYREK	Wide (W)
1-2	ORTA	Monderate (M)
2-10	SIK	Close (Cl)
10-20	ÇOK SIK	Intense (I)
>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions

% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
% 5-15	AZ	Little	%5-20	AZ	Little
% 15-35	ÇOK	Very	%20-50	ÇOK	Very
% 35	VE	And			

SPT	Standart Penetrasyon Testi / Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
		K	Karot Numunesi / Core Sample
BST	Basınçlı Su Testi / Water Pressure Test	P	Pressiyometre Deneyi / Pressuremeter Test
UD	Örselenmemiş Numune / Undisturbed Sample	k	Permeabilite Deneyi / Permeability Test

SONDAJ MÜHENDİSİ / Drilling Engineer	KONTROL / Checked
İSİM / Name	
İMZA / Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-14İ

SAYFA Page No: 2 / 5

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph
6	SPT-3	6.00	SPT-3			20	32	22	54	54
	K-5	6.45								
7		7.50								
	SPT-4		SPT-4			27	36	37	73	73
8		7.95								
	K-6	8.40	P-3	43.70	749					
9		9.00								
	SPT-5		SPT-5			16	30	40	70	70
		9.45								
10	K-7									
		10.50								
	SPT-6		SPT-6			27	26	20	46	46
11		10.95								
	K-8	11.40	P-4	30.40	251					
12		12.00								
	SPT-7		SPT-7			9	13	19	32	32
		12.45								
13	K-9									
		13.50								
14	K-10									
		14.40	P-5	43.10	2077					
15	SPT-8	15.00	SPT-8			14	50/5	-	R	R
		15.20								
	K-11									
16										

10 20 30 40 50 60

JEOTEKNİK TANIMLAMA
Geotechnical Description

YAMAÇ MOLOZU

Muhtelif renkli (Kahve-kırmızımsı kahve-koyu gri, krem, bej renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri-blok boyutlu, köşeli-yarı köşeli, kireçtaşı kökenli, sert; % 30-35, ince malzemeli; % 10-15, kumlu.

4.50-5.20, 16.50-17.00 m'ler arasında, maksimum boyutu 60 cm'ye varan, molozlu/bloklu zemin ayırtlanmıştır.

11.10-13.30, 15.30-16.40 m'ler arasında, kumlu çakıllı KİL seviyesi ayırtlanmıştır.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				55	-	
				39	-	
				84	-	
				100	-	
				89	-	
				70	-	
				65	-	

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dörtlük Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-14İ**
SAYFA Page No: **3 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
16	K-11	16.50									YAMAÇ MOLOZU Muhtelif renkli (Kahve-kırmızımsı kahve-koyu gri, krem, bej renkli), sıkı-çok sıkı, kumlu killi ÇAKIL. Islak, ince-iri-blok boyutlu, köşeli-yarı köşeli, kireçtaşı kökenli, sert; % 30-35, ince malzemeli; % 10-15, kumlu. 4.50-5.20, 16.50-17.00 m'ler arasında, maksimum boyutu 60 cm'ye varan, molozlu/bloklu zemin ayırtlanmıştır. 11.10-13.30, 15.30-16.40 m'ler arasında, kumlu çakıllı KİL seviyesi ayırtlanmıştır.					65	-
17	K-12															81	-
18	SPT-9	18.00	SPT-9			20	33	28	61	61	**17.80 m** YAMAÇ MOLOZU Kahve-koyu kahve renkli, çok katı, kumlu çakıllı KİL. Nemli, düşük-orta plastisiteli; % 30-35, ince-iri taneli, köşeli, sert, çakıllı; % 5-15, kumlu.						
19	K-13	18.45 18.90	P-6	32.60	506											100	-
	SPT-10	19.50 19.67	SPT-10			13	50/2	-	R	R							
20	K-14										**20.60 m** YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli,çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu. 23.80-24.50 m'ler arası kireçtaşı kökenli blok gözlenmiştir.					98	-
21	SPT-11	21.00	SPT-11			19	23	36	59	59							
	K-15	21.45 21.50														100	-
	SPT-12		SPT-12			25	45	50/10	R	R							
22	K-16	21.90 22.50														92	-
	SPT-13		SPT-13			16	45	50/3	R	R							
23	K-17	22.83 22.90	P-7	16.20	158											94	-
24	K-18	24.00														69	-
25		25.50															
	SPT-14		SPT-14			20	35	50/5	R	R							
26	K-19	25.85 25.90	P-8	35.90	305											45	-

SONDAJ MÜHENDİSİ Drilling Engineer | KONTROL Checked

İSİM Name

İMZA Signature

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonge@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-14İ**
SAYFA Page No: **4 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
26	K-19										YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli,çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu. 23.80-24.50 m'ler arası kireçtaşı kökenli blok gözlenmiştir.					45	-
27		27.00									**27.00 m** YAMAÇ MOLOZU Muhtelif renkli (Gri-sarımsı açık kahve renkli) killi kumlu ÇAKIL. Islak, ince-iri taneli, köşeli-yarı köşeli, sert, genellikle kireçtaşı kökenli; % 30-35, ince-iri taneli kumlu; % 10-15, ince malzemeli.						
28	K-20	28.50													71	-
29	K-21	29.40	P-9	42.20	1789						**28.60 m** SİLTTAŞI Sarımsı açık kahverenkli, ufalanabilir-az sert, zayıf-çok zayıf dayanımlı, çok-tümüyle ayrışmış. Süreksizlikler; 0°, 10°, 20°, açık, mat, pürüzlü, MnO boyalıdır. 28.60-29.80 m'ler arasında, gevşek-orta sıkı tutturulmuş, karbonatlı kil-silt matrkisli, çakıltaşı seviyesi ayırtlanmıştır.		IV	IV/V	>20	78	0
30	K-22	30.00									**30.40 m** KUMTAŞI - SİLTTAŞI ARDALANMASI Kumtaşı: Sarımsı açık kahverenkli, az-orta sert, orta zayıf-zayıf dayanımlı, az ayrışmış, orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil/silt matriksli.					81	53
31		31.50									Silttaşı: Sarımsı açık kahverenkli, az-orta sert, orta zayıf-zayıf dayanımlı, az ayrışmış. Süreksizlikler; 0°, 10°, 20°, açık, mat, pürüzlü, MnO boyalı; 0°, 10°, kapalı, 1-5 mm kalsit dolguludur.		III/IV	II/III	1-2		
32	K-23	32.40	P-10	44.50	13342						**32.40 m** KUMTAŞI - SİLTTAŞI ARDALANMASI Kumtaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış, sıkı-orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil/silt matriksli. Silttaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış, Süreksizlikler; 0°, 20°, 90°, açık, parlak, kaygan; 0°, 20°, kapalı, 1-5 mm kalsit dolguludur. 35.20-35.30 m'ler arasında, ince taneli ve 38.10-38.40 m'ler arasında ise ince-iri taneli, çakıltaşı seviyeleri ayırtlanmıştır.					87	73
33		33.00														
34	K-24												III	I/II	0-1	99	99
35		35.40	P-11	42.70	9607											
36	K-25															95	95

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yyproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-14İ**
SAYFA Page No: **5 / 5**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
36																		
37	K-25										KUMTAŞI - SİLTTAŞI ARDALANMASI Kumtaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış, sıkı-orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil/silt matriksli. Silttaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, taze-az ayrışmış, Süreksizlikler; 0°, 20°, 90°, açık, parlak, kaygan; 0°, 20°, kapalı, 1-5 mm kalsit dolguludur. 35.20-35.30 m'ler arasında, ince taneli ve 38.10-38.40 m'ler arasında ise ince-iri taneli, çakıltaşı seviyeleri ayırtlanmıştır.					95	95	
		37.50											III	I/II	0-1			
38	K-26															89	89	
39		39.00									**KUYU SONU: 39.00 m** Sandık - 1/7 (0.00 - 7.50) m Sandık - 2/7 (7.50 - 14.25) m Sandık - 3/7 (14.25 - 19.15) m Sandık - 4/7 (19.15 - 24.35) m Sandık - 5/7 (24.35 - 30.00) m Sandık - 6/7 (30.00 - 35.40) m Sandık - 7/7 (35.40 - 39.00) m							
40																		
41																		
42																		
43																		
44																		
45																		
46																		

Not : Kuyuya 39.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole	No:	CPS-16İ	
SAYFA Page	No:	1 / 4	

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 16.05.2016 - 19.05.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 22.50 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 30.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 30.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 656.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-06 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 833.00
SONDÖR / Driller	: Murat AYDIN	SONDAJ KOTU / Elevation (m)	: 1170.51

Sondaj Derinliği (m)	Numune Cinsi	Manevra Boyu	Yerinde Deney	Pres. Deneyi Net Limit Basınç (kg/cm²)	Pres. Deneyi Elastik Modül	Standart Penetrasyon Deneyi 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Jeoteknik Tanımlama	Profil	Dayanımlılık	Ayrışma	Kırık / Fracture (30 cm)	Karot % (TCR)	RQD %	Point Load / IS_{50} (MPa)
0		0.00								(Tanımı Sonraki Sayfadadır.) 0.15 m							
1	K-1														45	-	
		1.50															
	SPT-1		SPT-1			2	2	2	4								
2		1.95								YAMAÇ MOLOZU							
	K-2									Sarımsı açık kahverenkli, çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli, çakıllı; % 10-15, ince-iri taneli, kumlu.					90	-	
3		3.00															
	SPT-2		SPT-2			4	4	6	10								
		3.45															
4	K-3	3.90	P-1	3.30	85					Birim alt seviyelerine doğru, çakıl oranı artmaktadır.					70	-	
		4.50															
	SPT-3		SPT-3			14	7	10	17								
5		4.95															
	K-4														62	-	
6		6.00															

DAYANIMLILIK / Strength (ISRM)

I	DAYANIMLI	Strong (R5)
II	ORTA DAYANIMLI	M.Strong (R4)
III	ORTA ZAYIF	M.Weak (R3)
IV	ZAYIF	Weak (R2)
V	ÇOK ZAYIF	Very to Extremely Weak (R1)

AYRIŞMA / Weathering

I	TAZE	Fresh
II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ÇOK AYRIŞMIŞ	Highly W.
V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained

N : 0-2	ÇOK YUMUŞAK	V.Soft
N : 3-4	YUMUŞAK	Soft
N : 5-8	ORTA KATI	M.Stiff
N : 9-15	KATI	Stiff
N : 16-30	ÇOK KATI	V.Stiff
N : >30	SERT	Hard

İRİ TANELİ / Coarse Grained

N : 0-4	Ç. GEVŞEK	V.Loose
N : 5-10	GEVŞEK	Loose
N : 11-30	ORTA SIKI	M.Dense
N : 31-50	SIKI	Dense
N : >50	ÇOK SIKI	V.Dense

KAYA KALİTESİ TANIMI / RQD

%0-25	ÇOK ZAYIF	V.Poor
%25-50	ZAYIF	Poor
%50-75	ORTA	Fair
%75-90	İYİ	Good
%90-100	ÇOK İYİ	Excellent

KIRIKLAR - 30 cm / Fractures

1	SEYREK	Wide (W)
1-2	ORTA	Monderate (M)
2-10	SIK	Close (Cl)
10-20	ÇOK SIK	Intense (I)
>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions

% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
% 5-15	AZ	Little	%5-20	AZ	Little
% 15-35	ÇOK	Very	%20-50	ÇOK	Very
% 35	VE	And			

SPT	Standart Penetrasyon Testi / Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
BST	Basınçlı Su Testi / Water Pressure Test	K	Karot Numunesi / Core Sample
UD	Örselenmemiş Numune / Undisturbed Sample	P	Pressiyometre Deneyi / Pressuremeter Test
		k	Permeabilite Deneyi / Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ortlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-15İ**
SAYFA Page No: **2 / 4**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph
6	SPT-4	6.00	SPT-4			5	7	10	17	17
		6.45								
7	K-5	6.90	P-2	14.30	214					
		7.50								
	SPT-5		SPT-5			6	11	22	33	33
8		7.95								
	K-6									
9	SPT-6	9.00	SPT-6			50/3	-	-	R	R
		9.03								
	K-7									
10										
		10.50								
	SPT-7		SPT-7			21	24	20	44	44
11		10.95								
	K-8									
12	SPT-8	12.00	SPT-8			25	21	50/9	R	R
		12.39								
	K-9									
13	SPT-9	13.50	SPT-9			50/4	-	-	R	R
		13.54								
14	K-10									
15		15.00								
	SPT-10		SPT-10			13	22	28	50	50
		15.45								
	K-11									
16		15.90	P-3	19.40	263					

10 20 30 40 50 60

JEOTEKNİK TANIMLAMA
Geotechnical Description

(Tanımı Önceki Sayfadadır.)

6.40 m

YAMAÇ MOLOZU

Kırmızımsı kahverenkli, sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-orta taneli, köşeli-yarı köşeli, genel olarak kireçtaşı kökenli, sert, çakıllı; % 10-15, ince-iri taneli, kumlu.

8.30 m

YAMAÇ MOLOZU

Sarımsı açık kahverenkli, sert, kumlu molozlu/bloklu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 35-40, ince-iri taneli, köşeli-yarı köşeli, sert, genel olarak kireçtaşı kökenli, çakıllı; % 15-20, maksimum 40 cm boyutunda, sert, dayanımlı, kireçtaşı kökenli, bloklu; % 5-10, ince-iri taneli, kumlu.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				100	-	
				100	-	
				86	-	
				100	-	
				72	-	
				68	-	
				100	-	

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Dirlik Mahallesi 450. Caddo No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-16İ**
SAYFA Page No: **3 / 4**

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	Pres. Deneyi Press. Test (kg / cm²) Net Limit Basınç Net Limit Pressure	Elastik Modül Modulus of Elasticity	Standart Penetrasyon Deneyi Standart Penetration Test: Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph (10 20 30 40 50 60)	Jeoteknik Tanımlama Geotechnical Description	Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / IS_{50} (MPa)
16	K-11										(Tanımı Önceki Sayfadadır.)					100	-	
	SPT-11	16.50	SPT-11			50/14	-	-	R	R								
		16.64									**16.70 m**							
17	K-12										YAMAÇ MOLOZU					37	-	
18		18.00									Krem-bej renkli, çok sıkı, kumlu killi ÇAKIL. Islak, orta-iri taneli, köşeli-yarı köşeli, kireçtaşı kökenli, sert, % 15-20, ince malzemeli, % 10-15, ince-iri taneli, dağılgan, kumlu.							
	K-13															27	-	
19		19.50																
20	K-14		P-4	12.00	123						**20.20 m**					45	0	
		20.40																
21		21.00																
	SPT-12		SPT-12			20	30	32	62	62	SİLTTAŞI		V	IV/V	>20			
		21.45									Yeşilimsi açık kahverenkli, yumuşak-ufalanabilir, çok zayıf dayanımlı, çok-tümüyle ayrışmış.							
22	K-15															100	0	
		22.50									Süreksizlikler; yoğun ayrışma nedeniyle gözlenememektedir.							
	SPT-13		SPT-13			10	14	23	37	37			IV	III/IV	2-10			
23		22.95											V	IV/V	>20	70	24	
	K-16										**23.75 m**							
24		24.00									SİLTTAŞI							
	K-17										Açık kahverenkli, orta sert, orta zayıf dayanımlı, az-orta derecede ayrışmış.			II/III	2-10	64	30	
		24.90									Süreksizlikler; 10°, 20°, açık, mat, pürüzlü, MnO boyalı; 0°, 30°, kapalı, 1-5 mm kalsit dolgulu.		II/III					
25		25.00	P-5	43.20	7126						25.00-25.30 m'ler arası, kumtaşı seviyesi ayırtlanmıştır.							
	K-18										**25.60 m**			II	0-1	95	85	
26											(Tanımı Sonraki Sayfadadır.)							

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-15İ
SAYFA Page No: 4 / 4

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
26	K-18	26.50									SİLTTAŞI-KUMTAŞI-ÇAKILTAŞI ARDALANMASI Silttaşı: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış. Kumtaşı: Gri-koyu gri renkli, orta sert, orta-orta zayıf dayanımlı, az ayrışmış, orta sıkı tutturulmuş, ince-iri taneli, karbonatlı kil-silt matriksli. Çakıltaşı: Gri-koyu gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, sıkı-orta sıkı tutturulmuş, karbonatlı kil-silt matriks içerisinde; % 40-45, ince-orta taneli, yarı yuvarlak-yarı köşeli, sert, muhtelif kökenli çakıllar içermektedir. Süreksizlikler; 30°, 45°, 90°, açık, mat, pürüzlü, kalsit dolgulu; 45°, 90°, kapalı, 1-2 mm kalsit dolgulu.					95	85	
27	K-19														0-1	100	82	
28		28.00											II/III	II				
29	K-20															100	40	
		29.40	P-6	43.20	8811										2-10			
	K-21	29.50														92	28	
30		30.00									**KUYU SONU: 30.00 m** Sandık - 1/6 (0.00 - 7.10) m Sandık - 2/6 (7.10 - 11.85) m Sandık - 3/6 (11.85 - 18.40) m Sandık - 4/6 (18.40 - 24.00) m Sandık - 5/6 (24.00 - 29.30) m Sandık - 6/6 (29.30 - 30.00) m							
31																		
32																		
33																		
34																		
35																		
36																		

Not : Kuyuya 30.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Birlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

YP-9110-FRM-0081
Sondaj Logu

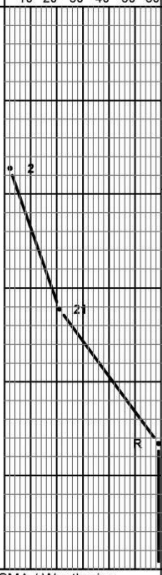
SONDAJ LOGU / BORING LOG

SONDAJ Borehole No:	CPS-16İ
SAYFA Page No:	1 / 3

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 12.05.2016 - 13.05.2016
SONDAJ YERİ / Boring Location	: POZANTI - TEKİR MEVKİİ / HEYELAN	MUH.BOR.DER. / Casing Depth	: 9.00 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	: 9.25 m - 13.05.2016
SONDAJ DER. / Boring Depth	: 24.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 24.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 659.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-04 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 875.00
SONDÖR / Driller	: Necati AŞKIN	SONDAJ KOTU / Elevation (m)	: 1159.65

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	JEOTEKNİK TANIMLAMA Geotechnical Description	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR) T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00								YAPAY DOLGU (YOL DOLGUSU) Muhtelif renkli (Krem-bej-açık kahve), killi kumlu ÇAKIL. Islak, ince-iri taneli, dağılgan-sert, muhtelif-kireçtaşı kökenli, yarı köşeli-köşeli; % 20-25, ince-iri taneli, dağılgan-sert, kumlu; % 5-15, ince malzemeli. — 0.40 m						
1	K-1									YAMAÇ MOLOZU Yeşilimsi-açık kahverenkli, çok yumuşak, çakıllı kumlu KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-iri taneli, dağılgan, kumlu; % 5-15, ince-iri taneli, dağılgan-sert, köşeli-yarı köşeli, muhtelif kökenli, çakıllı.				49	-	
		1.50														
	SPT-1		SPT-1			1	1	1	2							
2		1.95								— 1.95 m						
	K-2									YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri taneli, sert, köşeli-yarı köşeli, muhtelif-kireçtaşı kökenli, çakıllı; % 5-10, ince-çok ince taneli, kumlu. Birim, yoğun karbonat konkresyonludur.				26	-	
3		3.00														
	SPT-2		SPT-2			4	9	12	21							
		3.45														
4	K-3	3.90	P-1	29.10	308									95	-	
		4.50														
	SPT-3	4.82	SPT-3			8	21	50/2	R	— 4.80 m						
5	K-4									YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, açık gri renkli, kumlu çakıllı molozlu bloklu KİL. Nemli, orta-yüksek plastisiteli, % 25-30, maksimum 50 cm'ye varan, sert, dayanımlı, kireçtaşı kökenli, moloz-bloklu; % 15-20, ince-iri taneli, sert, köşeli-yarı köşeli, kireçtaşı kökenli, çakıllı; % 5-15, ince-çok ince taneli, dağılgan, kumlu.				100	-	
		5.70														
6	K-5													57	-	

GRAFİK Graph



PROFİL Profile

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering			İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh	N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.	N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.	N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.	N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.	N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
						N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions					
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi / Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
		K	Karot Numunesi / Core Sample
BST	Basınçlı Su Testi / Water Pressure Test	P	Pressiyometre Deneyi / Pressuremeter Test
UD	Örselenmemiş Numune / Undisturbed Sample	k	Permeabilite Deneyi / Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name: Hüseyin Eren KUŞÇU, Jeoloji Mühendisi	
İMZA Signature:	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

Rev. No: 01 — Bu döküman YP IT grubunun programları kullanılarak otomatik olarak çizilmiştir. — Rev. Tar: 13.07.2011

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-16İ
SAYFA Page No: 2 / 3

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
6	K-5									
7	K-6	6.80								
	SPT-4	7.50	SPT-4			18	22	50/5	R	R
8	K-7	7.85								
		8.40	P-2	34.60	734					
9	SPT-5	9.00	SPT-5			4	5	6	11	11
10	K-8	9.45								
	SPT-6	10.50	SPT-6			7	10	11	21	21
11	K-9	10.95								
		11.40	P-3	39.00	510					
12	SPT-7	12.00	SPT-7			5	10	13	23	23
	K-10	12.45								
13	SPT-8	13.50	SPT-8			14	50/5	-	R	R
14	K-11	13.70								
	K-12	14.50								
15		15.90								
16		16.00	P-4	45.40	12716					

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli, açık gri renkli, kumlu çakıllı molozlu bloklu KİL. Nemli, orta-yüksek plastisiteli, % 25-30, maksimum 50 cm'ye varan, sert, dayanımlı, kireçtaşı kökenli, moloz-bloklu; % 15-20, ince-iri taneli, sert, köşeli-yarı köşeli, kireçtaşı kökenli, çakıllı; % 5-15, ince-çok ince taneli, dağılgan, kumlu.

9.00 m

YAMAÇ MOLOZU

Açık kahve-yeşilimsi açık kahverenkli, katı-çok katı, çakıllı kumlu KİL. Nemli, orta-yüksek plastisiteli; % 20-25, ince-çok ince taneli, dağılgan, kumlu; % 10-20, ince-iri taneli, sert, yarı köşeli-köşeli, kireçtaşı kökenli, çakıllı.

12.00 m

KİLTAŞI

Kahve-yeşilimsi kahverenkli, yumuşak, çok zayıf dayanımlı, tümüyle ayrışmış (killeşmiş).

Süreksizlikler; ayrışmadan dolayı gözlenememektedir

14.50 m

KİLTAŞI - KUMTAŞI ARDALANMASI

KİLTAŞI: Gri-yeşilimsi gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış.

KUMTAŞI: Açık gri-gri renkli, orta sert-sert, orta dayanımlı, az ayrışmış, karbonat içerisinde, ince-iri taneli, orta sıkı-sıkı tutturulmuş.

