İSTANBUL TECHNICAL UNIVERSITY ★ INSTITUTE OF SCIENCE AND TECHNOLOGY

COMPARATIVE LIQUEFACTION ANALYSES ON ADAPAZARI SOIL

M. Sc. Thesis by Emre SERDAR, Civ. Eng.

Department : Civil Engineering Programme: Soil Mechanics & Geotechnical Engineering

JUNE 2006

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Supervisor (Chairman): Prof. Dr. Ahmet SAĞLAMER

Members of the Examining Committee: Prof.Dr. Mete İNCECİK (İ.T.Ü.)

Prof.Dr. Sönmez YILDIRIM (Y.T.Ü.)

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ADAPAZARI ZEMİNİ ÜZERİNDE KARŞILAŞTIRMALI SIVILAŞMA ANALİZİ

YÜKSEK LİSANS TEZİ İnş. Müh. Emre SERDAR (501011564)

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Tez Danışmanı :	Prof.Dr. Ahmet SAĞLAMER	
Diğer Jüri Üyeleri :	Prof.Dr. Mete İNCECİK (İ.T.Ü.)	
	Prof.Dr. Sönmez YILDIRIM (Y.T.Ü.)	

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PREFACE

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Istanbul, June 2006

Emre SERDAR

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NOTATIONS

SPT	: Standard Penetration Test
USCS	: Unified Soil Classification System
SCPTu	: Seismic Piezocone Test
СРТ	: Cone Penetration Test
DMT	: Dilatometer Test
PMT	: Pressuremeter Test
DHT	: Downhole Test
SASW	: Spectral Analyses of Surface Waves
SRER	: Seismic Refraction
VST	: Vane Shear Test
BPT	: Becker Penetration Test
CSR	: Cyclic Stress Ratio
CRR	: Cyclic Resistance Ratio
ER	: Energy Ratio
ASTM	: American Society of Testing Materials
FC	: Fine Content
PI	: Plasticity Index

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LIST OF SYMBOLS

u	: Pore water pressure	
D _r	: Relative density	
Ір	: Plasticity index	
D ₅₀	: Mean grain diameter (mm)	
D ₁₀	: 10% grain diameter (mm)	
$\mathbf{F}_{\mathbf{L}}$: Resistance ratio against liquefaction	
R	: Dynamic shear strength ratio	
L	: Shear stress ratio during an earthquake	
r _w	: Modification factor based on earthquake motion properties	
R _L	: Cyclic triaxial strength ratio	
r _d	: Reduction coefficient in the depth direction of the shear stress ratio	
	during an earthquake	
k _{hc}	: Design lateral force coefficient used with the ductility design method	
σ_v	: Total overburden pressure	
σ_v '	: Effective overburden pressure	
X	: Depth from the ground surface (m)	
γt1	: Unit weight (tf/m ³) of the soil shallower than the ground water level	
γ _{t2}	: Unit weigh (tf/m ³) of the soil deeper than the ground water level	
γ' _{t2}	: Effective unit weight (tf/m^3) of the soil deeper than the ground water	
	level	
h _w	: Depth of the ground water level(m)	
τ_{f}	: Shear strength	
φ'	: Effective angle of internal friction	
A, a	: Constants, normally having values of 1,000 and 0.5, respectively	
K ₂	: A function of the index properties of the soil and is an inverse	
	function of the shear strain amplitude.	
G	: Shear modulus	
Su	: Undrained shear strength	
$\sigma_{\rm m}$ '	: Mean effective stress	
Ko	: Lateral earth pressure coefficient	
(N1)60	: Standardized SPT blowcount	
CSR _{eq}	: Cyclic stress ratio generated by the anticipated earthquake ground	
COD	motions at the site	
CSR _{liq}	: Cyclic stress ratio required to generate liquetaction	
q _c	: lip resistance	
τ _e	: Seismic shear strength	
σ_{vo}	: Total overburden pressure	
S	: Soil factor	
α	: Ratio of the design ground acceleration on type A ground, a_g , to the acceleration of gravity g	

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ÖZET

ADAPAZARI ZEMİNİ ÜZERİNDE KARŞILAŞTIRMALI SIVILAŞMA ANALİZİ

Emre SERDAR

Depremler sırasında, yapılar üzerinde meydana gelen en dramatik hasarlardan biri de kaba daneli zeminlerin sebep olduğu sıvılaşmadır. 17 Ağustos 1999, Adapazarı depreminin yapılar üzerinde meydana gelen hasarlardaki yerel zemin koşulları etkisini incelememiz açısından istisnai bir fırsat tanımıştır.

Bu tez çalışmasında, dört farklı yönetmelik, California Sismik Tasarım Yönetmeliği, Eurocode 8, T.C Bayıdırlık ve İskan Bakanlığı Afet Bölgelerinde Yapılacak Yapılarla İlgili Yönetmelik (1998) ve Japon Karayolu Yönetmeliği, için sıvılaşma analizleri yapılmıştır. Tezin asıl amacı, sıvılaşma riski olan bölgelerde yapılacak yapılar için yönetmeliklerde bulunan sıvılaşma kriterlerine gösterilmesi gereken önemi vurgulamak ve kısa dönemde, Afet Bölgelerinde Yapılacak Yapılarla İlgili Yönetmelik' te mevcut olmayan sıvılaşma ile ilgili kısımların belirtilmesi gerekliliğini göstermek ve orta - uzun dönemde ise Türkiye'nin Avrupa Birliğine girmeye çalıştığı bugünlerde Eurocode 8' in Türkçe'ye çevrilerek uygulanmasında gördüğüm yararı belirtmek isterim.

Anahtar Kelimeler: Sıvılaşma, Yönetmelik, Adapazarı.

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ABSTRACT

COMPARATIVE LIQUEFACTION ANALYSES ON ADAPAZARI SOIL

Emre SERDAR

One of the most dramatic causes of damage of structures during earthquakes is the development of liquefaction in saturated cohesionless deposits. In 17 August 1999, Adapazarı earthquake provides an exceptional opportunity to investigate the effects of local soil conditions on damage patterns under strong shaking conditions in areas that experienced ground failure.

In this thesis; the primary goal is, to develop a comparative liquefaction analysis according to Turkish Specification for Structures to be Built in Disaster Areas, Eurocode 8, Japanese and Californian Seismic Codes, at sites undergoing ground failure to clarify that, a careful consideration should be given while we are analyzing and designing of the structures in that region, to suggest that we have to complete the missing parts about liquefaction in Turkish Specification for Structures to be Built in Disaster Areas and to suggest that a translation of Eurocode 8 should be made and should be in force.

Keywords: Liquefaction, Specification, and Adapazarı.

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1. INTRODUCTION

One of the most dramatic causes of damage of structures during earthquakes is the development of liquefaction in saturated cohesionless deposits. These deposits tend to densify when subjected to earthquake loading. However, when saturated, the tendency to densify causes the excess pore water pressure to increase. Consequently, the effective stress of soil decreases. The cohesionless deposit will suffer a great deal of loss of strength until the excess pore water pressure has a chance to dissipate. The phenomenon of pore pressure build, following with the loss of soil strength is known as liquefaction.

The study of liquefaction has become extensive since the Niigata and the Alaska earthquakes occurred in 1964. The study that has been considered as a major breakthrough on the subject of liquefaction is the one conducted by Seed and Idriss. They proposed a procedure to evaluate the liquefaction resistance of soils based on Standard Penetration Test (SPT) blow counts. The procedure is known as the "Simplified Procedure". This procedure has become a worldwide standard practice. The procedure has evolved over the years as considerable efforts have been devoted to the study of liquefaction. Many efforts have been done to develop this procedure, especially in relation to in situ tests (Youd, et al., 2001).

The primary importance of the site conditions or the effects of the subsurface layers on the ground motion characteristics during earthquakes has been realized for a long period of time. In the art or rather the science of microzonation, this aspect of earthquake engineering has been studied in certain detail. Even though, there are numerous examples pointing out clearly the predominant influence of the local site conditions on the structural damage observed during past earthquakes, there appears to be some controversy among the researchers and engineers in assessing the magnitude of this effect. Some of the basic reasons for diversity of the approaches proposed in this field may be attributed to the interdisciplinary nature of earthquake engineering. The seismologists and geologists due to their scientific formation are more interested and involved with tectonic phenomena causing earthquakes and the source characteristics. On the other hand, engineers are faced with the problem of analyzing and designing of the structures that need to be earthquake resistant. In this respect the question imposed in relation to the magnitude, duration and frequency content of the acceleration on the ground surface whether the local site conditions or the source characteristics are main controlling factors. At the present, in the majority of the answers given to such a question, though the local site conditions are considered as the primary factor (Ansal 1999).

In 17 August 1999, Adapazarı earthquake ($M_w = 7.4$) provides an exceptional opportunity to investigate the effects of local soil conditions on damage patterns under strong shaking conditions in areas that experienced ground failure (http://peer.berkeley.edu 2000).

The primary goal of this study is to develop a comparative liquefaction analysis for 30 field logs investigated at Adapazarı region, according to Turkish Specification for Structures to be Built in Disaster Areas, Eurocode 8, Japanese and Californian Seismic Codes. At sites undergoing ground failure, we have to clarify that, a careful consideration should be given while we are analyzing and designing the structures in that region.

2. LIQUEFACTION

2.1 Definition of Liquefaction

Liquefaction is a phenomenon in which the strength and stiffness of a soil is reduced by earthquake shaking or other rapid loading. Liquefaction and related phenomena have been responsible for tremendous amounts of damage in historical earthquakes around the world.

Liquefaction occurs in saturated soils, that is, soils in which the space between individual particles is completely filled with water. This water exerts a pressure on the soil particles that influences how tightly the particles themselves are pressed together. Prior to an earthquake, the water pressure is relatively low. However, earthquake shaking can cause the water pressure to increase to the point where the soil particles can readily move with respect to each other (www.ce.washington.edu 2000).

The strength that a saturated soil can mobilize to resist shearing along a given plane depends on the effective or intergranular pressure on the plane and the effective coefficient of friction. The shearing resistance or strength τ_f may be written:

$$\tau_f = \sigma' \tan \phi' \tag{2.1}$$

In which σ' is the effective stress and ϕ' is the effective angle of internal friction. In saturated sand the intergranular normal stress σ' is defined as:

$$\sigma' = \sigma - u \tag{2.2}$$

Where:

 σ : Total normal stress

u: Pore water pressure

Then,

$$\tau_f = (\sigma - u) \tan \phi' \tag{2.3}$$

If the pore water pressure, u, increases, while the total stress σ remains constant, the shear strength τ_f across any plane of failure decreases independent of the friction angle ϕ' . When $u = \sigma$, then $\tau_f = 0$, and the sand has lost all its shear strength and is said to have liquefied. The sand is sometimes considered to have liquefied when large strains occur under applied loads. In soil mechanics practice, the term "soil liquefaction" may be defined by two criteria. One defines liquefaction in terms of loss of strength and material transformation of a granular material into a fluid. An alternate definition is expressed in terms of the amount of strain or deformation that is unacceptable from a structural viewpoint.

2.2 Flow Liquefaction and Cyclic Mobility

The term liquefaction has actually been used to describe a number of related phenomena. Because the phenomena can have similar effects, it can be difficult to distinguish between them. The mechanisms causing them, however, are different. These phenomena can be divided into two main categories: flow liquefaction and cyclic mobility (www.ce.washington.edu 2000).

2.2.1 Flow Liquefaction

Flow liquefaction is a phenomenon in which the static equilibrium is destroyed by static or dynamic loads in a soil deposit with low residual strength. Residual strength is the strength of a liquefied soil. Static loading, for example, can be applied by new buildings on a slope that exert additional forces on the soil beneath the foundations. Earthquakes, blasting, and pile driving are all example of dynamic loads that could trigger flow liquefaction. Once triggered, the strength of a soil susceptible to flow liquefaction is no longer sufficient to withstand the static stresses that were acting on the soil before the disturbance. After this relatively small disturbance, the static driving force caused by gravity, becomes greater than the frictional resisting force and causes acceleration. The path that brings an unstable state is analogous to the static or dynamic disturbance precedes an instability that allows gravity to take over and produce large, rapid movements (www.ce.washington.edu 2000).

2.2.2 Cyclic Mobility

Cyclic mobility is a liquefaction phenomenon, triggered by cyclic loading, occurring in soil deposits with static shear stresses lower than the soil strength. Deformations due to cyclic mobility develop incrementally because of static and dynamic stresses that exist during an earthquake. Lateral spreading, a common result of cyclic mobility, can occur on gently sloping and on flat ground close to rivers and lakes (www.ce.washington.edu 2000).

2.3 Factors Affecting Liquefaction

The major factors associated with the liquefaction of saturated cohesionless soils are: initial relative density, cyclic shear stress level, initial (static) shear stress level, initial effective confining pressure, drainage conditions, and the number of cyclic shear stress applications, or duration of shaking. Of additional importance are fines content and soil grain characteristics such as particle size, shape, and gradation. Soil structure, the fabric as a result of previous history, is known to be a significant parameter, but it is difficult to define or sometimes even recognize and, hence, its effects are difficult to quantify.

The foregoing factors reflect the physical properties of the soil, the initial stress conditions, soil stratification, and the characteristics of the applied earthquake motions. Many of these items are difficult to control precisely in the laboratory and impossible to evaluate reliably in the field. A brief discussion follows on some of the more significant factors affecting liquefaction.

2.3.1 Dynamic Shear Stress Level

The fundamental concept of liquefaction is based upon the coupling of shear strain and volumetric strain exhibited by soils. The process of pore pressure buildup, leading to liquefaction under cyclic loading, is dependent upon the volumetric strain response under applied shear stresses. The residual increment of pore water pressure generated by an applied dynamic shear stress cycle is, under undrained conditions, related to the shear strain which is, in turn, related to the magnitude of that stress cycle. Actual earthquake motions may have components in all three principal directions. The most critical stresses from a liquefaction viewpoint arise from vertically propagating horizontal shear waves. Vertical stress components are not considered significant since these are of a dilatational nature and completely absorbed by the pore water.

2.3.2 Dynamics of Earthquake Shear Stress

Earthquake ground motions generally consist of a number of randomly distributed peak stress cycles of varying shapes and magnitudes. Difficulties involved in analyzing the various random earthquake ground motions have led to an attempt to express earthquake records in terms of an equivalent number of uniform stress cycles (Lee and Chan, 1972). The number of significant cycles in a particular earthquake record depends directly upon the frequency content and the duration of loading. These, in turn, are related to the magnitude of the earthquake, the distance to its epicenter, and the nature of the materials through which the stress waves must propagate.

It has been noted by Peacock and Seed (1968) and Yoshimi and Oh-Oka (1975) that the frequency of vibration, at least within 0.17 to 12 cps, which covers the range of earthquake motions, at least in overburden, is of secondary importance. The actual shape of the stress pulse used in laboratory test simulations has been found not to be critical; i.e., whether or not it is in the form of a sine wave, a saw tooth, or other form. It is common to present soil susceptibility to liquefaction in terms of number of uniform stress cycles causing liquefaction under a specified level of applied shear stress. The number of stress cycles a specimen can withstand increases almost exponentially with a decrease in shear stress level for any constant confining stress level and relative density.

There are some weaknesses in simulating random earthquake motions in terms of uniform cycles. For example Martin, Finn and Seed (1975) note that the tendency for dry sands to undergo volume changes is a direct function of dynamic shear strain level. But dynamic shear strain level is a function of soil modulus of rigidity G, which in turn depends upon the effective confining stress level and, hence, the pore water pressure generated. Since the pore pressure level existing at the time of application of a specific peak is very important, the relative position of any peak in a sequence of loading cycles is significant. Consideration of the effects of stress reversals also suggests that the peculiar characteristics of the loading history (i.e., the symmetry of the stress record, etc.) may be significant. Ishihara, Tatsuoka and Yasuda (1975) note that ground motion inputs in which the maximum peak occurs early are less critical than input records for which the peaks are more uniformly distributed (i.e., vibratory as opposed to shock loadings).

2.3.3 Relative Density

The relative density of a soil is one of the major factors regarding liquefaction potential of cohesionless sands. Relative density is stressed here rather than absolute density since it is actually the pore volume of the soil compared to its minimum and maximum possible pore volumes that is of significance. The denser a soil, the lower is its tendency toward volume contraction during shearing; the lower is the pore pressure which will be generated; hence, the more unlikely to liquefy.

Relative density can be controlled in the laboratory using reconstructed samples; however, in typical field situations with complex stratification, relative density may lose its meaning. A factor such as relative density has meaning only in uniform soil conditions; actual experience shows that natural soil deposits are quite often very heterogeneous.

It is also conceivable that there is an upper limit of relative density, D_r , above which a soil under field behavior will either no longer tend to compress and generate pore pressures or will, immediately upon commencing yielding, undergo volume increases prohibit liquefaction. Soils are not likely to liquefy at relative densities above 75 percent. Although cyclic mobility (temporary loss of strength) can occur at relative densities up to 100 percent, it is thought that negligible distortions occur in this range at least prior to any drainage or pore water redistribution (Castro and Poulos, 1976). It is impossible to define an upper limit to D_r beyond which liquefaction will not occur; nevertheless, it appears it is less probable for a value of Dr above about 80 percent.

2.3.4 Initial Effective Confining Stress

The resistance of a soil to liquefaction under cyclic loading has been noted to be a function of the effective confining pressure, prior to application of shear. Field observations of liquefaction of level ground have generally been limited to relatively shallow depths, in few cases below 50 or 60 feet. This was noted by Kishida (1969) who observed in the 1964 Niigata earthquake that liquefaction did not occur where

effective overburden stress exceeds 2 kg/cm² (27 psi). Although there is a trend toward reduced liquefaction potential at higher stresses, the observed field cases are very limited and cannot be expected to apply in all situations. Liquefaction evaluations must not omit regions simply because the effective pressure exceeds some empirical value.

Because it is difficult to estimate lateral stress levels in the field, the vertical effective stress is used to define the level of confinement, but much work is available (Seed and Idriss, 1971) to indicate that the ratio of lateral to vertical stress K_o and, hence, the true degree of confinement actually existing in the field are of major importance.

The shear stress level required to cause liquefaction in remolded sand specimens at a relative density less than 80 percent has been found to vary linearly with confining stress levels (Seed and Lee, 1966, and Peacock and Seed, 1968). Therefore it has been found convenient to normalize the effects of dynamic cyclic shear stress level with the value of initial effective confining stress. It is important to recognize that the use of this normalized ratio may not always be applicable to field conditions, particularly where strongly developed structure or cementation is present. Thus, this simplification in treatment of liquefaction potential may not be valid in all circumstances. Soils near the ground surface, under very small degrees of confinement could have resistance to liquefaction in excess of that suggested from test results acquired at higher confining stress levels. This might be associated with material fabric or structure, or, in effect, equivalent to a previous stress history or over-consolidation pressure. This exists for hydraulic fill sands and has been suggested by Meehan (1976).

2.3.5 Drainage Conditions

The rate at which pore water pressure is permitted to dissipate from within a soil body has a major influence upon whether or not liquefaction can occur, particularly under cyclic loading (Wong, Seed, and Chan, 1974). Since the rate of pore pressure dissipation is known to be a function of the square of the longest drainage path, the detailed geometry of the soil profile is important. A study of the interrelationships between different layer compressibilities and permeabilities on the occurrence of liquefaction has been presented by Yoshimi and Kuwabara (1973). This analytical study, based upon solutions to the Terzaghi one-dimensional consolidation problem, illustrates that liquefaction will propagate easily from a lower liquefied layer to an overlying permeability than the initially liquefied striation.

A useful tool for investigating the influence of drainage on potentially liquefiable soil strata is discussed by Seed, Martin and Lysmer (1975). Effective stress computer codes provide a numerical solution of the diffusion equation with a pore pressure generating term included to represent the earthquake-generated pore-pressure increases. It is possible to investigate the influence of length of drainage path, stratification, water table and saturation level variations, different permeabilities, compressibilities, densities, and other conditions.

2.3.6 Grain Size Characteristics

Limits on gradation curves can define bounds separating liquefiable and nonliquefiable soils. The lower boundary on particle size shows the influence of the fines in decreasing the tendency of the soils to density. Plastic fines make more difficult for the sand particles to come free of each other and seek denser arrangements, (NRC 1985). Fines content has been shown to be a factor in the occurrence of liquefaction and is delineated in field prediction relationships. The upper boundaries are significant because they are associated with the permeability of coarser material. Thus, increased drainage and dissipation of pore pressure can occur. Both the grain size and distribution can control the pore pressure buildup and dissipation.

2.3.7 Previous Stress History

The influence of previous stress history is of major interest in liquefaction studies. Finn, Bransby and Pickering (1970) present laboratory data showing that a sample, which has previously liquefied, is more susceptible to liquefaction. A specimen of sand at an initial relative density of 50 percent and an initial effective isotropic confining pressure of 200 kN/m² was subjected to cyclic loading with stress reversals. The specimen first underwent limited flow or cyclic mobility under the extensional portion of the 25th load cycle. This specimen then underwent several additional cycles wherein it reliquefied, flowed, and then restablilized. After a total of 29 load cycles, the specimen was permitted to drain, and was reconsolidated under an effective spherical pressure of 200 kN/m², which yielded a relative density of 60 percent. Upon resumption of cyclic loading the specimen was noted as reliquefying during the extensional segment of its first loading cycle, in spite of its increased

relative density value over that of the initial test sequence. Based on such information, it is possible that the number of loading cycles required to cause liquefaction is substantially reduced by previous episodes of liquefaction. The conclusion is that judgment is necessary in interpreting liquefaction potential of sites which underwent previous liquefaction.

2.4 Parameters Indirectly Affecting Liquefaction

There is a family of soil parameters which, while not related to the liquefaction process directly, do influence the liquefaction potential. These are the response parameters which dictate how a soil will respond to applied stress. For example, since volumetric changes and, hence, liquefaction potential can be related to the distortional strain levels which a soil undergoes (Martin, Finn, and Seed, 1975), the shear stiffness or modulus of rigidity of a soil under a specific load level is of particular concern. Earthquake motions can be either amplified or attenuated, depending upon characteristics of the soil profile (and its interaction with the frequency content of the disturbing earthquake) which, in turn, depend upon the values of the stiffness and damping parameters involved.

Since many treatments of earthquake-induced liquefaction deal with vertically transmitted horizontal shear waves, one approach to analysis requires only a value for the shear modulus, G, together with a damping coefficient, to account for the energy absorption of the soil. Extensive experimental work dealing with these two parameters has been carried out by Seed and Idriss (1970), and Hardin and Drnevich (1970). These studies permit characterizing the shear response parameters of soil in terms of the basic soil index properties and the existing stress and strain states. For example, the shear modulus value for clean granular soils is related to void ratio, mean effective stress, maximum cyclic shear strain amplitude, and number of loading cycles (some soils have an additional dependency upon overconsolidation ratio, degree of saturation, and plasticity index). Soil damping, particularly in cohesionless soils, is at least partially due to relative movements between soil particles and, hence, is hysteric. The contribution by dry friction to the damping ratio should be substantially independent of strain rate. For analytical expediency damping is sometimes represented by an equivalent viscous damping. For soils, damping is generally specified as a percentage of critical damping, and measured in terms of specific damping capacity, related to the ratio of the area within a hysteric loop during a load cycle and the maximum stored energy during the cycle. Seed and Idriss (1970) have derived expressions for damping ratio as a function of strain level, number of cycles, frequency, mean effective stress, and the other index properties mentioned in reference to shear modulus.

The shear modulus is noted as increasing with density and confining pressure and decreasing with shear strain amplitude. Damping coefficients on the other hand increase with shear strain amplitude and appear to decrease with confining stress and increased density. Previous stress history is noted as increasing shear stiffness and decreasing damping. Shear modulus of granular materials is treated as:

$$G = A.K_2.(\sigma)^a \tag{2.4}$$

Where, A and a are constants, normally having values of 1,000 and 0.5, respectively, and K_2 is a function of the index properties of the soil and is an inverse function of the shear strain amplitude.

It has been found (Seed and Idriss, 1970; Hardin and Drnevich, 1970) that shear modulus values at any strain level may be normalized in terms of maximum shear modulus to permit a generalized relationship for many soil materials to be collapsed into a single relationship. Damping ratios, as mentioned, were found to vary as functions of soil index properties as well as the stress and strain states. Although cohesive materials have been treated in the same format as granular materials, their soil models have not been found quite as satisfactory in this context. It is more expedient to normalize the shear modulus of clays in terms of the undrained shear strength, S_u , in the form of G/S_u versus shear strain amplitude. It is again possible to collapse the various shear modulus relationships into a single curve by normalizing them by the maximum way, modulus values determined at very small strain levels, such as by measuring shear wave velocities in the field, can be used to predict the shear modulus under design loading conditions. Damping ratios for clays have been studied less extensively than for granular materials. Little data is available for materials other than sans and clays, but available information indicates that coarser grained materials such as gravels may be expected to behave as sands (Seed and Idriss, 1970; Hardin and Drnevich, 1970). Peats are generally treated in the same format as clays.

2.5 Potentially Liquefiable Soil Types

The quantitative liquefaction evaluation procedures in practice are based on the behavior of predominantly sandy soils. These methods have been validated with field studies over the last three decades, and a consensus has emerged regarding their application (Youd and Idriss 1997). Understanding the liquefaction behavior of silty and gravelly soils has, however, substantially lagged. Recommendations for these soils have been largely "rules of thumb" tempered by field observations made after earthquakes. For example, cohesive soils with a fine content greater than 30%, and whose fines either classify as "clays" based on the Unified Soil Classification System (USCS), or have a plasticity index (PI) of greater than 30%, are not generally considered potentially susceptible to soil liquefaction (Seed 1992; Youd and Idriss 1997).

The influence of fine-grained soil on the liquefaction resistance of predominantly sandy soils is a topic that has received considerable attention over the past decade (Ishihara 1993). Laboratory testing of silts has been performed, but to a very limited scale and with varying results. Recent examination of fine-grained soil behavior during earthquakes and the results of laboratory tests reveal that uniformly graded loose sandy soils that contain as much as 25% to 30% non-plastic to low plasticity fines may be highly liquefiable. Finn and others provide a review of the design and analysis of structures in potentially liquefiable silty soils.

In addition to sandy and silty soils, some gravelly soils and even rockfills are potentially vulnerable to liquefaction. A number of well-documented field case histories confirm that gravelly soils can liquefy. In recent years, the liquefaction behavior of gravelly soils has been investigated in the laboratory. Most coarse, gravelly soils are relatively free draining; if the voids are filled with finer particles, or the surrounded soils are less pervious, then drainage may be impeded and cyclic pore pressure generation or liquefaction becomes more likely. Similarly, when they are of considerable thickness and lateral extent, deposits of coarse gravelly soils may not be capable of dissipating pore pressures and may be vulnerable to potential liquefaction.

Field evidence has shown that most liquefied gravelly soils are sand-gravel composites. They present the results of cyclic triaxial tests on soils with increasing percentages of gravel content. They conclude that sand-gravel composites show an

increase in cyclic strength with increased gravel content, even though the relative density of the composite is constant. This result raises questions about the relationship between laboratory test results and actual field behavior. Currently, the best techniques available for quantitative evaluation of the liquefaction resistance of coarse gravelly soils are those described by Harder, Seed, and several papers contained in Prakash and Dakoulas. These methods involve two primary evaluation procedures: (1) the use of very large-scale Becker Hammer penetration resistance correlations, or (2) corrections to penetration resistances obtained by the SPT. Application and support for the former method is provided by Harder, where case histories are provided to examine the application of the Becker penetration test for characterizing the liquefaction potential of gravelly soils.

3. EVALUATION OF LIQUEFACTION SUSCEPTIBILITY: IN-SITU AND LABORATORY PROCEDURES

3.1 Liquefaction Hazard Evaluation

The liquefaction of a loose, saturated granular soil occurs when the cyclic shear stresses and strains passing through the soil deposit induce a progressive increase in excess hydrostatic pore water pressure. During an earthquake, the cyclic shear waves that propagate upward from the underlying bedrock induce the tendency for the loose sand layer to decrease in volume. If undrained conditions are assumed, an increase in pore water pressure and an equal decrease in the effective confining stress are required to keep the loose sand at constant volume.

The degree of excess pore water pressure generation is largely a function of the initial density of the sand layer, and the intensity and duration of seismic shaking. In loose to medium dense sands, pore pressures can be generated which are equal in magnitude to the confining stress. In this state, no effective or intergranular stress exists between the sand grains and a complete loss of shear strength is temporarily experienced.

The following types of phenomena can result from soil liquefaction:

- 1. Catastrophic flow failures,
- 2. Lateral spreading and ground failures,
- 3. Excessive settlement,
- 4. Loss of bearing capacity,
- 5. Increase in active lateral earth pressures behind retaining walls, and
- 6. Loss of passive resistance in anchor systems.

Two phenomena commonly occur in soils when loading cyclically: liquefaction and cyclic mobility. Because both lead to a substantial rise in pore water pressures and large strains in the laboratory, they are often confused. Generally, liquefaction occurs only in specimens that are highly contractive, whereas cyclic mobility may occur in specimens from any initial state. The difference between these phenomena and the factors affecting them, as observed in the laboratory, are summarized by Castro and Poulos (1977). In an effort to clarify some of the terminology associated with liquefaction, some definitions are provided below (Seed 1979; Youd and Perkins 1987).

3.2 Triggering of Liquefaction or Initial Liquefaction

Denotes a condition where, during the course of cyclic stress applications, the residual pore water pressure on completion of any full stress cycle becomes equal to the applied confining pressure. The development of initial liquefaction has no implications concerning the magnitude of the soil deformations. However, it defines a condition that is a useful basis for assessing various possible forms of subsequent soil behavior.

3.3 Initial Liquefaction with Limited Strain Potential or Cyclic Mobility

Denotes a condition in which cyclic stress applications develop a condition of initial liquefaction. Subsequent stress applications cause limited strains to develop because of the remaining resistance of the soil to deformation or because the soil dilates; the pore pressure drops and the soil stabilizes under the applied loads. However, once the cyclic stress applications stop and if they return to the zero stress condition, there will be a residual pore water pressure in the soil equal to the overburden pressure,

and this will lead to an upward flow of water in the soil which could have deleterious consequences for overlying layers.

3.4 Liquefaction with Large Strain Potential

Denotes a condition where a soil will undergo continued deformation at a constant low residual stress or with no residual resistance, due to the buildup of high pore water pressures that reduce the effective confining pressure to a very low value. The pore pressure buildup may be due to either static or cyclic stress applications.

In order to be susceptible to liquefaction, the soil must be fully saturated and subjected to a sudden or rapid loading such as that of an earthquake. The resistance of a soil to liquefaction is dependent on a combination of the soil properties, environmental factors, and characteristics of the earthquake. Soil properties such as the mineralogy, gradation or grain-size distribution, and particle shapes (e.g., angularity) all affect the soil's liquefaction resistance. The six principal environmental factors affecting a soil's intrinsic resistance to cyclic pore pressure generation or liquefaction during seismic loading are shown below (Seed 1992).

- Relative Density: The resistance to cyclic pore pressure generation, as well as residual undrained strength, increase with the relative density of the soil. Relative density is the most important factor governing the liquefaction resistance of a cohesionless soil.
- 2. Geologic Age: The time under a sustained overburden can significantly increase the liquefaction resistance of some soils over time.
- Prior Cyclic Load History: Prior seismic excitation can increase liquefaction resistance. This effect can also, however, be erased by more recent seismic excitation causing full or nearly full liquefaction.
- 4. Overconsolidation: Overconsolidation and the associated increased lateral effective confining stress can increase liquefaction resistance by increasing the coefficient of lateral earth pressure (K_o), which in turn increases the overall mean effective stress (σ_m ').
- 5. Soil Fabric: The method of deposition and compaction can have a significant influence on liquefaction resistance.

6. Drainage Characteristics: The ability to rapidly dissipate excess pore pressures, which is a function of both the permeability of the soil and the drainage boundary conditions imposed by the surrounding soils, will affect the liquefaction resistance.

One additional factor with a potentially significant impact on liquefaction resistance is the effective confining stress. Resistance to cyclic pore pressure generation and/or liquefaction increases with increased effective confining stress. As a result, site conditions involving near-surface water tables or phreatic surfaces tend to represent an inherently more liquefaction-susceptible condition than those with a deeper water table.

The evaluation of liquefaction hazard is generally performed in several stages: (1) preliminary geological/geotechnical site evaluation, (2) quantitative evaluation of liquefaction potential and its potential consequences, and if necessary, (3) development of mitigation and foundation remediation programs. The scope of the investigation required is dependent not only on the nature and complexity of geologic site conditions, but also on the economics of a project and on the level of risk acceptable for the proposed structure or development.