Süreksizlikler; 0°, 5°, 30°, 45°, 80°, açık, mat, pürüzlü, kil-silt dolgulu; 0°, 5°,45°, 80°, kapalı, seyrek 1.0 mm'ye varan kalsit dolgulu.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
				57	-	
				39	-	
				55	-	
				100	-	
				10	-	
	V	V	>20	100	0	
				62	12	
	III					
	II	II	1-2	100	100	

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-16İ**
SAYFA Page No: **3 / 3**

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
16		16.00											III					
17																		
	K-13												II			100	100	
18																		
											KİLTAŞI - KUMTAŞI ARDALANMASI		III					
19		19.00									KİLTAŞI: Gri-yeşilimsi gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış.							
20											KUMTAŞI: Açık gri-gri renkli, orta sert-sert, orta dayanımlı, az ayrışmış, karbonat içerisinde, ince-iri taneli, orta sıkı-sıkı tutturulmuş.			II	1-2			
	K-14	20.40	P-5	52.40	13439											100	95	
21											Süreksizlikler; 0°, 5°, 30°, 45°, 80°, açık, mat, pürüzlü, kil-silt dolgulu; 0°, 5°,45°, 80°, kapalı, seyrek 1.0 mm'ye varan kalsit dolgulu.							
22		22.00											II/III					
23	K-15															100	100	
		23.40	P-6	43.60	41291								III					
24		24.00									**KUYU SONU: 24.00 m**							
											Sandık - 1/4 (0.00 - 7.85) m Sandık - 2/4 (7.85 - 14.50) m Sandık - 3/4 (14.50 - 19.20) m Sandık - 4/4 (19.20 - 24.00) m							
25																		
26																		

Not : Kuyuya 24.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirinlik Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsel@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole	No:	CPS-21İ
SAYFA Page	No:	1 / 3

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 30.06.2016 - 02.07.2016
SONDAJ YERİ / Boring Location	: Pozantı / Tekir Mevki / HEYELAN	MUH.BOR.DER. / Casing Depth	: 6.00 m (HW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 24.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 24.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 714.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-04 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 395 002.00
SONDÖR / Driller	: Necati AŞKIN	SONDAJ KOTU / Elevation (m)	: 1148.49

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00									Koyu kahve-açık kahverenkli, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli, çakıllı; % 5-10, ince-iri taneli, sert, kumlu.							
											0.40 m							
1	K-1															32	-	
	SPT-1	1.50	SPT-1			17	23	20	43	43								
2	K-2	1.95									YAMAÇ MOLOZU Kahve-kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 25-30, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli, çakıllı; % 10-15, ince-iri taneli, kumlu.					26	-	
3	SPT-2	3.00	SPT-2			17	10	11	21	21								
	K-3	3.45	P-1	3.00	31						Birim yer yer karbonat konkresyonludur.					17	-	
4	SPT-3	3.90	SPT-3			6	12	10	22	22								
	K-4	4.50														57	-	
5		4.95																
6		6.00																

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering			İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh	N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.	N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.	N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.	N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.	N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
						N : >30	SERT	Hard			

KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures			ORANLAR / Proportions					
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)	% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)	% 5-15	AZ	Little	%5-20	AZ	Little
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)	% 15-35	ÇOK	Very	%20-50	ÇOK	Very
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)	% 35	VE	And			
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)						

SPT	Standart Penetrasyon Testi Standart Penetration Test	S	Sediman Numunesi / Sediment Sample	SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
BST	Basınçlı Su Testi Water Pressure Test	K	Karot Numunesi / Core Sample	İSİM Name: Hüseyin Eren KUŞÇU Jeoloji Mühendisi	
UD	Örselenmemiş Numune Undisturbed Sample	P	Pressiyometre Deneyi Pressuremeter Test	İMZA Signature	
		k	Permeabilite Deneyi Permeability Test		

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-21İ

SAYFA Page No: 2 / 3

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	KOMANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph (10 20 30 40 50 60)
6	SPT-4	6.00	SPT-4			23	36	44	80	80
		6.45								
7	K-5	6.90	P-2	26.80	370					
		7.50								
	SPT-5		SPT-5			14	16	14	30	30
8		7.95								
	K-6									
9	SPT-6	9.00	SPT-6			35	50/12	-	R	R
		9.27								
10	K-7	9.90	P-3	47.50	1979					
		10.50								
	SPT-7		SPT-7			21	33	40	73	73
11		10.95								
	K-8									
12	SPT-8	12.00	SPT-8			12	50/5	-	R	R
		12.20								
13	K-9	12.90	P-4	30.30	470					
		13.50								
	SPT-9		SPT-9			7	10	11	21	21
14		13.95								
	K-10									
15	SPT-10	15.00	SPT-10			27	50/9	-	R	R
		15.24								
	K-11									
16		15.90	P-5	46.70	851					

JEOTEKNİK TANIMLAMA Geotechnical Description

YAMAÇ MOLOZU

Kahve-kırmızımsı kahverenkli, çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 25-30, ince-iri taneli, köşeli-yarı köşeli, sert, muhtelif kökenli, çakıllı; % 10-15, ince-iri taneli, kumlu.

Birim yer yer karbonat konkresyonludur.

12.20 m

YAMAÇ MOLOZU

Koyu kahverenkli, çok katı, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 15-25, ince-iri taneli, köşeli - yarı köşeli, sert, muhtelif-kireçtaşı kökenli, çakıllı; % 10-15, ince-iri taneli, dağılgan, kumlu.

14.30 m

SİLTTAŞI-KUMTAŞI ARDALANMASI

Silttaşı: Kahve-açık kahverenkli, ufalanabilir, çok zayıf dayanımlı, tümüyle ayrışmış.

Kumtaşı: Kahve-açık kahverenkli, orta sert, orta zayıf dayanımlı, orta derecede ayrışmış, ince-iri taneli, orta sıkı-sıkı tutturulmuş, kil-silt matriksli.

Süreksizlikler ayrışmadan dolayı gözlenememektedir.

PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
				19	-	
				31	-	
				33	-	
				67	-	
				96	-	
	V	V	>20	95	0	
	III	III	0-1	48	12	
	V	V	>20			

SONDAJ MÜHENDİSİ Drilling Engineer

İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi

İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yonsjc@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-21İ
SAYFA Page No: 3 / 3

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)	T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
16	K-11										(Tanımı Önceki Sayfadadır.)		V	V	>20	48		12	
		16.50									**16.50 m**								
17															1-2				
	K-12														2-10	100		66	
18															0-1				
		18.50													2-10				
19											SİLTTAŞI-KUMTAŞI ARDALANMASI Silttaşı: Gri-koyu gri renkli, orta sert, orta zayf dayanımlı, az ayrışmış.								
		19.40	P-6	47.20	67774														
20	K-13										Kumtaşı: Gri-açık gri renkli, orta sert, orta-orta zayıf dayanımlı, az ayrışmış, ince-iri taneli, sıkı tutturulmuş, karbonatlı kil-silt matriksli.		II/III	II		100		88	
21											Süreksizlikler; 5°, 45°, 70°, açık, parlak, kaygan; 5°, 30°, kapalı, maksimum 1 cm.'ye varan, kalsit dolgulu, MnO boyalı.				0-1				
		21.50																	
22																			
	K-14															100		100	
23																			
		23.40	P-7	45.10	10560														
24		24.00									**KUYU SONU: 24.00 m** Sandık - 1/4 (0.00 - 12.50) m Sandık - 2/4 (12.50 - 16.50) m Sandık - 3/4 (16.50 - 21.50) m Sandık - 4/4 (21.50 - 24.00) m								
25																			
26																			

Not : Kuyuya 24.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonje@yukselproje.com.tr
www.yukselproje.com.tr

Sondaj Logu

SONDAJ LOGU / BORING LOG

SONDAJ Borehole	No:	CPS-22İ	
SAYFA Page	No:	1 / 4	

PROJE ADI / Project Name	: Tarsus - Pozantı Otoyolu Tekir Hy.	BAŞ. - BİT. TAR. / Start-Finish Date	: 13.05.2016 - 15.05.2016
SONDAJ YERİ / Boring Location	: Pozantı / Tekir Mevkii / HEYELAN	MUH.BOR.DER. / Casing Depth	: 19.50 m (NW)
KİLOMETRE / Chainage	:	YASS ve Ölçüm Tarihi / GWL & Date	:
SONDAJ DER. / Boring Depth	: 30.00 m	KOOR. SİSTEMİ / Coor. System	: TM36 WGS84
DELİK ÇAPI / Hole Diameter	: 30.00 m (NQWL)	KOORDİNAT / Coordinate (N-S) X	: 4 135 767.00
SONDAJ MAK. & YÖNT. / D.Rig & Met.	: YPSM-02 / ROTARY	KOORDİNAT / Coordinate (E-W) Y	: 394 940.00
SONDÖR / Driller	: Ramazan KAVAKLI	SONDAJ KOTU / Elevation (m)	: 1155.50

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / IS_{50} (MPa)
0		0.00																
1	K-1															49	-	
	K-2	1.50														100	-	
2	SPT-1	1.80	SPT-1			10	11	12	23	23	YAMAÇ MOLOZU							
		2.25																
	K-3	2.40	P-1	5.60	104						Muhtelif renkli (kahve-kırmızımsı kahve-sarımsı açık kahve-yer yer mor), çok katı-sert, kumlu çakıllı KİL. Nemli, orta-yüksek plastisiteli; % 20-30, ince-iri taneli, dağılgan-sert, köşeli-yarı köşeli, çakıllı; % 5-15, ince-iri taneli, dağılgan, kumlu.					83	-	
3	SPT-2	3.00	SPT-2			7	6	9	15	15								
	K-4	3.45									Birim içerisinde 1.50-1.70 m'ler arası kireçteşı kökenli blok, 4.50-7.00 m. 'ler arası kum çakıl oranının arttığı gözlenmektedir.					71	-	
4	SPT-3	4.50	SPT-3			12	15	22	37	37								
5	K-5	4.95																
		5.40	P-2	28.60	318											38	-	
6		6.00																

DAYANIMLILIK / Strength (ISRM)			AYRIŞMA / Weathering		
I	DAYANIMLI	Strong (R5)	I	TAZE	Fresh
II	ORTA DAYANIMLI	M.Strong (R4)	II	AZ AYRIŞMIŞ	Slightly W.
III	ORTA ZAYIF	M.Weak (R3)	III	ORTA D. AYRIŞMIŞ	Mod. Weath.
IV	ZAYIF	Weak (R2)	IV	ÇOK AYRIŞMIŞ	Highly W.
V	ÇOK ZAYIF	Very to Extremely Weak (R1)	V	TÜMÜYLE A.	Comp. Weat.

İNCE TANELİ / Fine Grained			İRİ TANELİ / Coarse Grained		
N : 0-2	ÇOK YUMUŞAK	V.Soft	N : 0-4	Ç. GEVŞEK	V.Loose
N : 3-4	YUMUŞAK	Soft	N : 5-10	GEVŞEK	Loose
N : 5-8	ORTA KATI	M.Stiff	N : 11-30	ORTA SIKI	M.Dense
N : 9-15	KATI	Stiff	N : 31-50	SIKI	Dense
N : 16-30	ÇOK KATI	V.Stiff	N : >50	ÇOK SIKI	V.Dense
N : >30	SERT	Hard			

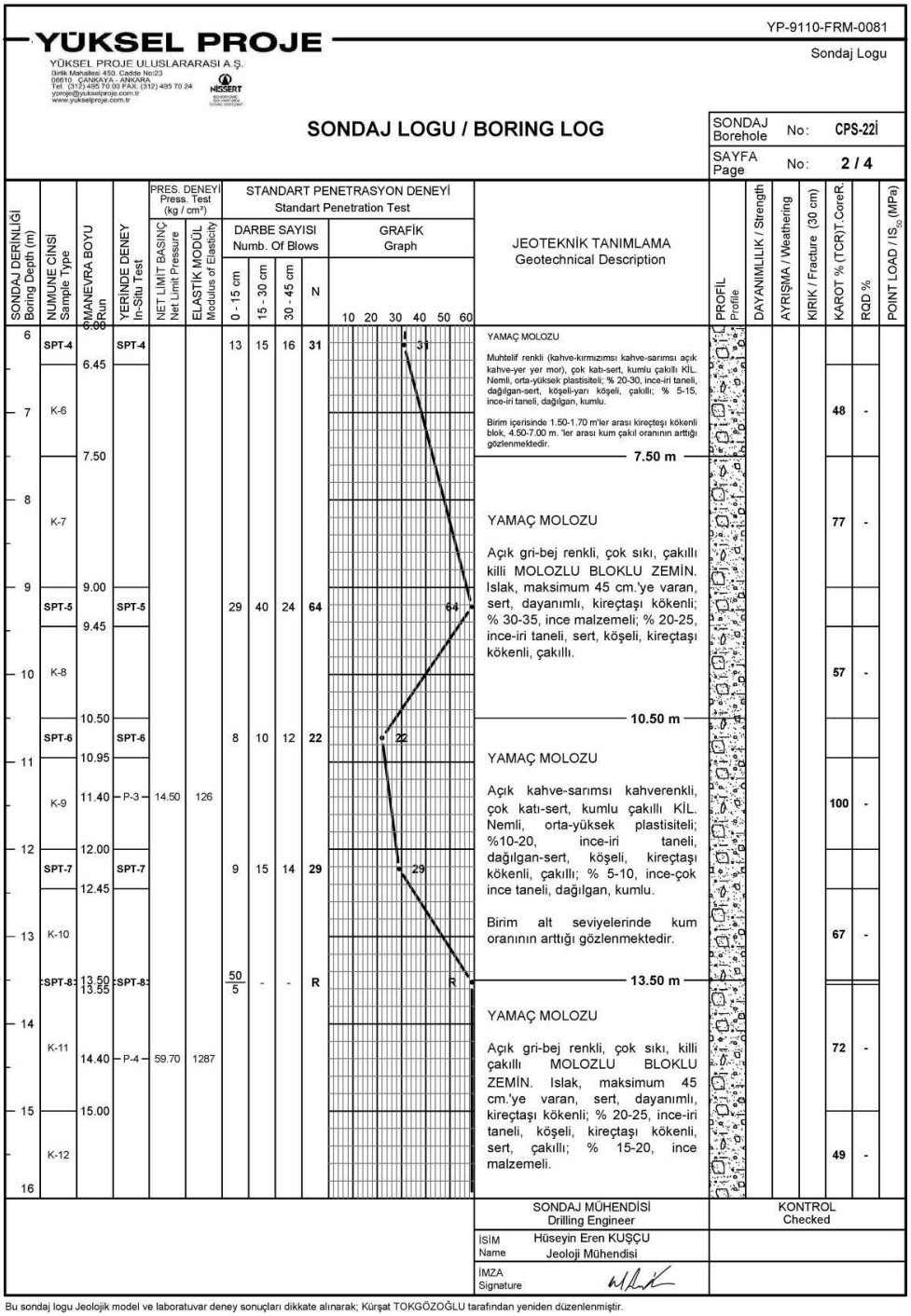
KAYA KALİTESİ TANIMI / RQD			KIRIKLAR - 30 cm / Fractures		
%0-25	ÇOK ZAYIF	V.Poor	1	SEYREK	Wide (W)
%25-50	ZAYIF	Poor	1-2	ORTA	Monderate (M)
%50-75	ORTA	Fair	2-10	SIK	Close (Cl)
%75-90	İYİ	Good	10-20	ÇOK SIK	Intense (I)
%90-100	ÇOK İYİ	Excellent	>20	PARÇALI	Crushed (Cr)

ORANLAR / Proportions					
% 5	PEK AZ	Slightly	%5	PEK AZ	Slightly
% 5-15	AZ	Little	%5-20	AZ	Little
% 15-35	ÇOK	Very	%20-50	ÇOK	Very
% 35	VE	And			

SPT	Standart Penetrasyon Testi / Standart Penetration Test	S	Sediman Numunesi / Sediment Sample
BST	Basınçlı Su Testi / Water Pressure Test	K	Karot Numunesi / Core Sample
UD	Örselenmemiş Numune / Undisturbed Sample	P	Pressiyometre Deneyi / Pressuremeter Test
		k	Permeabilite Deneyi / Permeability Test

SONDAJ MÜHENDİSİ Drilling Engineer	KONTROL Checked
İSİM Name: Hüseyin Eren KUŞÇU	
Jeoloji Mühendisi	
İMZA Signature	

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.



Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

Rev. No: 01

Bu döküman YP IT grubunun programları kullanılarak otomatik olarak çizilmiştir.

Rev. Tar: 13.07.2011

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Şirlik Mahallesi 450. Cadde No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 PAX: (312) 495 70 24
yonsje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: **CPS-22İ**
SAYFA Page No: **3 / 4**

Sondaj Derinliği Boring Depth (m)	Numune Cinsi Sample Type	Manevra Boyu Run	Yerinde Deney In-Situ Test	Pres. Deneyi Press. Test (kg / cm²) Net Limit Basınç Net Limit Pressure	Elastik Modülü Modulus of Elasticity	Standart Penetrasyon Deneyi Standart Penetration Test Darbe Sayısı Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	Grafik Graph 10 20 30 40 50 60
16	K-12	16.50								
	SPT-9		SPT-9			12	39	42	81	81
17		16.95								
	K-13	17.40	P-5	47.50	598					
18	SPT-10	18.00	SPT-10			16	50/14	-	R	R
		18.29								
	K-14									
19										
	SPT-11	19.50	SPT-11			20	26	50/8	R	R
20		19.88								
	K-15	20.40	P-6	44.80	12290					
21		21.00								
	K-16									
22										
		22.50								
23	K-17									
		23.40	P-7	43.10	15824					
24		24.00								
	K-18									
25		25.20								
	K-19									
26										

JEOTEKNİK TANIMLAMA
Geotechnical Description

Profil Profile	Dayanımlılık / Strength	Ayrışma / Weathering	Kırık / Fracture (30 cm)	Karot % (TCR)T.CoreR.	RQD %	Point Load / IS_{50} (MPa)
				49	-	

(Tanımı Önceki Sayfadadır.)

16.50 m

KİLTAŞI

Yeşilimsi açık kahverenkli, yumuşak, çok zayıf dayanımlı, tümüyle ayrışmış,

Süreksizlikler ayrışma nedeniyle gözlenememektedir.

19.95-20.45 m.'ler arasının ezik zon olduğu düşünülmektedir.

V	V	>20	95	0	
			58	0	

20.45 m

KİLTAŞI

Yeşilimsi açık kahverenkli, az sert, zayıf dayanımlı, orta derecede ayrışmış.

Süreksizlikler; 0°, 5°, 45° açık, mat, pürüzlü; 0°, 5°, 20° kapalı, maksimum 1 cm. 'ye varan, karbonat dolgulu.

Birim ince tabakalı olup yer yer 10 cm.'ye varan, seyrek, kumtaşı tabakaları gözlenmiştir.

23.95-24.25 m.'ler arası çok zayıf dayanımlı (muhtemel ezik zon) seviye ayırtlanmıştır.

IV	III	2-10	77	25	
			87	7	
V	V	>20			

24.25 m

KİLTAŞI - KUMTAŞI ARDALANMASI

KİLTAŞI

Gri-koyu gri renkli-yer yer sarımsı açık kahverenkli, orta sert, orta zayıf dayanımlı, az ayrışmış.

KUMTAŞI

Gri-açık gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, karbonat matriks içerisinde, ince-iri taneli, sıkı-orta sıkı tutturulmuş.

Süreksizlikler; 0°, 45°, 60°, 70° açık, mat, pürüzlü; 5°, 10° kapalı, maksimum 0.5 cm.'ye varan seyrek, kalsit dolgulu.

			96	71	
III	II	0-1			
			84	73	

SONDAJ MÜHENDİSİ
Drilling Engineer

İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi

İMZA Signature:

KONTROL
Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

YÜKSEL PROJE
YÜKSEL PROJE ULUSLARARASI A.Ş.
Ilıklık Mahallesi: 450. Caddesi No:23
06610 ÇANKAYA - ANKARA
Tel: (312) 495 70 00 FAX: (312) 495 70 24
yproje@yukselproje.com.tr
www.yukselproje.com.tr

SONDAJ LOGU / BORING LOG

SONDAJ Borehole No: CPS-22İ
SAYFA Page No: 4 / 4

SONDAJ DERİNLİĞİ Boring Depth (m)	NUMUNE CİNSİ Sample Type	MANEVRA BOYU Run	YERİNDE DENEY In-Situ Test	PRES. DENEYİ Press. Test (kg / cm²) NET LİMİT BASINÇ Net Limit Pressure	PRES. DENEYİ ELASTİK MODÜL Modulus of Elasticity	STANDART PENETRASYON DENEYİ Standart Penetration Test DARBE SAYISI Numb. Of Blows 0 - 15 cm	15 - 30 cm	30 - 45 cm	N	GRAFİK Graph 10 20 30 40 50 60	JEOTEKNİK TANIMLAMA Geotechnical Description	PROFİL Profile	DAYANIMLILIK / Strength	AYRIŞMA / Weathering	KIRIK / Fracture (30 cm)	KAROT % (TCR)T.CoreR.	RQD %	POINT LOAD / $IS_{(50)}$ (MPa)
26																		
	K-19	26.40	P-8	43.10	18634						KİLTAŞI - KUMTAŞI ARDALANMASI KİLTAŞI Gri-koyu gri renkli-yer yer sarımsı açık kahverenkli, orta sert, orta zayıf dayanımlı, az ayrışmış.					84	73	
27		27.00																
28	K-20										KUMTAŞI Gri-açık gri renkli, orta sert, orta zayıf dayanımlı, az ayrışmış, karbonat matriks içerisinde, ince-iri taneli, sıkı-orta sıkı tutturulmuş.		III	II	0-1	100	98	
29																		
		29.40	P-9	54.90	218752						Süreksizlikler; 0°, 45°, 60°, 70° açık, mat, pürüzlü; 5°, 10° kapalı, maksimum 0.5 cm.'ye varan seyrek, kalsit dolgulu.							
30		30.00									**KUYU SONU: 30.00 m** Sandık - 1/5 (0.00 - 7.75) m Sandık - 2/5 (7.75 - 14.40) m Sandık - 3/5 (14.40 - 19.88) m Sandık - 4/5 (19.88 - 25.60) m Sandık - 5/5 (25.60 - 30.00) m							
31																		
32																		
33																		
34																		
35																		
36																		

Not : Kuyuya 30.00 metre İnklinometre borusu yerleştirilip, 40x40x15 cm boyutlarında kilitli metal kutu içinde koruma altına alınmıştır.

SONDAJ MÜHENDİSİ Drilling Engineer
İSİM Name: Hüseyin Eren KUŞÇU
Jeoloji Mühendisi
İMZA Signature

KONTROL Checked

Bu sondaj logu Jeolojik model ve laboratuvar deney sonuçları dikkate alınarak; Kürşat TOKGÖZOĞLU tarafından yeniden düzenlenmiştir.

B. Core Box Photographs

BOREHOLE NO: CPS – 04İ
DEPTH: 42.00 m

CORE-BOX NO: 1 / 7 **DEPTH:** 0.00 – 7.50 m

CORE-BOX NO: 2 / 7 **DEPTH:** 7.50 – 15.80 m

BOREHOLE NO: CPS – 04İ
DEPTH: 42.00 m

CORE-BOX NO: 3 / 7 **DEPTH:** 15.80 – 24.45 m

CORE-BOX NO: 4 / 7 **DEPTH:** 24.45 – 29.30 m

BOREHOLE NO: CPS – 04İ
DEPTH: 42.00 m

CORE-BOX NO: 5 / 7 **DEPTH:** 29.30 – 32.50 m

CORE-BOX NO: 6 / 8 **DEPTH:** 32.50 – 38.80 m

BOREHOLE NO: CPS – 04İ
DEPTH: 42.00 m

CORE-BOX NO: 7 / 7 **DEPTH:** 38.80 – 42.00 m

BOREHOLE NO: CPS – 05İ
DEPTH: 45.00 m

CORE-BOX NO: 1 / 8 **DEPTH:** 0.00 – 8.15 m

CORE-BOX NO: 2 / 8 **DEPTH:** 8.15 – 15.00 m

BOREHOLE NO: CPS – 05İ
DEPTH: 45.00 m

CORE-BOX NO: 3 / 8 **DEPTH:** 15.00 – 23.10 m

CORE-BOX NO: 4 / 8 **DEPTH:** 23.10 – 29.80 m

BOREHOLE NO: CPS – 05İ
DEPTH: 45.00 m

CORE-BOX NO: 5 / 8 **DEPTH:** 29.80 – 36.60 m

CORE-BOX NO: 6 / 8 **DEPTH:** 36.60 – 39.40 m

BOREHOLE NO: CPS – 05İ
DEPTH: 45.00 m

CORE-BOX NO: 7 / 8 **DEPTH:** 39.40 – 44.50 m

CORE-BOX NO: 8 / 8 **DEPTH:** 44.50 – 45.00 m

BOREHOLE NO: CPS – 07İ
DEPTH: 48.00 m

CORE-BOX NO: 1 / 7 **DEPTH:** 0.00 – 6.70 m

CORE-BOX NO: 2 / 7 **DEPTH:** 6.70 – 15.75 m

BOREHOLE NO: CPS – 07İ
DEPTH: 48.00 m

CORE-BOX NO: 3 / 7 **DEPTH:** 15.75 – 21.70 m

CORE-BOX NO: 4 / 7 **DEPTH:** 21.70 – 28.30 m

BOREHOLE NO: CPS – 07İ
DEPTH: 48.00 m

CORE-BOX NO: 5 / 7 **DEPTH:** 28.30 – 36.00 m

CORE-BOX NO: 6 / 8 **DEPTH:** 36.00 – 43.80 m

BOREHOLE NO: CPS – 07İ
DEPTH: 48.00 m

CORE-BOX NO: 7 / 7 **DEPTH:** 43.80 – 48.00 m

BOREHOLE NO: CPS – 09İ
DEPTH: 36.00 m

CORE-BOX NO: 1 / 6 **DEPTH:** 0.00 – 9.95 m

CORE-BOX NO: 2 / 6 **DEPTH:** 9.95 – 16.35 m

BOREHOLE NO: CPS – 09İ
DEPTH: 36.00 m

CORE-BOX NO: 3 / 6 **DEPTH:** 16.35– 22.20 m

CORE-BOX NO: 4 / 6 **DEPTH:** 22.20 – 28.00 m

BOREHOLE NO: CPS – 09İ
DEPTH: 36.00 m

CORE-BOX NO: 5 / 6 **DEPTH:** 28.00 – 34.45 m

CORE-BOX NO: 6 / 6 **DEPTH:** 34.45 – 36.00 m

BOREHOLE NO: CPS – 10İ
DEPTH: 30.00 m

CORE-BOX NO: 1 / 5 **DEPTH:** 0.00 – 10.85 m

CORE-BOX NO: 2 / 5 **DEPTH:** 10.85 – 17.60 m

BOREHOLE NO: CPS – 10İ
DEPTH: 30.00 m

CORE-BOX NO: 3 / 5 **DEPTH:** 17.60 – 22.54 m

CORE-BOX NO: 4 / 5 **DEPTH:** 22.54 – 25.50 m

BOREHOLE NO: CPS – 10İ
DEPTH: 30.00 m

CORE-BOX NO: 5 / 5 **DEPTH:** 25.50– 30.00 m

BOREHOLE NO: CPS – 11İ
DEPTH: 42.00 m

CORE-BOX NO: 1 / 7 **DEPTH:** 0.00 – 9.75 m

CORE-BOX NO: 2 / 7 **DEPTH:** 9.75 – 17.15 m

BOREHOLE NO: CPS – 11İ
DEPTH: 42.00 m

CORE-BOX NO: 3 / 7 **DEPTH:** 17.15– 23.20 m

CORE-BOX NO: 4 / 7 **DEPTH:** 23.20 – 30.80 m

BOREHOLE NO: CPS – 11İ
DEPTH: 42.00 m

CORE-BOX NO: 5 / 7 **DEPTH:** 30.80 – 36.05 m

CORE-BOX NO: 6 / 8 **DEPTH:** 36.05 – 41.50 m

BOREHOLE NO: CPS – 11İ
DEPTH: 42.00 m

CORE-BOX NO: 7 / 7 **DEPTH:** 41.50 – 42.00 m

BOREHOLE NO: CPS – 12İ
DEPTH: 42.00 m

CORE-BOX NO: 1 / 8 **DEPTH:** 0.00 – 7.95 m

CORE-BOX NO: 2 / 8 **DEPTH:** 7.95 – 13.25 m

BOREHOLE NO: CPS – 12İ
DEPTH: 42.00 m

CORE-BOX NO: 3 / 8 **DEPTH:** 13.25 – 19.20 m

CORE-BOX NO: 4 / 8 **DEPTH:** 19.20 – 24.45 m

BOREHOLE NO: CPS – 12İ
DEPTH: 42.00 m

CORE-BOX NO: 5 / 8 **DEPTH:** 24.45 – 30.00 m

CORE-BOX NO: 6 / 8 **DEPTH:** 30.00 – 35.00 m

BOREHOLE NO: CPS – 12İ
DEPTH: 42.00 m

CORE-BOX NO: 7 / 8 **DEPTH:** 35.00 – 40.00 m

CORE-BOX NO: 8 / 8 **DEPTH:** 40.00 – 42.00 m

BOREHOLE NO: CPS – 14İ
DEPTH: 39.00 m

CORE-BOX NO: 1 / 7 **DEPTH:** 0.00 – 7.50 m

CORE-BOX NO: 2 / 7 **DEPTH:** 7.50 – 14.25 m

BOREHOLE NO: CPS – 14İ
DEPTH: 39.00 m

CORE-BOX NO: 3 / 7 **DEPTH:** 14.25 – 19.15 m

CORE-BOX NO: 4 / 7 **DEPTH:** 19.15 – 24.35 m

BOREHOLE NO: CPS – 14İ
DEPTH: 39.00 m

CORE-BOX NO: 5 / 7 **DEPTH:** 24.35 – 30.00 m

CORE-BOX NO: 6 / 8 **DEPTH:** 30.00 – 35.40 m

BOREHOLE NO: CPS – 14İ
DEPTH: 39.00 m

CORE-BOX NO: 7 / 7 **DEPTH:** 35.40 – 39.00 m

BOREHOLE NO: CPS – 15İ
DEPTH: 30.00 m

CORE-BOX NO: 1 / 6 **DEPTH:** 0.00 – 7.10 m

CORE-BOX NO: 2 / 6 **DEPTH:** 7.10 – 11.85 m

BOREHOLE NO: CPS – 15İ
DEPTH: 30.00 m

CORE-BOX NO: 3 / 6 **DEPTH:** 11.85 – 18.40 m

CORE-BOX NO: 4 / 6 **DEPTH:** 18.40 – 24.00 m

BOREHOLE NO: CPS – 15İ
DEPTH: 30.00 m

CORE-BOX NO: 5 / 6 **DEPTH:** 24.00 – 29.30 m

CORE-BOX NO: 6 / 6 **DEPTH:** 29.30 – 30.00 m

BOREHOLE NO: CPS – 16İ
DEPTH: 24.00 m

CORE-BOX NO: 1 / 4 **DEPTH:** 0.00 – 7.85 m

CORE-BOX NO: 2 / 4 **DEPTH:** 7.85 – 14.50 m

BOREHOLE NO: CPS – 16İ
DEPTH: 24.00 m

CORE-BOX NO: 3 / 4 **DEPTH:** 14.50 – 19.20 m

CORE-BOX NO: 4 / 4 **DEPTH:** 19.20 – 24.00 m

BOREHOLE NO: CPS – 21İ
DEPTH: 24.00 m

CORE-BOX NO: 1 / 4 **DEPTH:** 0.00 – 12.50 m

CORE-BOX NO: 2 / 4 **DEPTH:** 12.50 – 16.50 m

BOREHOLE NO: CPS – 21İ
DEPTH: 24.00 m

CORE-BOX NO: 3 / 4 **DEPTH:** 16.50– 21.50 m

CORE-BOX NO: 4 / 4 **DEPTH:** 21.50 – 24.00 m

BOREHOLE NO: CPS – 22İ
DEPTH: 30.00 m

CORE-BOX NO: 1 / 5 **DEPTH:** 0.00 – 7.75 m

CORE-BOX NO: 2 / 5 **DEPTH:** 7.75 – 14.40 m

BOREHOLE NO: CPS – 22İ
DEPTH: 30.00 m

CORE-BOX NO: 3 / 5 **DEPTH:** 14.40 – 19.88 m

CORE-BOX NO: 4 / 5 **DEPTH:** 19.88 – 25.60 m

BOREHOLE NO: CPS – 22İ
DEPTH: 30.00 m

CORE-BOX NO: 5 / 5 **DEPTH:** 25.60– 30.00 m

C. Summary of the Standard Penetration Test (SPT) Results

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-01	SPT-1	0.50	0.71	35	50	-	R
	SPT-2	1.00	1.45	27	46	32	78
	SPT-3	1.50	1.95	18	20	25	45
	SPT-4	2.00	2.45	12	25	29	54
	SPT-5	2.50	2.95	16	31	24	55
	SPT-6	3.00	3.45	11	8	16	24
	SPT-7	3.50	3.95	11	19	20	39
	SPT-8	4.00	4.35	13	16	50	R
	SPT-9	4.50	4.95	14	10	10	20
CPS-02	SPT-1	0.50	0.95	18	19	12	31
	SPT-2	1.00	1.45	22	15	18	33
	SPT-3	1.50	1.95	15	13	10	23
	SPT-4	2.00	2.45	8	7	7	14
	SPT-5	2.50	2.95	4	5	5	10
	SPT-6	3.00	3.45	3	6	7	13
	SPT-7	3.50	3.95	7	7	4	11
	SPT-8	4.00	4.35	20	6	8	14
	SPT-9	4.50	4.95	7	8	7	15
CPS-03	SPT-1	0.50	0.95	37	28	9	37
	SPT-2	1.00	1.10	50	-	-	R
	SPT-3	2.00	2.45	29	35	31	66
	SPT-4	2.50	2.95	32	29	41	70
	SPT-5	3.00	3.45	21	42	39	81
	SPT-6	3.50	3.95	36	26	36	62
	SPT-7	4.00	4.45	29	22	22	44
	SPT-8	4.50	4.88	45	32	50	R
CPS-04i	SPT-1	1.50	1.95	13	12	20	32
	SPT-2	3.00	3.45	22	18	17	35
	SPT-3	4.50	4.95	14	13	12	25
	SPT-4	6.00	6.45	12	20	24	44
	SPT-5	7.50	7.95	19	22	23	45
	SPT-6	9.00	9.45	23	39	36	75
	SPT-7	10.50	10.95	17	31	39	70
	SPT-8	12.00	12.45	8	9	13	22
	SPT-9	13.50	13.95	1	16	22	38
	SPT-10	15.00	15.29	40	50	-	R
	SPT-11	16.50	16.56	50	-	-	R
	SPT-12	18.00	18.13	50	-	-	R
	SPT-13	19.50	19.90	31	34	50	R
	SPT-14	22.50	22.95	16	15	20	35
	SPT-15	24.00	24.45	30.28	35	28	63
	SPT-16	25.50	25.95	10	24	28	52
	SPT-17	27.00	27.36	24	44	50	R
	SPT-18	28.50	28.95	19	22	33	55
	SPT-19	30.00	30.45	25	29	40	69

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-05i	SPT-1	1.50	1.77	10	50	-	R
	SPT-2	3.00	3.45	7	8	10	18
	SPT-3	4.50	4.95	25	20	40	60
	SPT-4	6.00	6.10	50	-	-	R
	SPT-5	7.50	7.64	50	-	-	R
	SPT-6	9.00	9.02	50	-	-	R
	SPT-7	13.50	13.60	50	-	-	R
	SPT-8	21.00	21.45	7	10	12	22
	SPT-9	22.50	22.95	5	5	10	15
	SPT-10	24.00	24.45	7	13	14	27
	SPT-11	25.50	25.55	50	-	-	R
	SPT-12	28.50	28.95	17	28	34	62
	SPT-13	30.00	30.45	12	19	26	45
	SPT-14	31.50	31.95	14	22	33	55
	SPT-15	33.00	33.45	10	14	17	31
	SPT-16	34.50	34.90	8	14	15	29
	SPT-17	36.00	36.45	20	26	26	52
	SPT-18	37.50	37.70	25	50	-	R
	SPT-19	39.00	39.40	16	15	50	R
CPS-06	SPT-1	0.50	0.95	31	35	29	64
	SPT-2	1.00	1.13	50	-	-	R
	SPT-3	1.20	1.25	50	-	-	R
	SPT-4	2.00	2.45	12	24	37	61
	SPT-5	2.50	2.95	13	14	12	26
	SPT-6	3.00	3.45	14	13	11	24
	SPT-7	3.50	3.95	28	19	12	31
	SPT-8	4.00	4.35	19	17	50	R
	SPT-9	4.50	5.15	25	37	46	83
CPS-07i	SPT-1	1.50	1.95	6	8	6	14
	SPT-2	3.00	3.45	3	4	3	7
	SPT-3	4.50	4.95	3	4	5	9
	SPT-4	6.00	6.02	50	-	-	R
	SPT-5	10.50	10.95	9	16	19	35
	SPT-6	12.00	12.10	50	-	-	R
	SPT-7	13.50	13.95	20	14	11	25
	SPT-8	16.50	16.95	25	21	24	45
	SPT-9	18.00	18.05	50	-	-	R
	SPT-10	28.75	29.20	14	20	22	42
	SPT-11	31.00	31.45	12	17	25	42
	SPT-12	33.00	33.40	25	31	50	R
CPS-08	SPT-1	0.50	0.78	29	50	-	R
	SPT-2	1.00	1.45	10	7	10	17
	SPT-3	1.50	1.95	13	13	13	26
	SPT-4	2.00	2.45	10	9	8	17
	SPT-5	2.50	2.52	50	-	-	R
	SPT-6	3.00	3.45	8	40	16	56
	SPT-7	3.50	3.95	16	10	8	18
	SPT-8	4.00	4.35	13	33	24	57
	SPT-9	4.50	4.95	8	9	36	45

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-09i	SPT-1	1.50	1.95	4	6	5	11
	SPT-2	3.00	3.45	6	5	6	11
	SPT-3	4.50	4.62	50	-	-	R
	SPT-4	6.00	6.45	6	5	6	11
	SPT-5	7.50	7.95	7	5	4	9
	SPT-6	9.00	9.45	16	14	11	25
	SPT-7	10.50	10.95	13	17	20	37
	SPT-8	12.00	12.03	50	-	-	R
	SPT-9	13.50	13.58	50	-	-	R
	SPT-10	15.00	15.45	18	24	35	59
	SPT-11	16.50	16.95	9	12	14	26
	SPT-12	18.00	18.45	16	17	40	47
	SPT-13	19.50	19.72	18	50	-	R
	SPT-14	21.00	21.45	13	25	33	58
	SPT-15	22.50	22.95	24	32	40	72
	SPT-16	24.00	24.45	18	20	24	44
	SPT-17	25.50	25.95	17	18	24	42
	SPT-18	27.00	27.42	7	12	50	R
	SPT-19	28.50	28.60	50	-	-	R
	SPT-20	31.00	31.29	45	50	-	R
CPS-10i	SPT-1	1.50	1.95	18	32	22	54
	SPT-2	3.00	3.45	16	15	19	34
	SPT-3	4.50	4.95	11	14	30	44
	SPT-4	6.00	6.45	13	20	23	43
	SPT-5	7.50	7.95	23	24	14	38
	SPT-6	9.00	9.45	23	23	22	45
	SPT-7	10.50	10.62	50	-	-	R
	SPT-8	12.00	12.45	3	4	5	9
	SPT-9	13.50	13.95	11	10	22	32
	SPT-10	15.00	15.11	50	-	-	R
	SPT-11	16.50	16.95	22	28	21	49
	SPT-12	18.00	18.45	4	8	9	17
	SPT-13	19.50	19.55	50	-	-	R
	SPT-14	22.50	22.54	50	-	-	R
	SPT-15	24.00	24.37	10	35	50	R

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-11i	SPT-1	1.50	1.95	3	4	4	8
	SPT-2	3.00	3.45	5	6	6	12
	SPT-3	4.50	4.95	8	26	7	33
	SPT-4	6.00	6.45	7	3	9	12
	SPT-5	7.50	7.95	14	18	17	35
	SPT-6	9.00	9.45	9	10	12	22
	SPT-7	10.50	10.60	50	-	-	R
	SPT-8	12.00	12.45	5	5	9	14
	SPT-9	13.50	13.95	11	12	12	24
	SPT-10	16.50	16.75	12	50	-	R
	SPT-11	18.00	18.45	11	11	14	25
	SPT-12	19.50	19.78	12	50	-	R
	SPT-13	22.50	22.67	35	50	-	R
	SPT-14	24.00	24.45	39	47	40	87
	SPT-15	25.50	25.95	26	23	28	51
	SPT-16	27.00	27.45	15	21	18	39
	SPT-17	28.50	28.85	20	23	50	R
	SPT-18	30.00	30.45	5	8	9	17
	SPT-19	31.50	31.95	6	9	39	48
	SPT-20	33.00	33.05	50	-	-	R
	SPT-21	34.50	34.55	50	-	-	R
	SPT-22	36.00	36.05	50	-	-	R
CPS-12i	SPT-1	1.50	1.95	2	3	4	7
	SPT-2	3.00	3.45	3	2	3	5
	SPT-3	4.50	4.95	0	10	7	17
	SPT-4	6.00	6.45	6	5	10	15
	SPT-5	7.50	7.95	5	7	11	18
	SPT-6	9.00	9.45	47	14	15	29
	SPT-7	10.50	10.95	9	12	14	26
	SPT-8	12.00	12.45	13	29	24	53
	SPT-9	13.50	13.95	23	30	47	77
	SPT-10	15.00	15.45	10	32	37	69
	SPT-11	16.50	16.95	18	20	24	44
	SPT-12	18.00	18.45	10	12	23	35
	SPT-13	19.50	19.95	10	30	21	51
	SPT-14	21.00	21.30	8	31	50	R
	SPT-15	22.50	22.95	10	12	26	38
	SPT-16	24.00	24.45	18	29	40	69
CPS-13	SPT-1	0.50	0.63	50	-	-	R
	SPT-2	1.00	1.45	10	12	15	27
	SPT-3	1.50	1.95	13	10	11	21
	SPT-4	2.00	2.45	11	12	9	21
	SPT-5	2.50	2.95	21	15	9	18
	SPT-6	3.00	3.45	10	12	18	30
	SPT-7	3.50	3.82	17	28	50	R
	SPT-8	4.00	4.13	50	-	-	R
	SPT-9	4.50	4.95	16	23	25	48

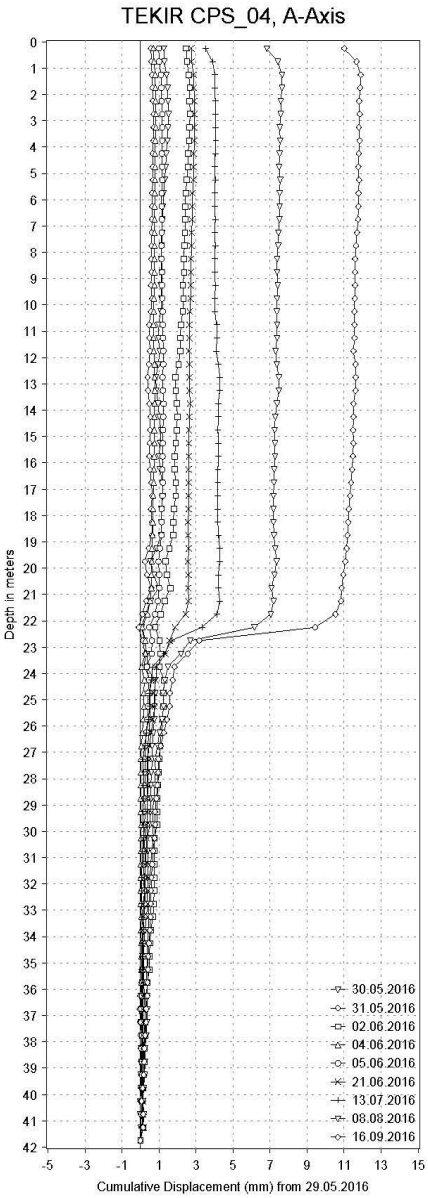
Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-13A	SPT-1	0.50	0.74	12	50	-	R
	SPT-2	1.00	1.45	8	3	7	10
	SPT-3	1.50	1.95	3	4	6	10
	SPT-4	2.00	2.45	4	5	6	11
	SPT-5	2.50	2.95	4	6	8	14
	SPT-6	3.00	3.45	4	6	9	15
	SPT-7	3.50	3.95	3	5	8	13
	SPT-8	4.00	4.45	4	6	8	14
	SPT-9	4.50	4.95	6	11	12	23
CPS-14i	SPT-1	1.50	1.75	40	50	-	R
	SPT-2	3.00	3.45	6	5	21	26
	SPT-3	6.00	6.45	20	32	22	54
	SPT-4	7.50	7.95	24	36	37	73
	SPT-5	9.00	9.45	16	30	40	70
	SPT-6	10.50	10.95	27	26	20	46
	SPT-7	12.00	12.45	9	13	19	32
	SPT-8	15.00	15.20	14	50	-	R
	SPT-9	18.00	18.45	20	33	28	61
	SPT-10	19.50	19.67	13	50	-	R
	SPT-11	21.00	21.45	19	23	36	59
	SPT-12	21.50	21.90	25	45	50	R
	SPT-13	22.50	22.95	16	45	50	R
	SPT-14	25.50	25.85	20	35	50	R
CPS-15i	SPT-1	1.50	1.95	2	2	2	4
	SPT-2	3.00	3.45	4	4	6	10
	SPT-3	4.50	4.95	14	7	10	17
	SPT-4	6.00	6.45	5	7	10	17
	SPT-5	7.50	7.95	6	11	22	33
	SPT-6	9.00	9.03	50	-	-	R
	SPT-7	10.50	10.95	21	24	20	44
	SPT-8	12.00	12.39	25	21	50	R
	SPT-9	13.50	13.54	50	-	-	R
	SPT-10	15.00	15.45	13	22	28	50
	SPT-11	16.50	16.64	50	-	-	R
	SPT-12	21.00	21.45	20	30	32	62
	SPT-13	22.50	22.95	10	14	23	37
CPS-16i	SPT-1	1.50	1.95	1	1	1	2
	SPT-2	3.00	3.45	4	9	12	21
	SPT-3	4.50	4.82	8	21	50	R
	SPT-4	7.50	7.85	18	22	50	R
	SPT-5	9.00	9.45	4	5	6	11
	SPT-6	10.50	10.95	7	10	11	21
	SPT-7	12.00	12.45	5	10	13	23
	SPT-8	13.50	13.70	14	50	-	R

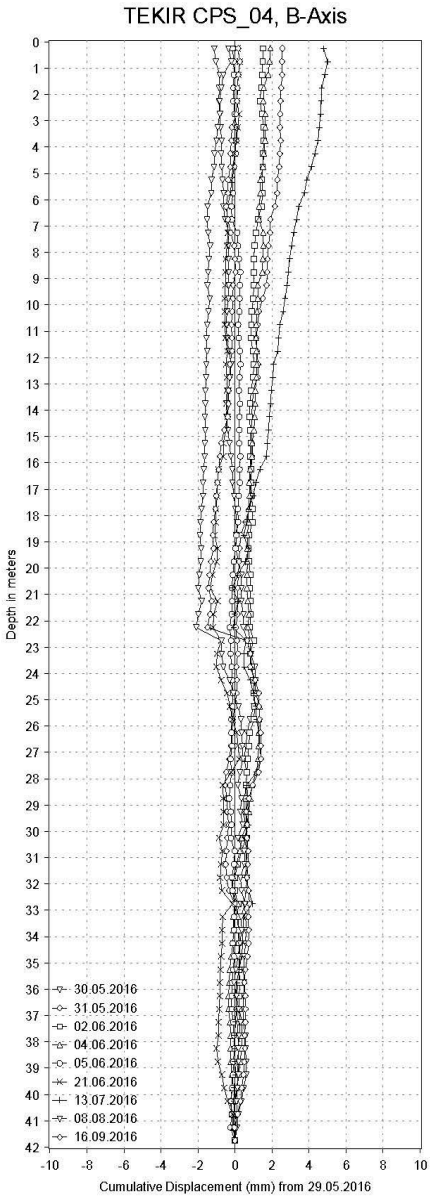
Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-17	SPT-1	0.50	0.95	21	40	36	76
	SPT-2	1.00	1.45	18	21	18	39
	SPT-3	1.50	1.95	11	10	8	18
	SPT-4	2.00	2.45	5	4	9	13
	SPT-5	2.50	2.95	7	5	4	9
	SPT-6	3.00	3.45	6	13	17	30
	SPT-7	3.50	3.95	9	17	24	41
	SPT-8	4.00	4.45	11	26	34	60
	SPT-9	4.50	4.95	9	20	24	44
CPS-18	SPT-1	0.50	0.63	50	-	-	R
	SPT-2	1.00	1.45	36	22	25	47
	SPT-3	1.50	1.54	50	-	-	R
	SPT-4	1.70	2.13	15	25	50	R
	SPT-5	2.20	2.23	50	-	-	R
	SPT-6	3.00	3.32	18	25	50	R
	SPT-7	3.50	3.83	29	44	50	R
	SPT-8	4.50	4.95	19	30	22	52
CPS-19	SPT-1	0.50	0.95	18	22	18	40
	SPT-2	1.00	1.45	23	12	13	25
	SPT-3	1.50	1.95	7	3	3	6
	SPT-4	2.00	2.20	3	50	-	R
	SPT-5	2.50	2.95	7	10	9	19
	SPT-6	3.00	3.45	25	12	12	24
	SPT-7	3.50	3.95	26	18	16	34
	SPT-8	4.00	4.45	11	18	26	44
	SPT-9	4.50	4.95	10	15	18	33
CPS-20	SPT-1	0.50	0.77	19	50	-	R
	SPT-2	1.00	1.45	3	3	3	6
	SPT-3	1.50	1.95	13	14	12	26
	SPT-4	2.00	2.45	14	13	14	27
	SPT-5	2.50	2.95	20	24	24	48
	SPT-6	3.00	3.45	16	36	23	59
	SPT-7	3.50	3.95	15	21	30	51
	SPT-8	4.00	4.45	14	15	18	33
	SPT-9	4.50	4.95	12	34	50	R
CPS-21i	SPT-1	1.50	1.95	17	23	20	43
	SPT-2	3.00	3.45	17	10	11	21
	SPT-3	4.50	4.95	6	12	10	22
	SPT-4	6.00	6.45	23	36	44	80
	SPT-5	7.50	7.95	14	16	14	30
	SPT-6	9.00	9.27	35	50	-	R
	SPT-7	10.50	10.95	21	33	40	73
	SPT-8	12.00	12.20	12	50	-	R
	SPT-9	13.50	13.95	7	10	11	21
	SPT-10	15.00	15.24	27	50	-	R