3.5 Current Trends and Challenges in In-Situ Testing

In complement to conventional drilling and sampling operations for site exploration, direct measurements from in-situ tests are increasingly used to derive soil properties and parameters for geotechnical analysis and design. The interpretations of initial geostatic stress state and stress-strain-strength-flow characteristics are calibrated with laboratory test data obtained from high-quality samples, but at high costs. Considerable gains in efficiency, economy, and time are to be obtained by in-situ devices, including cone, dilatometer, pressure meter, and vane. Current interpretation procedures use a hybrid of empirical, analytical, experimental, and/or numerical methods, whereas a comprehensive integrated numerical simulation of all field tests is needed. Of particular interest, the seismic piezocone test with dissipation phases (SCPTu) offers an optimal collection of five separate readings (q_t , f_s , u_b , t_{50} , and V_s) of soil behavior within a single sounding, and therefore should be adopted for routine geotechnical investigations.

Soils are extremely complex four-dimensional (x, y, z, t) materials in their constituent behavior, having varied mineralogical and geological constituents, threephase particulate components, and logarithmic size distributions. In addition, the aspects of initial stress state, nonlinear stiffness, strength, anisotropy, permeability, drainage characteristics, and geological behavior provide a formidable task for all those charged with conducting a meaningful site investigation. Yet, these geomaterials must be characterized adequately before any new foundation, embankment, roadway, earthen dam, tunnel, or excavation is constructed on or within the ground. A thorough investigation of a particular geologic formation should consider the initial anisotropic-preconsolidated geostatic stress state and nonlinear stress-strain strength behavior, drainage paths, and flow behavior under dry/saturated, drained/undrained, as well as partially-saturated conditions. Since Mother Nature has bequeathed such a wide diversity of particulates, mineralogies, fabrics, cementitious agents, and packing arrangements, a fully global numerical model which integrates all aspects of the ground may be difficult to formulate in the near future. At present, the best practice is to employ a combination of drilling, sampling, and in-situ field testing during geotechnical site exploration. Figure 3.1 shows the chart for the evaluation of the soil characteristics (Paul W. Mayne 2004).



Figure 3.1 Evaluation of Soil Parameters in Nature

A good number of different in-situ tests are available for site investigation with the most common being the standard penetration test (SPT), cone penetration (CPT), piezocone (CPTu), flat plate dilatometer (DMT), pressuremeter (PMT), and vane shear test (VST). For measurements of mechanical waves, especially the shear wave, the geophysical methods include: crosshole (CHT), downhole (DHT), seismic reflection (SRFL), and spectral analysis of surface waves (SASW), as well as recent improvements in seismic refraction (SRFR). For most geotechnical projects, the full suite of drilling & sampling, laboratory and in-situ testing cannot be implemented because of time and costs. Depending upon the nature of geologic setting and level of the proposed construction, perhaps only a select number of lab tests (i.e., index, consolidation, direct shear, triaxial, permeability) and one or two of the basic in-situ tests (i.e., SPT, CPT, CPTu, DMT, PMT, VST) can be implemented. For these tests, the tasks of soil parameter interpretation can be handled by empirical, closed-form analytical, numerical, or experimental methods. In many cases, an assortment of these different methods is adopted in practical applications. Figure 3.2 shows some in-situ testing methods.



Figure 3.2 Some In-Situ Testing Methods

3.6 Selection of Empirical Method for Liquefaction Assessment

Methods for assessing liquefaction potential reviewed above are based on field performance of liquefiable soil deposits in past earthquakes. These empirical methods rely on some in situ measure of the liquefaction resistance of a soil. While any of a number of in situ soil tests could be used to evaluate liquefaction potential, most of the effort to develop suitable criteria has been based on one of four test measurements: Standard Penetration Test (SPT) blowcounts, Cone Penetration Test (CPT) tip resistance, Becker Penetration Test (BPT) blowcounts, and in situ shear wave velocity.

3.6.1 Approach Used To Develop Empirical Methods

Regardless of the in situ test employed, the approach for developing an empirical criterion for liquefaction assessment is basically the same. Sites subject to possible soil liquefaction in past earthquakes are studied and a database (or "catalog") is compiled of soil deposits that did or did not liquefy. For each case study:

1. Based on the field evidence, a judgment is made as to whether or not liquefaction occurred.

- 2. A representative measure of the in situ soil strength is determined.
- 3. The shear stresses induced in the soil by the earthquake are estimated.

A liquefaction assessment criteria is formulated by then attempting to separate conditions (represented by normalized shear stress and strength parameters) where a soil liquefied from those conditions where no liquefaction was observed.

In compiling data on sites subjected to possible soil liquefaction, a critical consideration is how to distinguish between soil layers that did and did not liquefy during an earthquake. For nearly all of the available assessment methods, this distinction is made on the basis of surface manifestations of soil liquefaction (Seed et al. 1985; Liao et al. 1988; Fear and McRoberts 1995; Stark and Olson 1995). Liquefaction is judged to have occurred if sand boils, ground cracking, lateral ground movements, settlement or translation of structures, bearing capacity failures, or uplifting of buried pipes and tanks is observed. If no such surface evidence is observed, the site is assumed to have not liquefied. Defining "liquefaction" in this manner is consistent with the definition adopted in this study. However, at some sites with no apparent liquefaction, deeper soils could have liquefied without producing surface evidence. Ishihara (1985) investigated the conditions where evidence of liquefaction in deeper layers is suppressed by the intact overburden soil. However, Youd and Garris (1994; 1995) have shown that Ishihara's findings are not valid for sites subject to lateral spreading.

For each case study, a representative index of the liquefaction resistance of the soil deposit is needed. The in situ penetration resistance can be used because the same factors that contribute to cyclic shear strength will increase the resistance to penetration. In addition, when surface evidence indicates liquefaction, the specific subsurface soil layer that liquefied must be identified before a representative index value can be defined. Seed and his co-workers (1985) appear to have identified the critical, liquefied deposit at each site as the soil layer with the lowest penetration resistance, and then compiled the average SPT blowcount measured in this critical layer. However, re-examinations of their data set indicate that the minimum blowcount in a boring was frequently compiled (Liao and Whitman 1986; Fear and McRoberts 1995). While the lowest observed blowcount may be an erroneous or spurious data point, this approach has merit because the sublayer with minimum

penetration resistance will also have the least resistance to liquefaction. In addition to using the minimum blowcount, both Liao and Whitman (1986) and Fear and McRoberts (1995) considered each boring at a site as one case study to decrease the correlation among observations in their data catalogs. Because judgment is involved, different blowcount values are inevitably compiled for the same sites in the various liquefaction catalogs. To indicate the severity of the seismic loading imparted to a liquefiable soil, the cyclic shear stress generated by an earthquake is usually estimated from the peak horizontal accelerations at the ground surface. Most empirical liquefaction assessment methods are based on the cyclic stress ratio (CSR), which is calculated from the maximum horizontal surface acceleration (amax) generated by an earthquake at a given site. Values of CSR in the available liquefaction catalogs are often based on fairly approximate values of amax estimated from empirical attenuation equations (Liao and Whitman 1986; Ambraseys 1988).

Finally, the accumulation of excess pore pressures and shear strains is affected by static shear stresses in a slope that should be considered in a liquefaction assessment (Seed and Harder 1990). However, most liquefaction assessment models were developed from case studies of fairly level ground where the static shear stresses are very small. In using these methods to evaluate liquefaction potential at sites with gentle slopes, "the effects of the initial sustained shear stress on the triggering of liquefaction are considered negligible and ignored for all practical purposes" (Ishihara 1993). Hence, the static shear stress imparted by a mild surface slope in a lateral spread can be ignored in predicting soil liquefaction.

3.6.2 Methods based on the Standard Penetration Test

The most comprehensive liquefaction data catalogs are based on Standard Penetration Test (SPT) blowcounts (N_{SPT}). Starting in the 1970's, H. B. Seed and his colleagues worked to develop a reliable method for assessing liquefaction potential based on SPT data. Their framework for SPT-based assessments of liquefaction potential was developed in a series of papers that includes Seed and Idriss (1971), Seed et al. (1977), Seed (1979), Seed and Idriss (1982), and Seed et al. (1983). Significant contributions were also suggested in the work of Tokimatsu and Yoshimi (1983). This research culminated in the liquefaction criteria published by Seed et al. (1985).

The empirical chart published by Seed et al. (1985) is based on a standardized SPT blowcount, $(N_1)_{60}$, and the cyclic stress ratio (CSR). To get $(N_1)_{60}$, the measured N_{SPT} is corrected for the energy delivered by different hammer systems and normalized with respect to overburden stress. Boundary curves separating liquefied from unliquefied soils, in terms of CSR and $(N_1)_{60}$, were conservatively drawn to encompass nearly all observed cases of liquefaction in the data catalog. Three separate boundary curves were presented for clean to silty sands. To consider the effects of earthquake magnitude on the duration of strong shaking, magnitude scaling factors were specified. Over the last decade, the empirical method given by Seed et al. (1985), sometimes referred to as the "simplified procedure", has been widely used for evaluating potential soil liquefaction in North America and around the world.

Recently, Fear and McRoberts (1995) carefully re-examined this liquefaction database and found that, while fines content affects the liquefaction resistance of a soil, this effect may be less pronounced than indicated by Seed et al. (1985). The analysis by Fear and McRoberts also suggests a transition zone, instead of a single boundary line, for separating conditions leading to severe liquefaction damage from those with no apparent liquefaction. Overall, Fear and McRoberts (1995) conclude that the liquefaction criteria established by Seed et al. (1985) will, as intended, conservatively predict liquefaction in some cases where no liquefaction damage would be observed.

In the empirical charts proposed by Seed and his colleagues, boundary lines between liquefied and unliquefied conditions were drawn subjectively. Several researchers have suggested using statistical analyses to construct these empirical lines more objectively. Liao et al. (1988) performed a statistical regression analysis to systematically develop a liquefaction criteria in terms of CSR and $(N_1)_{60}$. For a liquefaction probability of 0.18, the model proposed by Liao et al. (1988) agrees fairly well with the boundary line drawn by Seed et al. (1985). However, Liao and his colleagues found that their data does not support using fines content as a continuous variable; instead, they developed two models, one for clean sands and a second for silty sands.

Many of the empirical methods for liquefaction resistance rely on magnitude scaling factors published by Seed et al. (1983). These magnitude scaling factors were developed from cyclic laboratory test data and are based on a representative number

of uniform load cycles in different magnitude earthquakes. Ambraseys (1988) points out that the idea of an equivalent, uniform stress cycle may oversimplify differences in ground motions from different magnitude earthquakes. Using essentially the same data as Seed et al. (1985), Ambraseys developed an empirical liquefaction criteria expressed directly in terms of CSR, $(N_1)_{60}$, and earthquake magnitude (M_w) . Significantly, the analysis by Ambraseys indicates that Seed's magnitude scaling factors poorly represent the field data on liquefaction. Using a larger data catalog, Loertscher and Youd (1994) found that the magnitude scaling factors used by Seed et al. (1983) are significantly conservative for moderate-sized (M = 5 to 7) earthquakes.

Other researchers have developed SPT-based empirical methods that directly use the earthquake magnitude and source distance to represent the seismic energy imparted to the soil, instead of the cyclic stress ratio (based on a_{max}) and magnitude scaling factor. Two models of this type, which also use corrected (N₁)₆₀ values, are given by Liao et al. (1988) and Law et al. (1990). Because estimates of peak surface accelerations are not required, empirical correlations based on earthquake magnitude and distance are easier to use in a liquefaction assessment. However, because the attenuation of seismic energy varies in different geologic regimes, these methods are not necessarily valid for geographic regions other than those represented in the data used to develop the model. Liquefaction criteria based on site-specific estimates of surface accelerations are thus more easily applied in different geographic regions (Liao et al. 1988).

Finally, liquefaction assessments in Japan are often performed using the SPT-based, empirical method specified in the Japanese bridge design code. This method was developed in Japan from a large number of cyclic triaxial tests on soil samples with a known SPT penetration resistance (Ishihara 1985; 1993). Hence, this empirical method is based largely on laboratory tests, where sample disturbance is a potential issue, in contrast to the direct correlation with field behavior used in the other methods described here.

3.6.3 Methods Based On Other in -Situ Tests

The Cone Penetration Test (CPT) yields a continuous profile of penetration resistance and is thus well-equipped for detecting thin, liquefiable layers within a larger, stable soil deposit. Early CPT-based empirical methods for liquefaction

evaluations were developed by converting SPT blowcounts in the available liquefaction case studies to equivalent CPT tip resistances. Models of this type include those proposed by Seed et al. (1983), Robertson and Campanella (1985), and Seed and De Alba (1986). In a different approach, Mitchell and Tseng (1990) used a model of cone penetration together with laboratory test data to suggest a liquefaction criteria using the CPT. However, these methods suffer from a lack of direct correlation between the measured CPT tip resistance and observed field performance of liquefiable soils in earthquakes. Using data from sites mostly in China, Shibata and Teparaksa developed a CPT-based liquefaction criterion that was based directly on field performance data. Using a more extensive database, Stark and Olson (1995) also developed an empirical method based on measured CPT tip resistances. Stark and Olson used a normalized tip resistance and drew bounding curves between liquefied and unliquefied states for clean sand, silty sand, and sandy silt.

Because large gravel particles interfere with the penetration of both the SPT sampler and the cone penetrometer, the SPT and CPT are not reliable for evaluating the liquefaction potential of gravelly soil deposits. To overcome this problem, the Becker Penetration Test (BPT) has been used for investigating the liquefaction potential of gravelly soils in North America (Harder 1996). The BPT involves driving a large diameter (168 mm recommended), closed-end casing into the ground using a doubleacting diesel hammer. The number of hammer blows is typically recorded for every 30 cm of penetration. Using empirical correlations, BPT blowcounts can be converted to equivalent SPT blowcounts as discussed by Harder (1996). The equivalent-NSPT values can then be used to evaluate the potential for soil liquefaction using the SPT-based methods discussed in this chapter. Unfortunately, additional research and development is needed to further standardize the BPT and improve interpretations for liquefaction susceptibility.

Many of the same factors that contribute to the liquefaction resistance of a soil deposit (density, confinement, stress history, geologic age, etc.) also influence the velocity of traveling shear waves (Finn 1991; Robertson et al. 1992). Moreover, the shear wave velocity of a soil deposit can be measured economically with surface geophysics; this is particularly advantageous in evaluating gravelly soils that are difficult to penetrate or sample. Hence, several researchers have attempted to correlate liquefaction potential with in situ shear wave velocity. Both Robertson et al.
(1992) present correlations, in terms of a normalized shear wave velocity and cyclic stress ratio, which were developed directly from a limited number of field cases. Other methods for evaluating liquefaction potential based on shear wave velocities. However, additional data is needed to validate and improve the proposed correlations between shear wave velocity and liquefaction resistance.

3.7 In-Situ Liquefaction Resistance: The Cyclic Resistance Ratio of Soil

The cyclic resistance ratio (CRR) is defined as the ability of the soil to resist the shear stresses induced by the earthquake. The CRR can be determined through empirical relationships based largely on SPT and/or CPT resistance, or laboratory tests.

Once the equivalent uniform cyclic shear stress ratios resulting from the earthquake loading (CSR_{eq}) have been calculated at each point of interest, the next step is to evaluate the resistance of the in situ materials to cyclic pore pressure generation or accumulation of cyclic shear strain. This constitutes evaluation of the resistance to triggering of potential liquefaction failure; defined as sufficient pore pressure or strain accumulation to bring the material to a condition at which undrained residual (or .steady state.) strength will control behavior. The evaluation of in situ liquefaction resistance can be accomplished using either the SPT or CPT resistance data.

3.7.1 Cyclic Resistance Ratio Based on Standard Penetration Tests

The first step in evaluating the potential for soil liquefaction is to compute corrected values of $(N_1)_{60}$ from the measured SPT blowcounts. Here is the list for drilling and SPT procedures recommended:

- 1. Boring diameter of 66 to 115 mm (2.5 to 4.5 inch).
- 2. Borehole filled with drilling mud or cased to full depth.
- 3. Drilling method: wash boring with side discharge bit or rotary boring with side or upward discharge bit. Clean the bottom of the borehole (maximum allowable heave of 70 mm) before perform SPT. Hollow stem auger techniques are not recommended unless extreme care is taken to avoid heave and disturbance.

- 4. Standard sampler of 51 mm (2.00 inch) outside diameter, 35 mm (1.38 inch) inside diameter, and at least 457 mm (18 inch) long. If the sampler is made to hold a liner, a liner must be in place.
- Record number of blows for each 150 mm (6 inch) of penetration. N_{SPT} is the number of blows for penetration from 150 to 450 mm (6 to 18 inch) from bottom of the borehole.

The most common technique for estimating the CRR is based on empirical relationships with the normalized SPT blowcount, $(N_1)_{60}$. The relationship is depicted by empirical curves plotted by Seed and others (1985), which divides sites that liquefied historically from those that did not on the basis of $(N_1)_{60}$. The relationship between CSReq and (N1)60 for M 7.5 earthquakes is illustrated in Figure 3.3. The points on the figure represent case studies where the cyclic stress ratios have been calculated following earthquakes. In practice it is common to use the chart to obtain the CRR of the sandy soil based on field SPT data. Given the $(N_1)_{60}$ values, the CRR (or τ_{av}/σ_{vo}' as indicated in Figure 3.3) can be determined using the appropriate curve. Alternatively, the practitioner can utilize the chart to determine the minimum SPT penetration resistance required for a given factor of safety against liquefaction. In this case the CSReq is used to enter the chart and the corresponding $(N_1)_{60}$ values for a factor of safety of one is determined. The latter approach is common when developing specifications for remedial soil improvement. Note that the ratio τ_{av}/σ_{vo}' provided in Figure 3.3 can refer to either CRR or CSR_{eq}, depending on the approach employed.



Figure 3.3 Empirical Relationships between the Cyclic Stress Ratio Initiating Liquefaction and (N₁)₆₀ Values for Silty Sands in M _{7.5} Earthquakes (Youd and Idriss 1997).

3.7.2 Corrected SPT Blowcounts

The measured SPT blowcount (N_{SPT}) is first normalized for the overburden stress at the depth of the test and corrected to a standardized value of (N_1)₆₀. Using the recommended correction factors given by Robertson and Fear (1996), the corrected SPT blowcount is calculated with:

$$(N_1)_{60} = N_{SPT} \cdot C_N \cdot C_E \cdot C_B \cdot C_S \cdot C_R$$
(3.1)

The first correction factor (C_N) normalizes the measured blowcount to an equivalent value under one atmosphere of effective overburden stress:

$$C_N = \sqrt{\frac{P_a}{\sigma'_{vo}}} \le 2.0 \tag{3.2}$$

Where σ'_{vo} is the vertical effective stress at the depth of N_{SPT} and P_a is one atmosphere of pressure (101.325 kPa) in the same units as σ'_{vo} . The maximum value

of 2.0 limits C_N at depths typically less than 1.5 m. The factor C_E is used to correct the measured SPT blowcount for the level of energy delivered by the SPT hammer. Using 60% of the theoretical maximum energy as a standard, this correction is given by:

$$C_{E} = \frac{Actual \ Energy \ Delivered \ to \ the \ Top \ of \ the \ Drill \ Rod}{0.60 * Theoritical \ Max. \ SPT \ Hammer \ Energy} = \frac{ER}{60}$$
(3.3)

Where ER is the energy ratio and the theoretical maximum SPT hammer energy is 4200 lb (from 140 weight dropping 30 inches in each blow). The energy ratio (ER) should be measured for the particular SPT equipment used. When such measurements are unavailable, the energy ratio and correction factor can be estimated from the average values given by Seed et al. (1985):

Country	Hammer Type	Hammer Release	ER	C _E
United States	Safety	Rope and pulley	60	1.00
United States	Donut	Rope and pulley	45	0.75
Japan	Donut	Rope and pulley,	67	1.12
		special throw release		
Japan	Donut	Free Fall	78	1.30

Table	3.	1
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The third correction factor, C_B , is for borehole diameters outside the recommended range. The following values are recommended (Robertson and Fear 1996):

Table 3.2

Diameter of Borehole	C _B
65 to 115 mm	1.00
150 mm	1.05
200 mm	1.15

The fourth correction factor, C_S , is for SPT samplers used without a sample liner. If the split spoon sampler is made to hold a liner but is used without one, the measured

blowcount should be corrected with $C_S=1.2$. Otherwise, $C_S=1.0$ for a standard sampler.

The last correction factor is C_R , which is used to correct for the loss of energy through reflection in short lengths of drill rod. In the recommendations, values of the correction factor C_R are given for ranges of rod length. For the analysis of case studies, these recommended values of C_R were approximated with a linear equation:

Table	3.3
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Ζ	C _R
z≤3 m	0.75
3 m <z<9 m<="" th=""><th>(15+z)/24</th></z<9>	(15+z)/24
z≥9 m	1.00

Below you can find a simplified flowchart for evaluating the liquefied thickness of soil based on SPT blowcounts.



Figure 3.4 Flowchart for evaluating the liquefied thickness of soil based on SPT blowcounts.

4. CODES USED FOR THE ANALYSES

4.1 Californian Code

Given the highly variable nature of Holocene deposits that are likely to contain liquefiable materials, most sites will require borings to determine whether liquefiable materials underlie the project site. Borings used to define subsurface soil properties for other purposes (e.g., foundation investigations, environmental or groundwater studies) may provide valuable subsurface geologic and/or geotechnical information.

The vast majority of liquefaction hazards are associated with sandy soils and silty soils of low plasticity. Cohesive soils are generally not considered susceptible to soil liquefaction. However, cohesive soils with:

- 1. A clay content (percent finer than 0.005 mm) less than 15 percent,
- 2. A liquid limit less than 35 percent, and
- 3. A moisture content of the in-place soil that is greater than 0.9 times the liquid limit (i.e., sensitive clays),

are vulnerable to significant strength loss under relatively minor strains (Seed and others, 1983). Although not classically defined as "liquefaction" and so not addressed by these Guidelines, these soils represent an additional seismic hazard that, if present, should be addressed.

In addition to sandy and silty soils, some gravelly soils are potentially vulnerable to liquefaction. Most gravelly soils drain relatively well, but when: (a) their voids are filled with finer particles, or (b) they are surrounded by less pervious soils, drainage can be impeded and they may be vulnerable to cyclic pore pressure generation and liquefaction. Gravelly geologic units tend to be deposited in a more-turbulent depositional environment than sands or silts, tend to be fairly dense, and so generally resist liquefaction. Accordingly, conservative "preliminary" methods may often suffice for evaluation of their liquefaction potential. For example, gravelly deposits which can be shown to be pre-Holocene in age (older than about 11,000 years) are generally not considered susceptible to liquefaction.

In order to be susceptible to liquefaction, potentially liquefiable soils must be saturated or nearly saturated. In general, liquefaction hazards are most severe in the upper 50 feet of the surface, but on a slope near a free face or where deep foundations go beyond that depth, liquefaction potential should be considered at greater depths. If it can be demonstrated that any potentially liquefiable materials present at a site:

- 1. Are currently unsaturated (e.g., are above the water table),
- 2. Have not previously been saturated (e.g., are above the historic-high water table), and
- 3. Are highly unlikely to become saturated (given foreseeable changes in the hydrologic regime),

then such soils generally do not constitute a liquefaction hazard that would require mitigation. Note that project development, changes in local or regional water management patterns, or both, can significantly raise the water table or create zones of perched water. Extrapolating water table elevations from adjacent sites does not, by itself, demonstrate the absence of liquefaction hazards, except in those unusual cases where a combination of uniformity of local geology and very low regional water tables permits very conservative assessment of water table depths. Screening investigations should also address the possibility of local "perched" water tables, the raising of water levels by septic systems, or the presence of locally saturated soil units at a proposed project site.

Relatively thin seams of liquefiable soils (on the order of only a few centimeters thick), if laterally continuous over sufficient area, can represent potentially hazardous planes of weakness and sliding, and may thus pose a hazard with respect to lateral spreading and related ground displacements. Thus, the screening investigation should identify nearby free faces (cut slopes, streambanks, and shoreline areas), whether on or off-site, to determine whether lateral spreading and related ground displacements might pose a hazard to the project. If such features are found, the quantitative evaluation of liquefaction usually will be warranted because of potential life-safety concerns.

Even when it is not possible to demonstrate the absence of potentially liquefiable soils or prove that such soils are not and will not become saturated, it may be possible to demonstrate that any potential liquefaction hazards can be adequately mitigated through a simple strengthening of the foundation of the structure, as described in the mitigation section of this chapter, or other appropriate methods.

If the screening evaluation indicates the presence of potentially liquefiable soils, either in a saturated condition or in a location which might subsequently become saturated, then the resistance of these soils to liquefaction and/or significant loss of strength due to cyclic pore pressure generation under seismic loading should be evaluated. If the screening investigation does not conclusively eliminate the possibility of liquefaction hazards at a proposed project site (a factor of safety of 1.5 or greater), then more extensive studies are necessary.

A number of investigative methods may be used to perform a screening evaluation of the resistance of soils to liquefaction. These methods are somewhat approximate, but in cases wherein liquefaction resistance is very high (e.g., when the soils in question are very dense) then these methods may, by themselves, suffice to adequately demonstrate sufficient level of liquefaction resistance, eliminating the need for further investigation. It is emphasized that the methods described in this section are more approximate than those discussed in the quantitative evaluation section, and so require very conservative application.

Methods that satisfy the requirements of a screening evaluation, at least in some situations, include:

- Direct in-situ relative density measurements, such as the ASTM D 1586-92 (Standard Penetration Test [SPT]) or ASTM D3441-94 (Cone Penetration Test [CPT]).
- 2. Preliminary analysis of hydrologic conditions (e.g., current, historical and potential future depth(s) to subsurface water). Current groundwater level data, including perched water tables, may be obtained from permanent wells, driller's logs and exploratory borings. Historical groundwater data can be found in reports by various government agencies, although such reports often provide information only on water from production zones and ignore shallower water.
- Non-standard penetration test data. It should be noted that correlation of nonstandard penetration test results (e.g., sampler size, hammer weight/drop, hollow stem auger) with SPT resistance is very approximate, and so requires

very conservative interpretation, unless direct SPT and non-standard test comparisons are made at the site and in the materials of interest.

- 4. Geophysical measurements of shear-wave velocities.
- 5. "Threshold strain" techniques represent a conservative basis for screening of some soils and some sites (National Research Council, 1985). These methods provide only a very conservative bound for such screening, however, and so are conclusive only for sites where the potential for liquefaction hazards is very low.

4.1.1 Quantitative Evaluation of Liquefaction Resistance

Liquefaction investigations are best performed as part of a comprehensive investigation. These Guidelines are to promote uniform evaluation of the resistance of soil to liquefaction.

4.1.1.1 Detailed Field Investigations

Engineering geologic investigations should determine:

- 1. The presence, texture (e.g., grain size), and distribution (including depth) of unconsolidated deposits;
- The age of unconsolidated deposits, especially for Quaternary Period units (both Pleistocene and Holocene Epochs);
- 3. Zones of flooding or historic liquefaction; and,
- 4. The groundwater level to be used in the liquefaction analysis, based on data from well logs, boreholes, monitoring wells, geophysical investigations, or available maps. Generally, the historic high groundwater level should be used unless other information indicates a higher or lower level is appropriate.

The engineering geologic investigations should reflect relative age, soil classification, three-dimensional distribution and general nature of exposures of earth materials within the area. Surficial deposits should be described as to general characteristics (including environment of deposition) and their relationship to present topography and drainage. It may be necessary to extend the mapping into adjacent areas. Geologic cross sections should be constrained by boreholes and/or trenches when available.

4.1.1.2 Geotechnical Field Investigation

The vast majority of liquefaction hazards are associated with sandy and/or silty soils. For such soil types, there are at present two approaches available for quantitative evaluation of the soil's resistance to liquefaction. These are: (1) correlation and analyses based on in-situ Standard Penetration Test (SPT) (ASTM D1586-92) data, and (2) correlation and analyses based on in-situ Cone Penetration Test (CPT) (ASTM D3441-94) data. Both of these methods have some relative advantages. Either of these methods can suffice by itself for some site conditions, but there is also considerable advantage to using them jointly.

Seed and others (1985) provide guidelines for performing "standardized" SPT, and also provide correlations for conversion of penetration resistance obtained using most of the common alternate combinations of equipment and procedures in order to develop equivalent "standardized" penetration resistance values $(N_1)_{60}$. These "standardized" penetration resistance values can then be used as a basis for evaluating liquefaction resistance.

SPT Advantages	CPT Advantages
Retrieves a sample. This permits	Provides continuous penetration
identification of soil type with certainty,	resistance data, as opposed to averaged
and permits evaluation of fines content	data over discrete increments (as with
(which influences liquefaction	SPT), and so is less likely to "miss" thin
resistance). Note that CPT provides poor	layers and seams of liquefiable material.
resolution with respect to soil	
classification, and so usually requires	
some complementary borings with	
samples to more reliably define soil types	
and stratography.	
Liquefaction resistance correlation is	Faster and less expensive than SPT, as no
based primarily on field case histories,	borehole is required.
and the vast majority of the field case	
history database is for in-situ SPT data.	

Table 4.1 Comparative advantages of SPT and CPT methods

Cone penetration test (CPT) tip resistance (q_c) may also be used as a basis for evaluation of liquefaction resistance, by either (a) direct empirical comparison between q_c data and case histories of seismic performance (Olsen, 1988), or (b) conversion of qc-values to "equivalent" (N_1)₆₀-values and use of correlations between (N_1)₆₀ data and case histories of seismic performance. At present, Method (b), conversion of q_c to equivalent (N_1)₆₀, is preferred because the field case history data base for SPT is well-developed compared to CPT correlations. A number of suitable correlations between q_c and (N_1)₆₀ are available (e.g., Robertson and Campanella, 1985; Seed and De Alba, 1986). These types of conversion correlations depend to some extent on knowledge of soil characteristics (e.g., soil type, mean particle size (D_{50}), fines content). When the needed soil characteristics are either unknown or poorly defined, then it should be assumed that the ratio

$$\frac{q_c \left(kg \,/\, cm^2\right)}{N \left(blows \,/\, feet\right)} \tag{4.1}$$

is approximately equals to 5 for conversion from q_c to "equivalent" N-values.

4.1.1.3 Geotechnical Laboratory Testing

The use of laboratory testing (e.g., cyclic triaxial, cyclic simple shear, cyclic torsional tests) on "undisturbed" soil samples as the sole basis for the evaluation of in-situ liquefaction resistance is not recommended, as unavoidable sample disturbance and/or sample densification during reconsolidation prior to undrained cyclic shearing causes a largely unpredictable, and typically unconservative, bias to such test results. Laboratory testing is recommended for determining grain-size distribution (including mean grain size D_{50} , effective grain size D_{10} , and percent passing #200 sieve), unit weights, moisture contents, void ratios, and relative density.

In addition to sandy and silty soils, some gravelly soils are potentially vulnerable to liquefaction (Evans and Fragasy, 1995, Evans and Zhou, 1995). Most gravelly soils drain relatively well, but when their voids are filled with finer particles, or they are surrounded (or "capped") by less pervious soils, drainage can be impeded and they may be vulnerable to liquefaction. Gravelly soils tend to be deposited in a more turbulent environment than sands or silts, and are fairly dense, and so are generally resistant to liquefaction. Accordingly, conservative "preliminary evaluation" methods (e.g., geologic assessments and/or shear-wave velocity measurements) often

suffice for evaluation of their liquefaction potential. When preliminary evaluation does not suffice, more accurate quantitative methods must be used. Unfortunately, neither SPT nor CPT provides reliable penetration resistance data in soils with high gravel content, as the large particles impede these small-diameter penetrometers. At present, the best available technique for quantitative evaluation of the liquefaction resistance of coarse, gravelly soils involves correlations and analyses based on in-situ penetration resistance measurements using the very large-scale Becker-type Hammer system (Harder, 1988).

4.1.2 Evaluation of Potential Liquefaction Hazards

The factor of safety for liquefaction resistance has been defined as:

Factor of Safety =
$$\frac{CSR_{liq}}{CSR_{eq}}$$
 (4.2)

Where CSR_{eq} is the cyclic stress ratio generated by the anticipated earthquake ground motions at the site, and CSR_{liq} is the cyclic stress ratio required to generate liquefaction (Seed and Idriss, 1982). For the purposes of evaluating the results of a quantitative assessment of liquefaction potential at a site, a factor of safety against the occurrence of liquefaction greater than about 1.3 can be considered an acceptable level of risk. This factor of safety assumes that high-quality, site-specific penetration resistance and geotechnical laboratory data were collected, and that ground-motion data from DMG (Petersen and others, 1996) were used in the analyses. If lower factors of safety are calculated for some soil zones, then an evaluation of the level (or severity) of the hazard associated with potential liquefaction of these soils should be made.

Such hazard assessment requires considerable engineering judgment. The following is, therefore, only a guide. The assessment of hazard associated with potential liquefaction of soil deposits at a site must consider two basic types of hazard:

- 1. Translational site instability (sliding, edge failure, lateral spreading, flow failure, etc.) that potentially may affect all or large portions of the site; and
- More localized hazard at and immediately adjacent to the structures and/or facilities of concern (e.g., bearing failure, settlement, localized lateral movements).

As Bartlett and Youd (1995) have stated: "Two general questions must be answered when evaluating the liquefaction hazards for a given site:

- 1. "Are the sediments susceptible to liquefaction?"; and
- "If liquefaction does occur, what will be the ensuing amount of ground deformation?""

4.2 Eurocode 8 (prEN 1998-1:2003 & prEN 1998-5:2003)

EN 1998 applies to the design and construction of buildings and civil engineering works in seismic regions. Its purpose is to ensure that in the event of earthquakes:

- 1. Human lives are protected;
- 2. Damage is limited; and
- 3. Structures important for civil protection remain operational.

The random nature of the seismic events and the limited resources available to counter their effects are such as to make the attainment of these goals only partially possible and only measurable in probabilistic terms. The extent of the protection that can be provided to different categories of buildings, which is only measurable in probabilistic terms, is a matter of optimal allocation of resources and is therefore expected to vary from country to country, depending on the relative importance of the seismic risk with respect to risks of other origin and on the global economic resources.

4.2.1 General Rules, Seismic Actions and Rules for Buildings

4.2.1.1 Identification of Ground Types

Ground types A, B, C, D, and E, described by the stratigraphic profiles and parameters given in Table 4.2 and described hereafter, may be used to account for the influence of local ground conditions on the seismic action. This may also be done by additionally taking into account the influence of deep geology on the seismic action.

Table 4.2	Ground	Types
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Ground Type	Description of Stratigraphic Profile		Parameters	
		vs ₃₀	N _{SPT}	Cu
		(m/s)	(blows/30cm)	(kPa)
А	Rock or other rock-like geological	>800	-	-
	formation, including at most 5 m of			
	weaker material at the surface.			
В	Deposits of very dense sand, gravel, or	360-	>50	>250
	very stiff clay, at least several tens of	800		
	meters in thickness, characterized by a			
	gradual increase of mechanical			
	properties with depth.			
С	Deep deposits of dense or	180-	15-50	70-
	medium/dense sand, gravel or stiff clay	360		250
	with thickness from several tens to			
	many hundreds of metres.			
D	Deposits of loose-medium cohesionless	<180	<15	<70
	soil (with or without some soft cohesive			
	layers), or of predominantly soft-to-firm			
	cohesive soil.			
E	A soil profile consisting of a surface			
	alluvium layer with vs values of type C			
	or D and thickness varying between			
	about 5 m and 20 m, underlain by stiffer			
	material with vs > 800 m/s.	100		10.00
\mathbf{S}_1	Deposits consisting, or containing a	<100	-	10-20
	layer at least 10 m thick, of soft			
	(DI > 40) and high water content			
~	(P1 > 40) and high water content			
S_2	Deposits of liquefiable soils, of			
	sensitive clays, or any other soil profile			
	not included in types $A - E$ or SI			

4.2.1.2 Potentially Liquefiable Soils

A decrease in the shear strength and/or stiffness caused by the increase in pore water pressures in saturated cohesionless materials during earthquake ground motion, such as to give rise to significant permanent deformations or even to a condition of nearzero effective stress in the soil, shall be hereinafter referred to as liquefaction.

An evaluation of the liquefaction susceptibility shall be made when the foundation soils include extended layers or thick lenses of loose sand, with or without silt/clay fines, beneath the water table level, and when the water table level is close to the ground surface. This evaluation shall be performed for the free-field site conditions (ground surface elevation, water table elevation) prevailing during the lifetime of the structure.

Investigations required for this purpose shall as a minimum include the execution of either in situ Standard Penetration Tests (SPT) or Cone Penetration Tests (CPT), as well as the determination of grain size distribution curves in the laboratory.

For the SPT, the measured values of the blowcount N_{SPT} , expressed in blows/30 cm, shall be normalized to a reference effective overburden pressure of 100 kPa and to a ratio of impact energy to theoretical free-fall energy of 0,6. For depths of less than 3 m, the measured N_{SPT} values should be reduced by 25%.

Normalization with respect to overburden effects may be performed by multiplying the measured N_{SPT} value by the factor $(100/\sigma'_{vo})^{1/2}$, where σ'_{vo} (kPa) is the effective overburden pressure acting at the depth where the SPT measurement has been made, and at the time of its execution. The normalization factor $(100/\sigma'_{vo})^{1/2}$ should be taken as being not smaller than 0.5 and not greater than 2.

Energy normalizations requires multiplying the blowcount value obtained by the factor ER/60, where ER is one hundred times the energy ratio specific to the testing equipment.

For buildings on shallow foundations, evaluation of the liquefaction susceptibility may be omitted when the saturated sandy soils are found at depths greater than 15 m from ground surface.

The liquefaction hazard may be neglected when $\alpha \cdot S < 0.15$ and at least one of the following conditions is fulfilled:

- 1. The sands have a clay content greater than 20% with plasticity index PI > 10;
- 2. The sands have a silt content greater than 35% and, at the same time, the SPT blowcount value normalized for overburden effects and for the energy ratio $N_{1(60)} > 20$;
- 3. The sands are clean, with the SPT blowcount value normalized for overburden effects and for the energy ratio $N_{1(60)} > 30$.

If the liquefaction hazard may not be neglected, it shall as a minimum be evaluated by well-established methods of geotechnical engineering, based on field correlations between in situ measurements and the critical cyclic shear stresses known to have caused liquefaction during past earthquakes.

Empirical liquefaction charts illustrating the field correlation approach under level ground conditions applied to different types of in situ measurements are given in Annex B. In this approach, the seismic shear stress τ_e , may be estimated from the simplified expression:

$$\tau_e = 0.65 \alpha S \sigma_{vo} \tag{4.3}$$

Where σ_{vo} is the total overburden pressure, S is the soil factor and α is the ratio of the design ground acceleration on type A ground, a_g , to the acceleration of gravity g. This expression may not be applied for depths larger than 20 m.

Ground Type	S
А	1.00
В	1.20
С	1.15
D	1.35
Е	1.40

 Table 4.3 Soil parameter values

If the field correlation approach is used, a soil shall be considered susceptible to liquefaction under level ground conditions whenever the earthquake-induced shear stress exceeds a certain fraction λ of the critical stress known to have caused liquefaction in previous earthquakes. The value ascribed to λ for use in a Country may be found in its National Annex. The recommended value is $\lambda = 0.8$, which implies a safety factor of 1.25.

4.3 Turkish Code for Structures to be Built in Disaster Areas

The objective of this Part of the Specification is to define the minimum requirements for the earthquake resistant design and construction of buildings and building-like of structures or their parts subjected to earthquake ground motion.

The general principle of earthquake resistant design to this Specification is to prevent structural and non-structural elements of buildings from any damage in low intensity earthquakes; to limit the damage in structural and non-structural elements to repairable levels in medium-intensity earthquakes, and to prevent the overall or partial collapse of buildings in high-intensity earthquakes in order to avoid the loss of life.

4.3.1 Determination of Soil Conditions

4.3.1.1 Soil Groups and Local Site Classes

Soil groups and local site classes to be considered as the bases of determination of local soil conditions are given in Table 4.4 and Table 4.5, respectively. Values of soil parameters in Table 4.4 are to be considered as standard values given for guidance only in determining the soil groups.

Soil investigations based on appropriate site and laboratory tests are mandatory to be conducted for below given buildings with related reports prepared and attached to design documents. Soil groups and local site classes to be defined in accordance with Table 4.4 and Table 4.5 shall be clearly indicated in reports.

Soil	Description of Soil Group	Stand.	Relative	Unconf.	Shear
Group		Penetr.	Density	Compres.	Wave
		(N/30)	(%)	Strength	Velocity
A	1. Massive volcanic rocks, unweathered sound metamorphic rocks, stiff	-	-	>1000	>1000
	2. Very dense sand, gravel	>50 >32	85-100 -	- >400	>700 >700
	3. Hard clay, silty lay				
В	1. Soft volcanic rocks such as tuff and agglomerate, weathered cemented sedimentary rocks with planes	-	-	500-1000	700-1000
	of discontinuity				
	2. Dense sand, gravel	30-50	65-85	-	400-700
	3. Very stiff clay, silty clay	16-32	-	200-400	300-700
С	1. Highly weathered soft metamorphic rocks and cemented sedimentary rocks with planes of discontinuity	-	-	<500	400-700
	2. Medium dense sand and gravel	10-30	35-65	-	200-400
	3. Stiff clay, silty clay	8-16	-	100-200	200-300
D	1. Soft, deep alluvial layers with high water table	-	-	-	<200
	2. Loose sand	<10	<35	-	<200
	3 . Soft clay, silty clay	<8	-	<100	<200

Table 4.4 Soil Groups

Regarding the buildings outside the scope of given above, in the first and second seismic zones, available local information or observation results shall be included or published references shall be quoted in the seismic analysis reports to identify the soil groups and local site classes in accordance with Table 4.4 and Table 4.5.

In the first and second seismic zones, horizontal bedding parameters as well as horizontal and vertical load carrying capacities of piles under seismic loads in Group (C) and (D) soils according to Table 4.4 shall be determined on the basis of soil investigations including in-situ and laboratory tests.

Local Site Class	Soil Group According to Table 4.4 and
	Topmost Layer Thickness
Z1	Group (A) Soils
	Group (B) Soils with $h_1 \le 15 \text{ m}$
Z2	Group (B) Soils with $h_1 > 15$ m
	Group (C) Soils with $h_1 \le 15 \text{ m}$
Z3	Group (C) Soils with 15 m $<$ h ₁ \le 50 m
	Group (D) Soils with $h_1 \le 10 \text{ m}$
Z4	Group (C) Soils with $h_1 > 50$ m
	Group (D) Soils with $h_1 > 10 \text{ m}$

Table 4.5

4.3.1.2 Investigation of Liquefaction Potential

In all seismic zones, Group (D) soils according to Table 4.4 with water table less than 10 m from the soil surface shall be investigated and the results shall be documented to identify whether the liquefaction potential exists, by using appropriate analytical methods based on in-situ and laboratory tests.

4.4 Japanese Design Specifications for Highway Bridges (Part V. Seismic Design)

4.4.1 Evaluation of Sandy Soils with Potential to Develop Soil Liquefaction

4.4.1.1 Sandy Soil Layers Requiring Liquefaction

In principle, a liquefaction assessment of an alluvial saturated sandy soil layer characterized by the three following conditions shall be performed as specified in 4.4.1.2, because during an earthquake, it might liquefy, effecting a bridge.

- 1. The ground water level is less than 10 m from the surface of the ground at the site, and there is a saturated soil layer at a depth less than 20 m from the surface of the ground at the site.
- A soil layer with a fine-grained fraction FC of 35% or less, or a soil layer with a plasticity index I_p of less than 15, even if the fine-grained fraction is higher than 35%.
- A soil layer with a mean grain diameter D₅₀ less than 10 mm, and a 10% grain diameter D₁₀ of 1 mm or less.

4.4.1.2 Liquefaction Assessment:

For soil layers that require a liquefaction assessment in accordance with the provision in 4.4.1.1, the resistance ratio F_L against liquefaction shall be calculated by equation (4.4), and it shall be assumed that any layer for which this value is 1.0 or less will liquefy.

$$F_L = R/L \tag{4.4}$$

$$R = c_w \cdot R_L \tag{4.5}$$

$$L = r_d . k_{hc} . \frac{\sigma_v}{\sigma'_v}$$
(4.6)

$$r_d = 1.0 - 0.015x \tag{4.7}$$

$$\sigma_{v} = \{\gamma_{t1} \cdot h_{w} + \gamma_{t2} (x - h_{w})\} / 10$$
(4.8)

$$\sigma'_{v} = \{\gamma_{t1}.h_{w} + \gamma'_{t2}(x - h_{w})\}/10$$
(4.9)

(For Type I earthquake motion):

$$c_w = 1.0$$
 (4.10)

(For Type II earthquake motion):

$$c_{w} = \begin{cases} 1.0 & (RL \le 0.1) \\ 3.3RL + 0.67 & (0.1 < RL \le 0.4) \\ 2.0 & (0.4 < RL) \end{cases}$$
(4.11)

Where,

FC: Fine-grained fraction (%). (Transit weight percentage of the soil grains with a diameter less than 75 μ m)

I_p: Plasticity index

D₅₀: Mean grain diameter (mm)

D₁₀: 10% grain diameter (mm)

F_L: Resistance ratio against liquefaction

R: Dynamic shear strength ratio

L: Shear stress ratio during an earthquake

rw: Modification factor based on earthquake motion properties

R_L: Cyclic triaxial strength ratio, it shall be found as specified in Chapter 4.4.1.3

r_d: Reduction coefficient in the depth direction of the shear stress ratio during an earthquake

k_{hc}: Design lateral force coefficient used with the ductility design method

 σ_v : Total overburden pressure (kgf/cm²)

 $\sigma v'$: Effective overburden pressure (kgf/cm²)

x: Depth from the ground surface (m)

 γ_{t1} : Unit weight (tf/m³) of the soil shallower than the ground water level

 γ_{t2} : Unit weigh (tf/m³) of the soil deeper than the ground water level

 γ'_{t2} : Effective unit weight (tf/m³) of the soil deeper than the ground water level

h_w: Depth of the ground water level(m)

The following has been determined based on the results of research conducted since the Niagata Earthquake and is supplemented by analysis of cases resulting from the Hyogo-ken Nanbu Earthquake.

The stipulations in the provisions for soil layers requiring liquefaction assessment are based on the following grounds:

- Almost all past cases of liquefaction during earthquake occurred in alluvial sandy layers. But because liquefaction has occurred in soil layers other than alluvial sandy layers during the Hyogo-ken Nanbu Earthquake and other recent earthquakes, the range of soil layers requiring liquefaction assessment has been reviewed as described below.
- 2. The depth of the soil layers was set as within 20 m of the ground surface in light of past experience and the degree of its effects on structures.
- 3. As the lower limit of the grain size of a soil layer that requires liquefaction assessment, the earlier Seismic Design Specifications (February 1990) stipulated a minimum mean grain size D₅₀ of 0.02 mm, but in response to the results of recent research, the limit is now stipulated as stated in the provision. In past cases, most layers found to have liquefied had a fine-grained fraction FC of less than 35%, but because liquefaction has also occurred in soil layers with an FC value over 35% but a low plasticity index, low plasticity silly soil for example, the assessment standards are now as stipulated in the above provision. Consequently, if the FC is less thin 35%, liquid and plasticity limit testing need not be performed.
- 4. As the upper limit of the grain size of a soil layer that requires liquefaction assessment, the earlier Seismic Design Specifications (February 1990) stipulated a maximum mean grain diameter D_{50} of 2 mm, but because observations of the effects of recent earthquakes including the Hyogo-ken Nanbu Earthquake have revealed liquefaction of gravely soil with a mean diameter higher than 2 mm. the upper limit has been revised as stipulated in the above provision. But the grain diameter indicated here shall be a value obtained by means of grain size analysis of specimens obtained by means of standard penetration testing. Standard penetration test specimens have a finer grain size than the in-situ material as a consequence of the effect of crushing

of their grains. The extent of this difference is not necessarily a uniform relationship because of variations in the hardness or coarseness of the grains, but a moan grain diameter of 10 mm in a specimen obtained by standard penetration testing roughly corresponds to in-situ material with a mean grain diameter of about 20 mm or more. The 10% grain diameter D_{10} , was set at max. 1 mm to account for the tact that the permeability of coarse gravelly soil with a low uniformity coefficient is high, and such soil resists liquefaction. Sandy soil and gravelly soil shall be distinguished by determining if the mean grain diameter D_{50} is less than 2 mm or is greater than 2 mm.

5. There has not been confirmed case of liquefaction of diluvial soil caused by any past earthquake, including the Hyogo-ken Nanbu Earthquake. Because the N value of diluvial soil is generally high and, as a result of diagenesis, its resistance to liquefaction is also high and there is small probability of the liquefaction of diluvial soil. But because in some regions, there is diluvial soil with a low N value or that which has lost its diagenesis ability, such diluvial soil should be the object of liquefaction assessments.

It stipulates that liquefaction assessments shall be performed for Type I and Type II earthquake motion used for the ductility design method. Because the cyclic triaxial strength ratio R_L fluctuates widely according to the cyclic properties of earthquake motion, it shall be corrected by equations (4.10) and (4.11) depending on whether it is Type I or Type II earthquake motion.

4.4.1.3 Cyclic Triaxial Strength Ratio

Cyclic triaxial strength ratio R_L shall be calculated by equation (4.12).

$$R_{L} = \begin{cases} 0.0882\sqrt{N_{a}/1.7} & (Na < 14) \\ 0.0882\sqrt{N_{a}/1.7} + 1.6 \times 10^{-6} (N_{a} - 14)^{4.5} & (14 \le N_{a}) \end{cases}$$
(4.12)

Where,

Sandy soil case:

$$N_a = c_1 \cdot N_1 + c_2 \tag{4.13}$$

$$N_1 = 1.7N / (\sigma'_v + 0.7) \tag{4.14}$$

$$c_{1} = \begin{cases} 1 & (0\% \le FC < 10\%) \\ (FC + 40)/50 & (10\% \le FC < 60\%) \\ FC/20 - 1 & (60\% \le FC) \end{cases}$$
(4.15)

$$c_{2} = \begin{cases} 0 & (0\% \le FC < 10\%) \\ (FC - 10)/18 & (10\% \le FC) \end{cases}$$
(4.16)

Gravelly soil case:

$$N_a = \{1 - 0.36 \log_{10}(D_{50}/2)\}N_1$$
(4.17)

Where,

R_L: Cyclic triaxial strength ratio.

N: N value obtained from standard penetration testing.

 N_1 : N value converted to correspond to effective overburden pressure of 1 kgf/cm².

N_a: Corrected N value to accounting for the effects of grain size.

c₁, c₂: Modification factor of the N value based on the fine-grained fraction.

FC: Fine-grained fraction (%). (Transit weight percentage of the soil grains with a diameter less than 75 μ m).

D₅₀: Mean grain diameter (mm).

It is stipulated that the equation used to compute the cyclic triaxial strength ratio R_L as stipulated in the provision shall be found by distinguishing sandy soil from gravelly soil based cm the results of laboratory undrained cyclic (triaxial testing using frozen undisturbed specimens and on the results of analysis of cases including those observed after the Hyogo-ken Nanbu Earthquake.

In the earlier Seismic Design Specifications (February 1990), the cyclic triaxial strength ratio was evaluated by supplementing the strength ratio obtained from the N value with the correction term of the strength ratio obtained from the mean grain diameter D_{50} and the fine-grained traction FC respectively, but under this specification, the effects of the grain size of sandy soil shall be evaluated by correcting the N value based on the fine-grained fraction FC. This change was made for the following reasons:

- Concerning the effects on the cyclic triaxial strength ratio of the grain size properties of soil, it has been conduced that in sandy soil that is relatively fine-grained, the effects of grain size may be evaluated based on its finegrained fraction FC.
- 2. A method accounting for the effects of grain size as an increment of the JV value provides a relatively higher fine-grained fraction and permits more appropriate evaluation of the strength of soil with a high N value than the method accounting for the effects of the grain size as the increment of the cyclic triaxial strength ratio.

Penetration testing to measure the N value should be performed based on the free drop method which results in the loss of little energy at the moment of impact. And because with equation (4.16), the N value of gravelly soil is measured a little high under the effects of the existence of gravel, the N value that has been obtained shall be reduced in accordance with the mean grain diameter D_{50} to evaluate the cyclic triaxial strength ratio. But because little data of this kind has been accumulated for gravelly soil and because the correction method presented in equation (4.16) is not fully reliable, the assessment may be done in another manner.

It has been argued that the cyclic triaxial strength ratio of soil in reclaimed land is lower than the value obtained by equation (4.12), but because insufficient data is available and differences between its strength properties and those of alluvial soil have not been clarified, this specification has not established special provisions governing soil in reclaimed land. More survey and research work must be conducted in this area.

On river beds and at other locations where the water level is above the surface of the ground, the total overburden pressure and the effective overburden pressure shall be found treating the ground water level as the surface of the ground. This is stipulated because water, which does not transmit shear force, does not act as an external force against the ground during an earthquake and because the load of the water above the ground surface, does not contribute to an increase in the effective overburden pressure.

But when considered particularly necessary, the most up-to-date detailed ground exploration and testing at the site, laboratory soil properties testing, and response

analysis of the ground may be performed to assess liquefaction potential with reference to existing data.

5. ANALYSES

Below, it can be find a typical evaluation of the potential for liquefaction to occur by comparing equivalent measures of earthquake loading and liquefaction resistance of the SPT Log A-2, investigated at Adapazarı region according to the codes mentioned above. The most common approach to characterization of earthquake loading is through the use of cyclic shear stresses. The potential for liquefaction evaluated, by obtaining the data for SPT logs from the web address http://peer.berkeley.edu/turkey/adapazari/phase1/index.html at first. Then, degree of saturation (S), dry unit weight (γ_{dry}) and void ratio (e) values are assigned for the soil profiles. Bulk unit weight (γ_{bulk}) and (γ_n) values are calculated. After that, σ_{vo} and σ_{vo} ' values are calculated respectively. Then, the necessary SPT (N) corrections are made according to the related code. The liquefaction potential is evaluated by comparing the earthquake loading (CSR) with the liquefaction resistance (CRR); this is usually expressed as a factor of safety against liquefaction, FS = CRR / CSR. A factor of safety greater than the values stated in the codes indicates that the liquefaction resistance exceeds the earthquake loading, and therefore that liquefaction would not be expected.

In Appendix A, it can be find the evaluation of the potential for liquefaction of 30 field logs investigated at that region, according to the 4 code mentioned above. Appendix B shows the maps and locations of the investigated field logs.

able 5.1 L	iquefa	totion Analyses of SPT	LogA	-2 Act	cordin	lg to (Californi	ian Code												
st ID	Depth (m)	Layer Description	h (m)	e	s	rr (γ _{dry} kN/m ³)	γ _{bulk} (kN/m ³)	γ_n (kN/m ³)	σ (kN/m²)	σ' (kN/m²)	SPT (N)	C	$\mathbf{C}_{\mathbf{R}}$	(N ₁) ₆₀	CRR _{7.5}	$\mathbf{r}_{\mathbf{D}}$	CSR	Fs	End Condition
T A-2	1,00	Fill	1,00	0,90	0,25		13,50	25,65	14,66	14,66	14,66									
	2,40	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	1,40	1,00	1,00	33	12,00	24,00	16,91	38,33	24,59	4	2,03	0,73	9	0,06	96'0	0,36	0,17	
	4,20	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	1,80	1,20	1,00	50	13,00	28,60	18,35	71,36	39,97	7	1,59	0,80	e	0,02	0,97	0,40	0,06	
	4,60	ML: Brown/gray clayey silt with traces of fine sand	0,40	0,40	1,00	35	19,00	26,60	21,80	80,08	44,77	7	1,50	0,82	6	0,09	0,96	0,40	0,24	
	6,80	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	2,20	0,60	1,00	47	17,00	27,20	20,68	125,57	68,68	3	1,21	0,91	c	0,03	0,95	0,40	0,08	
	8,00	ML: Gray clayey silt with some fine sand	1,20	0,40	1,00	39	19,00	26,60	21,80	151,74	83,07	10	1,10	0,96	11	0,12	0,94	0,40	0,30	
	10,20	SP-SM: Poorly graded gray fine sand with silt. Gravel content ∼ 8% in sample S-A2- 10	2,20	0,60	1,00		16,00	25,60	19,68	195,03	104,78	26	0,98	1,00	26	0,28	06,0	0,39	0,71	Liquefaction

	End Condition		1	,		,		Liquefaction
	$\mathbf{F}_{\mathbf{S}}$		0,13	0,04	0,21	0,05	0,22	0,67
	CSR		0,49	0,56	0,56	0,57	0,57	0,50
	Soil Factor		1.35	1.35	1.35	1.35	1.35	1.15
	CRR _{7.5}		0,06	0,02	0,12	0,03	0,13	0,33
	(N ₁) ₆₀		9	e	10	4	11	25
	CER		1,00	1,00	1,00	1,00	1,00	1,00
	C_N		2,02	1,58	1,49	1,21	1,10	0,98
	N _{SPT}		ŝ	7	7	3	10	26
	SPT (N)		4	7	7	3	10	26
	σ' (kN/m²)	14,66	24,59	39,97	44,77	68,68	83,07	104,78
	σ (kN/m²)	14,66	38,33	71,36	80,08	125,57	151,74	195,03
	γ _n (kN/m ³)	14,66	16,91	18,35	21,80	20,68	21,80	19,68
ocode 8	$\gamma_{\rm bulk} \\ (kN/m^3)$	25,65	24,00	28,60	26,60	27,20	26,60	25,60
ng to Eur	$\gamma_{dry} \\ (kN/m^3)$	13,50	12,00	13,00	19,00	17,00	19,00	16,00
cordi	s	0,25	1,00	1,00	1,00	1,00	1,00	1,00
-2 Ac	e	0,90	1,00	1,20	0,40	0,60	0,40	0,60
Log A	h (m)	1,00	1,40	1,80	0,40	2,20	1,20	2,20
action Analyses of SPT	Layer Description	Fill	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content ∼ 8% in sample S-A2-10
Liquefa	Depth (m)	1,00	2,40	4,20	4,60	6,80	8,00	10,20
Table 5.2	Test ID	SPT A-2					I	

ſ • 5 SPT I • Table 5.2 Liquefaction Analy

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	End Condition					r		Liquefaction
	Fs		0,17	0,06	0,24	0,08	0,30	0,71
	CSR		0,36	0,40	0,40	0,40	0,40	0,39
	r _D		0,98	0,97	0,96	0,95	0,94	06'0
	CRR _{7.5}		0,06	0,02	0,09	0,03	0,12	0,28
	(N ₁) ₆₀		9	m	6	3	11	26
	$\mathbf{C}_{\mathbf{R}}$		0,73	0,80	0,82	0,91	0,96	1,00
	$\mathbf{C}_{\mathbf{N}}$		2,03	1,59	1,50	1,21	1,10	0,98
	SPT (N)		4	0	2	ŝ	10	26
	σ' (kN/m²)	14,66	24,59	39,97	44,77	68,68	83,07	104,78
	σ (kN/m²)	14,66	38,33	71,36	80,08	125,57	151,74	195,03
	γ _n (kN/m ³)	14,66	16,91	18,35	21,80	20,68	21,80	19,68
Code	γ _{bulk} (kN/m ³)	25,65	24,00	28,60	26,60	27,20	26,60	25,60
o Turkish	$\gamma_{dry} \\ (kN/m^3)$	13,50	12,00	13,00	19,00	17,00	19,00	16,00
ding t	TT	-	0 33	0 50	0 35	0 47	39	'
ccor	S	0,2	0 1,0	1,00	1,0	1,00	1,00	1,00
A-2 A	<u>و</u>	0,9(1,00	1,20	0,4(0,6(0,4(0,6(
Log	h (m)	1,00	1,40	1,80	0,40	2,20	1,20	2,20
action Analyses of SP1	Layer Description	Fill	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content \sim 8% in sample S-A2- 10
Liquefa	Depth (m)	1,00	2,40	4,20	4,60	6,80	8,00	10,20
Table 5.3	Test ID	SPT A-2						

defen. E ; SPT I AR A 7 A. 4 Table 5.3 Liquefaction Anal

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	End Condition							No Liquefaction
	FL		1,23	0,69	14,93	0,77	10,90	1,13
	Г		0,35	0,39	0,39	0,38	0,37	0,37
	rd		0,96	0,94	0,93	06'0	0,88	0,85
	×		0,43	0,27	5,79	0;30	4,08	0,42
	\mathbf{R}_{L}		0,43	0,27	5,79	0,30	4,08	0,42
	Na		25,34	15,82	42,17	18,86	39,88	24,99
	5		3,89	4,61	4,61	4,83	4,17	0,00
	c1		3,00	3,65	3,65	3,85	3,25	1,00
	SPT (N)		4	7	7	ŝ	10	26
	σ' (kN/m²)	14,66	24,59	39,97	44,77	68,68	83,07	104,78
	σ (kN/m²)	14,66	38,33	71,36	80,08	125,57	151,74	195,03
	γ _n (kN/m ³)	14,66	16,91	18,35	21,80	20,68	21,80	19,68
	γ _{bulk} (kN/m ³)	25,65	24,00	28,60	26,60	27,20	26,60	25,60
ese Code	γ _{dry} (kN/m ³)	13,50	12,00	13,00	19,00	17,00	19,00	16,00
Japan	\mathbf{D}_{50}		0,025	0,001	0,018	0,007	0,026	0,230
ng to	FC		80	93	93	97	85	7
cordi	s	0,25	1,00	1,00	1,00	1,00	1,00	1,00
-2 A	e	0,90	1,00	1,20	0,40	0,60	0,40	0,60
Log A	h (m)	1,00	1,40	1,80	0,40	2,20	1,20	2,20
ction Analyses of SPT	Layer Description	Fill	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content ~ 8% in sample S-A2-10
Liquefa	Depth (m)	1,00	2,40	4,20	4,60	6,80	8,00	10,20
Table 5.4	Test ID	SPT A-2	6				1	

6. CONCLUSION

An attempt has been made in this thesis to point out the importance of the local soil conditions on the ground motion characteristics during earthquakes. It is evident that the degree of structural damages is directly related to the site properties. Therefore, careful consideration should be given to evaluate the significance of this phenomenon. However, even though it appears possible to establish some guidelines and to analyze the effects of various factors, such as bedrock depth, soil types, water table elevation and etc., the result obtained by analytical methods may not yield realistic results due to approximations made in defining the soil stratifications, due to simplifications made in defining soil properties and in modeling soil behavior, due to the assumptions made in defining the assumed earthquake motion in the underlying rock formation, and finally due to the mathematical model selected. This aspect of the deterministic approaches of various forms that may be adopted to evaluate the site condition necessitates the use of sound engineering experience and judgment to achieve realistic results. The numerical analysis performed would yield useful information that should be utilized to supplement a broader study in evaluating the site effects.

It can be seen from the results that with the greatest factor of safety, Californian code is the safest one. However; I believe that, Turkey, which is on the road of joining the EU, should carry out the European regulations for constructions, and especially for the structures that will be built in the disaster areas, the engineers should be loyal to Eurocode 8 (prEN 1998-1:2003 & prEN 1998-5:2003).

During the comparative liquefaction analysis according to Turkish Specification for Structures to be Built in Disaster Areas, Eurocode 8, Japanese and Californian Seismic Codes, it is concluded that, a careful consideration should be given while it has been analyzing and designing of the structures in that region; complementary documents should be added to the missing parts to liquefaction part of the Turkish Specification for Structures to be Built in Disaster Areas and a translation of Eurocode 8 should be made and should be in force in Turkey.