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-22i	SPT-1	1.80	2.25	10	11	12	23
	SPT-2	3.00	3.45	7	6	9	15
	SPT-3	4.50	4.95	12	15	22	37
	SPT-4	6.00	6.45	13	15	16	31
	SPT-5	9.00	9.45	29	40	29	64
	SPT-6	10.50	10.95	8	10	12	22
	SPT-7	12.00	12.45	9	15	14	29
	SPT-8	13.50	13.55	50	-	-	R
	SPT-9	16.50	16.95	12	39	42	81
	SPT-10	18.00	18.29	16	50	-	R
	SPT-11	19.50	19.88	20	26	50	R
CPS-23	SPT-1	0.50	0.63	50	-	-	R
	SPT-2	1.00	1.20	26	46	13	59
	SPT-3A	1.25	1.70				
	SPT-3B	1.25	1.70	8	11	24	35
	SPT-4	1.75	2.20	32	34	29	63
	SPT-5	2.25	2.70	18	31	25	56
	SPT-6	2.75	3.16	38	42	50	R
	SPT-7	3.20	3.65	26	39	20	59
	SPT-8	4.00	4.45	22	38	46	84
	SPT-9	4.50	4.95	19	17	21	38
	SPT-10	6.00	6.45	11	16	16	32
	SPT-11	7.50	7.95	18	13	14	27
	SPT-12	8.00	8.45	10	16	29	45
	SPT-13	9.00	9.45	12	21	19	40
	SPT-14	10.50	10.95	4	4	8	12
	SPT-15	12.00	12.45	10	15	21	36
	SPT-16	15.00	15.28	20	50	-	R
	SPT-17	16.50	16.95	17	28	48	76
	SPT-18	18.00	18.43	24	34	50	R
CPS-24	SPT-1	0.50	0.79	31	50	-	R
	SPT-2	1.00	1.45	7	12	26	38
	SPT-3	1.50	1.95	15	50	18	38
	SPT-4	2.00	2.45	14	15	15	30
	SPT-5	2.50	2.95	21	42	50	R
	SPT-6	3.00	3.45	26	25	50	R
	SPT-7	3.50	3.95	25	41	37	78
	SPT-8	4.00	4.45	22	18	16	34
	SPT-9	4.50	4.95	13	20	40	60

Borehole ID	Sample Type	Depth (m)		SPT Blow Numbers			SPT-N Value
				0 - 15 cm	15 - 30 cm	30 - 45 cm	
CPS-25	SPT-1	0.50	0.57	50	-	-	R
	SPT-2	0.60	0.73	50	-	-	R
	SPT-3A	1.00	1.25				
	SPT-3B	1.00	1.25	32	50	-	R
	SPT-4	1.50	1.88	12	9	50	R
	SPT-5	3.00	3.45	21	25	33	58
	SPT-6	4.50	4.55	50	-	-	R
	SPT-7	6.00	6.45	20	36	25	61
	SPT-8	7.50	7.82	19	32	5	R
	SPT-9A	9.00	9.22				
	SPT-9B	9.00	9.22	35	50	-	R
CPS-26	SPT-1	0.50	0.95	35	22	37	59
	SPT-2	1.00	1.45	25	33	28	61
	SPT-3	1.50	1.90	24	42	50	R
	SPT-4	2.00	2.45	30	43	44	87
	SPT-5	2.50	2.95	16	21	25	46
	SPT-6	3.00	3.45	18	33	34	67
	SPT-7	4.50	4.78	36	50	-	R
CPS-27	SPT-1	0.50	0.95	44	48	36	84
	SPT-2	1.00	1.45	32	36	49	85
	SPT-3	1.50	1.95	35	35	38	73
	SPT-4	2.00	2.45	21	21	35	56
	SPT-5	2.50	2.53	50	-	-	R
	SPT-6	3.00	3.45	18	19	24	43
	SPT-7	4.50	4.95	16	17	21	38
CPS-28	SPT-1	0.50	0.58	50	-	-	R
	SPT-2	1.00	1.45	13	11	18	29
	SPT-3	1.50	1.95	13	18	26	44
	SPT-4	2.00	2.45	17	13	14	27
	SPT-5	2.50	2.95	13	12	14	26
	SPT-6	2.95	3.40	8	13	14	27
	SPT-7	4.50	4.95	17	43	34	77
CPS-29	SPT-1	0.50	0.78	29	50	-	R
	SPT-2	1.00	1.45	12	18	15	33
	SPT-3	1.50	1.95	11	12	7	19
	SPT-4	2.00	2.45	5	4	6	10
	SPT-5	2.50	2.95	4	5	7	12
	SPT-6	2.95	3.40	5	9	8	17
	SPT-7	4.50	4.95	10	9	12	21
CPS-30	SPT-1A	0.50	0.95	28	30	19	49
	SPT-1B	0.50	0.95				
	SPT-2	1.00	1.45	13	13	9	22
	SPT-3	1.50	1.95	17	13	12	25
	SPT-4	2.00	2.45	6	10	12	22
	SPT-5	2.50	2.95	8	10	10	20
	SPT-6A	3.00	3.10				
	SPT-6B	3.10	3.45	5	8	25	33
	SPT-7	4.50	4.95	10	13	17	30

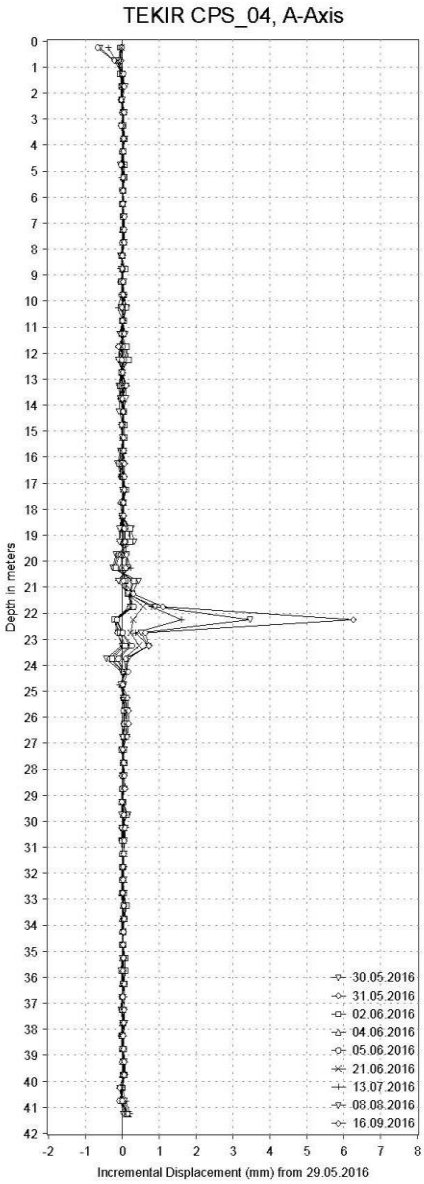
D. Inclinometer Readings

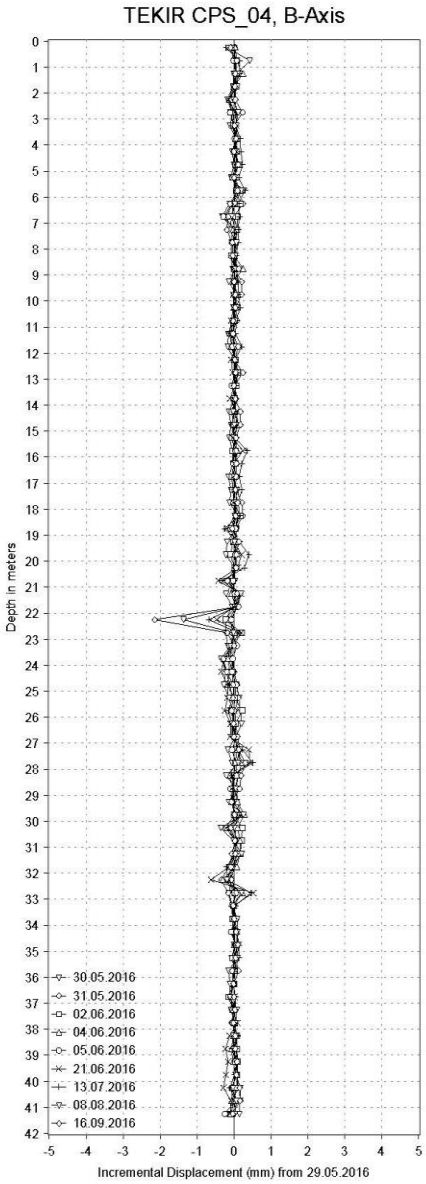




YÜKSEL PROJE

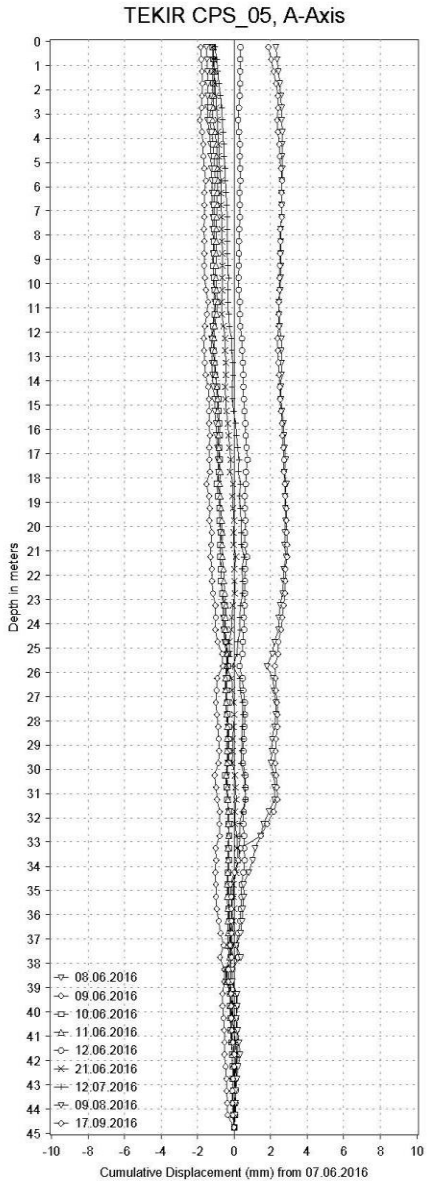
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

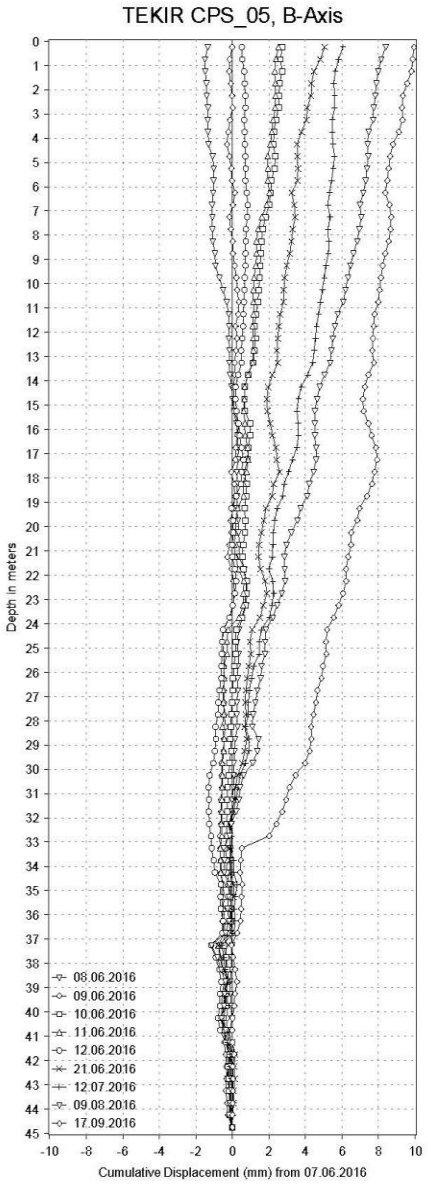




YÜKSEL PROJE

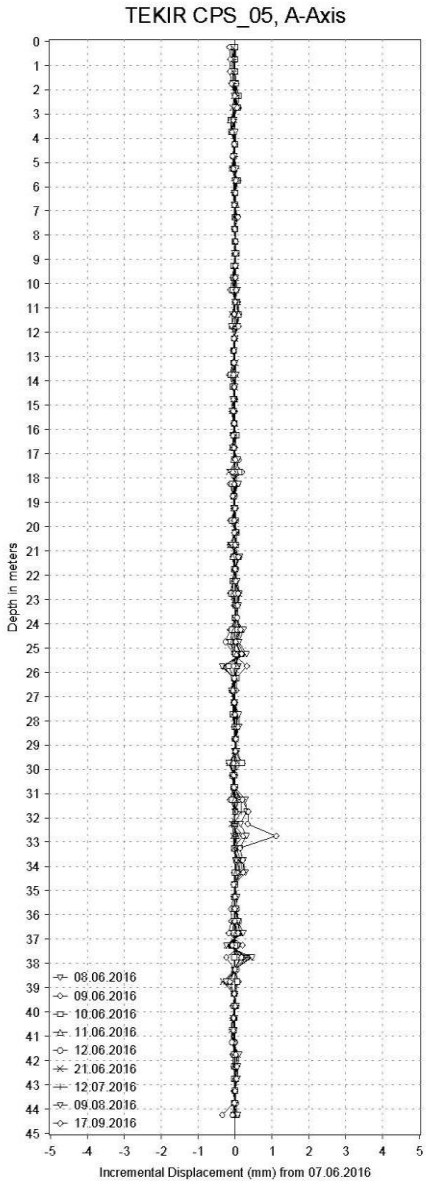
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

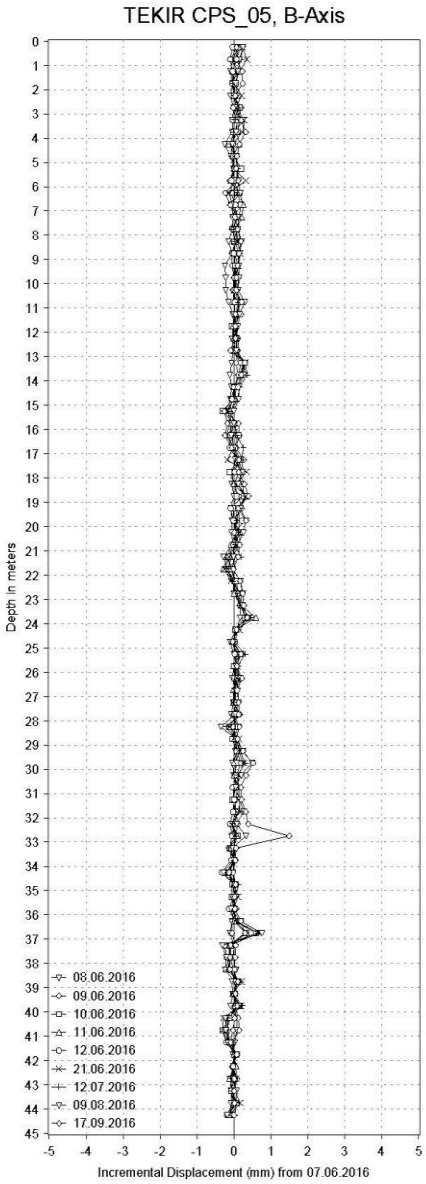




YÜKSEL PROJE

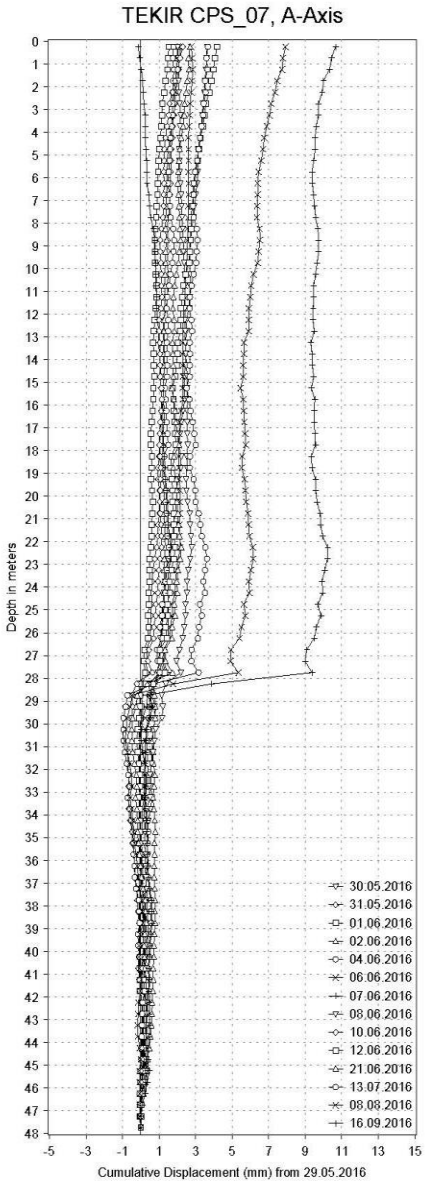
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

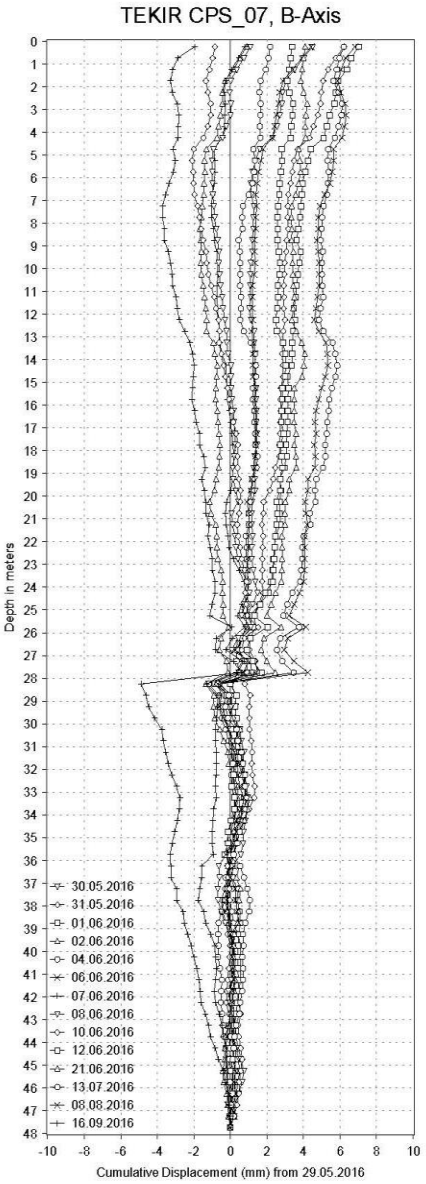




YÜKSEL PROJE

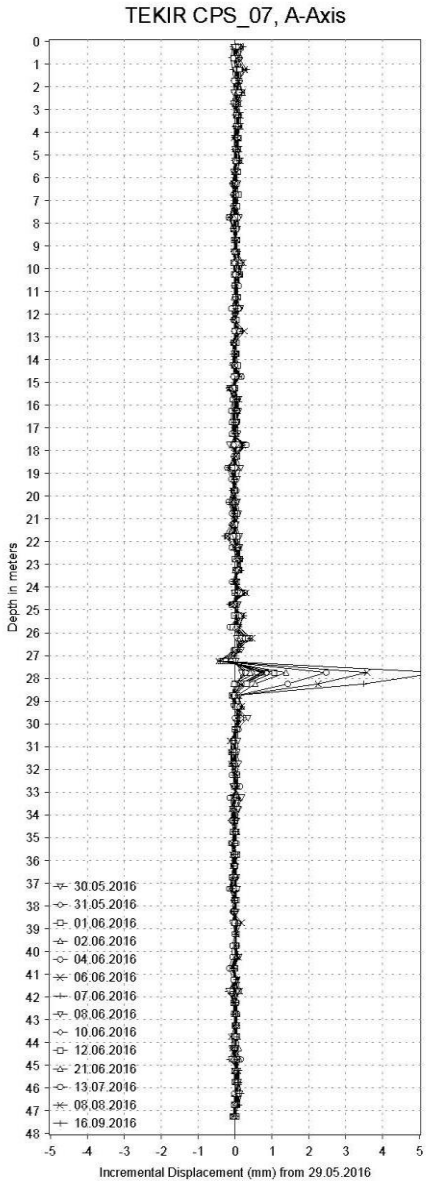
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

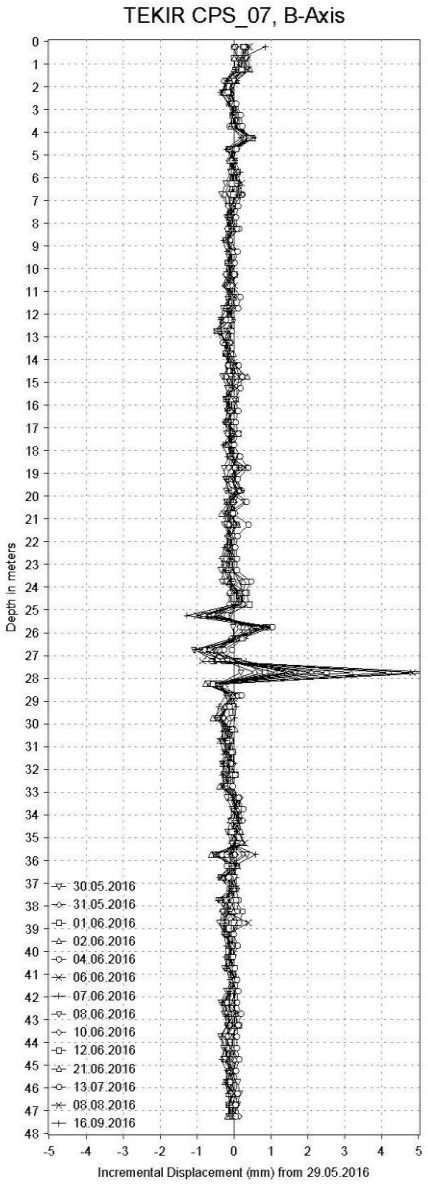




YÜKSEL PROJE

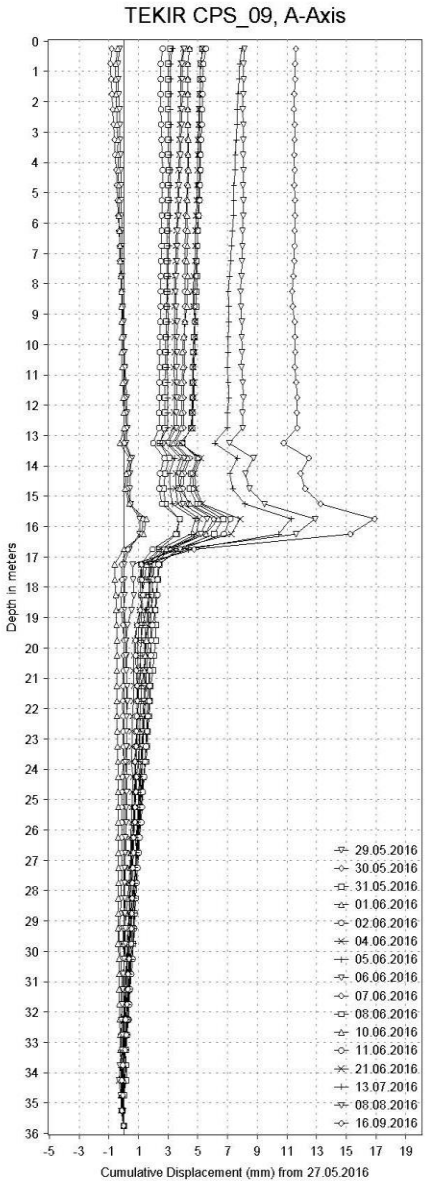
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