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APPENDIX A

	χ_{r_5} r_p CSR F_S End		8 0,97 0,39 0,21 -	5 0,97 0,39 0,12 -	5 0,96 0,39 0,12 -	3 0,95 0,40 0,08 -) 0,94 0,39 0,52 -	
	(₁) ₆₀ CR		8	5 0,0	0,0	0,0	7 0,2	
	E B		79	81	83	<u> </u>		
	<u>੍</u> ਰੋ		,59 0,	,50 0,	43 0,	5	0 90	
	(N) TY2		e v	4		m m	17	
	σ' (kN/m²)	14.66	40,28	45,08	49,88	69,44	91,03	
	a (kN/m²)	14,66	69,71	78,44	87,16	124,38	163,62	
	γ _n (kN/m ³)	14,66	18,35	21,80	21,80	20,68	21,80	
an Code	Y _{bulk} (kN/m ³)	25,65	28,60	26,60	26,60	27,20	26,60	
California	(kN/m ³)	13.50	13,00	19,00	19,00	17,00	19,00	
ing to	Ľ		15	29	29	S.	30	
ccord	Ś	0,25	1,00	1,00	1,00	1,00	1,00	
A-1 A	ی 	0.0	1,20	0,40	0,40	0,60	0,40	Ś
I Log	р (ш)	1,00	3,00	0,40	0,40	1,80	1,80	
faction Analyses of SP	Layer Description	Fill	CH: Brown, moist, sticky, high plasticity silty clay without visible sand particles. S-A1-4 shows darker tones and some fine to medium sand content	ML: Gray silt with sand. Field description: ML	ML: Brown, Iow plasticity silt with fine sand and some red clay points	CH: High plasticity gray clay with low sand content (traces). At 5.3 m a thin fine sand seam was identified. Sample A1- 7 exhibits some sand seams	ML: Gray sandy silt. Increasing sand content with depth	SP: Medium to fine
Liquel	Depth (m)	1.00	4,00	4,40	4,80	6,60	8,40	
Table A.I	Test ID	SPT A-I		1	LL		L	

End Condition	F	ı	,	F	3		iquefaction
Fs	-	0,17	0,06	0,24	0,08	0,30	0,71 L
CSR		0.36	0,40	0,40	0,40	0,40	0,39
r ₀		86,0	0,97	0,96	0,95	0,94	0,90
CRR _{7.5}		0,06	0,02	0,09	0,03	0,12	0,28
(N ₁) ₆₀		9	n	6	e	1	26
ڗ		0,73	0,80	0,82	16,0	0,96	1,00
C		2,03	1,59	1,50	1,21	1,10	0,98
SPT (N)		4	0	7	ŝ	10	26
α' (kN/m ²)	14,66	24,59	39,97	44,77	68,68	83,07	104,78
σ (kN/m ²)	14,66	38,33	71,36	80,08	125,57	151,74	195,03
γ _n (kN/m ³)	14,66	16,91	18,35	21,80	20,68	21,80	19,68
γ _{bulk} (kN/m ³)	25,65	24,00	28,60	26,60	27,20	26,60	25,60
Y _{dry} (kN/m ³)	13,50	12,00	13,00	19,00	17,00	19,00	16,00
	•	33	20	35	47	39	1
s	0,2;	1,0()0 [°] .	1,00	1,00	1,00	1,00
<u>ی</u>	0,9(1,20	0,40	0,60	0,40	0,60
	1,00	1,40	1,80	0,40	2,20	1,20	2,20
Layer Description	Ell	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content ∼ 8% in sample S-A2- 10
(m)	1,00	2,40	4,20	4,60	6,80	8,00	10,20
Test ID	SPT A-2	******			L	1	

Table A.2 Liquefaction Analyses of SPT Log A-2 According to Californian Code

	End Condition		E	a	No Liquefaction
	Fs		61,0	0,24	1,58
	CSR		0,32	0,36	0,36
	<u> </u>		0,97	0,94	0,93
	CRR _{7.5}		0,06	0,09	0,57
	(N ₁) ₆₀		Q	8	42
	٣		0,78	0,94	66'0
	<u>د</u>		1,56	1,06	1,00
	SPT (N)		ŝ	∞	42
	σ' (kN/m²)	26.39	41,76	89,74	101,58
	σ (kN/m²)	26,39	59,42	146,63	170,25
	γ _n (kN/m ³)	14,66	18,35	21,80	19,68
nian Code	γ _{butk} (kN/m ³)	25,65	28,60	26,60	25,60
o Califori	γ _{dry} (kN/m ³)	13,50	13,00	19,00	16,00
ding (LL) 60	37	I
Accor	ŝ	0,2	1,0(1,0(,
A-3 /	e (0,9(1,2(0,4(0,6(
T Log	h (m	1,80	1,80	4,00	1,20
action Analyses of SP	Layer Description	Fill	CH: Brown, high plasticity silty clay. At about 2 m there is a layer of brown fine sandy silt	ML: Gray low plasticity clayey silt with fine sand.	SAND: Gray poorly graded sand with silt and traces (8%) of fine rounded gravel
Liquef	Depth (m)	1,80	3,60	7,60	8,80
Table A.3	Test ID	SPT A-3			

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	End Condition	•	1	F	3	Liquefaction	No Liquefaction	
	FG.		0,21	0,20	0,30	0,80	1,51	0,29
	CSR		0,37	0,37	0,38	0,38	0,34	0,32
	°,		76,0	76,0	0,94	0,92	0,81	0,76
	CRR _{7.5}		0,08	0,07	0,12	0;30	0,51	0,09
	(N ₁) ₆₀		٢	7	10	28	40	∞
	ర్		0,79	0,81	0,96	-	gining	
	ථ		1,52	1,44	1,08	76,0	0,81	0,77
	SPT (N)		ø	9	10	29	49	11
	σ' (kN/m ²)	17,59	43,74	48,53	87,66	106,85	154,04	171,43
	α (kN/m²)	17,59	71,21	79,93	154,37	189,25	277,64	310,73
0	γ _n (kN/m ³)	14,66	19,15	21,80	20,68	21,80	21,04	20,68
nian Code	Y _{bulk} (kN/m ³)	25,65	27,55	26,60	27,20	26,60	26,10	27,20
to Califor	γ_{dry} (kN/m ³)	13,50	14,50	19,00	17,00	19,00	18,00	17,00
ding.		-	4) 36	(25	ł	69
Accor	<u>~~</u>	0 0,2	<u>0</u>	1,00	<u>0,</u>	1,00	1,00	1,00
A-4	e	6.0	6,0	0,4(0'0	0,4(0,45	0,60
T Log	р р (ш	1,2(2,80	0,40	3,60	1,60	4,20	1,60
action Analyses of SP	Layer Description	II:i	CL: Low to high plasticity, brown silty clay to clayey silt with traces of fine sand. Soil is highly inhomogeneous, showing variable FC	ML: Brown low plasticity silt with traces of fine sand	CL: Low to high plasticity gray silty clay to clayey silt with traces of fine sand	SANDY SILT: Gray low plasticity sandy silt	SAND: Gray poorly to well graded sand with silt. 22% gravel content in S-A4-9, very low (< 5%) in other samples.	CH: Gray, high plasticity stiff clay.
l Liquel	Depth (m)	1,20	4,00	4,40	8,00	9,60	13,80	15,40
Table A.4	Test ID	SPT A-4	- w	 .	********	I		J

÷ ۹ • 1 Table A.4 Liquefaction Analyses of SPT I.

5 Liqu	cfaction Analyses of SP	Log I	-1 V	ccord	ing to	Califorr	ian Code							Ĩ					
Ē Ē	th Layer Description	tı (m)	2	ŝ) TT	(tal/m)	Yheft (kN/m ³)	۲° ((kN/m ³)	σ (kN/m²)	a ^t (kN/m ²)	SPT (N)	ڻ	ڻ	(N ₁) ₆₀	CRR ₁₅	9	CSR	57 57	End Condition
ň) Fill	1.20	06.0	0,25	•	13,50	25.65	14,66	17,59	17.59							1		,
30	CLAYEY SILT: Olive gray clayey silt with traces of fine sand. S- C2-B is gray brown clayey silt. The brown tones may be due to oxidation of ferric minerals	1,80	0,80	1,00	57	16,00	28,80	20,36	54,24	36,58	m	1,66	0,75	4	0,04	0,98	0,34	11'0)
35,5	SAND AND SILT: Brown low plasticity silt to stilty fine stand. FC of recovered samples varies from 14% to 66%	1,50	0,50	1,00	5	17,00	25,50	20,27	84,65	52,27	â	9£,1	0,81	Ŷ	0,12	0,97	0,36	0.32	Liquefaction
05,6	SILTY SAND: Gray sand mixtures grading with depth from sandy sift to sand with silt and sand with silt and sand with silt and sand with silt and sand with silt from coarse gravel. Gravel content is irregularly variable from 72% to 27%. The singe of the gravel particles is variable from flat and elongated to well proportioned angular and rounded	\$°00	0,55	1,00	,	18,00	27,90	2],48	192,05	10,63	5	96'0	00 [°] .	38	OE O	0,92	Ē.	0,81	Liquefaction
2,5(CH: Stiff gray moist high plasticity silty clay. Wash water shows traces of shells.	3,00	09'0	00.1	62	17,00	27,20	20,68	254,09	143,24	×	0,84	1,00	7	0,07	0,84	0,35	0,20	ð
4,2(CLAY AND SAND: Interbedded thin strata of gray silty sand to sandy silt and gray silty clay to clayey silt	1,70	0,45	1,00	27	18,00	26,10	21,04	289,86	162,33	13	0,79	00,1	6	11'0	0,79	0,33	0,32	t.
6,4(CH: Moist gray high plasticity silty clay. Very thin (< 1 cm) red oxidized seams found in S-B1-11	2,20	3,60	1,00	58	17,00	27,20	20,68	335,36	186,25	2	0,74	00,1	σ	0'10	0,74	0,31	0,32	•

ſ		<u> </u>	1	1	
	End Condition	1	1	E Contraction of the second se	Liguefaction
	S. FT		0,10	0,43	0,73
	CSR		0,34	0,35	0,38
	£		0,98	0,97	0,94
	CRR _{7,5}		0,03	0,15	0,27
	(N1)60		4	13	25
	చ్		0,76	0,78	0,98
1	Ů		1,62	1,54	1,02
	SPT (N)		e	-	32
	σ' (kN/m ²)	17,59	38,69	42,88	96,80
	σ (kN/m²)	17,59	58,31	66,42	167,44
	γ _n (kN/m ³)	14,66	20,36	20,27	21,04
	Y _{bulk} (kN/m ³)	25,65	28,80	25,50	26,10
	Y _{dry} (kN/m ³)	13,50	16,00	17,00	18,00
	LL	•	40	37	ł
	s	0,25	1,00	1,00	1,00
	0	0,90	0,80	0,50	0,45
	h (n)	1,20	2,00	0,40	4,80
	Layer Description	Fill	CLAYEY SILT: Brown clayey silt with fine sand and red oxidized zones	SANDY SILT: Gray sandy silt	SAND: Well to poorly graded gray sand. Sand with silt in the upper 2 m of the layer. Gravel content in recovered samples is variable from 0% in S-B2- 7
	Depth (m)	1,20	3,20	3,60	8,40
	Test ID	SPT B-2			

Table A.6 Liquefaction Analyses of SPT Log B-2 According to Californian Code

	End Condition	1	,	iquefaction	iquefaction	P
	E S		0,16	0,86	0,59	0,32
	CSR		0,38	0,39	0,38	0,38
	r _b		76,0	0,95	16'0	16'0
	CRR _{7.5}		0,06	0,34	0,23	0,12
	(N ₁) ₆₀		ę	31	50	
	ڹ		0,81	0,88	1,00	1,00
	్ర		1,50	1,26	66'0	0,97
	SPT (N)		vs	28	20	-
	σ' (kN/m ²)	17,59	44,92	63,75	104,20	106,60
	σ (kN/m ²)	17,59	76,32	112,80	188,56	192,92
	$\gamma_n \\ (kN/m^3)$	14,66	18,35	20,27	21,04	21,80
nian Code	γ _{bulk} (kN/m ³)	25,65	28,60	25,50	26,10	26,60
o Califori	γ _{dry} (kN/m ³)	13,50	13,00	17.00	18,00	19,00
ding t	ГГ	1	48	29	B	32
Accor	Ś	0,2;	1,00	1,00	1,000	1,00
5	е (0,9(1,2(0,5(0,45	0,40
I Log	h (m	1,20	3,20	1,80	3,60	0,20
action Analyses of SP	Layer Description	Fill	CLAY: Brown tan silty clay to clayey silt. Red oxidation points in samples indicating oxidation of ferric minerals	SANDY SILT: Gray low plasticity sandy silt interbedded with gray silty clay with traces of fine sand. Thin gray clay layer at approximately 5.15 m.	SAND: Gray sand to silty sand of variable gradation interspersed with thin layers of silty clay. Variable gravel content in samples S-C1-6B and S-C1-7 (10 % - 20 %)	ML: Gray low plasticity clayey silt with fine sand
Liquef	Depth (m)	1,20	4,40	6,20	9,80	10,00
Table A.7	Test ID	SPT C-1			hannan	L

	SR F _S End Condition	23 0,27 -	44 0,12 -	43 0,21 -	1,15 Liquefaction	11 0,22 -
	L ^D Cč	,00 ,00		<u> </u>	95 0,4	92 0,4
	CRR _{7.5}	0,06 1.	0,05 0,	° 0,09	0,50 0,	60,0
	(N ₁) ₆₀	ę	ŝ	×	39	∞
	٣	0,75	0,81	0,87	0,89	1,00
	Č	2,00	1,57	1,36	1,30	1,03
	SPT (N)		4	۲	34	∞
	σ' (kN/m²)	6,69	40,86	54,57	59,51	95,03
	σ (kN/m²)	6,69	80,10	106,56	116,40	182,34
	γ _n (k/N/m ³)	13,39	18,35	20,36	19,68	21,27
nian Code	γ _{bulk} (kN/m ³)	27,60	28,60	28,80	25,60	27,00
to Californ	γ _{dry} (kN/m ³)	12,00	13,00	16,00	16,00	18,00
ding t	LL	5 40) 57	42	1	40
Accor	s	0 0,22	0 1,0(1,00	00,11
C-2	e ()	1,3	1,2	0,86	0,6(0,5(
T Log	h (m	0,50	4,00	1,30	0,50	3,10
action Analyses of SP	Layer Description	CLAYEY SILT: Dark brown clayey silt with uniform color. Moist, soft consistency.	CLAYEY SILT: Brown clayey silt to high plasticity silty clay. Traces of fine sand	CLAYEY SILT: Olive gray clayey silt with fine sand to sandy silt interbedded with clay seams. Very thin lamination at about 5.25 m.	SW-SM: Well graded gray sand with silt. Approximately 8% gravel content.	CLAYEY SILT: Alternating strata of gray silty clay and clavev silt.
Lique	Depth (III)	0,50	4,50	5,80	6,30	9,40
Table A.8	Test ID	SPT C-2				L

71

	End Condition	1	1	Liquefaction	3	I
	Fs		0,15	0,59	0,35	0,38
	CSR		0,38	0,38	0,38	0,37
	La.		0,96	0,95	0,95	0660
	CRR _{7.5}		0,06	0,22	0,13	0,14
	(N ₁) ₆₀		2.	20	12	12
	Ľ		0,87	0,88	0,92	1,00
	^N		1,26	1,24	1,15	0,95
	SPT (N)		'n	18		13
	σ' (kN/m ²)	17.59	63,84	65,82	76,69	113,36
	σ (kN/m²)	17.59	108,97	112,91	133,59	201,65
	γ _n (kN/m ³)	14,66	19,86	19,68	20,68	21,27
nian Code	γ_{bulk} (kN/m ³)	25,65	26,40	25,60	27,20	27,00
to Californ	γ _{dry} (k/m ³)	13,50	16,00	16,00	17,00	18,00
ding t	<u>LLL</u>	1	43	-		48
Accor	s.	0 0,2	5 1,0	0 1'0	0	0,1,00
C.J	• ()	6.0	0,6	0,6	0,6	0,5(
T Log	h (n	1,2(4,6(0,20	1.00	3,20
action Analyses of SP	Layer Description	Fill	SILT: Brown silt to clayey silt with traces of fine sand interspersed with strata of brown silty sand to sandy silt	SM: Gray silty fine sand	SILTY CLAY: Gray silty clay to clayey silt with some fine sand	CLAY AND SILT: Gray low plasticity silt with sand interbedded with gray high plasticity clay. Red oxidation zone towards the upper towards the upper portion of sample S- C3-6. The clay loses strength when remolded
Liquet	Depth (m)	1,20	5,80	6,00	7,00	10,20
Table A.9	Test ID	SPT C-3				L

c

Table A.1	0 Lique	faction Analyses of S	PT Log	C-4 A	ccord	ling to	Californ	uan Code	دع											
Test ID	Depth (m)	Layer Description	h (m)	ى	Ś	U TT	γ _{άτy} (N/m ³)	Y _{bulk} (kN/m ³)	γ _n (kN/m ³)	σ (kN/m²)	σ' (kN/m ²)	SPT (N)	C	C ^r	N1)60	CRR _{7.5}	°L D	CSR	Fs	End Condition
SPT C-4	1,20	Fill	1,20	0,90	0,25	•	13,50	25,65	14,66	17,59	17,59									1
ferente-na-naratenternaten a	4,80	CLAYEY SILT: Brown silty clay/clayey silt to sandy silt/silty sand	3,60	0,60	1,00	38	17,00	27,20	20,68	92,04	56,72	3	1,34 (,83	ε	0,03	96'0	0,36	0,08	ŀ

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Table A.1	I Lique	sfaction Analyses of SP	T Log	C-5 A	ccord	ling to	Califor.	nian Code	0					:						
Test ID	Depth (m)	Layer Description	h (m)	0	Ś	FT	۲ _{dry} kN/m ³)	Y _{bulk} (kN/m ³)	y _n (kN/m ³)	σ (kN/m ²)	σ' (kN/m²)	SPT (N)	చ్	ت	(N ₁) ₆₀	CRR _{7.5}	r _b	CSR	Fs	End Condition
SPT C-5	2,20	Fill	2,20 1	0,90 (0,25	-	13,50	25,65	14,66	32,26	32,26			1						-
	3,80	CL: Brown silty clay w/ red oxidized zones	1,60	0,90	1,00	44	14,50	27,55	19,15	62,89	47,19	7	1,47	0,78	5	0,02	0,97	0,30	0,07	
	5,80	CL: Gray silty clay	2	0,8	1	45	16	28,8	20,36	103,61	68,29	4	1,22	0,87	4	0,04	0,96	0,34	0,12	
	6,20	SILT: Gray clayey silt	0,40	0,60	1,00	36	18,00	28,80	21,68	112,28	73,04	40	1,18	0,88	42	0,57	0,95	0,34	1,69	-
		SAND: Gray fine to coarse sand with			<u> </u>															
	7,40	traces of gravel. Fine	1,20 (0,45] 1	1,00	,	18,00	26,10	21,04	137,54	86,52	34	1,08	0,93	34	0,38	0,94	0,35	1,10	Liquefaction
		gravel content in S-C5-						•							<u>.</u>					
		7 = 8%																		

Table A.1	12 Lique	faction Analyses of SI	T Log (C-6 A	ccord	ling to	o Califor	nian Code	<i>.</i> ,											
Test ID	Depth (m)	Layer Description	h (n)	9	s	EF	γ _{dry} kN/m ³)	Y _{bulk} (kN/m ³)	γ _n (kN/m ³)	σ (kN/m ²)	σ' (kN/m²)	SPT (N)	ٽ	C	(N ₁) ₆₀	CRR _{7,5}	L ^D	CSR	E.	End Condition
SPT C-6	1,00	11:1	1,00 (0,90	0,25	 ,	13,50	25,65	14,66	14,66	14,66		1							
	2,40	ML: Brown silt to silt with sand w/ red oxidized zones	1,40	0,60	1,00	36	17,00	27,20	20,68	43,61	29,88	7	1,84	0,75	ŵ	0,03	0,98	0,33	0,08	I
	2,60	CH: Brown high plasticity silty clay.	0,20	0,60	1,00	56	17,00	27,20	20,68	47,75	32,05	10	1.78	0,75	13	0,15	0,98	0,34	0,46	B
	3,00	SILTY SAND: Brown silty sand	0,40 (0.50	1,00	36	18,00	27,00	21,27	56,26	36,64	12	1,66	0,75	15	0,17	0,98	0,35	0,50	Liquefaction

	End Condition	*	y	1
	FIS STREET		0,17	0,13
	CSR		0,33	0,36
	r _D		0,98	0,97
	CRR _{1.5}		0,06	0,05
	(N ₁) ₆₀		9	5
	ů		0,75	0,78
	ٽ		1,84	1,50
	SPT (N)		4	4
	σ' (kN/m²)	14,66	29,88	45,09
	σ (kN/m²)	14,66	43,61	72,56
1	γ _n (kN/m ³)	14,66	20,68	20,68
	γ _{bulk} (kN/m ³)	25,65	27,20	27,20
	γ _{dry} (kN/m ³)	13,50	17,00	17,00
	ГГ	- 0	34	57
	s	0.25	1,00	1,00
	ల	0,90	0,60	0,60
2	h (m)	1,00	1,40	1,40
	Layer Description	111	ML: Brown low plasticity silt with sand to sandy silt. Soil has red oxidized points	CLAY: Brown high plasticity silty clay w/ red oxidized points
	Depth (m)	1,00	2,40	3,80
	Test ID	SPT C-7		

	ion						, , , ,	Ι
	End			1	1	,	Liquefac	•
	Fs		0,04	0,07	0,06	0,22	0,74	0,18
	CSR		0,39	0,40	0,41	0,41	0,40	0,38
	°,		0,99	0,98	0,98	0,97	0,93	0,90
	CRR _{7.5}		0,02	0,03	0,02	0,09	0,29	0,07
	(N ₁)60		7	m	m	∞	27	7
	చ్		0,75	0,75	0,76	0,8	0, 0,	1,00
	Č	_	2,27	2,05	1,71	1,48	1,01	0,93
	SPT (N)			2	2	٢	21	7
	σ' (kN/m²)	5.86	19,68	24,03	34,70	46,37	100,30	117,09
	σ (kN/m²)	5.86	33,41	41,69	62,17	83,65	184,66	215,19
e	γ _n (kN/m ³)	14.66	19,68	20,68	20,48	21,48	21,04	21,80
rding to Californian Code	Y _{bulk} (k//m ³)	25.65	25,60	27,20	26,35	27,90	26,10	26,60
	γ _{dry} (kN/m ³)	13,50	16,00	17,00	17,00	18,00	18,00	19,00
	T	1	33) 28	40	28	5	56
Acco	S	0,2,	1,00	1,00	1,00	1,00		1,00
g D-1	°	0,9	0,64	0,6(0,55	0,55	0,45	0,40
PT Lo	р (ш	0,40	1,40	0,40	1,00	1,00	4,80	1,40
cfaction Analyses of SI	Layer Description	Fill	CL: Black to dark gray clayey silt with some fine sand. The soil has organic odor but not related to soil composition. Probably due to nearby septic tank	ML: Dark gray to black sandy silt	CH: Brown silty clay with traces of red oxidized spots. Does not soften when remoulded	ML: Brown silt with traces of fine sand and red oxidized spots.	SAND: Well graded gray sand to well graded sand with fine gravel. Gravel content is inhomogeneous and varies from 3% to 24%. FC in all recovered samples is < 6%	MH: High plasticity silty clay with traces of fine sand
4 Liqu	Depth (m)	0,40	1,80	2,20	3,20	4,20	00,6	10,40
Table A.1	Test ID	SPT D-1		1		Ł		

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	End Condition		1	1	Liquefaction	
	Fs		0,16	0,09	0,72	
	CSR		0,28	0,35	0,37	
	LD		66,0	0,97	0,94	
	CRR _{7,5}		0,04	0,03	0,27	
	(N ₁) ₆₀		Ŷ	m	24	
	ూ	_	0,75	0,80	0,93	
	ਿੱ		2,03	14 14	1,08	
	SPT (N)		m	m	24	
	σ' (kN/m ²)	19,06	24,49	51,30	87,26	
	α (kN/m ²)	19,06	29,40	79,75	147,10	
e	γ _n (kN/m ³)	14.66	20,68	20,98	21,04	
rnian Cod	Y _{bulk} (kN/m ³)	25,65	27,20	27,13	26,10	
to Califor	γ _{dry} (kN/m ³)	13,50	17,00	17,50	18,00	
rding	T	10	36) 38	•	
Acco	s	0,2,	1,0(1,00		
g D-2	9 (0,9(0,6(0,55	0,45	
PT Lo	h (m	1,30	0,50	2,40	3,20	
faction Analyses of Sl	Layer Description	Fili -	CLAYEY SILT: Gray clayey silt to silty clay with fine sand and traces of shells. Strong organic odor, but not due to soil composition	CLAYEY SILT: Brown clayey silt to silty clay with traces of fine sand and red oxidized spots to sandy silt	SAND: Gray well to poorly graded sand with low silt content (< 6%) and varying fine gravel content (< 16%)	
15 Lique	Depth (m)	1,30	1,80	4,20	7,40	
Table A.1	Test ID	SPT D-2	<u> </u>			

	End Condition	-	1	1	Liquefaction
	ES.		0,23	0,40	0,71
	CSR		0;00	0,31	0.32
	r _D		0,97	0,97	0,96
	CRR _{7.5}		0,07	0,12	0,23
	(N1) ₆₀		٢	1	20
	C _R		0,79	0,81	0,83
	Č		1,40	1,34	1,27
	SPT (N)		Q	10	19
	σ' (kN/m²)	32,26	51,82	56,29	63,03
	σ (kN/m²)	32,26	69,48	77,87	90,50
e	γ _n (kN/m ³)	14,66	20,68	20,98	21,04
ording to Californian Code	γ _{butk} (kN/m ³)	25,65	27,20	27,13	26,10
	γ _{dry} (kN/m ³)	13,50	17,00	17,50	18,00
	LL	1	31) 32	-
Acco	Ś	0,2	1,0(1,00	1,0(
g D-3	ۍ 	0,9(0,6(0,55	0,45
PT Lo	h (m)	2,20	1,80	0,40	0,60
faction Analyses of Si	Layer Description	Fill	SILT: Brown sandy silt to low plasticity silt with traces of fine sand	CLAYEY SILT: Brown low plasticity clayey silt	SAND: Well graded gray sand with traces of gravel and silt
t6 Lique	Depth (m)	2,20	4,00	4,40	5,00
Table A.1	Test ID	SPT D-3			

	End Condition	-	Liquefaction	ł		Liquefaction	\$
	Fr _S		0,29	0,18	0,08	0,64	0,26
	CSR		0,34	0,37	0,39	0,39	0,39
	r _D		0,98	0,97	96,0	0,93	0,93
	CRR _{7.5}		0,10	0,07	0,03	0,25	0,10
	(N ₁) ₆₀		6	ę	m	33	6
	Ů		0,75	0,76	0,83	000,1	1,00
	ů	-	1,96	1,67	1,38	1,01	1,00
	SPT (N)		9	'n	m	3	6
	σ' (kN/m²)	14,66	26,43	36,48	52,92	98,76	100,94
	σ (kN/m²)	14,66	39,18	59,04	92,16	177,24	181,38
rding to Californian Code	γ _a (kN/m ³)	14,66	18,86	19,86	19,48	21,27	20,68
	γ _{bulk} (kN/m ³)	25,65	26,10	26,40	24,80	27,00	27,20
	γ_{dry} (kN/m ³)	13,50	14,50	16,00	16,00	18,00	17,00
	<u> </u>	<u>'</u>	,	31	29	1	39
Acco	S	0,2;	1,0(. 1,0(1,00	1,00
E E-1	<u>،</u>	0,9(0,8(0,62	0,52	0,50	0,60
PT Lo	h (n	1,00	1,30	1,00	1,70	4,00	0,20
sfaction Analyses of S	Layer Description	Fill	SP: Poorly graded, medium to fine brown clean sand	SILT AND SAND: Interbedded strata of brown low plasticity sandy silt and clayey silt with brown medium sand	SILTY CLAY: Brown clayey silt/silty clay. Traces of organics and oxidation veins	SAND: Gray fine to medium sand interbedded with gray low plasticity silt deposits. FC in this stratum varies from 3% to 61%	CLAY: Gray clay with traces of fine sand
7 Lique	Depth (m)	1,00	2,30	3,30	5,00	6,00	9,20
Table A.1	Test ID	SPT E-1					

-¢ : 1 C DT Table A.17 Liquefaction

r		T
End Condition	**	Liquefaction
Fs		0,25
CSR		0,34
r _D		0,98
CRR _{7.5}		0,09
(N ₁) ₆₀		8
CR	-	0,75
Š		1,75
SPT (N)		9
σ' (kN/m²)	14,66	33,00
σ (kN/m²)	14,66	48,69
γ _n (kN/m ³)	14,66	21,27
γ_{bulk} (kN/m ³)	25,65	27,00
γ _{dry} (kN/m ³)	13,50	18,00
LL	ŀ	1
s	0,25	1,0(
9	0,90	0,50
h (m)	1,00	1,60
Layer Description	Fill	SP-SM: Olive gray fine to medium sand with silt
Depth (m)	1,00	2,60
Test ID	SPT E-1B	

Table A.18 Liquefaction Analyses of SPT Log E-1B According to Californian Code

	End Condition	1	Liquefaction	3	ŀ	Liquefaction
	Бs		0,35	0,22	0,08	0,55
	CSR		0,36	0,37	0,39	0,39
	ĉ		0,98	0,97	0,96	0,95
	CRR _{7.5}		0,12	0,08	0,03	0,22
	(N ₁) ₆₀		ĨĨ	7	3	19
	CR		0,75	0,78	0,85	0,87
	చ్		1,81	1,61	1,32	1,27
	SPT (N)		∞	9	3	17
	o' (kN/m²)	14,66	30,95	39,00	57,75	62,33
	σ (kN/m²)	14,66	48,61	64,50	101,89	110,40
e	γ_n (kN/m ³)	14,66	18,86	19,86	19,68	21,27
nian Cod	γ _{bulk} (kN/m ³)	25,65	26,10	26,40	25,60	27,00
to Califor	γ _{dry} (kN/m ³)	13,50	14,50	16,00	16,00	18,00
rding	rr	,	1	25	53	33
Accol	s	0,25	1,00	1,00	1.00	1,00
E-2	e	0;0	0,80	0,65	0,60	0,50
T Log	h (m)	1,00	1,80	0,80	1,90	0,40
faction Analyses of SP	Layer Description	111	SP : Poorly graded fine to medium brown sand. FC <= 5%	ML: Brown silt to sandy silt with red oxidized points	CLAY: Gray silty clay	SILT AND SAND: Gray silt with sand to sandy silt/silty sand
19 Lique	(m) Depth	1,00	2,80	3,60	5,50	5,90
Table A.	Test ID	SPT E-2				

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	End Condition	1	F	ı	I	ı	Liquefaction
	R S		0,23	0,19	0,42	0,25	0,85
	CSR		0,37	0,39	0,40	0,39	0,36
	r ⁰		0,98	0,96	0,93	16'0	0,84
	CRR _{7.5}		0,08	0,07	0,17	0,10	0,31
	CR		0,75	0,82	0,98	1,00	1,00
	C _R		0.75	(15+b4)/24	(15+b4)/24	end	1
	్		1,73	1,40	1,05	0,88	0,87
	σ' (kN/m²)	11,73	33,85	51,48	92,03	132,24	134,64
2	σ (kN/m ²)	11,73	55,43	89,74	167,56	244,07	248,43
<u>.</u>	γ _n (kN/m ³)	14,66	19,86	20,18	20,48	20,68	21,80
	$\gamma_{\rm bulk}$ (kN/m ³)	25,65	26,40	26,40	26,35	27,20	26,60
	γ_{dry} (kN/m ³)	13,50	16,00	16,50	17,00	17,00	19,00
	ΓΓ	+) 29	41	29	946	26
	<i>w</i>	3 0,25 1,00		1,00	1,00	1,00	1,00
	9	0,90	0,65	0,60	0,55	0,60	0,40
	h (m)	0,80	2,20	1,70	3,80	3,70	0,20
	Layer Description	Fill	ML: Brown low plasticity sandy silt to silt	CL: Brown low plasticity silty clay to clayey silt with traces of fine sand	SILT AND SAND: Gray sandy silt to silty sand. FC of recovered samples varies from 35% to 77%	CLAY: Gray silty clay to clayey silt with traces of fine sand. LL of recovered samples varies from 38 to 57	SM: Gray silty fine sand
	Depth (m)	0,80	3,00	4,70	8,50	12,20	12,40
	Test ID	SPT F-1					

Table A.20 Liquefaction Analyses of SPT Log F-1 According to Californian Code

	End Condition		1	ŧ	T	I
	ъs		0,17	0,22	0,27	0,19
	CSR		0,36	0,38	0,38	0,38
	Ľ.		76,0	0,96	0,94	0,92
	CRR _{7.5}		0,06	0,08	0,10	0,07
	(N ₁) ₆₀		9	∞	6	٢
	చ్		0,77	0,83	0,94	1,00
	Č		1,57	1,34	1,09	0,97
	SPT (N)		v	7	6	7
	σ' (kN/m²)	14,66	41,04	56,25	84,51	106,69
	σ (kN/m²)	14,66	65,56	94,51	148,28	189,09
e	γ _n (kN/m ³)	14,66	20,36	20,68	20,68	21,48
rnian Cod	Y _{bulk} (kN/m ³)	25,65	28,80	27,20	27,20	27,90
to Califo	γ_{dry} (k/m ³)	13,50	16,00	17,00	17,00	18,00
rding	<u> </u>	•	34	51	29	55
Acco	s	0,2;	1,0(1,0(1,00	1,00
E-1	<u>و</u>	0,9(0,8(0,6(0,60	0,55
J Lo	h (m	1,00	2,50	1,40	2,60	1,90
action Analyses of SP	Layer Description	Fill	CLAYEY SILT: Interbedded strata of olive brown to brown clayey silt with traces of fine sand and brown sandy silt	CLAY: High plasticity gray silty clay	SILT AND SAND: Gray silt and sandy silt to silty sand. FC varies from 22% to 90%. 4 mm red silty clay to clayey silt seam found at approx. 7.2 m	MH: High plasticity gray clayey silt. Softens when remoulded. Red oxidized 5 mm-thick seam at approx. 9.2 m
11 Lique	Depth (m)	1,00	3,50	4,90	7,50	9,40
Table A.2	Test ID	SPT G-1				Multi un un conservativa de la conservativa de la conservativa de la conservativa de la conservativa de la cons

to Califo 111 .00 G.-1 of SPT I **Table A.21 Liquefaction Analyse**

	End Condition	F	ŧ	ł	ı	1	I	I	ı
	$F_{\rm S}$		0,26	0,32	0,31	0,30	0,23	0,18	0,50
-	CSR		0,35	0,36	0,38	0,38	0,38	0,36	0,33
	ГD		0,97	0,97	0,95	0,94	0,93	0,87	0,79
	CRR _{7.5}		0,09	0,12	0,12	0,12	0,09	0,07	0,17
	(N ₁) ₆₀		∞	10	10	10	8	9	4
	Ğ	С _в 0,79		0,81	0,91	0,96	0,99	1,00	1,00
	Ů		1,50	1,40	1,14	1,07	1,02	0,89	0,80
	SPT (N)		٢	6	10	01	œ	7	8
	σ' (kN/m²)	19,06	45,20	51,72	77,33	89,29	96,76	126,64	157,58
	σ (kN/m²)	19,06	70,71	83,12	132,27	155,02	169,35	226,70	286,09
	γ _n (kN/m ³)	14,66	19,86	20,68	20,48	20,68	20,48	20,48	20,48
rnian Cod	Y _{bulk} (kN/m ³)	25,65	26,40	27,20	26,35	27,20	26,35	26,35	26,35
to Califor	Y _{dry} (kN/m ³)	13,50	16,00	17,00	17,00	17,00	17,00	17,00	17,00
rding	IL	-	0 29	9 49	0 33	0 58	0 36	0 47	0 36
Acco	\$	0,2;	2	0,1,0	2 1,0	0 1,0	5 1,0	5 1,00	5 1,0
8 C-2		0,9	0,6	0,61	0,5.	0,6	0,5	0,5.	0,5
TL0	h (m	1.30	2,60	0,60	2,40	1,10	0,70	2,80	2,90
action Analyses of SPT	Layer Description	Fill	ML: Brown low plasticity silt with fine sand to sandy silt	CH: Gray high plasticity silty clay with traces of fine sand	ML: Gray low plasticity clayey silt to silt with sand. Red clay scams from approximately 6.15 m to 6.2 m	CH: Soft gray, high plasticity silty clay	ML: Gray clayey silt with traces of fine sand	CLAY: Gray silty clay to clayey silt. Some shells at approx. 10.3 m	ML: Interbedded strata of gray low plasticity silt with sand and gray clayey silt. Some red clay seams
2 Lique	(m)	1,30	3,90	4,50	6,90	8,00	8,70	11,50	14,40
Table A.2	Test ID	SPT G-2					<u></u>		

Colifornian Code \$ ¢ Ç CDT d 33 1

$ \begin{array}{ c c c c c c c c c c c c c c c c c c c$	3,00 0,90 0,25 - 13,50 25,65 14,66 43,99 43,99	T: Red silt. Very soil seen $0,40$ $0,50$ $1,00$ 26 $18,00$ $27,00$ $21,27$ $52,49$ $48,57$ 10 $1,44$ $0,77$ 11 $0,13$ $0,97$ $0,24$ $0,52$ -
²) (kN/r	43,5	48,5
σ (kN/m ²	43,99	52,49
γ ₁ (kN/m ³)	14,66	21,27
Y _{bulk} (kN/m ³)	25,65	27,00
Y _{dry} (kN/m ³)	13,50	18,00
1	ŀ	26
Ś	0,25	1,00
ę	0,90	0,50
h (m)	3,00	0,40
Layer Description	Fill	SANDY SILT: Red brown sandy silt. Very similar to the soil seen at the surface (ejecta) in Yagcioglu apartments
Depth (m)	3,00	3,40
Test ID	SPT G-3	

Table A.23 Liquefaction Analyses of SPT Log G-3 According to Californian Code

	T	_			T					
	End Condition	t	1	Liquefaction	1	9	1	Liquefaction	F	1
	F _S		0,15	0,47	0,11	0,41	0,19	0,24	0,24	0,17
	CSR		0,34	0,38	0,39	0,39	0,39	0,38	0,38	0,37
	r ⁵		0,99	0,98	0,96	0,95	0,93	06'0	0,89	0,87
	CRR _{7.5}		0,05	0,18	0,04	0,16	0,07	0,09	0,09	0,06
	(N ₁) ₆₀		5	15	4	14	٢	8	8	6
	రో		0,75	0,75	0,84	0,88	1,00	1,00	1,00	1,00
	ల్		2,27	1,83	1,31	1,21	0,98	0,93	0,92	0,89
	SPT (N)		3	1	4	13	4	6	6	7
	σ' (kN/m²)	8,80	19,67	30,34	59,38	69,25	104,77	116,01	120,35	129,05
	σ (kN/m²)	8,80	29,48	49,96	104,51	123,20	189,14	210,18	218,45	235,00
	γ _n (kN/m ³)	14,66	20,68	20,48	20,98	20,77	21,27	21,04	20,68	20,68
rnian Cod	γ _{bulk} (kN/m ³)	25,65	27,20	26,35	27,13	26,25	27,00	26,10	27,20	27,20
to Califor	γ _{dry} (kN/m ³)	13,50	17,00	17,00	17,50	17,50	18,00	18,00	17,00	17,00
rding	LL	-) 43	-	51	32) 56	1	37	20
Acco	ŝ	0 0,2;	0 1,0(5 1,0(2 1,0(0(1,0(0,1,0(1,00	00.1	1,00
g H-1		<u>6</u> ,0	0,6	0,5.	0,5	0,5(0,5(0,4:	0,6(0,6(
PT Lo	р (ш	0,60	1,00	1,00	2,60	0,90	3,10	1,00	0,40	0,80
faction Analyses of Si	Layer Description	Fill	CL: Dark gray to black clay with sand	SM: Gray to brown silty sand	CLAY: Brown, grading to grayclayey silt to silty clay	ML: Gray low plasticity silt with sand	CLAYEY SILT: Gray highplasticity silty clay to clayes silt interspersed with thin layers of silty sand to sandy silt	SP-SM: Gray fine to medium sand with silt	ML: Gray clayey silt	CH: Dark gray stiff high plasticity clay
4 Lique	Depth (m)	0,60	1,60	2,60	5,20	6,10	9,20	10,20	10,60	11,40
Table A.2	Test ID	SPT H-1		•	Vaniši - 16 19 19 19 19 19 19 19 19 19 19 19 19 19 19 19 19 1	L	Lease and an an an an an an an an an an an an an 			L,

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	End Condition	1	1	ſ	ł	No Liquefaction
	ы s		0,34	0,19	0,18	1,32
	CSR		0,34	0,37	0,39	0,39
	r _D		0,99	0,98	0,96	0,95
	CRR _{7.5}		0,12	0,07	0,07	0,52
	(N ₁) ₆₀		10	7	7	40
	Сĸ		0,75	0,75	0,84	0,88
	ů		2,27	1,81	1,29	1,20
	SPT (N)		6	5	6	38
	σ' (kN/m²)	8,80	19,67	30,84	60,63	70,74
	σ (kN/m²)	8,80	29,48	50,46	105,76	124,70
0	γ _n (kN/m ³)	14,66	20,68	20,98	21,27	21,04
nian Code	$\gamma_{\rm bulk}$ (kN/m ³)	25,65	27,20	27,13	27,00	26,10
to Califor	γ _{dry} (kN/m ³)	13,50	17,00	17,50	18,00	18,00
ding	P T	- 2	0 73	0 29	0 40	1
Accol	Ś	0 0,2	0 1,0	5 1,0	0 1,0	5 1,0
g I-1	e (0,9	0,6	0,5	0,5	0,4
PT Lo	ш р (ш	0,60	1,00	1,00	2,60	06'0
faction Analyses of Sl	Layer Description	Fill	CH: Gray high plasticity silty clay	SANDY SILT: Brown sandy silt	CLAYEY SILT: Gray clayey silt to silty clay with traces of fine sand	SP-SM: Fine to medium gray poorly graded sand with silt
25 Lique	Depth (m)	0,60	1,60	2,60	5,20	6,10
Table A.2	Test ID	SPT I-1				

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- 11 -

End Condition	3	,	,	Liquefaction
FS		0,13	0,08	0,51
CSR		0,37	0,38	0,37
r _b		0,97	0,96	0,89
CRR _{7.5}		0,05	0,03	0,19
(N ₁) ₆₀		Ś	'n	16
Ľ.		0,77	0,83	1,00
J		1,59	1,34	0,91
SPT (N)		4	m	8
σ' (kN/m ²)	11,73	39,99	56,33	122,80
σ (kN/m ²)	11,73	65,49	95,57	218,93
γ _n (kN/m ³)	14,66	20,68	21,48	21,27
Y _{bulk} (kN/m ³)	25,65	27,20	27,90	27,00
γ _{dry} (kN/m ³)	13,50	17,00	18,00	18,00
FI	1	36	20	36
s.	0.25	<u>, , , , , , , , , , , , , , , , , </u>	2 1,00	1,00
°	0,9	0.60	0,5,	0,5(
h (m	0,80	2,60	1,40	5,80
Layer Description	Fill	ML: Brown to gray clayey silt with traces of fine sand to silt with sand. Red oxidized zones throughout the stratum	CH: Gray high plasticity silty clay with traces of fine sand. Wood pieces found at approximately 3.9 m and 4.7 m	SILT AND SAND: Interbedded strata of gray low plasticity clayey silt and silty fine sand
Depth (III)	0,80	3,40	4,80	10,60
Test ID	SPT J-1	99-109, 111-19-19-190, 201 - 20 - 201 - 10 - 10 - 10 - 10 - 10		Anno Anno - Anno - Anno - Anno - Anno

Table A.26 Liquefaction Analyses of SPT Log J-1 According to Californian Code

	End Condition		J	1	Liquefaction	ı
	s M		0,17	0,08	0,46	0,29
	CSR		0,36	0,37	0,38	0,38
	°,		0,97	96'0	0,94	0,93
	CRR _{7.5}		0,06	0,03	0,18	0,11
	(N ₁) ₆₀		9	m	15	01
:	౮ఀ		0,77	0,84	0,94	0,99
	Š		1,58	1,29	1,07	0,99
	SPT (N)		Ŵ	ſſ	5	10
	σ' (kN/m²)	14,66	40,75	60,85	88,36	103,04
	σ (kN/m²)	14,66	64,29	102,06	153,10	179,56
	γ_n (kdN/m ³)	14,66	20,68	20,98	21,27	22,04
nian Cod	Y _{bulk} (kN/m ³)	25,65	27,20	27,13	27,00	27,55
to Califor	γ _{dry} (kN/m ³)	13,50	17,00	17,50	18,00	19,00
rding	EL .	•	30) 75	33) 66
Acco	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	0 0,2	0 1,0	2 1'00	0,1,00	2 1,00
<u>в</u> J-2	•	0,0) 0,6	0.5	0,51	0,4.
PT Le	p (m	1.00	2,40	1,80	2,40	1,20
action Analyses of SPT L	Layer Description	Fill	ML: Brown low plasticity clayey silt with fine sand to sandy silt. Silt layers alternate with silty clay/clayey silt	CH: Gray high plasticity silty clay with traces of brown roots. Does not soften when remoulded	SILT AND SAND: Alternating strata of gray silty fine sand and low plasticity clayey silt to sandy silt. Traces of wood at approximately 7.2 m. Seaming of gray silty clay with sandy silt in S-J2-6	CLAY AND SAND: Interbedded strata of high plasticity, gray silty clay and silty fine sand
27 Lique	Depth (m)	1,00	3,40	5,20	7,60	8,80
Table A.	Test ID	SPT J-2				

	End Condition	*	1	4	I	ŀ
	يتا د		0,21	0,19	0,60	0,23
	CSR		0.34	0,35	0,37	0,37
	r ₀		0,97	0,96	0,94	0,92
	CRR _{7.5}		0,07	0,07	0,22	0,08
	(N ₁) ₆₀		г	9	19	8
	Č.		0,79	0,83	0,94	1,00
	Ů		1,44	1,30	1,07	0,97
	SPT (N)		ø	9	19	∞
	σ' (kN/m ²)	21,99	49,16	60,03	88,29	108,40
	σ (kN/m²)	21,99	73,69	94,37	148,13	185,90
	γ _n (kN/m ³)	14,66	20,68	20,68	20,68	20,98
nian Code	γ _{bulk} (kN/m ³)	25,65	27,20	27,20	27,20	27,13
to Califor	Y _{dry} (kN/m ³)	13,50	17,00	17,00	17,00	17,50
ding	ГГ	t	30	95	29	61
Accor	S	0,25	1,00	1,00	1,00	1,00
J-3	e	0,90	0,60	0,60	0,60	0,55
PT Log	p (m)	1,50	2,50	1,00	2,60	1,80
faction Analyses of S	Layer Description	Fill	ML: Brown to gray clayey silt to silt with fine sand. Transition from brown to gray occurs at approx. 2.5 m	CH: Gray high plasticity silty clay	ML: Gray low plasticity silt with sand to sandy silt	CH: Gray silty clay
28 Lique	Depth (m)	1,50	4,00	5,00	7,60	9,40
Table A.1	Test ID	SPT J-3				

	End Condition	-	1	3
	Fs		0,23	0,15
	CSR		0,35	0,37
	5.		0,98	0,96
	CRR _{7.5}		0,08	0,06
	(N ₁) ₆₀		٦	9
	Ű		0,75	0,83
	Č		1,64	1,35
	SPT (N)		Ŷ	Ś
	σ' (kN/m²)	14,66	37,49	55,63
	σ (kN/m²)	14,66	58,09	92,90
	γ _n (kN/m ³)	14,66	20,68	20,48
	Y _{butk} (kN/m ³)	25,65	27,20	26,35
	γ _{dry} (kN/m ³)	13,50	17,00	17,00
9	II	•) 33	21
	s	0,2:	1,00	5 1,00
	e (0,9(0,6(0,5;
	h (m	1,00	2,10	1,70
	Layer Description	Fill	ML: Brown and gray clayey silt to brown low plasticity sandy silt. FC varies from 56% to 91%	SILTY CLAY: High plasticity gray silty clay/clayey silt interspersed with gray silt with sand
	Depth (m)	1,00	3,10	4,80
	Test ID	SPT J-4		

	End Condition	4	1	Liquefaction	ł
	r, R		0,18	0,64	0,38
	CSR		0,39	0,38	0,38
	r ₀		0,96	0,94	0,92
	CRR _{7.5}		0,07	0,25	0,14
	(N ₁) ₆₀		Q	52	13
	บ๊		0,86	0,98	1,00
	ػ		1,26	1,02	0,96
	SPT (N)		Q	22	13
	σ' (kN/m²)	11,73	63,90	97,48	109,47
	σ (kN/m²)	11,73	110,99	172,04	193,84
0	γ _n (kN/m ³)	14,66	20,68	21,80	21,80
rnian Cod	Y _{bulk} (R//m ³)	25,65	27,20	26,60	26,60
to Califor	γ_{dry} (kN/m ³)	13,50	17,00	19,00	19,00
rding	EL	-			37
Acco	s.	0 0,2:	1,00	0 1,00	0 1,00
R-J	e ()	6'0 (0.6	0,4	0,41
PTLO	h (m	0,8(4,80	2,80	1,00
faction Analyses of S	Layer Description	Fill	CLAY AND SILT: Brown low plasticity clayey silt/silty clay with traces of fine sand. S-K1-1 is dark gray and has a light odor, probably due to a nearby septic tank. Transition to gray color occurs at approx. 5.5 m	SILTY SAND: Gray silty sand to sand with silt	ML: Gray low plasticity silt to sandy silt
30 Lique	Depth (m)	0,80	5,60	8,40	9,40
Table A.	Test ID	SPT K-I			

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	End Condition	1 1		ł	ı	ı	4	No Liquefaction
-	E E		0,19	0'10	0,10	0,05	0,46	1,52
	CSR		0,54	0,55	0,55	0,56	0,48	0,49
	Soil Factor		- 35	1.35	1.35	1.35	1.15	1.15
	CRR _{7.5}		0 0 0	0,06	0,05	0,03	0,22	0,74
	6 6		9	ę	4	18	43	
ŀ	C _{ER}		00, 1	1,00	1,00	1,00	1,00	
	1,58 C _N		1,49	1,42	1,20	1,05	1,01	
	6 6		4	4	en.	17	43	
	SPT (N)	6 6		-5	4	n	17	43
	σ' (kN/m ²)	14,66	40.28	45,08	49,88	69,44	91,03	98,92
	σ (kN/m ²)	14,66	1/:69	78,44	87,16	124,38	163,62	179,37
	yn (kN/m ³)	14,66	18,35	21,80	21,80	20,68	21,80	19,68
ocode 8	Y _{bulk} (kN/m ³)	25,65	28,60	26,60		27,20	26,60	25,60
ng to Eur	Ydry (kN/m ³)	13.50	13,00	19,00	19,00	17,00	19,00	16,00
ccordi	s	0,25	1,000		1,00	1,00	1,00	
A-1 A	ల	e 0,90 1,20		0,40	0,40	0,60	0,40	0,60
T Log	h (m) 1,00 3,00		0,40	0,40	1,80	1,80	0,80	
action Analyses of SP7	Layer Description	Fill	CH: Brown, moist, sticky, high plasticity silty clay without visible sand particles. S-A1-4 shows darker tones and some fine to medium sand content	ML: Gray silt with sand. Field description: ML	ML: Brown, low plasticity silt with fine sand and some red clay points	CH: High plasticity gray clay with low sand content (traces). At 5.3 m a thin fine sand seam was identified. Sample A1- 7 exhibits some sand seams	ML: Gray sandy silt. Increasing sand content with	SP: Medium to fine poorly graded grav sand
t Liquef	Depth (m)	1.00	4,00	4,40	4,80	6,60	8,40	9,20
Table A.31	Test ID	SPT A-1						

	End Condition	•	ı	t		-	P	ı		Liquefaction
	Fs 0,13		0,13	0,04		0,21	0,05			0,67
	CSR 0,49		0,49	0,56		0,56	0,57	0.57		0,50
	Soil Factor		1.35	1.35		1.35	1.35	1.35		1.15
	С R R _{7.5} 0,06		0,06	0,02		0,12	0,03	013		0,33
	(N ₁) ₆₀		9	'n		10	4		-	25
	CER		1,00	1,00		1,00	1,00		224	1,00
	Ľ.		2,02	1,58		1,49	1,21	1 10	2	0,98
	NspT		e	2		7	÷	01	2	26
	SPT (N)	SPT (N)		7		7	ŝ	4	Γ	26
	σ' (kN/m ²)	14,66	24,59	39,97		44,77	68,68		83,07	104,78
	σ (kN/m ²)	14,66	38,33	71,36		80,08	125,57		4/.1C1	195,03
	γ _n (kN/m ³)	14,66	16,91	18,35		21,80	20,68		21,80	19,68
rocode 8	γ _{bulk} (kN/m ³)	25.65	24,00	28,60		26,60	27,20		26,60	25,60
ing to Eu	Y _{dry} (kN/m ³)	13.50	12,00	13,00		19,00	19,00		19,00	16,00
ccord	s N	0.25	1,00	1,00		1,00	1,00		1,00	1,00
A-2 A	ల	06.0	1,00	1,20		0,40			0,40	0,60
I Log	h (m)	00 -	1,40	1,80		0,40			1,20	2,20
action Analyses of SP	Layer Description	1111	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash	water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens	when remoulded	WIL: Uray crayey sur with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content ~ 8% in sample S-A2-10
2 Liquefi	Depth (m)	001	2,40	4,20		4,60	6,80		8,00	10,20
Table A.3.	Test ID	C Y LUN	7-17	4 <u></u>						

	End Condition	-	ı	•	No Liquefaction
	E S		0,19	0,18	1,52
	CSR		0,45	0,51	0,45
	Soil Factor		1.35	1.35	1.15
	CRR _{7.5}		0,08	0,09	0,68
-	(N ₁) ₆₀		∞	∞	42
	C _{ER}		1,00	1,00	1,00
	C _N		1,55	1,06	0,99
	Nsrt		ŝ	8	42
	SPT (N)		'n	~~	42
	σ' (kN/m²)	26,39	41,76	89,74	101,58
rocode 8	σ (kN/m²)	26,39	59,42	146,63	170,25
	γ_n (kN/m ³)	14,66	18,35	21,80	19,68
	γ _{bulk} (kN/m ³)	25,65	28,60	26,60	25,60
ling to Eu	γ _{dry} (kN/m ³)	13,50	13,00	19,00	16,00
ccord	s	0,25	1,00	1,00	1,00
A-3 A	ల	0,90	1,20	0,40	0,60
T Log.	h (m)	1,80	1,80	4,00	1,20
faction Analyses of SP	Layer Description	IL	CH: Brown, high plasticity silty clay. At about 2 m there is a layer of brown fine sendy silt	ML: Gray low plasticity clayey silt with fine sand.	SAND: Gray poorly graded sand with silt and traces (8%) of fine rounded gravel
3 Lique	Depth (m)	1,80	3,60	7,60	8,80
Table A.3	Test ID	SPT A-3			

+0 E.-e COL
	End Condition	Ŧ		9	ı	Liquefaction	No Liquefaction	
	Es.		0,20	0,18	0,22	0,79	1,28	0,16
	CSR		0,51	0,52	0,55	0,47	0,48	0,57
ſ	Soil Factor		1.35	1.35	1.35	1.15	1.15	1.35
	CRR _{7.5}		0,10	0,09	0,12	0,38	0,62	0,09
	(N1)60		0	6	=	28	39	8
	C _{ER}		1,00	1,00	1,00	1,00	1,00	1,00
	Č		1,51	1,44	1,07	0,97	0,81	0,76
	NSPT		Q	9	0	29	49	11
	SPT (N)		Ŷ	ę	10	29	49	
	σ' (kN/m ²)	17,59	43,74	48,53	87,66	106,85	154,04	171,43
	σ (kN/m²)	17,59	71,21	79,93	154,37	189,25	277,64	310,73
	γ _n (kN/m ³)	14,66	19,15	21,80	20,68	21,80	21,04	20,68
trocode 8	$\gamma_{\rm bulk}$ (kN/m ³)	25,65	27,55	26,60	27.20	26,60	26,10	27.20
ling to Ea	Y _{dry} (kN/m ³)	13,50	14,50	19,00	17,00	19,00	18,00	17,00
Accord	Ś	0,25	1,00	1,00	1,00	1,00	1,00	1,00
A-4 /	ల	0,90	06'0	0,40	0,60	0,40	0,45	0,60
T Log	h (m)	1,20	2,80	0,40	3,60	1,60	4,20	1,60
faction Analyses of SP	Layer Description		CL: Low to high plasticity, brown silty clay to clayey silt with traces of fine sand. Soil is highly inhomogeneous, showing variable FC	ML: Brown low plasticity silt with traces of fine sand	CL: Low to high plasticity gray silty clay to clayey silt with traces of fine sand	SANDY SILT: Gray low plasticity sandy silt	SAND: Gray poorly to well graded sand with silt. 22% gravel content in S-A4-9, very low (< 5%) in other samples.	CH: Gray, high plasticity stiff clay.
4 Lique	Depth (m)	1,20	4,00	4,40	8,00	9,60	13,80	15,40
Table A.3	Test ID	SPT A-4		1	·	1	I	L

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	Condition	-	1	Liquefaction	Liquefaction	۴	•	,
	F ₂		80'0	0,29	6, 0	0,12	0,19	0,17
F	۲. ۲.		0,47	0,51	<u>्</u> म	0,56	0,56	0,57
	Factor		1.3	1.35	1.5	1.35	1.35	1.35
	CRR _{7.5}		ta 0	0,15	0.37	0,07	0,10	01'0
	N ₁) ₆₀ (4	<u>e</u>	20 21	1	6	6
-	CEN C	-	<u>80</u>	<u> </u>	Ê.	00 ⁺ 1	00'1	1,00
F	۔ ٽ		1,65	80,1	0°5	0,84	0,78	
	Nsrt		2.25	6	ß	80	21	2
	(N) 14		r.	E.	¢,	×	13	12
-	d' h/m ²)	17.59	36,58	52,27	110,63	143,24	EC.231	186,25
-	a (N/m²)	17,59	کر بر بر	84,65	192.05	254,09	289,86	335,36
	Y, (N/at ²)	14,66	20,36	20,27	ञ् स् रः	20,68	21,04	20,68
code 8	Yhun (25.65	28,80	25,50	27,90	27,20	26,10	27,20
ig to Eure	Yury (Vm ¹)	13,50	16,00	17,60	13,00	17,00	18,00	17,00
cordii	<u>s</u>	ñ	00 <u>.</u>	00'1		1,00	00'1	1,00
×	v	06'0	08'0	0,50	\$50	0'00	0,45	0,60
Log	(II)	1,20		1,50	5,00	3,00	1,70	2,20
tction Analyses of SPT	Layer Description	Fill	CLAVEY SILT: Olive gray clayer silt with traces of fine sand. S- C2-B is gray brown clayer silt. The brown tones may be due to soust and of ferric minerals	SAND AND SILT: Brown low plashicity silt to silty fine sand. FC of recovered samples versis from 14% to versis	SILTY SAND: Gray sand mixures grading with depth from sandy silt to sand with silt and sand with silt and sand with silt from 51 to 250 s 279 s. from fine to coarse gravel. from fine to coarse gravel from fine to coarse gravel from fine to coarse gravel from fine to coarse gravel particles is variable from fint and elongated to well proportioned angular	CH: Stiff gray moist high plasticity stifty clay. Wash water shows traces of shells.	CLAY AND SAND: Interbedded thin strata of gray silty sand to sandy silt and gray silty clay to clayer silt	CH: Moist gray high plasticity silty clay. Very thin (< 1 cm) red oxidized seams found in S-B1-11
5 Liquefs	Depth (III)	1.20	3.00		05.9	12.50	02'FI	16,40
Table A.35	Test ID	SPT B-1						

	End Condition	3	B	1	Liquefaction
	FS		0,10	0,43	0,72
	CSR		0,47	0,49	0,46
	Soil Factor		1.35	1.35	1.15
	CRR _{7.5}		0,05	0,21	0,33
	(N1)60		ũ	17	25
	C C		1,00	1,00	
	Č		1,61	1,53	.03
	N _{SPT}		'n	-	25
	SPT (N)		ε		25
	σ' (kN/m²)	17,59	38,69	42,88	96,80
	σ (kN/m²)	17,59	58,31	66,42	167,44
	γ _n (kN/m ³)	14,66	20,36	20,27	21,04
rocode 8	Y _{bulk} (kN/m ³)	25,65	28,80	25,50	26,10
ling to Eu	γ _{dry} (kN/m ³)	13,50	16,00	17,00	18,00
ccord	s.	0,25	1,00	1,00	1.00
B-2 A	e	0,90	0,80	0,50	0,45
T Log	h (m)	1,20	2,00	0,40	4,80
faction Analyses of SP	Layer Description	IIE	CLAYEY SILT: Brown clayey silt with fine sand and red oxidized zones	SANDY SILT: Gray sandv silt	SAND: Well to poorly graded gray sand. Sand with silt in the upper 2 m of the layer. Gravel content in recovered samples is variable from 0% in S-B2- 7
36 Linnel	(m)	1,20	3,20	3,60	8,40
Tahle A.	Test ID	SPT B-2			

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·		r			I	<b>_</b>	1
	End Condition	-		,	Liquefaction	Liquefactio	1
	F _S			0,15	1,07	0,51	0,21
	CSR			0,53	0,47	0,48	0,57
	Soil Factor			1.35	Si. S	1.15	1.35
	CRR _{7.5}			0,08	0,51	0.25	0,12
	(N1)60			7	35	20	=
	CER			1,00	00'1	1,00	1,00
	ů			1,49	1,25	0,98	0,97
	Nspt			'n	28	20	
	SPT (N)			Ś	28	20	
	σ' (kN/m²)	17.59		44,92	63,75	104,20	106,60
	σ (kN/m ² )	17 59	1.2.1	76,32	112,80	188,56	192,92
	γ _n (kN/m ³ )	14 66		18,35	20,27	21,04	21,80
rocode 8	Ybaik (kN/m ³ )	25.65	1 00'07	28,60	25,50	26,10	26,60
ing to Eu	Y _{dry} (kN/m ³ )	13 50	00,61	13,00	17,00	18,00	19,00
ccord	s	76.0	<u>77</u>	1,00	<u> </u>	0,	1,00
C-1 A	e		0,2,0	1,20	0,50	0,45	0,40
I Log	h (m)		1,20	3,20	1,80	3,60	0,20
faction Analyses of SP1	Layer Description		Fill	CLAY: Brown tan silty clay to clayey silt. Red oxidation points in samples indicating oxidation of	SANDY SILT: Gray low plasticity sandy silt interbedded with gray silty clay with traces of fine sand. Thin gray clay layer at approximately 5.15 m.	SAND: Gray sand to sifty sand of variable gradation interspersed with thin layers of silty clay. Variable gravel content in samples S-C1-6B and S-C1-7 (10 % - 20 %)	ML: Gray low plasticity clayey silt
Lique	Depth (m)		1,20	4,40	6,20	9,80	10,00
Table A.37	Test ID		SPT C-1				

	End Condition	t	ı	,	No Liquefaction	ð
	ъ S	0,23	0,11	0,17	1,47	0,14
	CSR	0,31	0,62	0,61	0,52	0,60
	Soil Factor	1.35	1.35	1.35	1.15	1.35
	CRR _{7.5}	0,07	0,07	0,10	0,77	0,09
	(N ₁ ) ₆₀	9	ę	6	44	8
	Cer	0,75	1,00	1,00	1,00	1,00
	ۍ	2,00	1,56	۲. در	1,30	1,03
	Nspt		4	۲	34	ø
	SPT (N)	4	4	7	34	8
	σ' (kN/m²)	6,69	40,86	54,57	59,51	95,03
	σ (kN/m ² )	6,69	80,10	106,56	116,40	182,34
	γ _n (kN/m ³ )	13,39	18,35	20,36	19,68	21,27
rocode 8	Y _{bulk} (kN/m ³ )	27,60	28,60	28,80	25,60	27,00
ling to Eu	γ _{άry} (kN/m ³ )	12,00	13,00	16,00	16,00	18,00
ccord	s	0,25	1,00	1,00	1,00	1,00
C-2 A	o	1,30	1,20	0,80	0,60	0,50
T Log	h (n)	0,50	4,00	1,30	0,50	3,10
faction Analyses of SP	Layer Description	CLAYEY SILT: Dark brown clayey silt with uniform color. Moist, soft consistency.	CLAYEY SILT: Brown clayey silt to high plasticity silty clay. Traces of fine sand	CLAYEY SILT: Olive gray clayey silt with fine sand to sandy silt interbedded with clay seams. Very thin lamination at about 5.25 m.	SW-SM: Well graded gray sand with silt. Approximately 8% gravel content.	CLAYEY SILT: Alternating strata of gray silty clay and clayey silt.
8 Liquel	Depth (m)	0,50	4,50	5,80	6,30	9,40
<b>Fable A.3</b>	Test ID	SPT C-2		<u>+</u>		···· • ••••••••

	End Condition		I	Liquefaction	ŀ	ı
	s Fr		0,12	0,62	0,27	0,26
	CSR		0,54	0,46	0,55	0,56
-	Soil Factor		1.35	1.15	1.35	1.35
	CRR _{7.5}		0,07	0,29	0,15	0,14
	(N ₁ ) ₆₀		9	22	13	2
-	C _{ER}		1,00	1,00	1,00	00,
	Č		1,25	1,23	1,14	0,94
	Nspt		ſ	18	Ξ	£
	SPT (N)		ŝ	18	antes param	13
	σ' (kN/m ² )	17,59	63,84	65,82	76,69	113,36
	σ (kN/m²)	17,59	108,97	112,91	133,59	201,65
	γ _n (kN/m ³ )	14,66	19,86	19,68	20,68	21,27
urocode 8	γ _{bulk} (kN/m ³ )	25,65	26,40	25,60	27,20	27,00
ling to Eu	γ _{dry} (kN/m ³ )	13,50	16,00	16,00	17,00	18,00
ccord	s	0,25	1,00	1,00	1,00	00, 
C-3 A	ల	0,90	0,65	0,60	0,60	0,50
T Log	h (m)	1,20	4,60	0,20	1,00	3,20
faction Analyses of SP	Layer Description	Eile	SILT: Brown silt to clayey silt with traces of fine sand interspersed with strata of brown silty sand to sandy silt	SM: Gray silty fine sand	SILTY CLAY: Gray silty clay to clayey silt with some fine sand	CLAY AND SILT: Gray low plasticity silt with sand interbedded with gray high plasticity clay. Red oxidation zone towards the upper portion of sample S- C3-6. The clay loses strength when remolded
) Liaue	(m)	1.20	5,80	6,00	7,00	10,20
Table A.35	Test ID	SPT C-3		4 <u>,</u>	J	