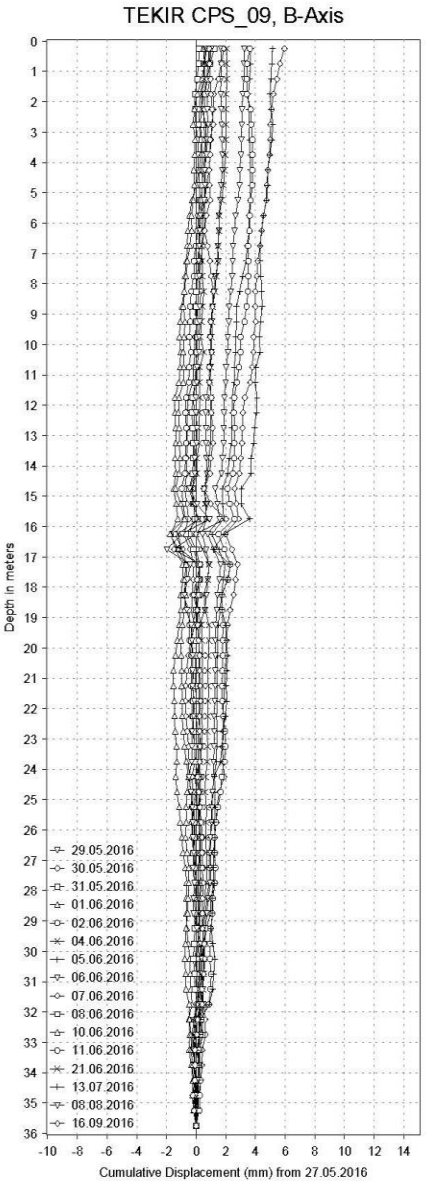




YÜKSEL PROJE

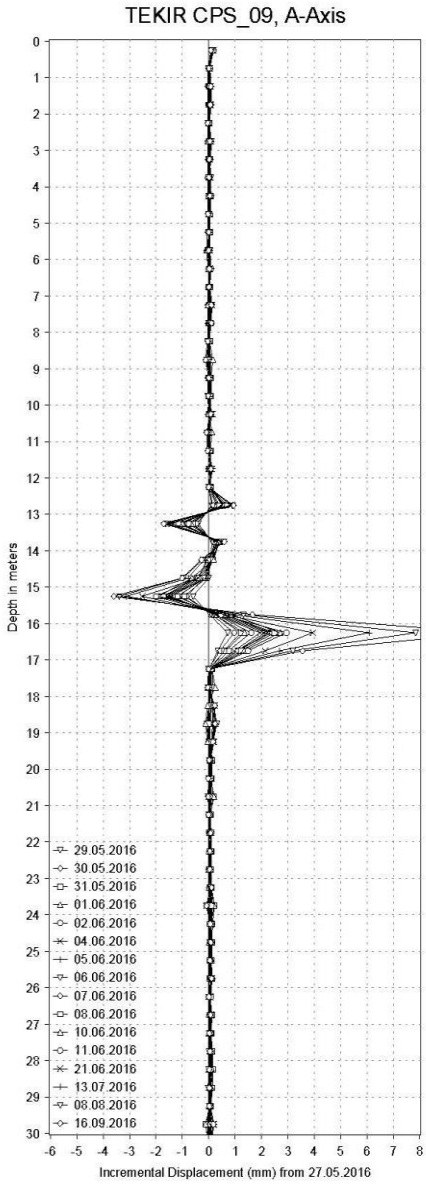
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

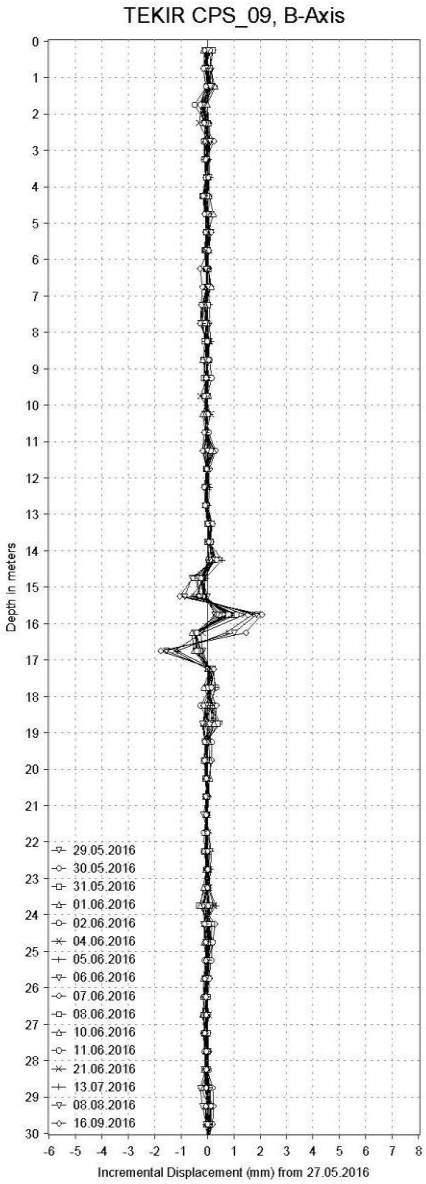




YÜKSEL PROJE

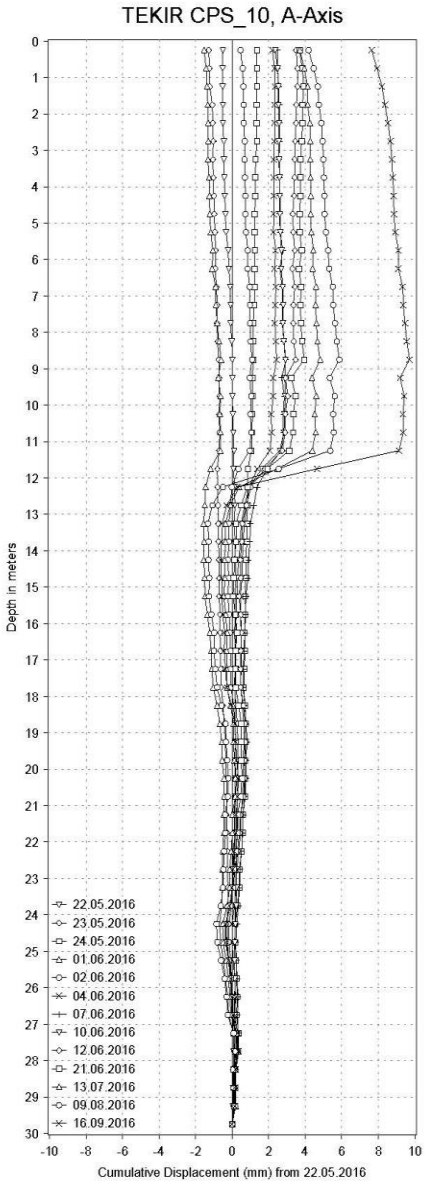
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

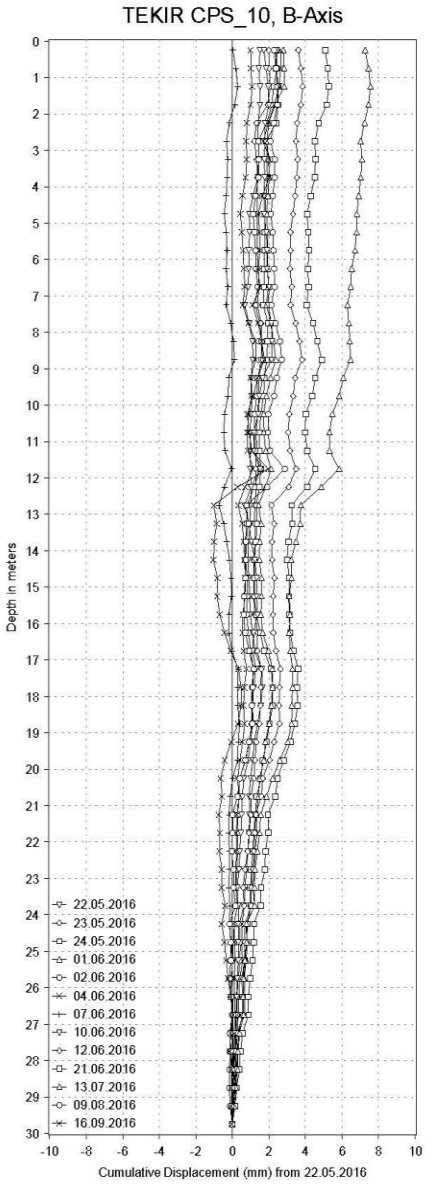




YÜKSEL PROJE

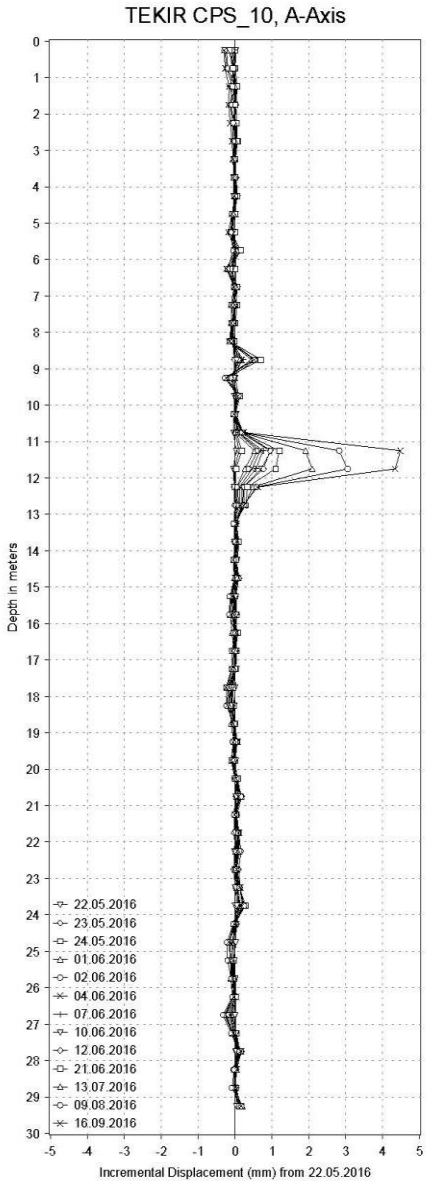
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

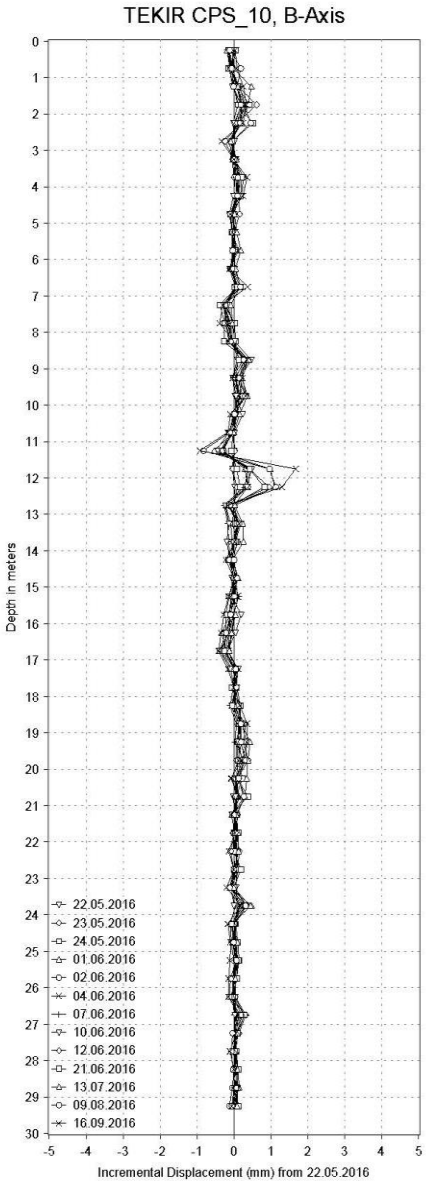




YÜKSEL PROJE

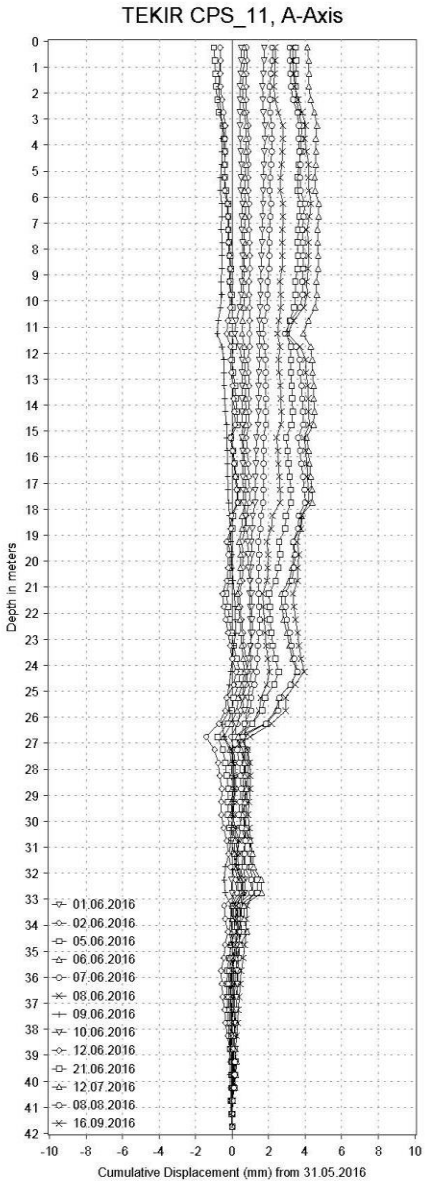
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

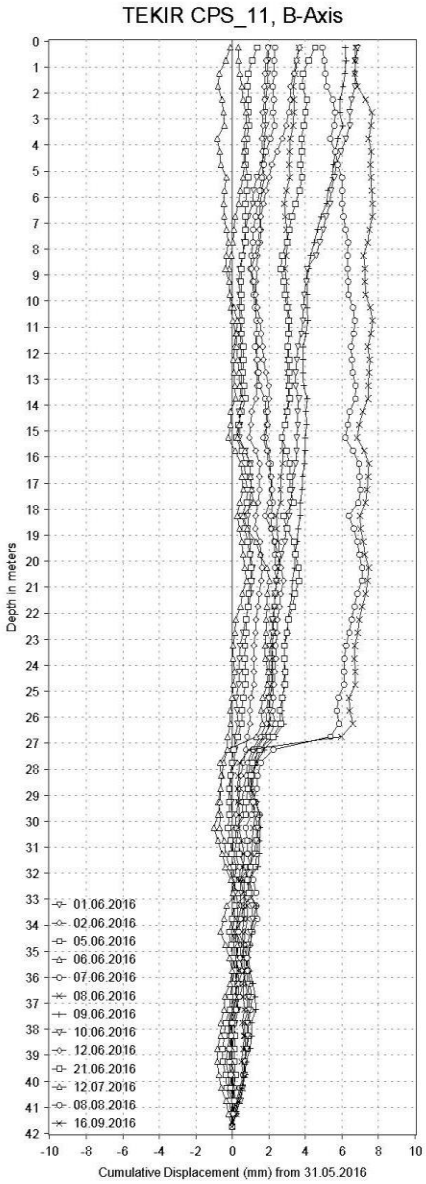




YÜKSEL PROJE

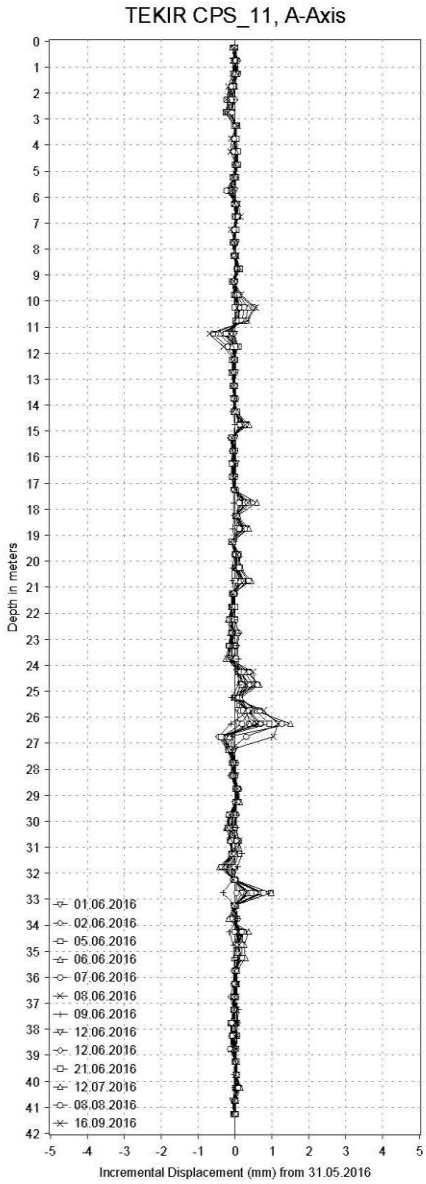
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

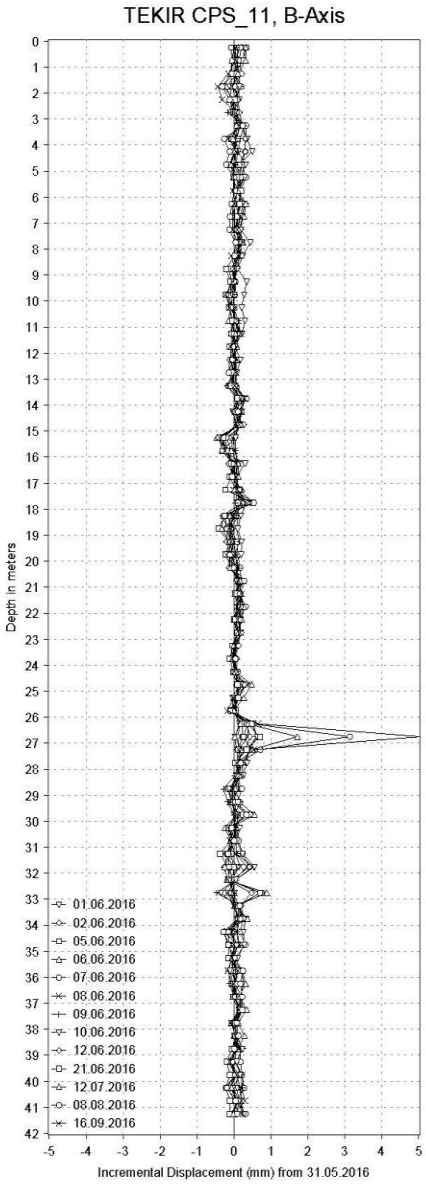




YÜKSEL PROJE

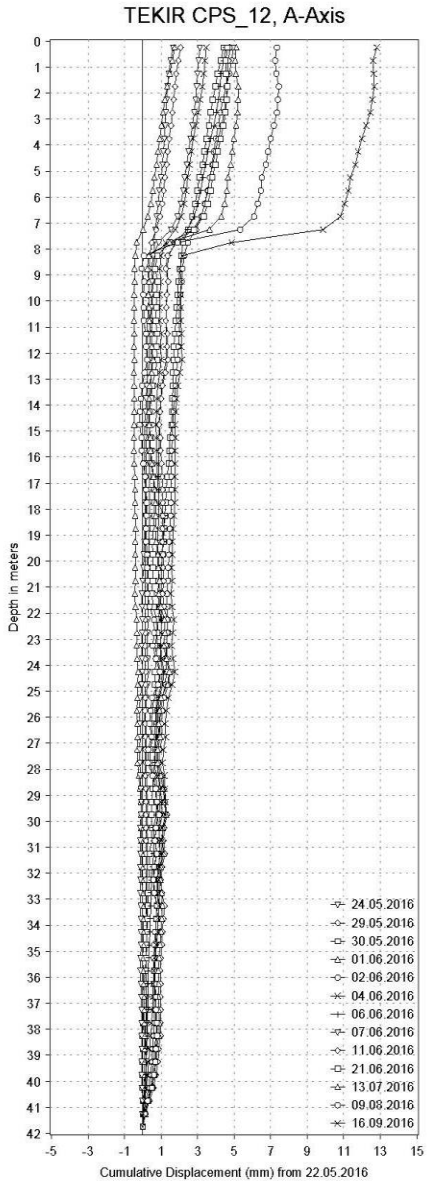
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

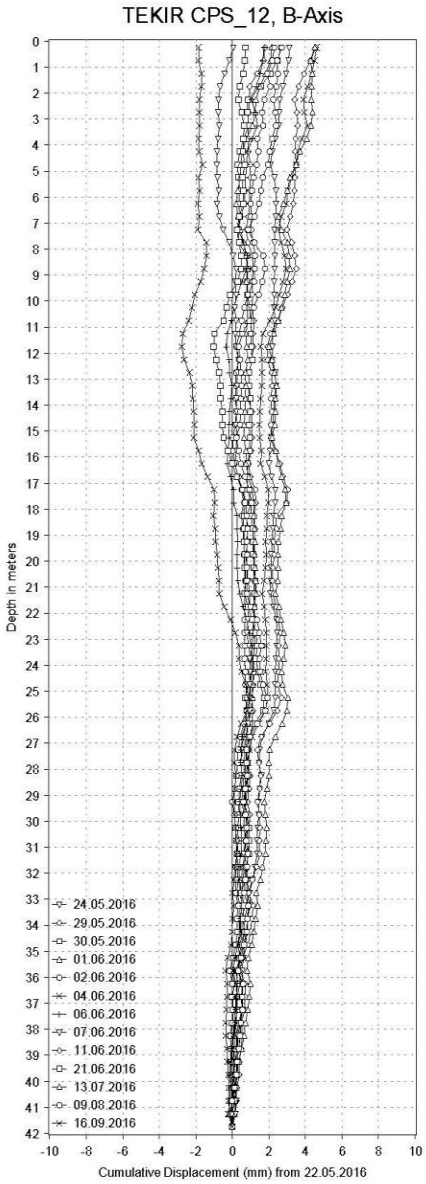




YÜKSEL PROJE

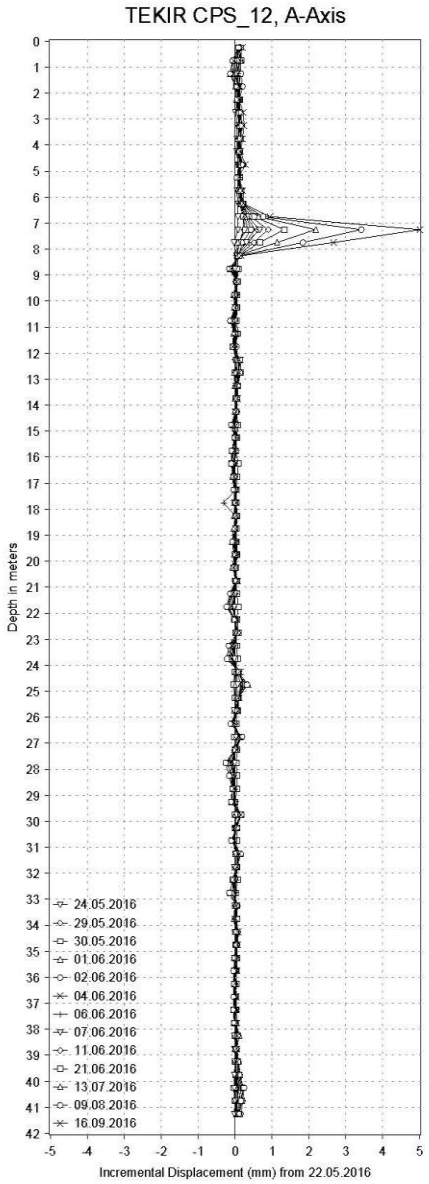
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