- - - -		C	7 T A C	-4 A.	brord	ing to Em	rarnde 8								1					
I able A.4	0 Luque	action Analyses of St	1 108																	
	Denth				c	Ydry	Ybulk	Ϋ́	σ	ō	SPT (N)	Nepr	ů	C	N ₁ ) ₆₀	RR _{7.5}	Soil	CSR	Fs.	End
Test ID	E	Layer Description	(m) a	 0	<u> </u>	(kN/m ³ )	(kN/m ³ )	([rN/m ³ )	(kN/m ² )	(kN/m ² )			<u></u>	1			ractor			Condition
	-			+	-	-			01											
SPT C-4	1 20	Fill	1.20 0	0106.0	).25	13.50	25,65	14.66	96,71	9C./1				-					-	
				-																
		CLAYEY SILT:																		
	00	Brown silty	3 60 0	UVY I	00	17 00	77 20	20.68	92.04	56.72		m	1,33	1,00	4	0,04	1.35	0,51	0,07	1
	4,80	clay/clayey silt to	nnic	2			1													
		sandv silt/siltv sand											-	-	-	-				
		Junty and were and	the second second second second second second second second second second second second second second second se		-															

	End Condition	•		1	,		1			No	Liquefaction		
	E. S			90,0	000	>	2,16			1 27			
	CSR			0,42	0.48	V. 10	0,41			0.43	5		
	Soil Factor			1.35	1 25	1.00	1.15			115			
	CRR _{7.5}			0,03	10.0	V,V4	0.89			0.54			
	(N ₁ ) ₆₀			ŝ	4		47			17	5		
	C _{ER}			1,00	4	3,	1.00			1 00	2,		
	Č			1,46	;	1,2,1	1.17			001	1,00		
	Nspt			2		4	40	2		76	÷		
	SPT (N)			2		ব	UT	2		č	<del>4</del> 0		
	σ' (kN/m²)	30.02	74,40	47,19		68,29	72 04	1050			70,08		
	α (kN/m ² )	70.00	07'70	62,89		103.61	90 011	114,40		i L L	137,54		
	γ" (kN/m ³ )		14,00	19,15		20.36	07 10	21,00			21,04		
rocode 8	Y _{bulk} (kN/m ³ )	27.20	C0,C2	27,55		28.8	00 00	20,00			26,10		
ling to Eu	Y _{dry} (kN/m ³ )		13.50	14.50		16		18,00			18,00		
ecord	ŝ		0,25	1.00				2,0			1,00		
C-5 A	9		0,90	0.90		0.8		0,60			0,45		
T 1,00	r (m) l		2,20	1.60		0	4	0,40			1,20	_	
botion Analyses of SP	Layer Description		Fill	CL: Brown silty clay	w/ red oxidized zones	Cr. Com alter alar	CL: Utay shirty utay	SILT: Gray clayey silt	SAND: Gray fine to	coarse sand with	traces of gravel. Fine	gravel content in S-C5	7 = 8%
t I ianof	Depth (m)		2,20	2 80	no-r	40 U	N0'C	6.20			7,40		
Tabla A A	Test ID		SPT C-5										

Table A A	J Linnaf	faction Analyses of SP	TIng(	C-6 A	ccord	ing to Eu	rocode 8													
Test ID	Luque Depth (m)	Layer Description	h (m)		s	Y _{dry} (kN/m ³ )	Y _{bulk} (kN/m ³ )	γ _n (kN/m ³ )	σ (kN/m²)	σ' (kN/m²)	SPT (N)	Nspt	Č	CER	N1)60	CRR7.5	Soil Factor	CSR	FF S	End Condition
					1.0	12 50	27.26	14 K6	14 66	14.66										•
SPT C-6	1,00	Fill	1.00	10510	107.0	100,01	C0107	00'+1	224											
	2,40	ML: Brown silt to silt with sand w/ red oxidized zones	1,40	0,60	1,00	17,00	27,20	20,68	43,61	29,88	а	1,5	1,83	1,00	n.	0,02	1.35	0,46	0,05	1
	2,60	CH: Brown high	0,20	0,60	1,00	17,00	27,20	20,68	47,75	32,05	10	7,5	1,77	1,00	13	0,16	1.35	0,47	0,34	Ŧ
		plasucity sury cray.			Ì															•
	3 00	SILTY SAND:	0.40	0.50	1,00	18,00	27,00	21,27	56,26	36,64	12	6	1,65	1,00	ŝ	0,18	1.35	0,48	0,38	Liquefaction
	2242	Brown silty sand		_																

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	End Condition	•	I	T
	E ^S		0,12	0,11
	CSR		0,46	0,51
	Soil Factor		1.35	1.35
	CRR _{7.5}		0,06	0,06
	(N ₁ ) ₆₀		5	6
	CER		1,00	1,00
	Č		1,83	1,49
	N _{SPT}		æ	4
	SPT (N)		4	4
	σ' (kN/m²)	14,66	29,88	45,09
	σ (kN/m²)	14,66	43,61	72,56
	γ _n (kN/m ³ )	14,66	20,68	20,68
rocode 8	γ _{bulk} (kN/m ³ )	25,65	27,20	27,20
ling to Fu	γ _{dry} (kN/m ³ )	13,50	17,00	17,00
Aconc	S	0,25	1,00	1,00
C-7	2	0.90	0,60	0,60
TIng	h (m)	1,00	1,40	1,40
faction Analyses of SP	Layer Description	Lill I	ML: Brown low plasticity silt with sand to sandy silt. Soil has red oxidized points	CLAY: Brown high plasticity silty clay w/ red oxidized points
13 1 1000	Depth (m)	1,00	2,40	3,80
Table A	Test ID	SPT C-7		

	End Condition	H	•	4	J	Ł	Liguefaction	•
	F _S		0,03	0,04	0,05	0,20	0,73	0,11
	CSR		0,53	0,55	0,56	0,57	0,49	0,58
	Soil Factor		1.35	1.35	1.35	1.35	1.15	1.35
	CRR ₇₅		10'0	0,02	0,03	0,12	0,36	0,06
	(N ₁ ) ₆₀		2	m	'n	10	27	9
	CER		1,00	1,00	00'1	1,00	1,00	1,00
	Č		2,25	2,04	1,70	1,47	1,00	0,92
	Nspt		0,75	1,5	~	7	27	٢
	SPT (N)			2	0	7	27	7
	σ' (kN/m ² )	5,86	19,68	24,03	34,70	46,37	100,30	117,09
	σ (kN/m²)	5,86	33,41	41,69	62,17	83,65	184,66	215,19
	$\gamma_n$ (kN/m ³ )	14,66	19,68	20,68	20,48	21,48	21,04	21,80
rocode 8	Y _{bulk} (kN/m ³ )	25,65	25,60	27,20	26,35	27,90	26,10	26,60
ing to Eu	Y _{dry} (kN/m ³ )	13,50	16,00	17,00	17,00	18,00	18,00	19,00
Accord	s	0,25	1,00	1,00	1,00	1,00	1,00	1,00
D-1 A	e	06.0	0,60	0,60	0,55	0,55	0,45	0,40
T Log	h (m)	0,40	1,40	0,40	1,00	1,00	4,80	1,40
faction Analyses of SP	Layer Description	Fill	CL: Black to dark gray clayey silt with some fine sand. The soil has organic odor but not related to soil composition. Probably due to nearby septic	ML: Dark gray to black sandv silt	CH: Brown silty clay with traces of red oxidized spots. Does not soften when remoulded	ML: Brown silt with traces of fine sand and red oxidized spots.	SAND: Well graded gray sand to well graded sand with fine gravel. Gravel content is inhomogeneous and varies from 3% to 24%. FC in all recovered samples is < 6%	MH: High plasticity silty clay with traces of fine sand
I Lique	Depth (m)	0,40	1,80	2,20	3,20	4,20	00'6	10,40
Table A.44	Test ID	SPT D-1	L	<del></del>	I	.L	<b>, , , , , , , , , , , , , , , , , , , </b>	

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	End Condition	ł	r	ı	Liquefaction
	Fs		0,12	0,07	0,75
	CSR		0,38	0,49	0,45
	Soil Factor		1.35	1.35	1.15
	CRR _{7,5}		0,04	0,04	0,34
ľ	(N ₁ ) ₆₀		Ś	4	26
	C _{ER}		1,00	1,00	1,00
	້		2,02	1,40	1,07
	N _{SPT}		2,25	n	24
	SPT (N)		ŝ	3	24
	σ' (kN/m²)	19,06	24,49	51,30	87,26
	σ (kN/m²)	19,06	29,40	79,75	147,10
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,04
rrocode 8	Y _{bulk} (kN/m ³ )	25,65	27,20	27.13	26,10
ing to Eu	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00
ccord	s	0,25	1,00	1,00	1,00
D-2 A	3	0.00	0,60	0,55	0,45
I Log	h (m)	1,30	0,50	2,40	3,20
faction Analyses of SP	Layer Description	Fill	CLAYEY SILT: Gray clayey silt to silty clay with fine sand and traces of shells. Strong organic odor, but not due to soil	CLAYEY SILT: CLAYEY SILT: Brown clayey silt to silty clay with traces of fine sand and red oxidized spots to	SAND: Gray well to poorly graded sand with low silt content (< 6%) and varying fine gravel content (< 16%)
5 Linne	Depth (m)	1.30	1,80	4,20	7,40
Tahle A.4	Test ID	SPT D-2			

	End Condition	•	•	ł	Liquefaction
	Fs.		0,22	0,37	0,81
	CSR		0,42	0,43	0,38
1	Soil Factor		1.35	1.35	1.15
	CRR _{7.5}		60'0	0,16	0,31
	(N ₁ ) ₆₀		~	13	24
ł	C EN		1,00	1,00	1,00
ľ	ڻ		1,39	1,33	1.26
	N _{SPT}		9	10	19
	SPT (N)		Q	10	61
	σ' (kN/m ² )	32,26	51,82	56,29	63,03
	σ (kN/m²)	32,26	69,48	77,87	90,50
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,04
rocode 8	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	26,10
ling to Eu	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00
Accord	s.	0,25	1,00	1,00	1,00
D-3 /	ల	0.90	0,60	0,55	0,45
T Log	h (m)	2,20	1,80	0,40	0,60
Faction Analyses of SP	Layer Description	Fill	SILT: Brown sandy sift to low plasticity silt with traces of fine	sand CLAYEY SILT: Brown low plasticity	clayey sut SAND: Well graded gray sand with traces of gravel and silt
6 Liques	Depth (m)	2.20	4,00	4,40	5,00
Tahle A.40	Test ID	SPT D-3			ациу баша у талара бай бай бай бай талара тал

	End Condition	3	Liquefaction	ţ	r	Liquefaction	1
	F _S		0,21	0,17	0,06	0,60	0,17
	CSR		0,47	0,51	0,55	0,48	0,56
	Soil Factor		1.35	1.35	1.35	2.	1.35
	CRR _{7.5}		0,10	60,0	0,03	0,29	0,10
	(N ₁ )60		6	∞	4	22	6
	CER		1,00	1,00	1,00	1,00	1,00
	Ů		1,95	1,66	1,37	1,01	1,00
	Nspt		4,5	S.	ĥ	23	6
	SPT (N)		9	S	Û	22	6
	σ' (kN/m ² )	14,66	26,43	36,48	52,92	98,76	100,94
	σ (kN/m ² )	14,66	39,18	59,04	92.16	177,24	181,38
	$\gamma_n^{\gamma_n}$ (kN/m ³ )	14,66	18,86	19,86	19,48	21,27	20,68
irocode 8	γ _{bulk} (kN/m ³ )	25,65	26,10	26,40	24,80	27,00	27,20
ling to Et	γ _{dry} (kN/m ³ )	13.50	14,50	16,00	16,00	18,00	17,00
ccord	s	0,25	1,00	1,00	1,00	1,00	1,00
E-1 A	э	0,90	0,80	0,65	0,55	0,50	0,60
T Log	h (m)	1,00	1,30	1,00	1,70	4,00	0,20
faction Analyses of SP	Layer Description		SP: Poorly graded, medium to fine brown clean sand	SILT AND SAND: Interbedded strata of brown low plasticity sandy silt and clayey silt with brown medium sand	SILTY CLAY: Brown clayey silt/silty clay. Traces of organics and oxidation veins	SAND: Gray fine to medium sand interbedded with gray low plasticity slit deposits. FC in this stratum varies from 3% to 61%	CLAY: Gray clay with traces of fine sand
17 Lique	Depth (m)	1,00	2,30	3,30	5,00	00'6	9,20
Table A.4	Test ID	SPT E-1					

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	End Condition	•	Liquefaction
	K. S		0,18
	CSR		0,46
	Soil Factor		1.35
	CRR _{1.5}		0,08
	(N ₁ ) ₆₀		∞
	CER		1,00
	Č		1,74
	N _{SPT}		4,5
	SPT (N)		9
	σ' (kN/m²)	14,66	33,00
	σ (kN/m²)	14.66	48,69
	γ _n (kN/m ³ )	14.66	21,27
irocode 8	Υ _{bulk} (kN/m ³ )	25.65	27,00
ling to Eu	Y _{dry} (kN/m ³ )	13.50	18,00
ccord	s	0.25	1,00
-1B A	0	0.00	0,50
T no I	4 (II)	1 00	1.60
ction Analyses of SP3	Layer Description	111	SP-SM: Olive gray fine to medium sand with silt
T innefa	Depth (m)	001	2,60
Toble A 48	Test ID	SPT E-1R	

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1. L. L. B. B. B. B. B. B. B. B. B. B. B. B. B.	End Condition	•	Liquefaction	3		Liquefaction
	FIS S		0,25	0,21	0,06	0,58
	CSR		0,49	0,52	0,55	0,47
	Soil Factor		1.35	1.35	1.35	1.15
	CRR _{7.5}		0,12	0,11	0,03	0,28
	(N ₁ ) ₆₀		Linne paret	10	4	22
:	CER		1,00	1,00	1,00	1,00
	C _N		1,80	1,60	1,32	1.27
	N _{SPT}		ę	9	3	17
	SPT (N)		∞	9	3	17
	σ' (kN/m²)	14,66	30,95	39,00	57,75	62,33
	σ (kN/m²)	14,66	48,61	64,50	101,89	110,40
	γ _n (kN/m ³ )	14,66	18,86	19,86	19,68	21,27
rocode 8	Y _{bulk} (kN/m ³ )	25,65	26,10	26,40	25,60	27,00
ling to Eu	γ _{dry} (kN/m ³ )	13,50	14,50	16,00	16,00	18,00
Accord	s	0,25	1,00	1,00	1.00	1,00
E-2 A	9	0,90	0,80	0,65	0.60	0,50
T Log	h (m)	1,00	1,80	0,80	1.90	0,40
faction Analyses of SP	Layer Description	[[]]	<b>SP:</b> Poorly graded fine to medium brown sand. FC <= 5%	ML: Brown silt to sandy silt with red ovidized mints	CLAY: Gray silty clay	SILT AND SAND: Gray silt with sand to sandy silt/silty sand
9 Lionoi	(m)	1.00	2,80	3,60	5.50	5,90
Table A.4	Test ID	SPT E-2				

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	End Condition		ł	ı	ł		Liquefaction
ŀ	Fs		0,16	0,16	0,31	0,16	0,77
ľ	CSR		0,51	0,55	0,57	0,58	0,49
Ī	Soil Factor		1.35	1.35	1.35	1.35	1.15
	CRR _{7.5}		0,08	0,09	0,18	0,09	0,38
	(N ₁ ) ₆₀		~	∞	15	6	28
ŀ	C _{ER}		00,1	1,00	1,00	1,00	1.00
	Č		1,72	1,39	1,04	0,87	0,86
	Nspt		4,5	9	14	10	33
	SPT (N)		9	9	4	10	33
	σ' (kN/m²)	11.73	33,85	51,48	92,03	132,24	134,64
	σ (kN/m²)	11,73	55,43	89,74	167,56	244,07	248,43
	γ _n (kN/m ³ )	14,66	19,86	20,18	20,48	20,68	21,80
rocode 8	Y _{bulk} (kN/m ³ )	25,65	26,40	26,40	26,35	27,20	26,60
ing to Eu	Y _{dry} (kN/m ³ )	13.50	16,00	16,50	17,00	17,00	19,00
ccord	s	0.25	1,00	1,00	1,00	1,00	1,00
F-1 A	ల	0,90	0,65	0,60	0,55	0,60	0,40
T Log	h (m)	0,80	2,20	1,70	3,80	3,70	0,20
faction Analyses of SP	Layer Description	1113	ML: Brown low plasticity sandy silt to silt	CL: Brown low plasticity silty clay to clayey silt with traces of fine sand	SILT AND SAND: Gray sandy silt to silty sand. FC of recovered samples varies from 35% to 77%	CLAY: Gray silty clay to clayey silt with traces of fine sand. LL of recovered samples varies from 38 to 57	SM: Gray silty fine sand
i0 Liquei	Depth (m)	0,80	3,00	4,70	8,50	12,20	12,40
Table A.5	Test ID	SPT F-1					

+ - 11 - ļ. 2020

	End Condition	•	L	B	ı	ı		
	Fs		0,17	0,19	0,20	0,12		
	CSR		0,50	0,53	0,55	0,56		
	Soil Factor		1.35	1.35	1.35	1.35		
	CRR _{7.5}		0,08	0,10	0,11	0,07		
	(N ₁ ) ₆₀		×	6	0	~		
ľ	CER		1,00	1,00	0 <u>,</u>	00,1		
	Č		1,56	1,33	1,09	0,97		
	Nspt		ŝ	7	6	٢		
	SPT (N)		Ŷ	7	6	7		
	σ' (kN/m ² )	14,66	41,04	56,25	84,51	106,69		
	σ (kN/m²)	14,66	65,56	94,51	148,28	189,09		
	γ _n (kN/m ³ )	14,66	20,36	20,68	20,68	21,48		
irocode 8	Y _{bulk} (kN/m ³ )	25,65	28,80	27,20	27,20	27,90		
ling to Eu	γ _{dry} (kN/m ³ )	13,50	16,00	17,00	17,00	18,00		
Accord	s	0,25	1,00	1,00	1,00	00,11		
G-1 2	ల	0.90	0,80	0,60	0,60	0,55		
T Log	h (m)	1,00	2,50	1,40	2,60	1,90		
action Analyses of SP	Layer Description	11:3	CLAYEY SILT: Interbedded strata of olive brown to brown clayey silt with traces of fine sand and brown sandy silt	CLAY: High plasticity gray silty clay	SILT AND SAND: Gray silt and sandy silt to silty sand. FC varies from 22% to 90%. 4 mm red silty clay to clayey silt seam found at approx. 7.2 m	MH: High plasticity gray clayey silt. Softens when remoulded. Red oxidized 5 mm-thick seam at approx. 9.2 m		
l Lique	Depth (m)	00.1	3,50	4,90	7,50	9,40		
Table A.5)	Test ID	SPT G-1		- <b>I</b>	£			

	$ \frac{\sigma'}{kN/m^2}  SPT (N)  N_{SPT}  C_N  C_{ER}  (N_1)_{6\theta}  CRR_{7,5}  \frac{Soil}{Factor}  CSR  F_S  \frac{End}{Condition} $	19.06	45,20 7 7 1,49 1,00 10 0,12 1.35 0,49 0,24 -		51,72 9 9 1,39 1,00 13 0,15 1.35 0,50 0,29 -			77,33 10 10 11 10,01 14,100 11 01 01 77,33		89,29 10 10 1,06 1,00 11 0,12 1.35 0,55 0,22 -		96,76 8 8 1,02 1,00 8 0,09 1.35 0,55 0,16 -		126,64 7 7 0,89 1,00 6 0,06 1.35 0,56 0,11 -		157,58 18 18 0,80 1,00 14 0,17 1.15 0,49 0,36 -		
	$\sigma$ $(kN/m^2)$ $(kN/m^2)$	19.06	70,71 45,20		83,12 51,72			132,27 77,33		155,02 89,29		169,35 96,76		226,70 126,64		286,09 157,58		
ocode 8	$\left. \frac{\gamma_{bulk}}{(kN/m^3)} \right  \frac{\gamma_n}{(kN/m^3)}$	75 65 14 66	26,40 19,86		27,20 20,68			26,35 20,48		27,20 20,68		26,35 20,48		26,35 20,48		26,35 20,48	~~	
g G-2 According to Eur	) e S $\left(\frac{\gamma_{dry}}{(kN/m^3)}\right)$	0 00 0 05 12 50	00,01 00,1 00,0 (		0.60 1.00 17,00			0 0,55 1,00 17,00		0 0,60 1,00 17,00		0 0,55 1,00 17,00		to 0.55 1,00 17,00		00,55 1,00 17,00	0,55 1,00 17,00	
action Analyses of SPT Lo	Layer Description h (m		ML: Brown low ML: Brown low Dasticity silt with fine 2.60	sand to sandy silt	CH: Gray high plasticity silty clay 0,60 with traces of fine	sand	ML: Gray low plasticity clayey silt to	silt with sand. Red 2,4 clay seams from	approximately 6.15 m to 6.2 m	CH: Soft gray, high plasticity 1,1	silty clay	ML: Gray clayey silt with traces of fine 0,7	sand	CLAY: Gray silty clay to clayey silt. Some 2,8 shells at approx. 10.3	M Interhedded	ML. Interpreted strata of gray low plasticity silt with 2,5 sand and gray clayey 2,5	1 n and alone 4	
Table A.52 Liquefa	Test ID Depth		SPT G-2 1,30		4,50			6,90		8,00		8,70		11,50		14,40		

Γ	u											
	End	1		I								
	ъ s	-		0,49								
	CSR			0,34								
	Soil factor			1.35								
	CRR _{7.5}		0,17									
	(N ₁ ) ₆₀											
	CER			1,00								
	Č			1,43								
	Nspt			10								
	SPT (N)			0_								
	σ' (kN/m²)	43.99		48,57								
	σ (kN/m²)	00 EF		52,49								
	γ _n (kN/m ³ )	14.66	2254	21,27								
rocode 8	γ _{bulk} (kN/m ³ )	75.65	CD.14	27,00								
ling to Fu	y _{dry} (kN/m ³ )	12 50	00,01	18,00								
A C C O L C	s	20.0	C7.V	1,00								
1.5			0.20	0,50								
TIA	h (m)		3,00	0,40								
Cotton Andreas of SD'	Layer Description		FIII	SANDY SILT: Red brown sandy silt. Very similar to the soil seen at the surface (ejecta) in Yagcioglu apartments								
	Depth (m)		3.00	3,40								
	Test ID		SPT G-3									

	End Condition	R	B	Liquefaction	,	,	ı	Liquefaction	1	ł
	Fs		0,11	0,35	0,09	0,34	0,12	0,16	0,15	0,10
	CSR		0,47	0,52	0,55	0,56	0,57	0,57	0,57	0,57
	Soil Factor		1.35	1.35	1.35	1.35	1.35	1.35	1.35	1.35
	CRR _{7.5}		0,05	0,18	0,05	0,19	0,07	0,09	0'0	0,06
	(N1)60		5	15	ŝ	16	۲	∞	∞	9
Ī	C _{ER}		1,00	1,00	1,00	1,00	1,00	1,00	1.00	1,00
	Č		2,25	1,82	1,30	1,20	0,98	0,93	16.0	0,88
	Nspt		2,25	8,25	4	13	٢	6	6	7
	SPT (N)		3	11	4	13	4	6	6	7
	σ' (kN/m²)	8,80	19,67	30,34	59,38	69,25	104,77	116,01	120.35	129,05
	σ (kN/m ² )	8,80	29,48	49,96	104,51	123,20	189,14	210,18	218,45	235,00
	γ _n (kN/m ³ )	14,66	20,68	20,48	20,98	20,77	21,27	21,04	20,68	20,68
rocode 8	Y _{bulk} (kN/m ³ )	25,65	27,20	26,35	27,13	26,25	27,00	26,10	27,20	27,20
ling to Eu	Y _{dry} (kN/m ³ )	13,50	17,00	17,00	17,50	17,50	18,00	18,00	17,00	17,00
Accord	s	0.25	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
H-1 A	9	0,90	0,60	0,55	0,55	0.50	0,50	0,45	0.60	0,60
T Log	h (m)	0,60	1,00	1,00	2,60	0.90	3,10	1,00	0,40	0,80
action Analyses of SF	Layer Description	Eill	CL: Dark gray to black clay with sand	SM: Gray to brown silty sand	CLAY: Brown, grading to grayclayey silt to silty clay	ML: Gray low plasticity silt with sand	CLAYEY SILT: Gray highplasticity silty clay to clayey silt interspersed with thin layers of silty sand to sandy silt	SP-SM: Gray fine to medium sand with silt	ML: Gray clayey silt	CH: Dark gray stiff high plasticity clay
4 Liquei	Depth (m)	0,60	1,60	2,60	5,20	6,10	9,20	10,20	10.60	11,40
Table A.5	Test ID	SPT H-1								

	End Condition	1	3	1	I	No Liquefaction
1	ъ S		0,24	0,13	0,15	1,73
	CSR		0,47	0,51	0,55	0,47
	Soil Factor		1.35	1.35	1.35	1.15
	CRR _{7.5}		0,11	0,07	0,08	0,81
	(N ₁ ) ₆₀		10	٢	∞	45
ſ	C _{ER}		1,00	1,00	1,00	1,00
	Č		2,25	1,80	1,28	1,19
	NsrT		4,5	3,75	6	38
	SPT (N)		9	5	6	38
	σ' (kN/m²)	8.80	19,67	30,84	60,63	70,74
	σ (kN/m²)	8.80	29,48	50,46	105,76	124,70
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,27	21,04
ocode 8	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	27,00	26,10
ing to Eur	Y ^{dry} (kN/m ³ )	13,50	17,00	17,50	18,00	18,00
ccord	s	0,25	1,00	1,00	1,00	1,00
I-1 A	ు	0,90	0,60	0,55	0,50	0,45
T Log	h (m)	0,60	1,00	1,00	2,60	0,90
faction Analyses of SP	Layer Description	Fill	CH: Gray high plasticity silty clav	SANDY SILT: Brown	standy sin CLAYEY SILT: Gray claycy silt to silty clay with traces of fine	sand SP-SM: Fine to medium gray poorly graded sand with silt
S Lique	Depth (m)	0,60	1,60	2,60	5,20	6,10
Table A.5	Test ID	SPT I-1				

	End Condition		ŗ		Liquefaction
	Fs		0,13	0,06	0,42
	CSR		0,51	0,53	0,48
	Soil Factor		1.35	1.35	1.15
	CRR _{7.5}		0,07	0,03	0,20
	(N ₁ ) ₆₀		Q	4	16
	C _{ER}		1,00	1,00	1,00
	Č		1,58	1,33	0,90
	NspT		4	ŝ	18
	SPT (N)		4	Ċ	8
	σ [†] (kN/m ² )	11.73	39,99	56,33	122,80
	σ (kN/m²)	(kN/m ³ ) (kN/m ² ) 14,66 11,73 20,68 65,49		95,57	218,93
	γ _n (kN/m ³ )			21,48	21,27
rocode 8	Y _{bulk} (kN/m ³ )	25,65	27,20	27,90	27,00
ing to Eu	γ _{dry} (kN/m ³ )	13,50	17,00	18,00	18,00
ccord	s	0,25	<mark>.</mark>	1,00	1,00
<u>J-1 A</u>	e	0,90	0,60	0,55	0,50
T Log	h (m)	0.80	2,60	1,40	5,80
faction Analyses of SP	Layer Description	Fill	ML: Brown to gray clayey silt with traces of fine sand to silt with sand. Red oxidized zones throughout the stratum	CH: Gray high plasticity silty clay with traces of fine sand. Wood pieces found at approximately 3.9 m	SILT AND SAND: Interbedded strata of gray low plasticity clayey silt and silty fine sand
6 Lique	Depth (m)	0,80	3,40	4,80	10,60
Table A.5	Test ID	SPT J-1			

F ;

	End Condition	•	,	I	Liquefaction	2
-	ы S		0,17	0,06	0,42	0,20
	CSR		0,50	0,53	0,46	0,55
	Soil Factor		1.35	1.35	1.15	1.35
	CRR _{7.5}		0,08	0,03	0,20	0,11
	(N ₁ ) ₆₀		∞	4	16	0
	E C		1,00	1,00	00	00,1
	ۍ		1,57	1,28	1,06	0,99
	Nspr		Ω	ŝ	15	0
	SPT (N)	5		ņ	5	0
	σ' (kN/m²)	14,66	40,75	60,85	88,36	103,04
	σ (kN/m ² )	14,66	64,29	102,06	153,10	179,56
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,27	22,04
rocode 8	γ _{bulk} (kN/m ³ )	25.65	27,20	27,13	27,00	27,55
ing to Eur	γ _{dry} (kN/m ³ )	13.50	17,00	17,50	18,00	19,00
ccordi	s	0.25	1,00	00,1	00,	1,00
J-2 A	ల	06.0	0,60	0,55	0,50	0,45
<b>F</b> Log	h (m)	00 1	2,40	1,80	2,40	1,20
faction Analyses of SP1	Layer Description		ML: Brown low plasticity clayey silt with fine sand to sandy silt. Silt layers alternate with silty clav/clavev silt	CH: Gray high plasticity silty clay with traces of brown roots. Does not soften when remoulded	SILT AND SAND: Alternating strata of gray silty fine sand and low plasticity clayey silt to sandy silt. Traces of wood at approximately 7.2 m. Seaming of gray silty clay with sandy silt in S-17-6	CLAY AND SAND: Interbedded strata of high plasticity, gray silty clay and silty fine sand
7 Liquei	(m)	1 00	3,40	5,20	7,60	8,80
Table A.5'	Test ID	c I J	2-C 1 1C	<u>n</u>		

	End Condition	*		R	a	3
	E. E		0,20	0,16	0,58	0,15
	CSR		0,47	0,49	0,45	0,54
	Soil Factor		1.35	1.35	1.15	1.35
	CRR _{7.5}		0,09	0,08	0,26	0,08
	(N ₁ ) ₆₀		6	∞	20	×
	CER		00,1	1,00	1,00	1.00
	C.		1,43	1,29	1,06	0.96
	N _{SPT}		ę	9	19	8
	SPT (N)		Q	6	61	8
	σ' (kN/m²)	21,99	49,16	60,03	88,29	108,40
	σ (kN/m²)	21,99	73,69	94,37	148,13	185,90
	γ _n (kN/m ³ )	14,66	20,68	20,68	20,68	20,98
rocode 8	Y _{bulk} (kN/m ³ )	25,65	27,20	27,20	27,20	27,13
ing to Eur	γ _{dry} (kN/m ³ )	13,50	17,00	17,00	17,00	17.50
ccord	s	0,25	1,00	1,00	1,00	1,00
J-3 A	ల	0,90	0,60	09*0	0,60	0,55
T Log	h (m)	1,50	2,50	1,00	2,60	1,80
iction Analyses of SPT	Layer Description	Fil	ML: Brown to gray clayey silt to silt with fine sand. Transition from brown to gray occurs at approx. 2.5 m	CH: Gray high plasticity silty clay	ML: Gray low plasticity silt with sand to sandy silt	CH: Gray silty clay
58 Linne	Depth (m)	1,50	4,00	5,00	7,60	9,40
Table A.5	Test ID	SPT J-3				

	End Condition	B								8		
	E S			0 73	1				; ; ;	U,13		
<b>.</b>	CSR		0,49					0,52				
	Soil Factor		1.35					1.35				
	CRR _{7.5}			11 0	C,11			0,07				
	(N ₁ )60			5	2			۲				
	C _{ER}			1 00					, ,	00.I		
	CN			67 1						1,34		
	Nspt				D				I	ŝ		
	SPT (N)	SPT (N)			0			Ś				
	σ' (kN/m²)	14,66			31,49					55,63		
	σ (kN/m²)	14,66	58,09						92,90			
	γ _n (kN/m ³ )	14,66			20,68					20,48		
rocode 8	$\gamma_{\text{bulk}}$ (kN/m ³ )	25,65		1	27,20					26,35		
ing to Eu	γ _{dry} (kN/m ³ )	13.50			17,00					17,00		
ccord	S	0,25			00,1					1,00		
J-4 A	ల	0.90			0,60					0,55		
T 1.09	h (m)	1,00			2,10					1.70		
faction Analyses of SP	Layer Description	Fill	ML: Brown and gray	clayey silt to brown	low plasticity sandy	silt. FC varies from	56% to 91%	SILTY CLAY: High	plasticity gray silty	clay/clayey silt	interspersed with gray	silt with sand
ionni. I Qi	Depth (n)	00.1			3,10					4,80		
Tahlo A 5	Test ID	SPT J-4				-						