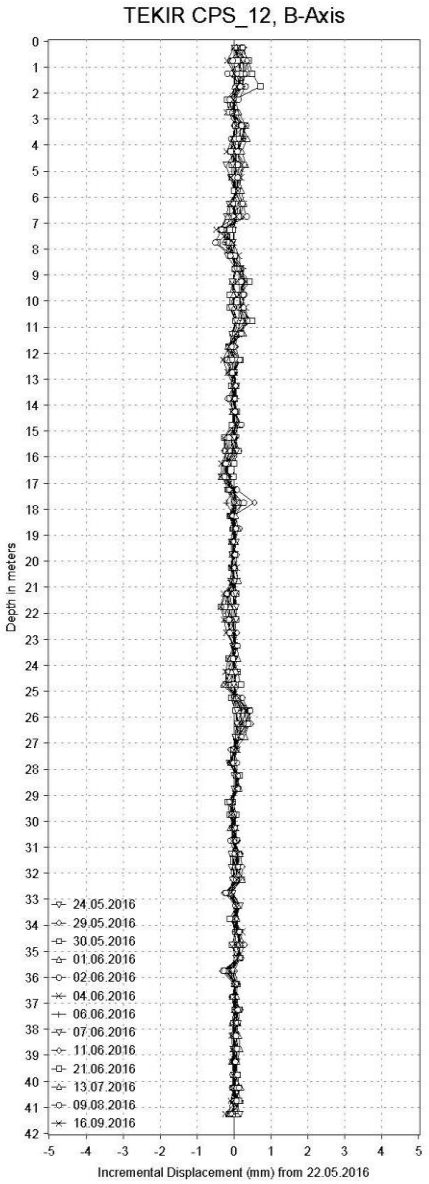




YÜKSEL PROJE

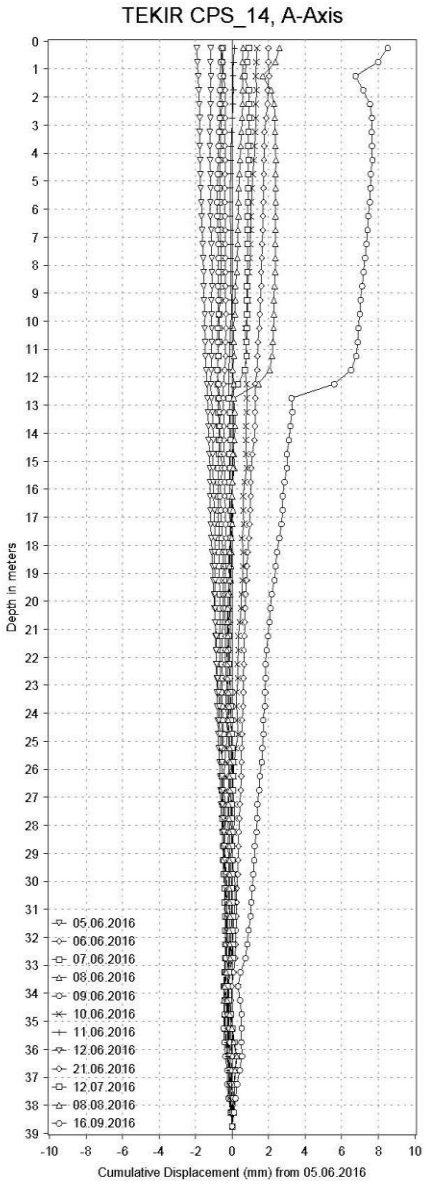
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

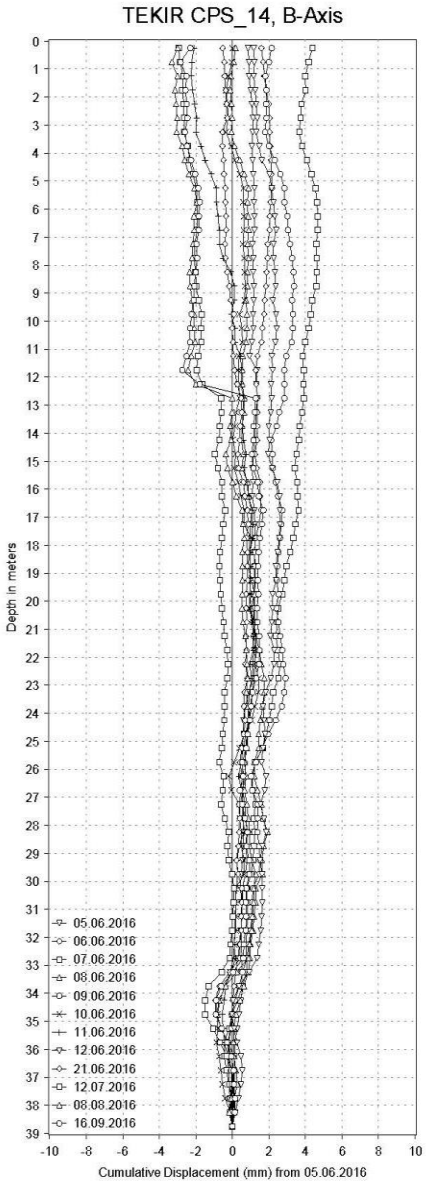




YÜKSEL PROJE

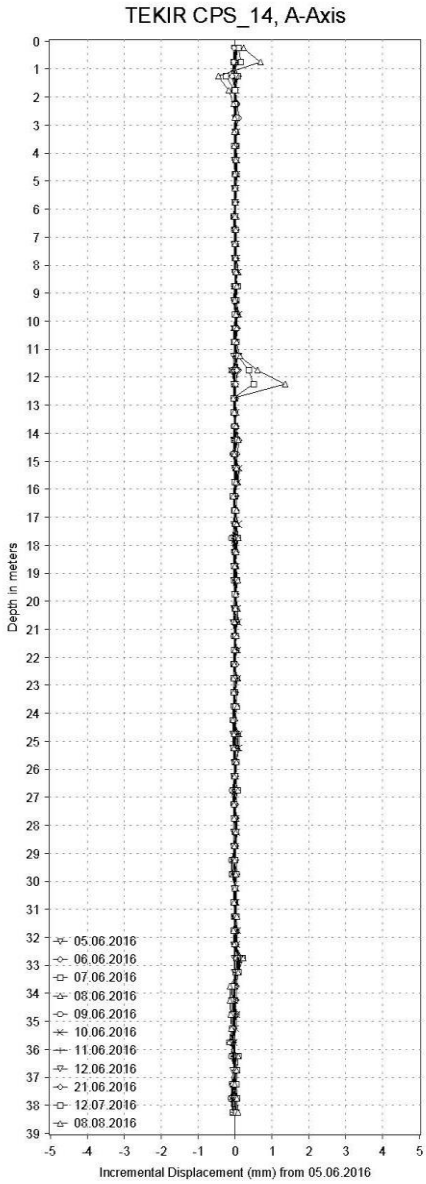
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

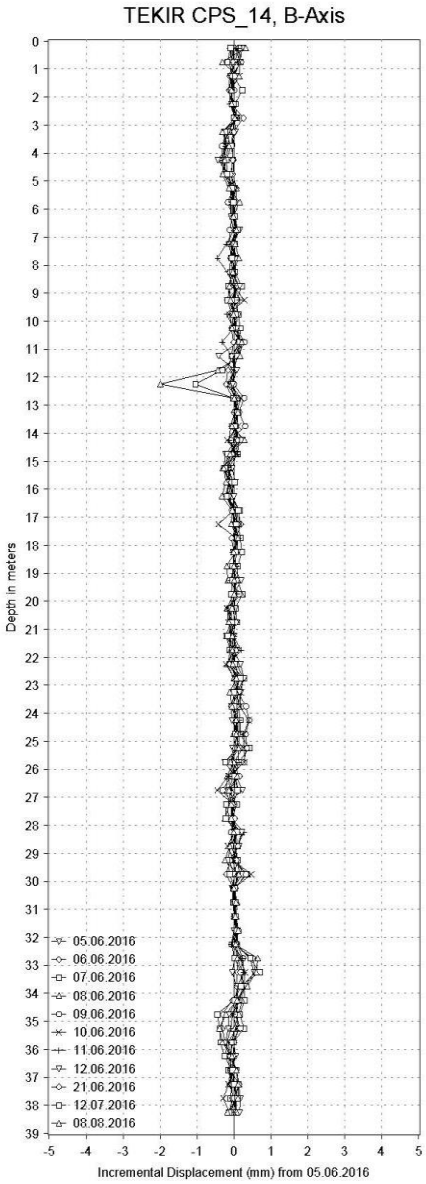




YÜKSEL PROJE

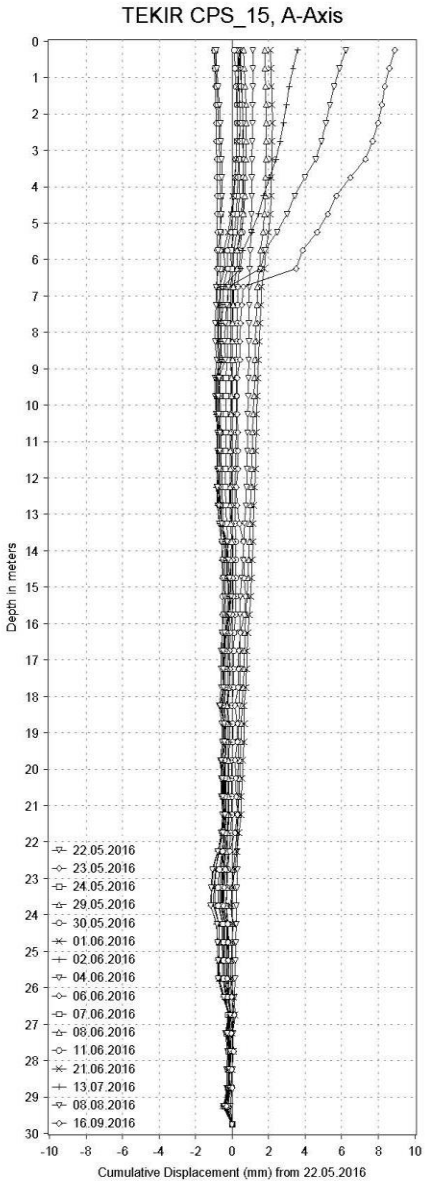
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

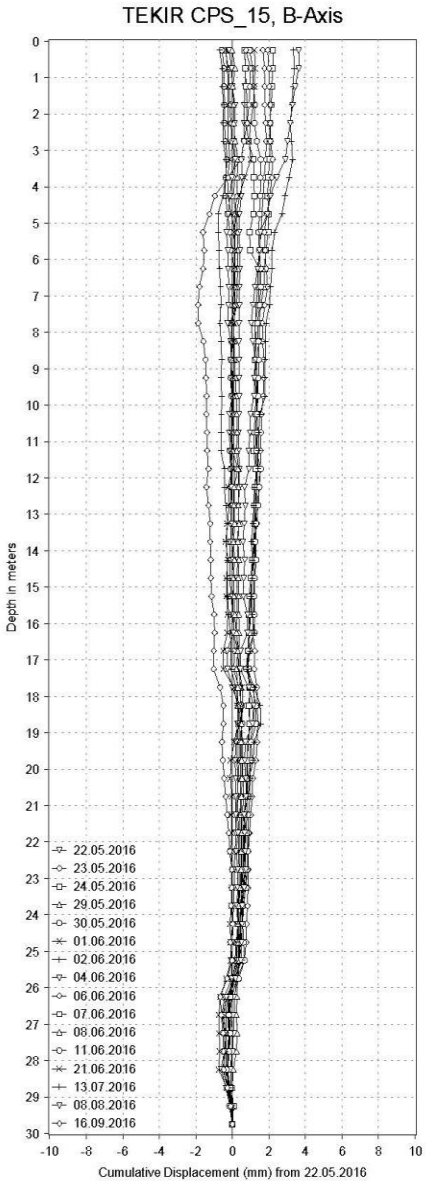




YÜKSEL PROJE

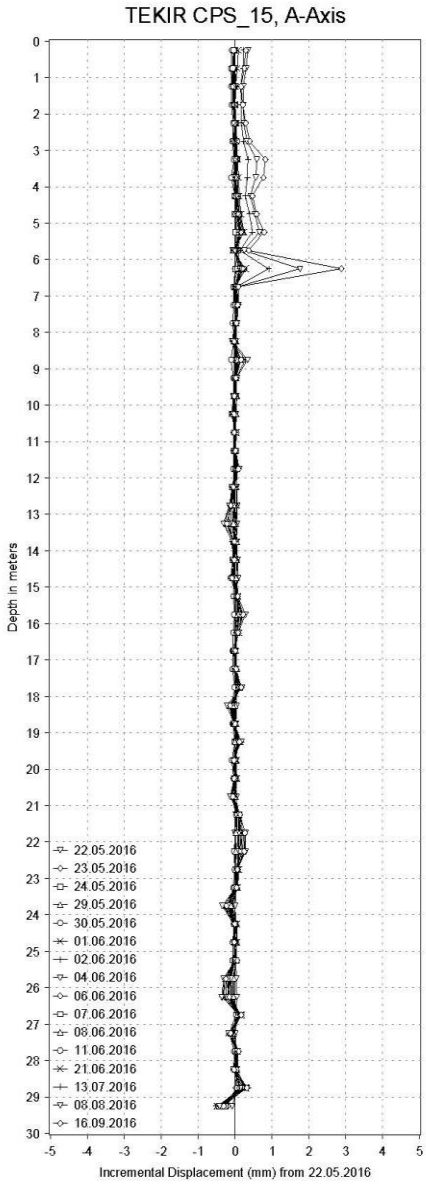
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

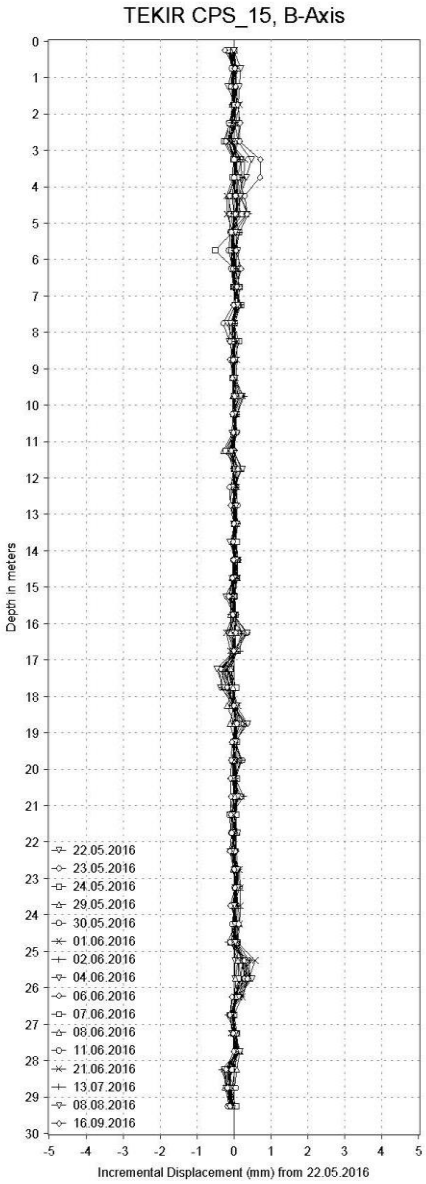




YÜKSEL PROJE

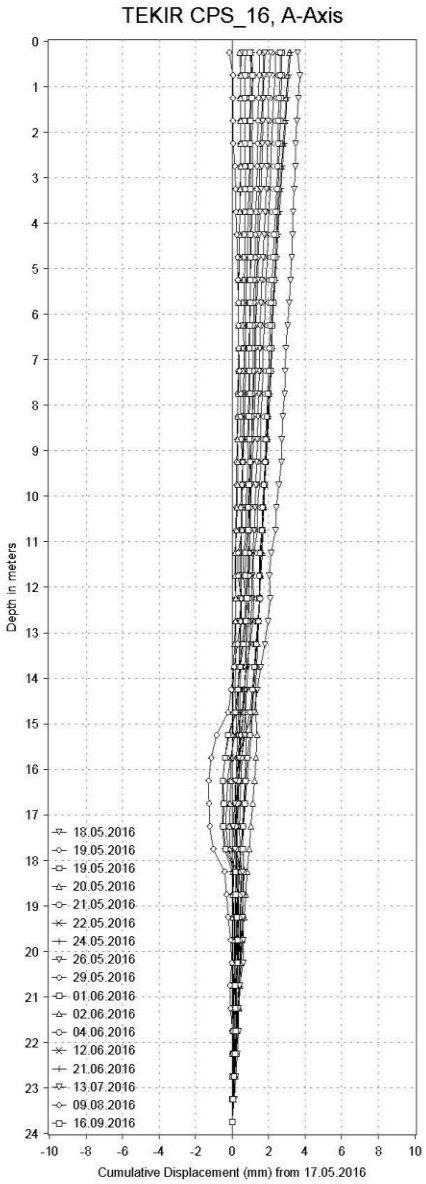
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

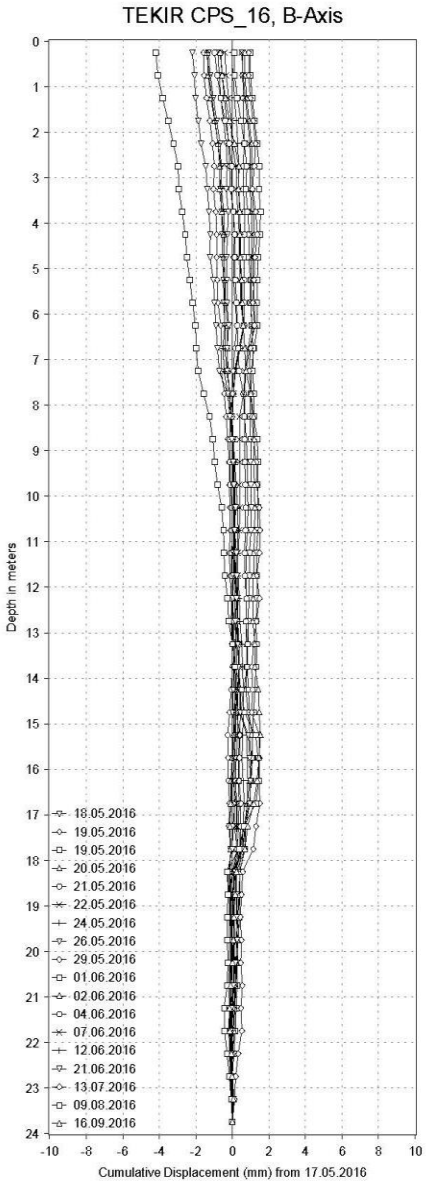




YÜKSEL PROJE

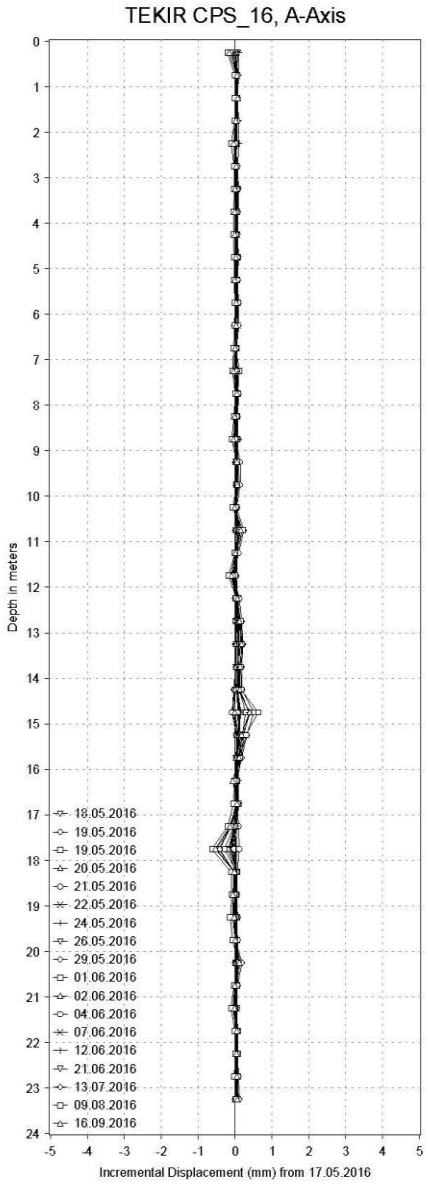
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

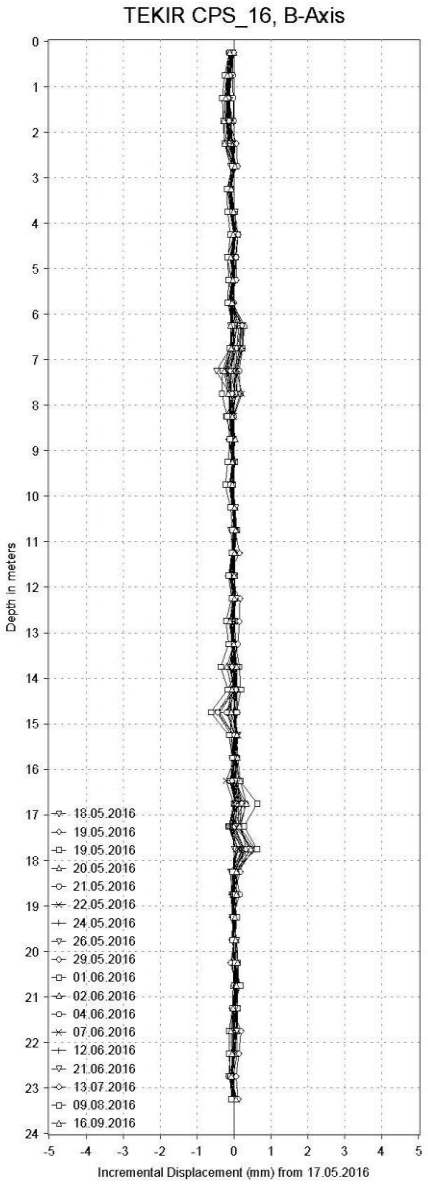




YÜKSEL PROJE

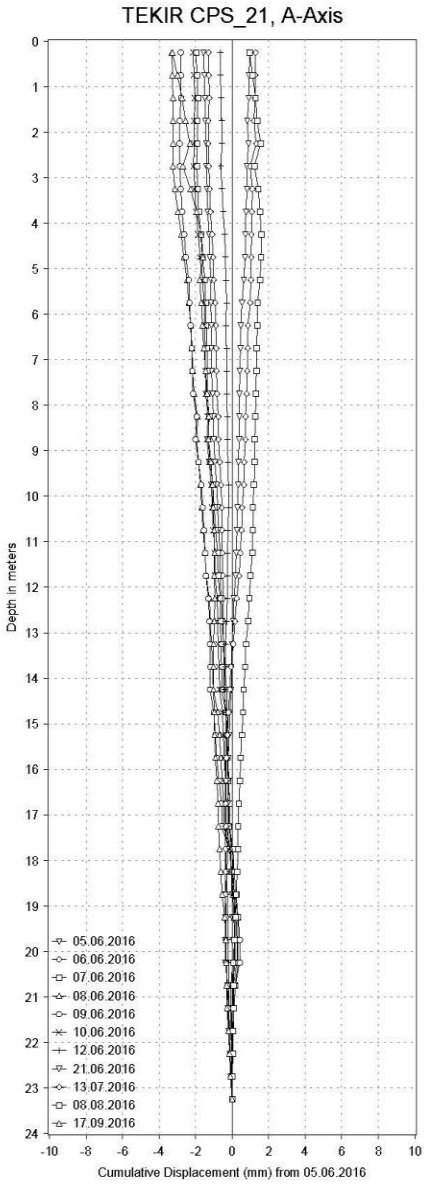
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

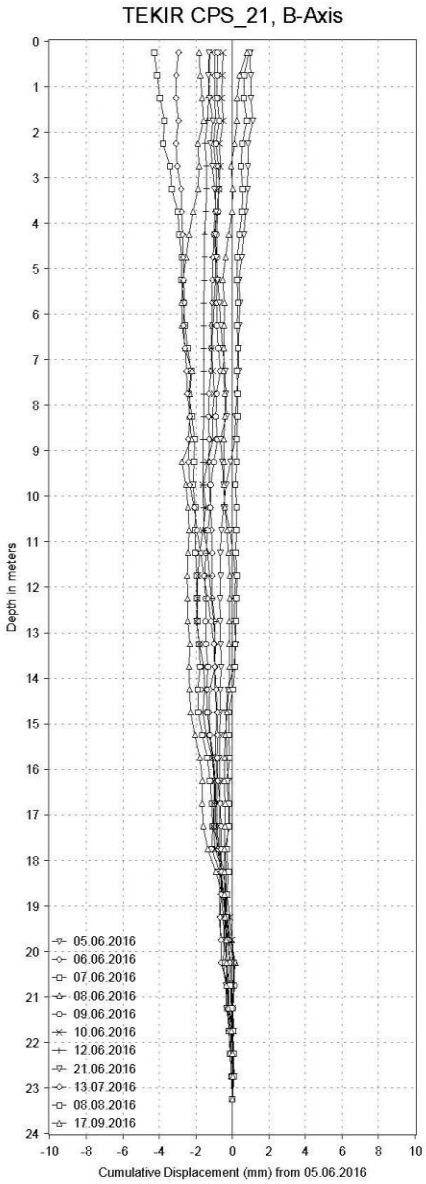




YÜKSEL PROJE

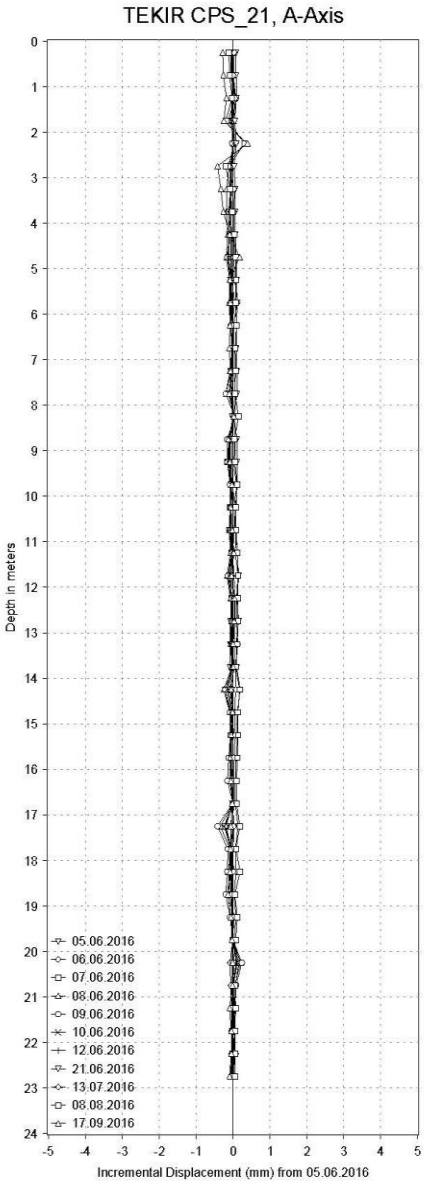
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

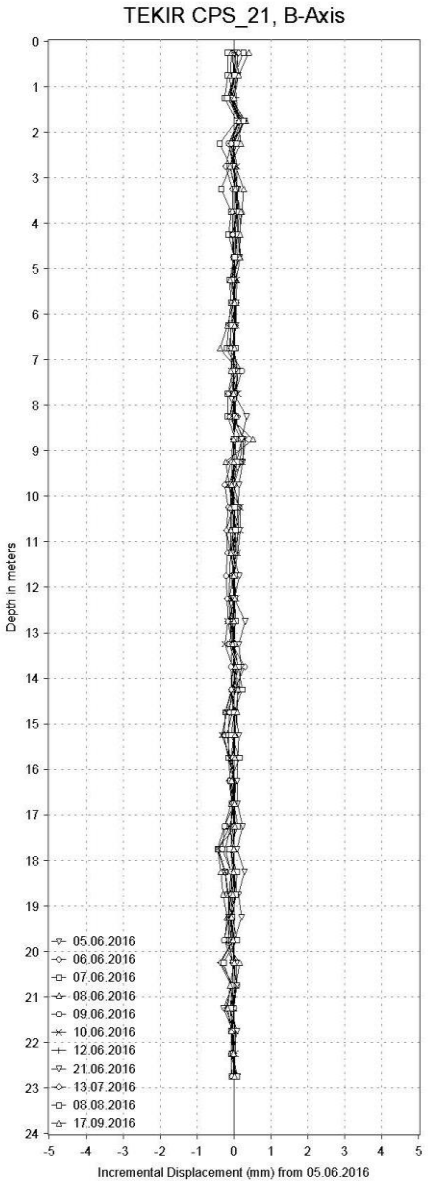




YÜKSEL PROJE

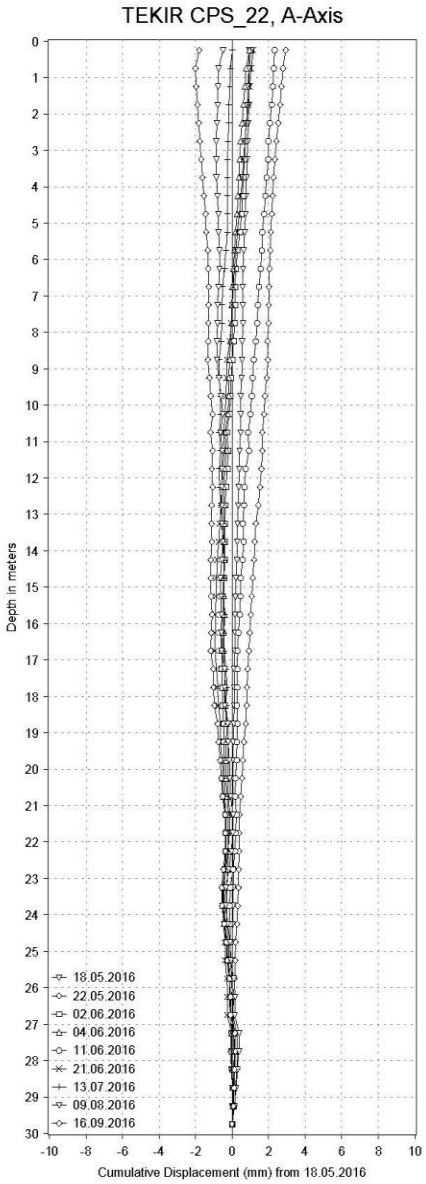
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

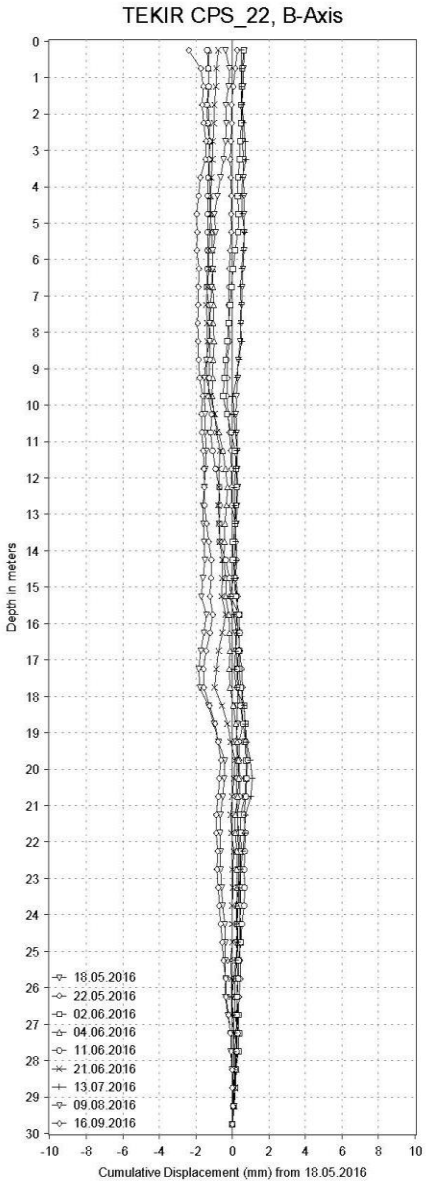




YÜKSEL PROJE

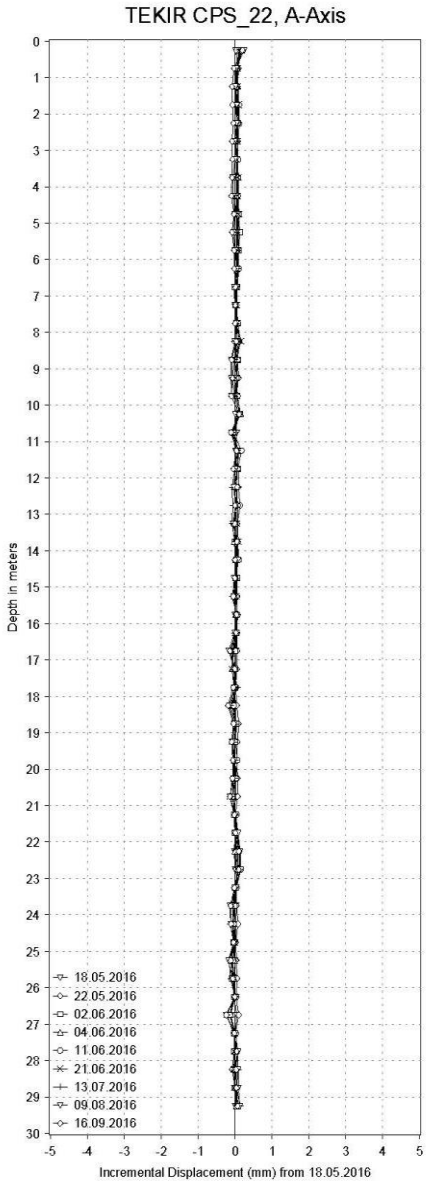
TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

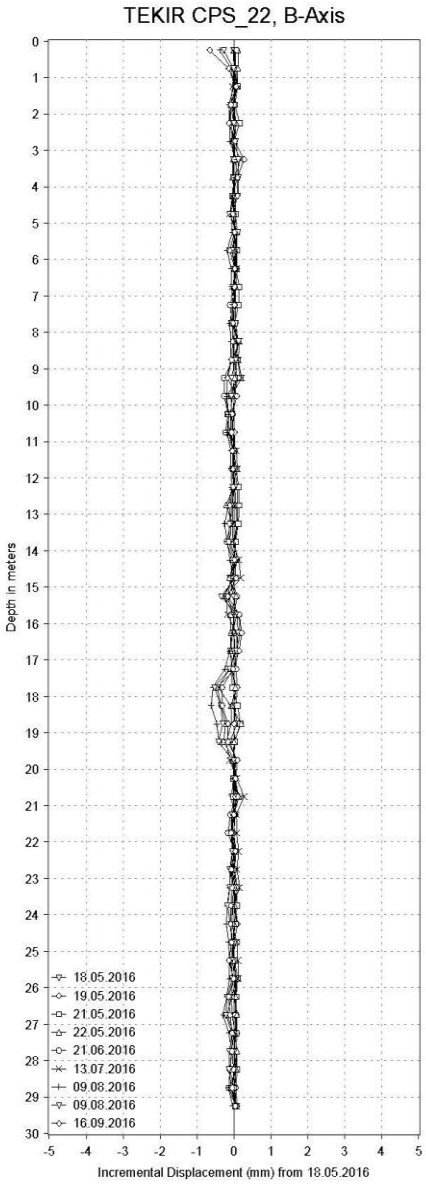




YÜKSEL PROJE

TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI





YÜKSEL PROJE

TARSUS - POZANTI OTOYOLU
KM:21+000 KESİMİ HEYELANI

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3245
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)*	10643964
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	***Deney Sorumlusu /** (Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /** (Controller of Laboratory)* A.Müge AREL Jeoloji Mühendisi Denetçi Belge No: 21122	

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN *(SAMPLE)*																								
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞ. DENEYİ * *(UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE LIMIT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_k (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u [kPa]	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-4İ	SPT-1	1,50-1,95	6,9				26,0	17,5	8,6		54,1	23,0	GC											
	SPT-2	3,00-3,45	8,2				-	NP	-		51,6	17,1	GM											
	SPT-3	4,50-4,95	4,5				-	NP	-		83,5	6,6	GP-GM											
	SPT-4	6,00-6,45	13,5				-	NP	-		41,8	25,5	GM											
	SPT-5	7,50-7,95	10,2				-	NP	-		57,3	17,6	GM											
	SPT-6	9,00-9,45	9,0				-	NP	-		45,7	23,6	GM											
	SPT-7	10,50-10,95	6,3				-	NP	-		57,0	14,0	GM											
	SPT-8	12,00-12,45	3,3				-	NP	-		89,5	3,7	GP											
	SPT-9	13,50-13,95	9,5				-	NP	-		58,5	19,8	GM											
	SPT-10	15,00-15,29	7,1				-	NP	-		58,3	18,7	GM											
	SPT-11	16,50-16,56	8,0				-	NP	-		41,6	25,3	GM											
	SPT-12	18,00-18,13	11,3				-	NP	-		43,5	20,0	GM											
	SPT-13	19,50-19,93	6,7				-	NP	-		61,7	10,1	GW-GM											
	SPT-14	22,50-22,95	29,0				-	NP	-		4,1	55,8	CL											
	SPT-15	24,00-24,45	24,4				46,4	25,1	21,3		19,0	49,4	SC											
	SPT-16	25,50-25,95	27,6				50,2	29,4	20,8		8,9	74,6	MH											
	SPT-17	27,00-27,36	27,3				65,4	34,2	31,2		8,2	68,5	MH											
BELİRSİZLİK *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)*:

YÜKSEL PROJE

T.C. ÇEVRE VE ŞEHİRCİLİK BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK Test TS EN ISO/IEC 17025 AB-0883-T

AB-0883-T
3245
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env. and Urb. Plan. No)*	10543954
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya ...	Tarih / *(Date)* 01.06.2016	Deney Sorumlusu / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	Laboratuvar Denetçi Mühendisi / *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi ... Sicil No: 4028

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE LMT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-4İ	SPT-18	28,50-28,95	26,0				35,2	20,9	14,3		2,1	68,7	CL										
	SPT-19	30,00-30,45	26,7				39,2	21,2	18,0		6,8	68,5	CL										

BELİRSİZLİK / *(UNCERTAINTY)*

AÇIKLAMA / *(EXPLANATION)* :

ZEML-FR-24 / REV03

3/3

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3253
06.16

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)* 10604941
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 09.06.2016	**Deney Sorumlusu /** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi /** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Oda Sicil No: 4092

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / *Test results belong to samples which are tested*

NUMUNENİN (SAMPLE)			su İçeriği TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞ. DENEYİ * (NATURAL UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ (LINEER SHRINKAGE LIMIT)	İLEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWEELING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			s_s	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-Sİ	SPT-1	1,50-1,77	12,8				-	NP	-		53,8	28,0	GM										
	SPT-2	3,00-3,45	15,0				-	NP	-		45,4	29,2	GM										
	SPT-3	4,50-4,95	12,8				-	NP	-		43,8	29,8	GM										
	SPT-4	6,00-6,10	1,7				-	NP	-		92,7	1,3	GP										
	SPT-5	7,50-7,64	6,9				-	NP	-		61,7	12,0	GM										
	SPT-7	13,50-13,60	4,4				-	NP	-		62,0	9,1	GW-GM										
	SPT-8	21,00-21,45	20,6				37,2	18,4	18,8		13,0	57,4	CL										
	SPT-9	22,50-22,95	33,3				NUMUNESİ YETERSİZ				7,4	79,8	CL/CH										
	SPT-10	24,00-24,45	20,4				52,4	26,4	26,0		10,6	58,9	CH										
	SPT-11	25,50-25,55	19,3				NUMUNESİ YETERSİZ				25,6	51,0	CL										
	SPT-12	28,50-28,95	19,6				34,9	19,7	15,2		6,0	61,3	CL										
	SPT-13	30,00-30,45	20,7				NUMUNESİ YETERSİZ				7,5	74,3	CL										
	SPT-14	31,50-31,95	23,4				44,9	23,3	21,6		4,5	72,0	CL										
	SPT-15	33,00-33,45	32,6				NUMUNESİ YETERSİZ				4,0	86,9	CL/CH										
	SPT-16	34,50-34,95	21,8				57,2	21,0	36,2		12,5	66,2	CH										
	SPT-17	36,00-36,45	21,3				45,6	23,9	21,7		13,1	60,6	CL										
	SPT-18	37,50-37,70	10,2				-	NP	-		38,7	20,2	SM										

BELİRSİZLİK / *(UNCERTAINTY)*

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3253
06.16

Müşteri / Proje Adı *(Consumer / Name of the Project)*	**TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ**	**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)*	**10604941**
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği	**Tarih /** *(Date)* **09.06.2016**	***Deney Sorumlusu /*** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /*** *(Controller of Laboratory)* A.Nilhe AREL Jeoloji Mühendisi

DENEY SONUÇLARI Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN *(SAMPLE)*			SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(BULK UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE LMT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-5İ	SPT-19	39,00-39,40	17,7				NUMUNESİ YETERSİZ				21,4	53,0	CL/CH										
BELİRSİZLİK / *(UNCERTAINTY)*																							

AÇIKLAMA / *(EXPLANATION)* **:**

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun çeregi Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3244
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)*	10543934
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	**Deney Sorumlusu /** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi /** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: [illegible]	

DENEY SONUÇLARI

Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE LIMIT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_k (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-7İ	SPT-1	1,50-1,95	15,8				-	NP	-		50,0	32,9	GM										
	SPT-2	3,00-3,45	36,9				81,0	43,2	37,8		4,3	87,7	MH										
	SPT-3	4,50-4,95	37,1				NUMUNESİ YETERSİZ				2,7	90,7	MH										
	SPT-5	10,50-10,95	11,2				-	NP	-		60,5	21,9	GM										
	SPT-6	1200-12,10	11,7				-	NP	-		64,2	5,2	GW-GM										
	SPT-7	13,50-13,95	14,8				-	NP	-		56,9	24,1	GM										
	SPT-8	16,50-16,95	11,1				-	NP	-		46,8	24,9	GM										
	SPT-9	18,00-18,05	10,9				-	NP	-		49,6	33,3	GM										
	SPT-10	28,75-29,20	39,1				NUMUNESİ YETERSİZ				-	96,2	CH										
	SPT-11	31,00-31,45	40,8				52,0	26,3	25,7		1,5	67,1	CH										
	SPT-12	33,00-33,40	32,0				NUMUNESİ YETERSİZ				-	62,9	CH										

BELİRSİZLİK / *(UNCERTAINTY)*

AÇIKLAMA / *(EXPLANATION)* **:**

ZEML-FR-24 / REV03

Bu rapor, Laboratuarımızın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir. / This report shall not be reproduced other than in full except with the permission of the laboratory. Testing reports without signature are not valid.
Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)
(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.
(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3243
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env.and Urb. Plan. No)*	10543908
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	***Deney Sorumlusu /** (Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /** (Controller of Laboratory)* A.Mithat AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4023

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / *Test results belong to samples which are tested*

NUMUNENİN (SAMPLE)																												
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	SU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞR. DENEYİ * (NAT. UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ * (LINEAR SHRINKAGE LIMIT)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGTH)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2					AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-9i	SPT-1	1,50-1,95	2,1				-	NP	-		66,4	10,3	GP-GM											
	SPT-2	3,00-3,45	6,9				-	NP	-		67,9	9,4	GP-GM											
	SPT-3	4,50-4,62	4,7				-	NP	-		47,6	18,1	GM											
	SPT-4	6,00-6,45	4,9				-	NP	-		71,5	11,8	GP-GM											
	SPT-5	7,50-7,95	7,6				-	NP	-		48,0	21,9	GM											
	SPT-6	9,00-9,45	1,3				-	NP	-		98,0	0,3	GP											
	SPT-7	10,50-10,95	4,6				-	NP	-		62,6	11,4	GP-GM											
	SPT-8	12,00-12,03	5,6				-	NP	-		64,9	14,0	GM											
	SPT-9	13,50-13,58	11,8				-	NP	-		58,6	17,2	GM											
	SPT-10	15,00-15,45	31,3				86,3	37,7	48,6		3,7	88,6	CH											
	SPT-11	16,50-16,95	35,4				66,3	25,1	41,2		1,2	83,9	CH											
	SPT-12	18,00-18,45	28,5				NUMUNESİ YETERSİZ				32,8	58,4	CL											
	SPT-13	19,50-19,72	26,7				NUMUNESİ YETERSİZ				23,1	64,5	CL											
	SPT-14	21,00-21,45	25,7				40,9	21,7	19,2		5,3	78,1	CL											
	SPT-15	22,50-22,95	24,0				48,0	22,2	25,8		7,8	75,6	CL											
	SPT-17	25,50-25,95	25,8				42,3	24,2	18,1		20,0	63,3	CL											
	SPT-18	27,00-27,42	40,7				48,9	32,5	16,4		2,4	65,8	ML											
BELİRSİZLİK / *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no 378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3243
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)* 10543908
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	***Deney Sorumlusu /*** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /*** *(Controller of Laboratory)* A.İlhne AREL Jeoloji Mühendisi Denetçi Belge No: 21122

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)			SU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞR. DENEYİ * (NAT. UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ (LINEAR SHRINKAGE LIM)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_o	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-9İ	SPT-19	28,50-28,60	8,3				-	NP	-		72,2	11,0	GP-GM										
	SPT-20	31,00-31,29	25,8				43,9	25,2	18,7		15,0	64,7	CL										
BELİRSİZLİK / *(UNCERTAINTY)*																							

AÇIKLAMA / *(EXPLANATION)* **:**

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3242
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env.and Urb. Plan. No)*	10543885
Mühür / Kaşe *(Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih / *(Date)*** 01.06.2016	**Deney Sorumlusu / *(Person in Charge of Test)*** ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi / *(Controller of Laboratory)*** A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 8389

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN *(SAMPLE)*																												
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	DOĞAL İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEAR SHRINKAGE LIMIT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGTH)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE OKANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			q_c	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-10İ	SPT-1	1,50-1,95	1,0				-	NP	-		79,3	5,7	GP-GM											
	SPT-2	3,00-3,45	3,4				-	NP	-		69,8	9,3	GP-GM											
	SPT-3	4,50-4,95	4,5				-	NP	-		59,0	11,0	GP-GM											
	SPT-4	6,00-6,45	1,5				-	NP	-		86,9	3,8	GP											
	SPT-5	7,50-7,95	2,6				-	NP	-		76,9	6,5	GP-GM											
	SPT-6	9,00-9,45	3,8				-	NP	-		62,1	11,2	GP-GM											
	SPT-7	10,50-10,62	0,2				-	NP	-		99,2	0,1	GP											
	SPT-8	12,00-12,45	40,7				77,5	39,2	38,3		3,0	83,2	MH											
	SPT-9	13,50-13,95	37,0				52,7	29,0	23,7		2,4	87,8	MH											
	SPT-10	15,00-15,11	24,2				NUMUNESİ YETERSİZ				4,1	66,7	CL/ML											
	SPT-11	16,50-16,95	17,0				-	NP	-		39,3	47,6	GM											
	SPT-12	18,00-18,45	23,7				-	NP	-		37,2	49,3	GM											
	SPT-13	19,50-19,55	12,7				-	NP	-		46,0	37,9	GM											
	SPT-14	22,50-22,54	12,6				-	NP	-		57,3	17,1	GM											
	SPT-15	24,00-24,37	23,8				39,0	21,7	17,3		23,1	61,2	CL/ML											
BELİRSİZLİK / *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)*:

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%85 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3241
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)*	10543856
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	***Deney Sorumlusu /*** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /*** *(Controller of Laboratory)* Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4022	

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)			SU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞR. DENEYİ * (NAT. UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ (LINEAR SHRINKAGE LIMIT)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-11İ	SPT-1	1,50-1,95	4,5				-	NP	-		62,1	12,1	GM										
	SPT-3	4,50-4,95	5,6				-	NP	-		56,9	9,2	GW-GM										
	SPT-4	6,00-6,45	30,7				NUMUNESİ YETERSİZ				5,6	78,1	CL/ML										
	SPT-5	7,50-7,95	6,3				-	NP	-		69,8	11,0	GP-GM										
	SPT-6	9,00-9,45	16,4				-	NP	-		53,5	30,7	GM										
	SPT-7	10,50-10,60	8,0				-	NP	-		51,7	14,3	GM										
	SPT-8	12,00-12,45	5,7				-	NP	-		74,9	9,0	GP-GM										
	SPT-9	13,50-13,95	2,5				-	NP	-		78,5	6,0	GP-GM										
	SPT-10	16,50-16,75	3,4				-	NP	-		85,3	3,2	GW										
	SPT-11	18,00-18,45	2,5				-	NP	-		81,2	3,8	GP										
	SPT-12	19,50-19,78	3,7				-	NP	-		77,9	4,2	GP										
	SPT-13	22,50-22,67	4,7				-	NP	-		71,4	9,2	GP-GM										
	SPT-14	24,00-24,45	7,4				-	NP	-		38,7	22,3	SM										
	SPT-15	22,50-22,95	23,4				-	NP	-		3,3	38,1	SM										
	SPT-16	27,00-27,45	34,5				NUMUNESİ YETERSİZ				41,4	53,7	CL/ML										
	SPT-17	28,50-28,85	19,8				-	NP	-		59,3	25,0	GM										
	SPT-18	30,00-30,45	39,6				67,1	36,2	30,9		2,4	89,4	MH										
BELİRSİZLİK / *(UNCERTAINTY)* :																							

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3241
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env.and Urb. Plan. No)*	10543856
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 01.06.2016	***Deney Sorumlusu /*** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi /*** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Oda Sicil No: 4023

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)			BU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞRL. DENEYİ * (NAT. UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ (LINEAR SHRINKAGE LAY)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ * (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) * (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2			AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_o	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-11İ	SPT-19	31,50-31,95	30,8				NUMUNESİ YETERSİZ				20,4	65,6	MH										
	SPT-20	33,00-33,05	6,8				-	NP	-		82,3	6,8	GP-GM										
	SPT-21	34,50-34,55	12,8				-	NP	-		53,9	18,0	GM										
	SPT-22	36,00-36,05	26,7				-	NP	-		12,1	44,5	SM										
BELİRSİZLİK / *(UNCERTAINTY)*																							