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	End Condition	1	I	Liquefaction	1
	ŝ		0,15	0,61	0,26
	CSR		0,55	0,47	0,56
	Soil Factor		1.3	1.15	1.35
	CRR _{7.5}		0,08	0,29	0,15
ĥ	(N ₁ ) ₆₀		∞	22	12
ľ	CER		1,00	1,00	1,00
	Č		1,25	1,01	0,96
	Nspt		و	22	13
	SPT (N)		C	22	3
	σ' (kN/m²)	11,73	63,90	97,48	109,47
	σ (kN/m²)	11,73	110,99	172,04	193,84
	γ _n (kN/m ³ )	14,66	20,68	21,80	21,80
rocode 8	γ _{bulk} (kN/m ³ )	25,65	27,20	26,60	26,60
ing to Eu	γ _{dry} (kN/m ³ )	13,50	17,00	19,00	19,00
ccord	s	0,25	00,	1,00	1,00
K-1 A	e	0.00	0,60	0,40	0,40
T Log	h (m)	0,80	4,80	2,80	1,00
faction Analyses of SP	Layer Description	Fill	CLAY AND SILT: Brown low plasticity clayey siltysilty clay with traces of fine sand. S-K1- 1 is dark gray and has a light odor, probably due to a nearby septic tank. Transition to gray color occurs at approx. 5.5 m	SILTY SAND: Gray silty sand to sand with silt	ML: Gray low plasticity silt to sandy silt
0 Liaue	(m)	0.80	5,60	8,40	9,40
Table A.6	Test ID	SPT K-1			

	End Condition	Ŧ	3	8	E	Γ	1	No Liquefaction
	Fs		0,21	0,12	0,12	0,08	0,52	1,67
	CSR		0,39	0,39	0,39	0,40	0,39	0,39
-	r _D		70,0	0,97	0,96	0,95	0,94	0,93
	CRR _{7.5}		0,08	0,05	0,05	0,03	0,20	0,66
	(N ₁ ) ₆₀		×	5	ŝ	n	17	44
-	ٽ		0,79	0,81	0,83	0,90	0,98	1,00
	ۍ		1,59	1,50	1,43	1,21	1,06	1,01
	SPT (N)		Q	4	4	ĥ	1	43
	$\sigma^{\prime}$ (kN/m ² )	14,66	40,28	45,08	49,88	69,44	91,03	98,92
1	σ (kN/m ² )	14,66	69,71	78,44	87,16	124,38	163,62	179,37
<u> </u>	γ _n (kN/m ³ )	14,66	18,35	21,80	21,80	20,68	21,80	19,68
ode	Y _{bulk} (k/m ³ )	25,65	28,60	26,60	26,60	27,20	26,60	25,60
Turkish (	γ _{dry} (kN/m ³ )	13,50	13,00	19,00	19,00	17,00	19,00	16,00
ling to	ΓΓ	1	2 I	29	29	5	30	•
ccord	Ś	0,25	00,1	1,00	1,00	1,00	1,00	1,00
A-1 A	ల	0,90	1,20	0,40	0,40	0,60	0,40	0,60
T Log	h (m)	1,00	3,00	0,40	0,40	1,80	1,80	0,80
faction Analyses of SP	Layer Description	Eill	CH: Brown, moist, sticky, high plasticity silty clay without visible sand particles. S-A1-4 shows darker tones and some fine to medium sand content	ML: Gray silt with sand. Field description: ML	ML: Brown, low plasticity silt with fine sand and some red clay points	CH: High plasticity gray clay with low sand content (traces). At 5.3 m a thin fine sand scam was identified. Sample AI- 7 exhibits some sand scams	ML: Gray sandy silt. Increasing sand content with denth	SP: Medium to fine poorly graded grav sand
I Lique.	Depth (m)	1,00	4,00	4,40	4,80	6,60	8,40	9,20
Table A.6.	Test ID	SPT A-1						

	End Condition		t	I	No Liquefaction
	Fs		0,19	0,24	1,58
	CSR		0,32	0,36	0,36
	rp		0,97	0,94	0,93
	CRR _{7.5}		0,06	0,09	0,57
	(N ₁ ) ₆₀		¢	∞	42
	C _R		0,78	0,94	66'0
	C		1,56	1,06	
	SPT (N)		Ŷ	8	42
	σ' (kN/m²)	26,39	41,76	89,74	101,58
	σ (kN/m²)	26,39	59,42	146,63	170,25
	γ _n (kN/m ³ ) 14.66		18,35	21,80	19,68
h Code	Y _{bulk} (kN/m ³ )	25,65	28,60	26,60	25,60
to Turkis	γ _{dry} (kN/m ³ )	13,50	13,00	19,00	16,00
rding			09 00	0 37	
Acco	<u>v</u>	0,2	1,0	0,1	0,0
e A-3	e	0,0	1,20	0,4	0,6
PT Lo	h (n	1,80	1,80	4,00	1,20
faction Analyses of SI	Layer Description	Fill	CH: Brown, high plasticity silty clay. At about 2 m there is a layer of brown fine sandv silt	ML: Gray low plasticity claycy silt with fine sand.	SAND: Gray poorly graded sand with silt and traces (8%) of fine rounded gravel
3 Lione	(m)	1.80	3,60	7,60	8,80
Table A.6	Test ID	SPT A-3			

	End Condition	•	ı	1	T	Liquefaction	No Liquefaction	ł
	F _S		0,21	0,20	0,30	0,80	1,51	0,29
	CSR		0,37	0,37	0,38	0,38	0,34	0,32
	^Q		0,97	0,97	0,94	0,92	0,81	0,76
	CRR _{7.5}		0,08	0,07	0,12	0,30	0,51	0,09
	(N ₁ ) ₆₀		7	7	0	28	40	∞
	C		0,79	0,81	0,96			
	Č		1,52	1,44	1,08	0,97	0,81	0,77
	(N) LAS		Ŷ	Q	01	29	49	11
	σ' (kN/m²)	17,59	43,74	48,53	87,66	106,85	154,04	171,43
	σ (kN/m²)	17,59	71,21	79,93	154,37	189,25	277,64	310,73
	γ _n (kN/m ³ )	14,66	19,15	21,80	20,68	21,80	21,04	20,68
hCode	Y _{bulk} (kN/m ³ )	25,65	27,55	26,60	27,20	26,60	26,10	27,20
to Turkis	γ _{dry} (kN/m ³ )	13,50	14,50	19,00	17,00	19,00	18,00	17,00
rding	ГГ	•	41	36	44	0 25	، م	0 69
Acco	S	0,25	1,00	1,00		0 1,00	2 1,00	0 1,0
g A-4	9 (	0,9(	)6'0	0,4(	0,66	0,4	0,4	9,0 0
$TL_0$	h (m	1,20	2,80	0,40	3,60	1,60	4,20	1,6(
faction Analyses of SP	Layer Description	Eill.	CL: Low to high plasticity, brown silty clay to clayey silt with traces of fine sand. Soil is highly inhomogeneous, showing variable FC	ML: Brown low plasticity silt with traces of fine sand	CL: Low to high plasticity gray silty clay to clayey silt with traces of fine sand	SANDY SILT: Gray low plasticity sandy silt	SAND: Gray poorly to well graded sand with silt. 22% gravel content in S-A4-9, very low (< 5%) in other samples.	CH: Gray, high plasticity stiff clay.
4 Lique	(m)	1.20	4,00	4,40	8,00	9,60	13,80	15,40
Table A.6	Test ID	SPT A-4						

-								
	End Condition	-	•	Liquefaction	Liquefaction	4	¥	4
	s S			0,32	18'0	0,20	0,32	0,32
F	CSR		0,34	0,36	0,37	0.35	0,33	0,31
	2		86'0	0,97	0,92	0,84	0,79	0,74
	CRR _{7.5}		0,04	0,12	0,30	0,07	0,11	0'10
	(N ₁ ) ₆₀		<del></del>	10	58	7	6	6
-	ű		0,75	4,81	00°,	1,00	1.00	00'1
	రే	Π	1,66	1,39	0,96	0,84	0,79	0,74
	SPT (N)		'n	Ø	29	œ	12	13
	a' (ادًاس ² )	17.59	36,58	52,27	110,63	143,24	162,33	186,25
	ط (اد/m ¹ )	17,59	54,24	84,65	192,05	254,09	289,86	335,36
	۲ _ه (tul/m ³ )	14.66	20.36	20,27		20,68	21,04	20,68
1 Code	Yhuik (kN/m ³ )	25,65	28,80	25,50	27,90	27,20	26,10	27,20
10 Turkist	لامبر (اد/۱۳)	13.50	16.00	17,00	18,00	17,00	18,00	17,00
ding	F	•	22	23	I	62	0 27	0 58
Accor	ŝ	0.25	00'1	1,00		1,00		
	<u>ہ</u>	06,0	0'80	0,50		0'01	0,4.	0,61
T Lot	ի (m)	1.20	1,80	1,50	2'00	3,00	1,70	2,20
faction Analyses of SP	Layer Description	Fill	CLAYEY SILT: Olive gray clayey silt with traces of fine sand. S- C2-B is gray brown clayey silt. The brown iones may be due to oxidation of ferric oxidation of ferric animetals	SAND AND SILT: Brown low plasticity silt to silty fine sand. FC of recovered sumples varies from 14% to 66%	SILTV SAND: Gray sand mixtures grading with depth from standy silt to sand with silt and sand with silt and fine to coarse gravel. Gravel content from 2% to 27%. The shape of the gravel particles is variable from flat and elongated to well proportioned angular	CH: Stiff gray moist high plasticity silty clay. Wash water shows traces of shells.	CLAY AND SAND: Interbedded thin strata of gray slity sand to sandy slit and gray sity clay to clayey sith	CH: Moist gray high plasticity sitty clay. Very thin (< 1 cm) red oxidized scams found in S-R1-11
5 Lique	(m)	1,20	3,00	4,50	05°6	12,50	14,20	16,40
Table A.6	Test ID	SPT B-1				. —		

	End Condition		ı	ŧ	Liquefaction
	Fs		0,10	0,43	0,73
	CSR		0,34	0,35	0,38
	r _D		0,98	0,97	0,94
	CRR _{7.5}		0,03	0,15	0,27
	(N ₁ ) ₆₀		ন্দ	13	25
	Cr		0,76	0,78	0,98
	Č		1,62	1,54	1,02
	SPT (N)		m		25
	σ' (kN/m²)	17,59	38,69	42,88	96,80
	σ (kN/m²)	17,59	58,31	66,42	167,44
	γ _n (kN/m ³ )	14,66	20,36	20,27	21,04
h Code	Y _{bulk} (kN/m ³ )	25,65	28,80	25,50	26,10
to <b>Turkis</b>	γ _{dry} (kN/m ³ )	13,50	16,00	17,00	18,00
SPT Lor B-2 According to Turkish Code	<b>LL</b>	1	) 40	0 37	· 0
Accol	S	0.25	0(1,0(	0(1)0	5 1,0
e B-2	e (	6,0	0,8	0,5	0,4
PT Lo	<b>h</b> (m	1,20	2,00	0,4(	4,8(
faction Analyses of SI	Layer Description	Fil	CLAYEY SILT: Brown clayey silt with fine sand and red oxidized zones	SANDY SILT: Gray sandv silt	SAND: Well to poorly graded gray sand. Sand with silt in the upper 2 m of the layer. Gravel content in recovered samples is variable from 0% in S-B2- 7
sh Linne	Depth (m)	1.20	3,20	3,60	8,40
Table A.6	Test ID	SPT B-2			

	End ondition	-	1	uefaction	luefaction	•
-	C C			,86 Liq	,59 Lic	,32
	<u></u>		38	0	38 0	38
	° CS	0 0, Ci		95 0,	91 0,	91 0,
	RR _{7.5} r		0,06	0,34 0,	0,23 0,	0,12
	(N ₁ ) ₆₀		ý	Ē	20	
	చ్		0,81	0,88	1,00	1,00
	ర్		1,50	1,26	0,99	0,97
	SPT (N)		ŝ	28	20	1
	σ' (kN/m²)	17,59	44,92	63,75	104,20	106,60
	σ (kN/m²)	17,59	76,32	112,80	188,56	192,92
	γ _n (kN/m ³ )	14,66	18,35	20,27	21,04	21,80
n Code	$\gamma_{\rm bulk}$ (kN/m ³ )	25,65	28,60	25,50	26,10	26,60
to Turkisl	γ _{dry} (kN/m ³ )	13,50	13,00	17,00	18,00	19,00
rding	FT	•	48	29	1 	0 32
Accol	S	0,25	1,00	1,00	1,00	0,1,0(
C-I	9 (	0,90	1,20	0,5(	.0,4,	0,41
T Lo	h (m)	1,20	3,20	1,80	3,60	0,20
faction Analyses of SP	Layer Description	Fill	CLAY: Brown tan silty clay to clayey silt. Red oxidation points in samples indicating oxidation of ferric minerals	SANDY SILT: Gray low plasticity sandy silt interbedded with gray silty clay with traces of fine sand. Thin gray clay layer at approximately 5.15 m.	SAND: Gray sand to silty sand of variable gradation interspersed with thin layers of silty clay. Variable gravel content in samples S-C1-6B and S-C1-7 (10 % - 20 %)	ML: Gray low plasticity clayey silt with fine sand
7 Lique	(m) (m)	1,20	4,40	6,20	9,80	10,00
Table A.6	Test ID	SPT C-1				

	End Condition	ŗ	·	No Liquefaction	,	
	Ћs	0,27	0,12	1,15	0,22	
	CSR	0,23	0,44	0,43	0,43	0,41
	^r	1,00	76,0	0,96	0,95	0,92
	CRR _{7.5}	0,06	0,05	0,09	0,50	0,09
	(N ₁ ) ₆₀	Q	Ś	∞	39	œ
	C,	0,75	0,81	0,87	0,89	1,00
	Š	2,00	1,57	1,36	1,30	1,03
	SPT (N)	4	4	7	34	∞
to Turkish Code	σ' (kN/m²)	6,69	40,86	54,57	59,51	95,03
	σ (kN/m²)	6,69	80,10	116,40	182,34	
	γ _n (kN/m ³ )	13,39	18,35	19,68	21,27	
	$\gamma_{\rm bulk}$ (kN/m ³ )	27,60	28,60	28,80	25,60	27,00
	γ _{dry} (kN/m ³ )	12,00	13,00	16,00	16,00	18,00
rding	LL L	40	) 57	42	,	0 40
Acco	s.	0,25	1,0(		0,1	0
0-2	•	1,3(	1,2(		0,6	0,5
T Log	h (m)	0,50	4,00	0,50	3,10	
faction Analyses of SP	Layer Description	CLAYEY SILT: Dark brown clayey silt with uniform color. Moist, soft consistency.	CLAYEY SILT: Brown clayey silt to high plasticity silty clay. Traces of fine sand	CLAYEY SILT: Olive gray clayey silt with fine sand to sandy silt interbedded with clay seams. Very thin lamination at about 5.25 m.	SW-SM: Well graded gray sand with silt. Approximately 8% gravel content.	CLAYEY SILT: Alternating strata of gray silty clay and clayey silt.
<b>3 Lique</b>	(m)	0,50	4,50	5,80	6,30	9,40
Table A.6	Test ID	SPT C-2		Anna Anna ann an Anna ann an Anna Anna		

	nd dition		t	faction	a	I
	Con E			Lique		
	ES.		0,15	0,59	0,35	0,38
	CSR		0,38	0,38	0,38	0,37
	r ₀		0,96	0,95	0,95	0,90
	CRR _{7.5}		0,06	0,22	0,13	0,14
	(N ₁ ) ₆₀		°.	20	2	13
	č		0,87	0,88	0,92	-00°
	C		1,26	1,24	1,15	0,95
	SPT (N)		Ŷ	18	servet servet	13
	σ' (kN/m²)	17,59	63,84	65,82	76,69	113,36
	σ (kN/m²)	17,59	108,97	112,91	133,59	201,65
	γ _n (kN/m ³ )	14,66	19,86	19,68	20,68	21,27
h Code	γ _{bulk} (kN/m ³ )	25,65	26,40	25,60	27,20	27,00
to Turkis	γ _{dry} (kN/m ³ )	13,50	16,00	16,00	17,00	18,00
rding	Ľ	-	43	-	31	9 48
Acco	s	0 0,2;	2 1,00	0 1,0(	0 1,0(	0,1,0
g C-3	e (	0,9	0,6	0,6	0,6	0,5
PT Lo	h (m	1,20	4,60	0,20	1,00	3,20
faction Analyses of SI	Layer Description	FII	SILT: Brown silt to clayey silt with traces of fine sand interspersed with strata of brown silty sand to sandy silt	SM: Gray silty fine sand	SILTY CLAY: Gray silty clay to clayey silt with some fine sand	CLAY AND SILT: Gray low plasticity silt with sand interbedded with gray high plasticity clay. Red oxidation zone towards the upper towards the upper portion of sample S- C3-6. The clay loses strength when remolded
9 Lique	Depth (m)	1,20	5,80	6,00	7,00	10,20
Table A.6	Test ID	SPT C-3			£	
Analyses of SPT Log C-4 According to Turkish Code	$ \text{TDescription}  \textbf{h}(\textbf{m})  \textbf{e}  \textbf{S}  \textbf{LL}  \frac{\gamma_{\text{dry}}}{(kN/m^3)}  \frac{\gamma_{\text{hulk}}}{(kN/m^3)}  \frac{\sigma}{(kN/m^3)}  \frac{\sigma}{(kN/m^3)}  \frac{\sigma}{(kN/m^2)}  (\frac{\sigma}{(kN/m^2)}  \textbf{SPT}(\textbf{N})  \textbf{C}_{N}  \textbf{C}_{R}  \textbf{C}_{R}  \textbf{CR}_{7.5}  \textbf{r}_{D}  \textbf{CSR}  \textbf{F}_{S}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  \textbf{Condition}  Con$	Fill   1,20 0,90 0,25 -   13,50 25,65   14,66   17,59   17,59   0	SY SILT:       Strutt       0,00       0,00       17,00       27,20       20,68       92,04       56,72       3       1,34       0,83       3       0,03       0,96       0,36       0,03       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036       0,036			
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<b>C-4 According to Turkish Code</b>	e S LL $\left  \begin{array}{c} \gamma_{\rm dry} \\ (kN/m^3) \end{array} \right  $	),90 0,25 - 13,50 25,65	3,60 1,00 38 17,00 27,20			
T Log C	4 (m)	1,20 0,	3,60 0,			
uefaction Analyses of SP	h Layer Description	EII	CLAYEY SILT: Brown silty clay/clayey silt to			
able A.70 Liqı	Test ID Dept (m)	PT C-4 1,20	4,80			

	End Idition	•	1		,	No efaction
	Ū Ū					Liqu
	Fs		0,07	0,12	1,69	1,10
-	CSR		0,30	0,34	0,34	0,35
	r _D		0,97	0,96	0,95	0,94
	CRR _{7.5}		0,02	0,04	0,57	0,38
	(N ₁ ) ₆₀		2	4	42	34
	Ľ		0,78	0,87	0,88	0,93
	ů		1,47	1,22	1,18	1,08
	SPT (N)		2	4	40	34
	σ' (kN/m²)	32,26	47,19	68,29	73,04	86,52
	σ (kN/m²)	32,26	62,89	103,61	112,28	137,54
	γ _n (kN/m ³ )	14,66	19,15	20,36	21,68	21,04
h Code	Y _{butk} (kN/m ³ )	25,65	27,55	28,8	28,80	26,10
to Turkis	Y ^{dry} (kN/m ³ )	13,50	14,50	16	18,00	18,00
rding	LLL	•	44	45	) 36	·
Acco	s	0,25	1,0(	-	1.0(	2
2.0-5	0	0,9(	0,9(	0.8	0,6(	0,4:
T Loi	h (n)	2,20	1,60	0	0.40	1,20
faction Analyses of SP	Layer Description	Fill	CL: Brown silty clay w/red oxidized zones	CL: Grav silty clav	SILT: Grav clavev silt	SAND: Gray fine to coarse sand with traces of gravel. Fine gravel content in S-C5- 7 = 8%
'I Lique.	Depth (m)	2.20	3.80	5.80	6.20	7,40
Table A.7	Test ID	SPT C-5				

ſ		T		T	B
	End Conditior	*	8	B	Liquefactic
	ьs		0,08	0,46	0,50
-	CSR		0,33	0,34	0,35
	r _D		0,98	0,98	0,98
	CRR _{7.5}		0,03	0,15	0,17
	(N ₁ ) ₆₀		'n	13	15
	Ľ		0,75	0,75	0,75
	Č		1,84	1,78	1,66
	SPT (N)		7	10	12
	σ' (kN/m²)	14,66	29,88	32,05	36,64
	σ (kN/m²)	14,66	43,61	47,75	56,26
	$\gamma_n$ (k/m ³ )	14,66	20,68	20,68	21,27
h Code	Y _{bulk} (kN/m ³ )	25,65	27,20	27,20	27,00
to Turkis	γ _{dry} (kN/m ³ )	13,50	17,00	17,00	18,00
rding	ГГ	-	) 36	) 56	) 36
Acco	s	0,25	1,00	1,00	1,0(
С. С.	<u>ی</u>	0,9(	0,6(	0,6(	0,5(
T Lo	h (m)	1,00	1,40	0,20	0,40
faction Analyses of SF	Layer Description	113	ML: Brown silt to silt with sand w/ red oxidized zones	CH: Brown high plasticity silty clay.	SILTY SAND: Brown silty sand
72 Lique	Depth (m)	1,00	2,40	2,60	3,00
Table A.	Test ID	SPT C-6			

rding to Turkich Code 9-<u>0</u>-0 CDT 6 

	End Condition	•	L	ı
	F _S		0,17	0,13
	CSR		0,33	0,36
	r _D		0,98	0,97
	CRR _{7.5}		0,06	0,05
	(N ₁ ) ₆₀		Q	ŝ
	С ^в		0,75	0,78
	CN		1,84	1,50
	SPT (N)		4	4
	σ' (kN/m²)	14,66	29,88	45,09
	σ (kN/m²)	14,66	43,61	72,56
	γ _n (kN/m ³ )	14,66	20,68	20,68
th Code	Y _{butk} (kN/m ³ )	25,65	27,20	27,20
to <b>Turkis</b>	γ _{dry} (kN/m ³ )	13,50	17,00	17,00
rding	<b>PT</b>	-	) 34	57
Acco	s	0.25	00'1 00	0(1)
E C-7	e	6,0	0,6(	0,6
PT LO	h (n	1,00	1,40	1,40
faction Analyses of SI	Layer Description	Fill	ML: Brown low plasticity silt with sand to sandy silt. Soil has red oxidized points	CLAY: Brown high plasticity silty clay w/ red oxidized points
73 Lique	(m)	1,00	2,40	3,80
Table A.	Test ID	SPT C-7		

	End Condition	1	,	B	ŀ	ı	Liquefaction	ų
	F _S		0,04	0,07	0,06	0,22	0,74	0,18
	CSR		0,39	0,40	0,41	0,41	0,40	0,38
ŀ	ĉ		66'0	0,98	0,98	0,97	0,93	0,90
	CRR _{7.5}		0,02	0,03	0,02	0,09	0,29	0,07
	09(1N)		7	3	'n	∞	27	4
ľ	Ğ		0,75	0,75	0,76	0,8	1,00	1,00
ľ	کّ		2,27	2,05	1,71	1,48	1.01	0,93
	SPT (N)			2	2	-	27	4
	σ' (kN/m²)	5,86	19,68	24,03	34,70	46,37	100,30	117,09
	σ (kN/m²)	5,86	33,41	41,69	62,17	83,65	184,66	215,19
	γ _n (kN/m ³ )	14,66	19,68	20,68	20,48	21,48	21,04	21,80
n Code	γ _{butk} (kN/m ³ )	25,65	25,60	27,20	26,35	27,90	26,10	26,60
to Turkisl	γ _{ury} (kN/m ³ )	13,50	16,00	17,00	17,00	18,00	18,00	19,00
ding 1	ſ	•	33	) 28	40	) 28	· · · · · · · · · · · · · · · · · · ·	0 56
Accor	s	0,25	1,00	1,00	1,00	1,0(	2 1,0	0.1.0
D-I	。 	0,90	0,60	0,60	0,55	0,5:	0,4:	0,4
T Log	h (m)	0,40	1,40	0,40	1,00	1,00	4,80	1,40
faction Analyses of SP'	Layer Description	Itt	CL: Black to dark gray clayey silt with some fine sand. The soil has organic odor but not related to soil composition. Probably due to nearby septic	ML: Dark gray to black sandv silt	CH: Brown silty clay with traces of red oxidized spots. Does not soften when remoulded	ML: Brown silt with traces of fine sand and red oxidized spots.	SAND: Well graded gray sand to well graded sand with fine gravel. Gravel content is inhomogeneous and varies from 3% to 24%. FC in all recovered samples is < 6%	MH: High plasticity silty clay with traces of fine sand
4 Liaue	Depth (m)	0.40	1,80	2,20	3,20	4,20	6,00	10,40
Table A.7	Test ID	SPT D-1						

	End Condition		1	,	Liquefaction
	F.		0,16	0,09	0,72
	CSR		0,28	0,35	0,37
	r _D		0,99	0,97	0,94
	CRR _{7.5}		0,04	0,03	0,27
	(N ₁ ) ₆₀		Ś	m	24
	ర్		0,75	0,80	0,93
	Č		2,03	*** 4	1,08
	SPT (N)		ę	'n	24
	σ' (kN/m²)	19,06	24,49	51,30	87,26
	σ (kN/m²)	19,06	29,40	79,75	147,10
	γ _n (kdN/m ³ )	14,66	20,68	20,98	21,04
h Code	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	26,10
to Turkis	Y _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00
rding	TT	-	36	0 38	۱ 0
Acco	S	0.2	0 1,00	5 1,0	5 1,0
g D-2	e (	0,9	0,6	0,5	0,4
PT Lo	h (m	1,30	0,50	2,40	3,2(
faction Analyses of Sl	Layer Description	Fill	CLAYEY SILT: Gray clayey silt to silty clay with fine sand and traces of shells. Strong organic odor, but not due to soil composition	CLAYEY SILT: Brown clayey silt to silty clay with traces of fine sand and red oxidized spots to sandy silt	SAND: Gray well to poorly graded sand with low silt content (< 6%) and varying fine gravel content (< 16%)
75 Lique	(m)	1,30	1,80	4,20	7,40
Table A.7	Test ID	SPT D-2			

	End Condition	1	3	1	Liquefaction
	F.S		0,23	0,40	0,71
	CSR		0,30	0,31	0,32
	£		0,97	0,97	0,96
	CRR _{7.5}		0,07	0,12	0,23
	(N ₁ ) ₆₀		7		20
	Ľ		0,79	0,81	0,83
	CN		1,40	1,34	1,27
	SPT (N)		9	10	61
	σ' (kN/m²)	32,26	51,82	56,29	63,03
	σ (kN/m ² )	32,26	69,48	77,87	90,50
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,04
h Code	y _{bulk} (kN/m ³ )	25,65	27,20	27,13	26,10
to Turkis	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00
rding	E	-		0 32	
Acco	s.	0,2:	0 1,00	5 1,0	5 1,0
2 D-3	٥ (	0,9(	0,6	0,5	0,4
PT Lo	h (m	2.20	1,80	0,40	0,6(
faction Analyses of SI	Layer Description	Fill	SILT: Brown sandy silt to low plasticity silt with traces of fine sand	CLAYEY SILT: Brown low plasticity clavev silt	SAND: Well graded gray sand with traces of gravel and silt
6 Lique	Depth (m)	2,20	4,00	4,40	5,00
Table A.7	Test ID	SPT D-3			

	End Condition		Liquefaction	t	ı	Liquefaction	\$
	E S		0,29	0,18	0,08	0,64	0,26
	CSR		0,34	0,37	0,39	0,39	0,39
	r _D		0,98	76,0	0,96	0,93	0,93
	CRR _{7.5}		0,10	0,07	0,03	0,25	0,10
ľ	(N ₁ ) ₆₀		6	ę	m	22	6
	č		0,75	0,76	0,83	1,00	1,00
	రి		1,96	1,67	1,38	1,01	1,00
	SPT (N)		9	Ŷ	c,	52	6
	σ' (kN/m ² )	14,66	26,43	36,48	52,92	98,76	100,94
	σ (kN/m ² )	14,66	39,18	59,04	92,16	177,24	181,38
	γ _n (kN/m ³ )	14,66	18,86	19,86	19,48	21,27	20,68
h Code	γ _{bulk} (kN/m ³ )	25,65	26,10	26,40	24,80	27,00	27,20
to Turkis	γ _{dry} (kdN/m ³ )	13,50	14,50	16,00	16,00	18,00	17,00
rding	ΓΓ	,		31	0 59	,	0 39
Acco	s	0,22	0 1,0(	2 1,00	5 1,0	0 1,0	0,1,0
-3 a	e ()	0.0	0,8	0,6	0,5	0 0,5	0 0,6
PT Lo	р р	1,0(	1,3(	1,00	L'.1	4,0	h 0,2
faction Analyses of Sl	Layer Description	Fill	SP: Poorly graded, medium to fine brown clean sand	SILT AND SAND: Interbedded strata of brown low plasticity sandy silt and clayey silt with brown medium sand	SIL TY CLAY: Browr clayey silt/silty clay. Traces of organics and oxidation veins	SAND: Gray fine to medium sand interbedded with gray low plasticity silt deposits. FC in this stratum varies from 3% to 61%	CLAY: Gray clay wit traces of fine sand
7 Lique	(m)	1,00	2,30	3,30	5,00	9,00	9,20
Table A.7.	Test ID	SPT E-1			<u></u>	ан Алим (ан ан ан ан ан ан ан ан ан ан ан ан ан а	

	,	End Condition				5 I innefaction		
		ES.				, 0 0	; ;	-
		CSR				PE 0	5	
		r ₀				0 08	5	
		CRR _{7.5}				0.00	<b>N</b>	
		(N ₁ ) ₆₀				ŏ		
		Ğ				0 75	, 'n	
		Š				1 75		
		SPT (N)				7	0	
		σ' (LN/m ² )	1	14.66			00,00	
		σ ///m ² /		14.66		4	48,09	
		γ _n (1.Ν.(3)		14.66	226		71,21	
th Code		Ybulk G-N1(3)	( IKINIII )	25.65	22.22	1	27,00	
to Turkis		Ydry	( IKINIM )	13 50	2262		18,00	
rdino		LL LL		ļ.,			-	
A cro		Ś		10.7	5		) Č	
R_1 R		<u>ہ</u>		0	5		0,5(	
T L ou		h (m)		10	2,1		1,60	
ation Anolycos of CD'	ICHUI AHAIYSES UL SL	Layer Description	•	115,3	1.11	SP-SM: Olive gray	fine to medium sand	with silt
Same I	rudnen	Depth	(H)	00 1	1,00		2,60	
Tr.L.L. A 70	Lable A./o	Test ID			N1 E-1B		- under	ш,,,,,,

ſ	_	T	uo		T	U
	End Condition	-	Liquefacti	1	1	Liquefacti
	Fs		0,35	0,22	0,08	0,55
	CSR		0,36	0,37	0,39	0,39
	<b>r</b> _D		0,98	0,97	0,96	0,95
	CRR _{7.5}		0,12	0,08	0,03	0,22
	(N ₁ ) ₆₀			~	3	61
	C _R		0,75	0,78	0.85	0,87
	Č		1,81	1,61	1,32	1,27
	SPT (N)		×	6	Э	17
	σ' (kN/m²)	14,66	30,95	39,00	57,75	62,33
	σ (kN/m²)	14,66	48,61	64,50	101,89	110,40
	γ _n (kN/m ³ )	14,66	18,86	19,86	19,68	21,27
h Code	Y _{bulk} (kN/m ³ )	25,65	26,10	26,40	25,60	27,00
to Turkis	Y _{dry} (kN/m ³ )	13,50	14,50	16,00	16,00	18,00
rding		-	، د	0 25	0 53	33
Acco	s.	0,2:	0 1,00	5 1,0	0 1,0	0 1,0
E E-2	e	0,9(	0,8(	0,6	0,0	0,5
PT Lo	р р и ш	1,00	1,80	0,80	1.90	0,40
faction Analyses of SI	Layer Description	1113	SP: Poorly graded fine to medium brown sand. FC <= 5%	ML: Brown silt to sandy silt with red oxidized points	CLAY: Gray silty clay	SILT AND SAND: Gray silt with sand to sandy silt/silty sand
79 Linue	(m)	1,00	2,80	3,60	5.50	5,90
Table A.	Test ID	SPT E-2				