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güvan aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir

(#) Our laboratory has a permission date 27.06.2012 and no:378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 430. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3221
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)* 10485787
Mühür / Kaşe *(Seal / Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *(Date)* 24.05.2016	**Deney Sorumlusu** / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi** / *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 211 Oda Sicil No: 4128

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)																											
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	SU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞ. DENEYİ * (NAT. UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÜZÜLME DENEYİ (LINEER SHRINKAGE LMT)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE ORANI TAYİNİ (ORGANIC CONTENT)
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2			AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_k (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_s	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-12İ	SPT-1	1,50-1,95	39,1				NUMUNESİ YETERSİZ				8,6	73,6	CL											
	SPT-2	3,00-3,45	38,4				NUMUNESİ YETERSİZ				5,2	88,2	CL											
	SPT-3	4,50-4,95	37,4				NUMUNESİ YETERSİZ				3,5	87,9	CL											
	SPT-4	6,00-6,45	19,3				-	NP	-		33,8	47,4	GM											
	SPT-5	7,50-7,95	42,4				NUMUNESİ YETERSİZ				36,4	55,3	CL											
	SPT-6	9,00-9,45	24,3				-	NP	-		36,3	45,6	GM											
	SPT-7	10,50-10,95	24,6				48,6	23,5	25,1		10,2	67,1	CL											
	SPT-8	12,00-12,45	14,9				-	NP	-		44,9	43,1	GM											
	SPT-9	13,50-13,95	24,6				48,5	23,3	25,2		45,1	38,1	CL											
	SPT-10	15,00-15,45	21,2				52,3	25,1	27,2		15,7	71,5	CH											
	SPT-11	16,50-16,95	29,4				45,2	25,8	19,4		6,9	65,5	CL											
	SPT-12	18,00-18,45	15,9				64,4	23,9	40,5		36,6	43,2	GC											
	SPT-13	19,50-19,95	30,4				NUMUNESİ YETERSİZ				17,3	68,3	CH											
	SPT-14	21,00-21,33	33,1				49,8	29,8	20,0		8,1	54,0	ML											
	SPT-15	22,50-22,95	22,8				41,0	28,0	13,0		6,5	60,8	ML											
	SPT-16	24,00-24,45	27,3				45,7	26,5	19,2		22,1	55,9	CL											
BELİRSİZLİK / *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)* :

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3256
06.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	**TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ**		**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)* **10605089**
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 09.06.2016	**Deney Sorumlusu /** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi /** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi
DENEY SONUÇLARI	Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested		

NUMUNENİN *(SAMPLE)*			SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞ. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEAR SHRINKAGE LIMIT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGTH)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
SONDAJ NO *(BOREHOLE NO)*	**NUMUNE NO** *(SAMPLE NO)*	**DERİNLİK (m)** *(DEPTH)*	TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1				TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-14İ	SPT-1	1,50-1,75	14,9				-	NP	-		39,7	45,0	GM											
	SPT-2	3,00-3,45	10,4				-	NP	-		65,6	13,3	GM											
	SPT-3	6,00-6,45	10,9				-	NP	-		58,3	25,5	GM											
	SPT-4	7,50-7,95	10,2				-	NP	-		28,7	30,7	SM											
	SPT-5	9,00-9,45	10,9				-	NP	-		55,3	18,6	GM											
	SPT-6	10,50-10,95	8,6				-	NP	-		57,4	16,4	GM											
	SPT-7	12,00-12,45	26,8				61,1	29,3	31,8		8,4	77,9	CH											
	SPT-8	15,00-15,20	17,9				-	NP	-		38,1	47,9	GM											
	SPT-9	18,00-18,45	17,5				-	NP	-		24,2	46,5	SM											
	SPT-10	19,50-19,67	17,3				-	NP	-		56,3	20,6	GM											
	SPT-11	21,00-21,45	23,8				NUMUNESİ YETERSİZ				32,7	50,9	CL/CH											
	SPT-12	21,50-21,90	17,9				NUMUNESİ YETERSİZ				34,6	51,7	CL/CH											
	SPT-13	22,50-22,83	21,1				57,5	23,3	34,2		20,6	62,9	CH											
	SPT-14	25,50-25,85	23,7				62,4	31,0	31,4		3,2	82,5	CH											
BELİRSİZLİK / *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)* **:**

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3222
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	**TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ**	**Çevre ve Şehircilik Bakanlık Rapor No:** *(Ministry of Env.and Urb. Plan. No)*	**10485850**
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *(Date)* 24.05.2016	**Deney Sorumlusu** / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi** / *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 2122 Oda Sicil No: 4038

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)																														
SONDAJ NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m) (DEPTH)	SU İÇERİĞİ TAYİNİ * # (WATER CONTENT)	DOĞAL BİRİM HACİM AĞR. DENEYİ * (UNIT WEIGHT)	KURU BİRİM HACİM AĞIRLIK DENEYİ * (DRY UNIT WEIGHT)	ÖZGÜL AĞIRLIK DENEYİ * # (SPECIFIC GRAVITY)	LİKİT LİMİT TAYİNİ * # (LIQUID LIMIT)	PLASTİK LİMİT TAYİNİ * # (PLASTIC LIMIT)	PLASTİSİTE İNDİSİ * # (PLASTICITY INDEX)	LİNEER BÖZÜLME DENEYİ (LINEER SHRINKAGE LMT)	ELEK ANALİZİ * # (SIEVE ANALYSIS)		ZEMİN SINIFI (USCS) (SOIL CLASSIFICATION)	HİDROMETRE DENEYİ # (HYDROMETER)	KONSOLİDASYON DENEYİ * (CONSOLIDATION TEST)	ŞİŞME BASINCI TAYİNİ * (SWELLING PRESSURE)	ŞİŞME YÜZDESİ TAYİNİ * (PERCENTAGE OF SWELLING)	SERBEST BASINÇ DENEYİ (UNCONFINED COMPRESSIVE STRENGHT)	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * (TRIAXIAL COMPRESSION TEST)		DİREK KESME DENEYİ (UU) (DIRECT SHEAR TEST)		ORGANİK MADDE (ORANI TAYİNİ (ORGANIC CONTENT)
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1				TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			q_u	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-15İ	SPT-1	1,50-1,95	20,3				-	NP	-		40,0	43,4	GM											
	SPT-2	3,00-3,45	25,5				-	NP	-		5,2	40,2	SM											
	SPT-3	4,50-4,95	29,6				NUMUNESİ YETERSİZ				28,3	59,3	CL											
	SPT-4	6,00-6,45	17,6				-	NP	-		32,0	33,7	SM											
	SPT-5	7,50-7,95	8,3				-	NP	-		78,9	14,9	GM											
	SPT-7	10,50-10,95	16,2				-	NP	-		39,0	30,3	GM											
	SPT-8	12,00-12,39	27,8				NUMUNESİ YETERSİZ				12,9	67,3	CL											
	SPT-9	13,50-13,54	10,6				-	NP	-		57,9	19,5	GM											
	SPT-10	15,00-15,45	18,9				-	NP	-		37,9	24,6	GM											
	SPT-11	16,50-16,64	20,4				65,7	32,0	33,7		37,9	45,8	GC											
	SPT-12	21,00-21,45	33,4				48,9	31,8	17,1		8,4	54,3	CL											
	SPT-13	22,50-22,95	43,1				63,3	39,5	23,8		8,7	70,0	MH											
BELİRSİZLİK / *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.

(#) Our laboratory has a permission date 27.06.2012 and no 378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3223
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env.and Urb. Plan. No)*	10485896
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 24.05.2016	**Deney Sorumlusu /** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi /** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)																														
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE LMT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2			TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-16İ	SPT-1	1,50-1,95	25,1				40,8	26,6	14,2		23,1	38,6	SM											
	SPT-2	3,00-3,45	21,7				NUMUNESİ YETERSİZ				31,9	54,2	CL											
	SPT-3	4,50-4,82	26,5				NUMUNESİ YETERSİZ				4,4	67,6	CL											
	SPT-4	7,5-7,85	23,9				NUMUNESİ YETERSİZ				29,9	59,0	CL											
	SPT-5	9,00-9,45	43,6				56,1	32,9	23,2		2,0	82,6	MH											
	SPT-6	10,50-10,95	26,4				-	NP	-		45,9	30,6	GM											
	SPT-7	12,00-12,45	32,9				NUMUNESİ YETERSİZ				9,4	75,3	ML											
	SPT-8	13,50-13,70	32,7				49,5	31,5	18,0		6,9	64,9	ML											
BELİRSİZLİK *(UNCERTAINTY)*																								

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu İzin belgesine sahiptir

(#) Our laboratory has a permission date 27.06.2012 and no.378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3259
06.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env.and Urb. Plan. No)*	10605255
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih /** *(Date)* 09.06.2016	**Deney Sorumlusu /** *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi /** *(Controller of Laboratory)* A.Mine AREL İnşaat Mühendisi Oda Sicil No: 40[illegible]

DENEY SONUÇLARI — Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN (SAMPLE)																												
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEER SHRINKAGE)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELL PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_n (gr/cm³)	γ_d (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			σ_s	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-21İ	SPT-1	1,50-1,95	7,5				-	NP	-		54,1	26,3	GM										
	SPT-2	3,00-3,45	12,7				-	NP	-		50,2	25,2	GM										
	SPT-3	4,50-4,95	22,3				36,4	19,3	17,1		15,4	71,6	CL										
	SPT-4	6,00-6,45	26,7				55,9	28,6	27,3		4,0	89,1	CH										
	SPT-5	7,50-7,95	12,3				-	NP	-		32,4	38,9	GM										
	SPT-6	9,00-9,27	10,4				-	NP	-		60,6	17,8	GM										
	SPT-7	10,50-10,95	14,7				NUMUNESİ YETERSİZ				13,0	66,4	CL/CH										
	SPT-8	12,00-12,20	31,7				NUMUNESİ YETERSİZ				9,2	83,0	CL/CH										
	SPT-9	13,50-13,95	47,3				65,6	36,4	29,2		1,7	80,3	MH										
	SPT-10	15,00-15,24	21,6				50,5	30,5	20,0		20,0	66,0	MH										
BELİRSİZLİK / *(UNCERTAINTY)*																							

AÇIKLAMA / *(EXPLANATION)* :

YÜKSEL PROJE

T.C.
ÇEVRE VE ŞEHİRCİLİK
BAKANLIĞI

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3224
05.16

ZEMİN MEKANİĞİ DENEY RAPORU
SOIL MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ	Çevre ve Şehircilik Bakanlık Rapor No: *(Ministry of Env and Urb. Plan. No)*	10486954
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih / *(Date)*** 24.05.2016	***Deney Sorumlusu / (Person in Charge of Test)*** ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi / (Controller of Laboratory)*** Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4078

DENEY SONUÇLARI Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

NUMUNENİN *(SAMPLE)*																													
SONDAJ NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m) *(DEPTH)*	SU İÇERİĞİ TAYİNİ * # *(WATER CONTENT)*	DOĞAL BİRİM HACİM AĞR. DENEYİ * *(NAT. UNIT WEIGHT)*	KURU BİRİM HACİM AĞIRLIK DENEYİ * *(DRY UNIT WEIGHT)*	ÖZGÜL AĞIRLIK DENEYİ * # *(SPECIFIC GRAVITY)*	LİKİT LİMİT TAYİNİ * # *(LIQUID LIMIT)*	PLASTİK LİMİT TAYİNİ * # *(PLASTIC LIMIT)*	PLASTİSİTE İNDİSİ * # *(PLASTICITY INDEX)*	LİNEER BÜZÜLME DENEYİ *(LINEAR SHRINKAGE LIMIT)*	ELEK ANALİZİ * # *(SIEVE ANALYSIS)*		ZEMİN SINIFI (USCS) *(SOIL CLASSIFICATION)*	HİDROMETRE DENEYİ # *(HYDROMETER)*	KONSOLİDASYON DENEYİ * *(CONSOLIDATION TEST)*	ŞİŞME BASINCI TAYİNİ * *(SWELLING PRESSURE)*	ŞİŞME YÜZDESİ TAYİNİ * *(PERCENTAGE OF SWELLING)*	SERBEST BASINÇ DENEYİ *(UNCONFINED COMPRESSIVE STRENGHT)*	ÜÇ EKSENLİ BASINÇ DENEYİ (UU) * *(TRIAXIAL COMPRESSION TEST)*		DİREK KESME DENEYİ (UU) *(DIRECT SHEAR TEST)*		ORGANİK MADDE ORANI TAYİNİ *(ORGANIC CONTENT)*
			TS EN ISO 17892-1	TS EN ISO 17892-2	TS EN ISO 17892-2	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1	TS 1900-1			TS 1900-1	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2	TS 1900-2		TS 1900-2		AASHTO T-267
			W_n (%)	γ_s (gr/cm³)	γ_k (gr/cm³)	G_s	LL (%)	PL (%)	PI	L_s (%)	+4 (%)	-200 (%)			e_0	kg/cm²	(%)	q_u (kPa)	c (kPa)	Φ (°)	c (kPa)	Φ (°)	(%)
CPS-22İ	SPT-1	1,80-2,25	26,8				51,0	19,7	31,3		4,1	84,6	CH											
	SPT-2	3,00-3,45	9,7				NUMUNESİ YETERSİZ				17,9	67,8	CH											
	SPT-3	4,50-4,95	9,9				27,2	16,0	11,2		72,9	15,3	GC											
	SPT-4	6,00-6,45	12,1				-	NP	-		48,2	25,6	GM											
	SPT-5	9,00-9,45	10,3				-	NP	-		27,3	45,1	SM											
	SPT-6	10,50-10,95	29,0				62,1	30,2	31,9		30,2	40,0	GC											
	SPT-7	12,00-12,45	41,3				62,1	33,7	28,4		20,1	60,1	MH											
	SPT-8	13,50-13,55	26,0				NUMUNESİ YETERSİZ				6,1	80,9	MH											
	SPT-9	16,50-16,95	17,4				-	NP	-		34,3	31,1	SM											
	SPT-10	18,00-18,29	32,4				-	NP	-		38,3	38,3	GM											
	SPT-11	19,550-19,88	32,9				58,5	34,7	23,8		2,4	89,5	MH											

BELİRSİZLİK / *(UNCERTAINTY)*

AÇIKLAMA / *(EXPLANATION)* :

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir) / The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)
(#) Laboratuvarımız 4708 sayılı Yapı Denetimi Hakkında Kanun gereği Çevre ve Şehircilik Bakanlığı tarafından 27.06.2012 tarih ve 378 nolu izin belgesine sahiptir.
(#) Our laboratory has a permission date 27.06.2012 and no 378 pursuant to 4708 construction supervision of the law by the Ministry of Environment and Urban Planning.

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3236
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	**TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ**		
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *Date* 01.06.2016	***Deney Sorumlusu*** */ (Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi*** *(Controller of Laboratory)* Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* σ_3 (MPa)	ε (*)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-4I	K-1	38,25-38,50			2,43		5,2	2,3				
	K-2	39,80-40,00			2,41		9,8	2,3				
	K-3	41,45-41,80			2,38		4,5	1,2				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

AB-0883-T
3249
06.16

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)*	**Tarih / Date**	**Deney Sorumlusu / (Person in Charge of Test)**	**Laboratuvar Denetçi Mühendisi** *(Controller of Laboratory)*
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	09.06.2016	ESRA AYŞE ERTAŞ	A.Mine AKEL Jeoloji Mühendisi Denetçi Belge No: ...122

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m.) (DEPTH)	SU İÇERİĞİ % (WATER CONTENT)	SU EMME % (WATER ABSORPTION)	BİRİM HACİM AĞIRLIK (gr/cm³) (UNIT WEIGHT)	NOKTA YÜKLEME İNDİSİ (MPa) (POINT LOAD INDEX)	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* (UNIAXIAL COMPRESSION TEST) TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) (MODULUS OF ELASTICITY)	POISSON ORANI (POISSON RATIO)	ÜÇ EKSENLİ BASINÇ DENEYİ (TRIAXIAL COMPRESSION TEST) c (MPa)	ÜÇ EKSENLİ BASINÇ DENEYİ φ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ (SLAKE DURABILITY INDEX)
CPS-5İ	K-1	40,50-40,90			2,47		15,7	4,5				
	K-2	42,50-42,80			2,44		4,8	1,4				
	K-3	44,15-44,50			2,44		10,2	2,6				

ZEML-FR-62 / REV02

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir)
The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3237
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)*	Tarih / *Date*	*Deney Sorumlusu / (Person in Charge of Test)*	*Laboratuvar Denetçi Mühendisi (Controller of Laboratory)*
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	01.06.2016	ESRA AYŞE ERTAŞ	A.Müge AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* c (MPa)	ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-7I	K-1	45,10-45,40			2,45		6,6	1,8				
	K-2	45,65-45,83			2,54		10,4	4,1				
	K-3	46,65-46,83			2,27		6,3	1,5				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3238
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *Date* 01.06.2016
Deney Sorumlusu /. *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No:2128

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* c (MPa)	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-9I	K-1	32,07-32,37			2,25		9,9	1,9				
	K-2	33,60-33,80			2,15		2,6	0,7				
	K-3	35,27-35,50			2,32		2,0	0,7				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3239
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)*	Tarih / *Date*	*Deney Sorumlusu / (Person in Charge of Test)*	*Laboratuvar Denetçi Mühendisi (Controller of Laboratory)*
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	01.06.2016	ESRA AYŞE ERTAŞ	A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21172 Oda Sicil No: 20028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* σ (MPa)	ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-10İ	K-1	25,60-25,92			2,18		3,5	0,6				
	K-2	27,57-27,85			2,43		15,4	3,4				
	K-3	29,10-29,42			2,47		13,1	2,3				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3240
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)*	Tarih / *Date*	Deney Sorumlusu / *(Person in Charge of Test)*	Laboratuvar Denetçi Mühendisi *(Controller of Laboratory)*
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	01.06.2016	ESRA AYŞE ERTAŞ	A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* C (MPa)	ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-11I	K-1	37,20-37,50			2,43		26,3	14,2				
	K-2	39,10-39,38			2,45		20,1	4,5				
	K-3	41,64-41,83			2,44		17,4	4,8				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3232
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ
Mühür / Kase *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *Date* 24.05.2016
Deney Sorumlusu / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* P (MPa)	θ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-12İ	K-1	27,50-27,88			2,32		15,4	1,3				
	K-2	29,50-29,74			2,33		11,9	1,9				
	K-3	30,66-30,87			2,40		28,4	4,9				
	K-4	32,80-33,00			2,49		31,9	6,4				
	K-5	34,00-34,18			2,47		23,8	5,9				
	K-6	36,14-36,45			2,47		24,0	7,3				
	K-7	37,00-37,26			2,35		8,7	2,7				
	K-8	41,65-41,96			2,40		21,0	2,9				

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir)
The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

2/2

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO IEC 17025
AB-0883-T

AB-0883-T
3250
06.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih** / *Date* 09.06.2016	***Deney Sorumlusu*** / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	***Laboratuvar Denetçi Mühendisi*** *(Controller of Laboratory)* A.Mine AR... Jeoloji Müh... Denetçi Belge No...

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / *Test results belong to samples which are tested*

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm³) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* σ (MPa)	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-14	K-1	30,40-30,78			2,33		10,8	2,2				
	K-2	32,38-32,66			2,55		35,0					
	K-3	34,38-34,80			2,42		11,7	2,8				
	K-4	35,40-35,84			2,40		13,6	3,1				
	K-5	38,35-38,66			2,42		16,7					

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2 dir)
The test results marked (*) in the report are accredited by Türkak (k=2 ie within 95%)

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

AB-0883-T
3233
05.16

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ		
Mühür / Kaşe *(Seal/Stamp)*	**Tarih / Date**	**Deney Sorumlusu /** *(Person in Charge of Test)*	**Laboratuvar Denetçi Mühendisi** *(Controller of Laboratory)*
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	24.05.2016	ESRA AYŞE ERTAŞ	A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 14728

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm^3) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)*	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)*		SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
							TS EN 1926			c (MPa)	φ (°)	
CPS-15İ	K-1	24,20-24,45			2,25		20,2	3,4				
	K-2	26,66-26,92			2,42		21,4	4,6				
	K-3	27,54-27,73			2,38		22,4	3,8				

ZEML-FR-62 / REV02

Raporda (*) işaretli deney sonuçları Türkak tarafından akredite edilmiştir. (%95 güven aralığında k=2'dir)
The test results marked (*) in the report are accredited by Türkak (k=2 is within 95%)

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06610 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3235
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ

Mühür / Kase (Seal/Stamp)	Tarih / Date	Deney Sorumlusu / (Person in Charge of Test)	Laboratuvar Denetçi Mühendisi (Controller of Laboratory)
YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	24.05.2016	ESRA AYŞE ERTAŞ	A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO (BOREHOLE NO)	NUMUNE NO (SAMPLE NO)	DERİNLİK (m.) (DEPTH)	SU İÇERİĞİ % (WATER CONTENT)	SU EMME % (WATER ABSORPTION)	BİRİM HACİM AĞIRLIK (gr/cm³) (UNIT WEIGHT)	NOKTA YÜKLEME İNDİSİ (MPa) (POINT LOAD INDEX)	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* (UNIAXIAL COMPRESSION TEST) TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) (MODULUS OF ELASTICITY)	POISSON ORANI (POISSON RATIO)	ÜÇ EKSENLİ BASINÇ DENEYİ (TRIAXIAL COMPRESSION TEST) c (MPa)	ÜÇ EKSENLİ BASINÇ DENEYİ (TRIAXIAL COMPRESSION TEST) ϕ (°)	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ (SLAKE DURABILITY INDEX)
CPS-16İ	K-1	14,70-15,02			2,23		2,6	0,6				
	K-2	16,35-16,65			2,25		7,3	1,0				
	K-3	18,71-18,94			2,29		11,7					
	K-4	21,60-21,97			2,37		27,4	2,5				
	K-5	23,45-23,75			2,36		14,8	1,8				

YÜKSEL PROJE ULUSLARARASI A.Ş.
ZEMİN VE KAYA MEKANİĞİ LABORATUVARI

YÜKSEL PROJE

Birlik Mh. 450. Cd. No:23 06810 Çankaya/ANKARA
Tel : (312) 495 70 00 (pbx) Faks : (312) 495 70 24
www.yukselproje.com.tr
yproje@yukselproje.com.tr

TÜRKAK
Test
TS EN ISO/IEC 17025
AB-0883-T

AB-0883-T
3234
05.16

KAYA MEKANİĞİ DENEY RAPORU
ROCK MECHANICS TEST REPORT

Müşteri / Proje Adı *(Consumer / Name of the Project)*	TARSUS-POZANTI OTOYOLU KM.21+200-21+700 HEYELAN ÖNLEM PROJESİ
Mühür / Kaşe *(Seal/Stamp)* YÜKSEL PROJE Uluslararası A.Ş. Zemin-Kaya Mekaniği Laboratuvarı	**Tarih / Date** 24.05.2016
Deney Sorumlusu / *(Person in Charge of Test)* ESRA AYŞE ERTAŞ	**Laboratuvar Denetçi Mühendisi** *(Controller of Laboratory)* A.Mine AREL Jeoloji Mühendisi Denetçi Belge No: 21122 Oda Sicil No: 4028

DENEY SONUÇLARI: Deney sonuçları, sadece deneyi yapılan numunelere aittir / Test results belong to samples which are tested

KUYU NO *(BOREHOLE NO)*	NUMUNE NO *(SAMPLE NO)*	DERİNLİK (m.) *(DEPTH)*	SU İÇERİĞİ % *(WATER CONTENT)*	SU EMME % *(WATER ABSORPTION)*	BİRİM HACİM AĞIRLIK (gr/cm^3) *(UNIT WEIGHT)*	NOKTA YÜKLEME İNDİSİ (MPa) *(POINT LOAD INDEX)*	TEK EKS. BASMA DAY. DENEYİ q_u (MPa)* *(UNIAXIAL COMPRESSION TEST)* TS EN 1926	ELASTİSİTE MODÜLÜ (Gpa) *(MODULUS OF ELASTICITY)*	POISSON ORANI *(POISSON RATIO)*	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* c (MPa)	ÜÇ EKSENLİ BASINÇ DENEYİ *(TRIAXIAL COMPRESSION TEST)* ϕ	SUDA AYRIŞMA DAYANIKLILIĞI İNDİSİ *(SLAKE DURABILITY INDEX)*
CPS-22İ	K-1	24,83-25,20			2,21		6,1	0,8				
	K-2	27,05-27,40			2,37		8,5	1,1				
	K-3	29,67-29,85			2,41		23,0	4,9				