**Turkish Code** \$ 5 CDT. ę

Table A.8	30 Lique	faction Analyses of SP	T Log	F-1 Ac	cordi	ing to	Turkish	Code						ŀ			-		
Test ID	(m)	Layer Description	h (m)	e		E	Y _{dry} kN/m ³ )	Y _{bulk} (kN/m ³ )	γ _n (kN/m ³ )	σ (kN/m ² )	σ' (kN/m ² )	రి	Ŭ	ؾ	CRR _{7.5}	2	CSR	Fs	End Condition
SPT F-1	0,80	HiH	0,80	0,90 (	0,25		13,50	25,65	14,66	11,73	11,73								4
	3,00	ML: Brown low plasticity sandy silt to silt	2,20	0,65	1,00	29	16,00	26,40	19,86	55,43	33,85	1,73	0.75	0,75	0,08	0,98	0,37	0,23	9
	4,70	CL: Brown low plasticity silty clay to clayey silt with traces of fine sand	1,70	0,60	1,00	14	16,50	26,40	20,18	89,74	51,48	1,40	(15+b4)/24	0,82	0,07	0,96	0,39	0,19	8
	8,50	SILT AND SAND: Gray sandy silt to silty sand. FC of recovered samples varies from 35% to 77%	3,80	0,55	1,00	29	17,00	26,35	20,48	167,56	92,03	1,05	(15+b4)/24	0,98	0,17	0,93	0,40	0,42	ţ
	12,20	CLAY: Gray silty clay to clayey silt with traces of fine sand. LL of recovered samples varies from 38 to 57	3,70	0,60	<u>8</u> ,	46	17,00	27,20	20,68	244,07	132,24	0,88		1,00	0,10	0,91	0,39	0,25	ŀ
	12,40	SM: Gray silty fine sand	0,20	0,40	1,00	26	19,00	26,60	21,80	248,43	134,64	0,87	l	1,00	0,31	0,84	0,36	0,85	Liquefaction

.,

	End Condition		ı	3	I	,
	rs Fi		0,17	0,22	0,27	0,19
	CSR		0,36	0,38	0,38	0,38
	r _D		76,0	0,96	0,94	0,92
	CRR _{7.5}		0,06	0,08	0,10	0,07
	(N ₁ ) ₆₀		ę	∞	6	~
	ూ		0,77	0,83	0,94	1,00
	Č		1,57	1,34	00,1	0,97
	SPT (N)		ŝ	7	6	4
	σ' (kN/m ² )	14,66	41,04	56,25	84,51	106,69
	σ (kN/m²)	14,66	65,36	94,51	148,28	189,09
	γ _n (kN/m ³ )	14,66	20,36	20,68	20,68	21,48
h Code	γ _{bulk} (kdN/m ³ )	25,65	28,80	27,20	27,20	27,90
to Turkis	γ _{dry} (k/N/m ³ )	13,50	16,00	17,00	17,00	18,00
rding	ГГГ	-	34	0 51	0 29	0 55
Acco	s.	0 0,2	0 1,0	0 1,0	0,1,0	55 1,0
g G-1	e (	0,9	0,8	0,6	0,0	0,5
PT Lo	<u>n</u>	1,00	2,50	1,4(	2,6(	1,9
faction Analyses of SI	Layer Description	Fill	CLAYEY SILT: Interbedded strata of olive brown to brown clayey silt with traces of fine sand and brown sandy silt	CLAY: High plasticity orav silty clav	SILT AND SAND: Gray silt and sandy silt to silty sand. FC varies from 22% to 90%. 4 mm red silty clay to clayey silt seam found at approx. 7.2 m	MH: High plasticity gray clayey silt. Softens when remoulded. Red oxidized 5 mm-thick seam at approx. 9.2 m
1 Liquei	Depth (m)	1,00	3,50	4,90	7,50	9,40
Table A.8	Test ID	SPT G-1				

	End adition	ť	3	3	I	ţ	t	F	1
-	Ö		9	5	errei			~~~~	0
-	E.		0,2	0,3	0,3	0,3	0,2	°.	ŏ
	CSR		0,35	0,36	0,38	0,38	0,38	0,36	0,33
	r _D		0,97	0,97	0,95	0,94	0,93	0,87	0,79
	CRR _{7.5}		0,09	0,12	0,12	0,12	60'0	0,07	0,17
	(N ₁ ) ₆₀		œ	10	10	10	∞	9	14
	ٽ		0,79	0,81	0,91	0,96	0,99	1,00	1,00
	Č		1,50	1,40	1,14	1,07	1,02	0,89	0,80
	SPT (N)		٢	6	0	10	∞	7	18
	σ' (kN/m²)	19,06	45,20	51,72	77,33	89,29	96,76	126,64	157,58
	σ (kN/m²)	19,06	70,71	83,12	132,27	155,02	169,35	226,70	286,09
	γ _n (kN/m ³ )	14,66	19,86	20,68	20,48	20,68	20,48	20,48	20,48
Code	γ _{bulk} (kN/m ³ )	25.65	26,40	27,20	26,35	27,20	26,35	26,35	26,35
to I urkis	Y _{dry} (kN/m ³ )	13,50	16,00	17,00	17,00	17,00	17,00	17,00	17,00
gung	Ľ	•	29	64 0	33	) 58	36	0 47	0 36
Acco	ŝ	0.25	1,00		1,00	0,11,0	2.1.0	2 1,0	5 1,0
5	<b>U</b>	0.90	0,65	0,60	0,55	0,6(	0,5:	0.5	0.5
L Log	h (m)	1.30	2,60	0,60	2,40	1,10	0,70	2,80	2,90
faction Analyses of SP	Layer Description	Fill	ML: Brown low plasticity silt with fine sand to sandy silt	CH: Gray high plasticity silty clay with traces of fine sand	ML: Gray low plasticity clayey silt to silt with sand. Red clay seams from approximately 6.15 m	CH: Soft gray, high plasticity silty clay	ML: Gray clayey silt with traces of fine sand	CLAY: Gray silty clay to clayey silt. Some shells at approx. 10.3 m	ML: Interbedded strata of gray low plasticity silt with sand and gray clayey silt. Some red clay seams
2 Liquei	Depth (m)	1.30	3,90	4,50	6,90	8,00	8,70	11,50	14,40
Table A.8.	Test ID	SPT G-2		<u>an da an an an an an an an an an an an an an</u>	<u>, , , , , , , , , , , , , , , , , , , </u>				

Table A.8	3 Lique	faction Analyses of SP	T Log (	G-3 A	ecord	ling to	Turkish	( Code										ŀ		
Test ID	Depth (m)	Layer Description	h (m)	e	s		γ _{dry} (N/m ³ )	Y _{bulk} (kN/m ³ )	γ _n (kN/m ³ )	σ (kN/m²)	σ' (kN/m²)	SPT (N)	ی د	 °	N1)60	CRR _{7.5}	- ²	CSR	Fs	End Condition
SPT G-3	3.00	11.1	3.00 (	0.00	0.25	1	13,50	25,65	14,66	43,99	43,99									2
	3,40	SANDY SILT: Red brown sandy silt. Very similar to the soil scen at the surface (ejecta) in Yagcioglu apartments	0,40	0,50	00,	26	18,00	27,00	21,27	52,49	48,57	10	1,44	,77		0,13	0,97	0,24	0,52	ı

	End Condition	-	*	iquefaction	3	8	ı	iquefaction	B	4
	E S H		0,15	0,47 L	0,11	0,41	0,19	0,24 L	0,24	0,17
-	CSR		0,34	0,38	0,39	0,39	0,39	0,38	0,38	0,37
	n D L		0,99	0,98	0,96	0,95	0,93	06,0	0,89	0,87
	CRR _{7.5}		0,05	0,18	0,04	0,16	0,07	0,09	0,09	0,06
	(N ₁ ) ₆₀		°.	15	4	14	2	×	8	9
	౮		0,75	0,75	0,84	0,88	1,00	1,00	1,00	1,00
	Č		2,27	1,83	1,31	1,21	0,98	0,93	0,92	0,85
	SPT (N)		e	11	4	13	~	6	6	7
	σ' (kN/m ² )	8,80	19,67	30,34	59,38	69,25	104,77	116,01	120,35	129,05
	σ (kN/m²)	8,80	29,48	49,96	104,51	123,20	189,14	210,18	218,45	235,00
	γ _n (kN/m ³ )	14,66	20,68	20,48	20,98	20,77	21,27	21,04	20,68	20,68
h Code	$\gamma_{\rm bulk}$ (kN/m ³ )	25,65	27,20	26,35	27,13	26,25	27,00	26,10	27,20	27,20
to Turkis	$\gamma_{dry}$ (kN/m ³ )	13,50	17,00	17,00	17,50	17,50	18,00	18,00	17,00	17,00
rding	ΓT	•	43	,	51	32	56	- (	37	02 0
Acco	Ś	0,25	1,00	1,00	- <u>-</u>	00.	<u> </u>	2 1'0(	0,1,0	0,1,0
5 H-1	9 	0,9(	0,6(	0,55	0,55	0,5(	0,5(	0,4	0,6	0,6
PT Log	p (II)	0,60	1,00	1,00	2,60	0,90	3,10	1,00	0,40	0,80
faction Analyses of SI	Layer Description	Fill	CL: Dark gray to black clay with sand	SM: Gray to brown silty sand	CLAY: Brown, grading to grayclayey silt to silty clay	ML: Gray low plasticity silt with sand	CLAYEY SILT: Gray highplasticity silty clay to clayey silt interspersed with thin layers of silty sand to sandy silt	SP-SM: Gray fine to medium sand with silt	ML: Gray clayey silt	CH: Dark gray stiff high plasticity clay
4 Liquei	Depth (m)	0,60	1,60	2,60	5,20	6,10	9,20	10,20	10,60	11,40
Table A.8	Test ID	SPT H-1		A,,		<u></u>				

Turkis	
According to	
SPT Log H-1	
Analyses of S	
Liquefaction	
A.84	

	End Condition		•	ı	t	No Liquefaction
	Ł		0,34	0,19	0,18	1;32
	CSR		0,34	0,37	0,39	0,39
	r _D		0,99	0,98	0,96	0,95
	CRR _{7.5}		0,12	0,07	0,07	0,52
	(N ₁ ) ₆₀		10	7	7	40
	$C_{\rm R}$		0,75	0,75	0,84	0,88
	Č		2,27	1,81	1,29	1,20
	SPT (N)		9	s	و	38
	σ' (kN/m²)	8,80	19,67	30,84	60,63	70,74
	σ (kN/m²)	8,80	29,48	50,46	105,76	124,70
o Turkish Code	γ _n (kN/m ³ )	14,66	20,68	20,98	21,27	21,04
	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	27,00	26,10
	$\gamma_{dry}$ (kN/m ³ )	13,50	17,00	17,50	18,00	18,00
ding (	LLL	5 - 1	) 73	29	40	•
Accor	s.	0.2	)0,1	1,0(	1,00	1,00
- I-I -	0	0,9(	0,6(	0,5:	0,5(	0,4;
T Loi	p (m)	0,60	1,00	1,00	2,60	0,90
faction Analyses of SF	Layer Description	11:4	CH: Gray high plasticity silty clay	SANDY SILT: Brown sandy silt	CLAYEY SILT: Gray clayey silt to silty clay with traces of fine sand	SP-SM: Fine to medium gray poorly graded sand with silt
35 Liquet	Depth (m)	0,60	1,60	2,60	5,20	6,10
Table A.5	Test ID	SPT I-1				

	End Condition	B		·	Liquefaction	
	Fs		0,13	0,08	0,51	
	CSR		0,37	0,38	0,37	
	¹ D		76,0	0,96	0,89	
	CRR _{7,5}		0,05	0,03	0,19	
	(N ₁ ) ₆₀		<del>ر</del> ي.	Ŷ	16	
	చ్		0,77	0,83	1,00	
	ů		1,59	1,34	0,91	
	SPT (N)		4	n	18	
	σ' (kN/m²)	11,73	39,99	56,33	122,80	
	σ (kN/m²)	11,73	65,49	95,57	218,93	
	γ _n (kN/m ³ )	14,66	20,68	21,48	21,27	
1 Code	Y _{bulk} (KN/m ³ )	25,65	27,20	27,90	27,00	
to Turkisl	$\gamma_{dry}$ (kN/m ³ )	13,50	17,00	18,00	18,00	
guib.	LLL	1	36	20	36	
Accol	s	0 0,2	0 		0,1	
g J-1	°	6,0	0,6	0,5	0,5	
PT Lo	u) 4	0,80	2,6(	1,4(	5,8(	
faction Analyses of SI	Layer Description	Fill	ML: Brown to gray clayey silt with traces of fine sand to silt with sand. Red oxidized zones throughout the stratum	CH: Gray high plasticity silty clay with traces of fine sand. Wood pieces found at approximately 3.9 m and 4.7 m	SILT AND SAND: Interbedded strata of gray low plasticity clayey silt and silty fine sand	
6 Lique	Depth (m)	0,80	3,40	4,80	10,60	
Table A.8	Test ID	I-f TqS				

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	End Condition		ı	1	Liquefaction	ı
	Fs S		0,17	0,08	0,46	0,29
	CSR		0,36	0,37	0,38	0,38
	°,		0,97	96,0	0,94	0,93
	CRR _{7.5}		0,06	0,03	0,18	0,11
	(N ₁ ) ₆₀		6	e	13	0
	CR		0,77	0,84	0,94	0,99
	Č		1,58	1,29	1,07	0,99
	SPT (N)		Ŷ	'n	5	10
	σ' (kN/m ² )	14,66	40,75	60,85	88,36	103,04
	σ (kN/m ² )	14,66	64,29	102,06	153,10	179,56
	$\gamma_n$ (kN/m ³ )	14,66	20,68	20,98	21,27	22,04
1 Code	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	27,00	27,55
to Turkisl	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00	19,00
guib.	<b>LL</b>	-	30	99 00		
Accol	Ś	0,2	1,00	2 1,00	0 1,0	5 1,0
g J-2	e (	0,9	0,61	0,55		
TL0	h (m	1,00	2,40	1,80	2,40	1,2(
faction Analyses of SI	Layer Description	E	ML: Brown low plasticity clayey silt with fine sand to sandy silt. Silt layers alternate with silty clay/clayey silt	CH: Gray high plasticity silty clay with traces of brown roots. Does not soften when remoulded	SILT AND SAND: Alternating strata of gray silty fine sand and low plasticity clayey silt to sandy silt. Traces of wood at approximately 7.2 m. Seaming of gray silty clay with sandy silt in S-J2-6	CLAY AND SAND: Interbedded strata of high plasticity, gray silty clay and silty fine sand
17 Lique	Depth (m)	1,00	3,40	5,20	7,60	8,80
Table A.8	Test ID	SPT J-2				

	End Condition	Ŧ	ı	3	t	8
	$\mathbf{F}_{\mathbf{S}}$		0,21	0,19	09'0	0,23
	CSR		0,34	0,35	0,37	0,37
	£		0,97	0,96	0,94	0,92
	CRR _{7.5}		0,07	0,07	0,22	0,08
	(N ₁ ) ₆₀		٢	9	61	∞
	$C_R$		0,79	0,83	0,94	1,00
	СN		1,44	1,30	1,07	0,97
	SPT (N)		Q	9	19	8
	σ' (kN/m ² )	21,99	49,16	60,03	88,29	108,40
	σ (kN/m²)	21,99	73,69	94,37	148,13	185,90
Code	γ _n (kN/m ³ )	14,66	20,68	20,68	20,68	20,98
	Y _{bulk} (kN/m ³ )	25,65	27,20	27,20	27,20	27,13
to Turkisl	γ _{dry} (kN/m ³ )	13,50	17,00	17,00	17,00	17,50
guib.		1	30	95	0 29	19 0
Accor	ŝ	0.25	<u>ŏ</u>	1,00	1,00	5 1,0(
c. J-3 .	<u>ی</u>	0,90	0,6(	0,6(	0,6(	0,5;
PT Los		1,50	2,50	1,00	2,60	1,80
faction Analyses of SF	Layer Description	Fill	ML: Brown to gray clayey silt to silt with fine sand. Transition from brown to gray occurs at approx. 2.5 m	CH: Gray high plasticity silty clay	ML: Gray low plasticity silt with sand to sandy silt	CH: Gray silty clay
S Linne	Depth (m)	1,50	4,00	5,00	7,60	9,40
Table A.8	Test ID	SPT J-3				

	End Condition		ı	1	
	ъ S		0,23	0,15	
	CSR		0,35	0,37	
	r _D		0,98	0,96	
	CRR _{7.5}		0,08	0,06	
	(N1)60		7	9	
	$C_R$		0,75	0,83	
	CN		1,64	1,35	
	SPT (N)		9	'n	
	α' (kN/m²)	14,66	37,49	55,63	
	σ (kN/m²)	14,66	58,09	92,90	
	γ _n (kN/m ³ )	14,66	20,68	20,48	
Code	γ _{bulk} (kN/m ³ )	25.65	27,20	26,35	
to Turkisl	$\gamma_{dry}^{\gamma_{dry}}$ (kN/m ³ )	13,50	17,00	17,00	
ding.		5 -	0 33	0 51	
Accol	so	0,2;	1,0	2 1,0	-
4-L a		0.9(	0,66	0,5,0	
TLO	h (n	1,00	2,10	1,70	
faction Analyses of SP	Layer Description	Fill	ML: Brown and gray clayey silt to brown low plasticity sandy silt. FC varies from 56% to 91%	SILTY CLAY: High plasticity gray silty clay/clayey silt interspersed with gray silt with sand	
900 I. 108	Depth (m)	1.00	3,10	4,80	
Tahle A	Test ID	SPT J-4			

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	End Condition	ſ	ı	Liquefaction	ı
	$\mathbf{F}_{\mathbf{S}}$		0,18	0,64	0,38
	CSR		0,39	0,38	0,38
	r _D		0,96	0,94	0,92
	CRR _{7.5}		0,07	0,25	0,14
	(N ₁ ) ₆₀		Ŷ	52	13
	ల్		0,86	0,98	1,00
	CN		1,26	1,02	0,96
	SPT (N)		ø	52	13
	σ' (kN/m²)	11,73	63,90	97,48	109,47
	σ (kN/m²)	11,73	110,99	172,04	193,84
h Code	γ _n (kN/m ³ )	14,66	20,68	21,80	21,80
	γ _{bulk} (kN/m ³ )	25,65	27,20	26,60	26,60
to <b>Turkis</b>	γ _{dry} (kN/m ³ )	13,50	17,00	19,00	19,00
rding	TT	-	14	,	0 37
Acco	s.	0 0.2	0	0(1)	0 1,0
<u>e</u> K-1	e	6.0	0,6	0,4	0,4
PT Lo	h (m	0.80	4,8(	2,8(	
faction Analyses of Sl	Layer Description	Fill	CLAY AND SILT: Brown low plasticity clayey silt/silty clay with traces of fine sand. S-K1- 1 is dark gray and has a light odor, probably due to a nearby septic tank. Transition to gray color occurs at approx. 5.5 m	SILTY SAND: Gray silty sand to sand with silt	ML: Gray low plasticity silt to sandy silt
0 Lique	Depth (m)	0,80	5,60	8,40	9,40
Table A.9	Test ID	SPT K-1			

	End Condition		1	T T		ı	t	No Liquefaction
	F.L		8,14	0,80	0,78	0,77	15,55	17,41
	r		0,38	0,38	0,38	0,38	0,37	0,36
	ł		0,94	0,93	0,93	06'0	0,87	0,86
	~		3,08	0,30	0,29	0,29	5,68	6,33
	RL		3,08	0,30	0,29	0,29	5,68	6,33
	"N		38,13	19,39	18,75	18,30	42,05	42,78
	c ₂		4,61	3,56	3,56	4,72	3,00	0,00
	c1		3,65	2,70	2,70	3,75	2,20	1,00
	SPT (N)		9	4	4	n	17	43
	σ' (kN/m²)	14,66	40,28	45,08	49,88	69,44	91,03	98,92
	σ (kN/m²)	14,66	69,71	78,44	87,16	124,38	163,62	179,37
	γ _n (kN/m ³ )	(kN/m ³ ) 14,66 18,35		21,80	21,80	20,68	21,80	19,68
e	Y _{hulk} (kN/m ³ )	25,65	28,60	26,60	26,60	27,20	26,60	25,60
anese Coc	Y ^{dry} (kN/m ³ )	13,50	13,00	19,00	19,00	17,00	19,00	16,00
o Japa	$\mathbf{D}_{\mathrm{S0}}$		0,004	0,045	0,045	0,012	0,057	0,290
ding t	FC		93	74	74	95	64	Ś
Accor	ŝ	0,25	1,00	1,00	1,00	1,00	1,00	1,00
I-A :	<u>ی</u>	0,90	1,20	0,40	0,40	0,60	0,40	0,60
PT Log	h (m)	1,00	3,00	0,40	0,40	1,80	1,80	0,80
action Analyses of SPT L	Layer Description	Fill	CH: Brown, moist, sticky, high plasticity silty clay without visible sand particles. S-A1-4 shows darker tones and some fine to medium sand content	ML: Gray silt with sand. Field description: ML	ML: Brown, low plasticity silt with fine sand and some red clay points	CH: High plasticity gray clay with low sand content (traces). At 5.3 m a thin fine sand scam was identified. Sample A1- 7 exhibits some sand scams	ML: Gray sandy silt. Increasing sand content with depth	SP: Medium to fine poorly graded gray sand
11 Lique	Depth (m)	1,00	4,00	4,40	4,80	6.60	8,40	9,20
Table A.	Test ID	SPT A-1						

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	End Condition		1	,	9	J	1	No Liquefaction
	L.		1,23	0,69	14,93	0,77	10,90	1.13
	<u>د</u>		0,35	0,39	0,39	0,38	0,37	0,37
	Ē		96,0	0,94	0,93	06'0	0,88	0,85
	<b>~</b>		0,43	0,27	5,79	0,30	4,08	0,42
	R		0,43	0,27	5,79	0,30	4,08	0,42
	Na		25,34	15,82	42,17	18,86	39,88	24,99
	C ³		3,89	4,61	4,61	4,83	4,17	00'00
	C1		3,00	3,65	3,65	3,85	3,25	1,00
	SPT (N)			7	7	m	01	26
	σ' (kN/m²)	14,66	24,59	39,97	44,77	68,68	83,07	104,78
	σ (kN/m²)	σ (kN/m²) 14,66 38,33		71,36	80,08	125,57	151,74	195,03
	γ _n (kN/m ³ )	γ _n (kN/m ³ ) 14,66 16,91		18,35	21,80	20,68	21,80	19,68
9	Y _{bulk} (kN/m ³ )	Ybuik (KN/m ³ ) 25,65 25,65 24,00		28,60	26,60	27,20	26,60	25,60
inese Cod	γ _{dry} (kN/m ³ )	13,50	12,00	13,00	19,00	17,00	19,00	16,00
o Japi	Dso		0,025	0,001	0,018	0,007	0,026	0,230
ding t	FC		80	63	93	97	85	7
Accor	s	0,25	1,000	1,00	1,00	1,00	1,00	1,00
5 A-2	<u>ہ</u>	0,90	1,00	1,20	0,40	0,60	0,40	0,60
T Loi	h (n	1,00	1,40	1,80	0,40	2,20	1,20	2,20
iction Analyses of SPT Li	Layer Description	Fill	ML: Brown clayey silt to silty clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine to medium sand in a silty clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with silt. Gravel content ~ 8% in sample S-A2-10
2 Lique	Depth (m)	1,00	2,40	4,20	4,60	6,80	8,00	10,20
Table A.5	Test ID	SPT A-2		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				L

	End Condition	F	1	E	No Liquefaction
	تر بتا		5,60	4,15	14,63
	Ч		0,31	0,34	0,34
	r _d		0,95	0,89	0,87
	R		1,75	1,40	4,95
	$\mathbf{R}_{\mathrm{L}}$		1,75	1,40	4,95
	, Z		34,77	33,44	41,13
	c ₂		4,94	4,39	0,00
	C_1		3,95	3,45	1,00
	SPT (N)		Ś	8	42
	σ' (kN/m²)	26,39	41,76	89,74	101.58
	σ (kN/m²)	26,39	59,42	146,63	170,25
	γ _n (kN/m ³ )	14,66	18,35	21,80	19,68
	Y _{bulk} (kN/m ³ )	25,65	28,60	26,60	25,60
nese Code	γ _{dry} (kN/m ³ )	13,50	13,00	19,00	16,00
Japa	$\mathbf{D}_{50}$		0,005	0,024	0,220
ling to	FC		66	89	6
ccord	s	0,25	1,00	1,00	1,00
A-3 A	Ð	0,90	1,20	0,40	0,60
T Log	h (m)	1,80	1,80	4,00	1,20
faction Analyses of SP	Layer Description	Fill	CH: Brown, high plasticity silty clay. At about 2 m there is a layer of brown fine sandy silt	ML: Gray low plasticity clayey silt with fine sand.	SAND: Gray poorly graded sand with silt and traces (8%) of fine rounded gravel
3 Lique	Depth (m)	1,80	3,60	7,60	8,80
Table A.9	Test ID	SPT A-3		<u></u>	<u></u>

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	End Condition		ı	3	ı	No Liquefaction	No Liquefaction	1
	E E		6,18 6	8,02	23,15	250,60	7,30	6,19
	ŗ		0,36	0.36	0,36	0,35	0,33	0,32
	r _d		0,94	0,93	0,88	0,86	0.79	0,77
	æ		2,20	2,87	8,35	88,42	2,43	2,01
	Ŗ		2,20	2,87	8,35	88,42	2,43	2,01
	z		36,10	37,70	44,72	66,47	36,68	35,55
	c ²		4,50	4,83	4,72	3,11	0,00	5,00
	J		3,55	3,85	3,75	2,30	.00	4,00
	SPT (N)		Ŷ	9	0	29	49	1
	σ' (kN/m²)	17,59	43,74	48,53	87,66	106,85	154,04	171,43
	σ (kN/m²)	17,59	71,21	79,93	154,37	189,25	277,64	310,73
	γ _n (lt/M ³ )	14,66	19,15	21,80	20,68	21,80	21,04	20,68
0	γ _{hulk} (kN/m ³ )	Y _{hulk} (kN/m ³ ) 25,65 27,55		26,60	27,20	26,60	26,10	27,20
nese Cod	γ ^{dry} (kN/m ³ )	13,50	14,50	19,00	17,00	19,00	18,00	17,00
o Japa	$D_{50}$		0,014	0,017	0,006	0,018	0,470	0,002
ding t	FC		6	97	95	66	6	100
Accor	Ś	0,25		1,00	1.00	1,00	1,00	1,00
A-4	e	0.90	0,90	0,40	0,60	0,40	0,45	0,60
T Log	h (m)	1,20	2,80	0,40	3,60	1,60	4,20	1,60
faction Analyses of SP	Layer Description	Fill	CL: Low to high plasticity, brown silty clay to clayey silt with traces of fine sand. Soil is highly inhomogeneous, showing variable FC	ML: Brown low plasticity silt with traces of fine sand	CL: Low to high plasticity gray silty clay to clayey silt with traces of fine sand	SANDY SILT: Gray low plasticity sandy silt	SAND: Gray poorly to well graded sand with silt. 22% gravel content in S-A4-9, very low (< 5%) in other samples.	CH: Gray, high plasticity stiff clay.
4 Lique	Depth (m)	1,20	4,00	4,40	8,00	9,60	13,80	15,40
Table A.9	Test ID	SPT A-4						

	End Condition	-	,	Liquefaction	No Liquefactior	۲	۲	•
	ц,		0,98	0,93	-11	542	0,79	7,32
	د		0.33	0,35	\$£,0	0,34	0,33	0,32
	2		0,96	£6'0	÷ *	18'0	0.79	0,75
	я		0.32	0,33	0,65	0.81	92'0	2,31
	R _L		0,32	0,33	0,65	18'0	0,26	16,2
	z		21,08	21,52	2X,75	30,18	14,61	36,39
	c		94 F	1,67	0.17	5,00	1,44	5,00
	5		3,50	0y't	999 -	00't	1,52	4,00
	SPT (N)		en .	\$	Ę	8	21	12
	a ^د (اندا/m²) :	17.59	36,58	<u>52,2</u> 7	£9'011	143,24	162,33	186,25
	a (kN/m³)	17,59	54,24	84,65	192,05	60'152	289,86	335,36
	۲. (kN/m ² )	14,66	20,36	20,27	8 <del>9</del> 17	20,68	21.04	20,68
	( ^t m/NJ)	25,65	28,80	25.50	27,50	27,20	36,10	27,20
mese Cod	Yan (kN/m ³ )	13,50	16,00	17,00	18,40	17,00	81	17,00
adaL o	n, s		0,023	0,105	6,930	001	060'0	00010
ding t	U.		8	Ŷ	<u>n</u>	8	36	100
Accor	ŝ	0.25	00	00'1	8°	00'1	00.1	00' ~~
8	<b>u</b>	06 0	0%0	0.50	0,60	55.0	0,6(	
T Lo	11 (m)	1.20		1.50	2'00	3,00	<u><u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u><u></u></u></u>	2,20
faction Analyses of SI	Layer Description	F.R	CLAVEY SILT: Obive gray clayey silt with traces of fine sand. S- C.2-B is gray brown clayer silt. The brown clayer silt. The brown clayer silt. The brown clayer silt. The brown orise and be due to oxidation of ferric minerals	SAND AND SILT: Brown low plasticity silt to silty fine sand. FC of recovered samples varies from 14% to (6%	SILTY SAND: Gray sand mixtures grading with deph from sandy sand sand with silt and sand with silt and fine to coarse gravel. Gravel coarse gravel from 35 to 27%. The shape of the gravel from first and proportioned angular and rounded	CH: Stiff gray moist high plasticity silty clay. Wash water shows traces of shells.	CLAY AND SAND: Interbedded thin strata of grav sitly sand to sandy sitt and grav sitly clay to clayey sitt	CH: Moist gray high plasticity silty clay. Very thin (< 1 cm) red oxidized scams found in S-B1-11
S Lique	Depth (m)	1.20	3,00	4,50	05.9	12,5()	14,20	16,40
Table A.9	Test ID	SPT B-1						

	End Condition		ı	F	No Liquefaction
-	FL		0,94	0,80	1,20
	Г		0,33	0,34	0,35
	ŗ		0,95	0,95	0,87
	×		0,31	0,27	0,42
	$\mathbf{R}_{\mathrm{L}}$		0,31	0,27	0,42
	z		20,46	16,44	25,19
	c ₂		4,39	0,00	0,00
	ۍ ۲		3,45	1,00	1,00
	SPT (N)		ũ	=	25
	σ' (kN/m ² )	17,59	38,69	42,88	96,80
	σ (kN/m²)	17,59	58,31	66,42	167,44
	γ _n (kN/m ³ )	14,66	20,36	20,27	21,04
	_{Դեսtk} (kN/m ³ ) 25,65		28,80	25,50	26,10
nese Code	$\gamma_{dry}$ (kN/m ³ )	13,50	16,00	17,00	18,00
Japai	$\mathbf{D}_{\mathrm{50}}$		0,026	0,400	0,700
ding t	FC		89	5	4
Accor	S	0,25	1,00	1,00	1,00
B-2	ی د	0,90	0,80	0,50	0,45
YL LOE	h (m)	1.20	2,00	0,40	4,80
faction Analyses of SP	Layer Description	Fill	CLAYEY SILT: Brown clayey silt with fine sand and red oxidized zones	SANDY SILT: Gray sandy silt	SAND: Well to poorly graded gray sand. Sand with silt in the upper 2 m of the layer. Gravel content in recovered samples is variable from 0% in S-B2- 7
6 Lique	Depth (m)	1,20	3,20	3,60	8,40
Table A.9(	Test ID	SPT B-2		L	L

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	End Condition	*	ı	No Liquefaction	Liquefaction	Ē
	Ъг Г		4,12	2459,95	0,84	12,53
	L L		0,37	0,37	0,36	0,36
	La	rd 0,93		0,91	0,85	0,85
	a		1,52	918,65	0,30	4,49
	RL		1,52	918,65	0,30	4,49
	z		33,94	102,39	19,29	40,49
	C2		4,94	3,67	0,00	4,39
	J		3,95	2,80	1,00	3,45
	SPT (N)		'n	28	20	Ξ
	σ' (kN/m²)	σ' (kN/m ² ) 17,59 44,92		63,75	104,20	106,60
	σ (kN/m²)	σ (kN/m²) 17,59 76,32		112,80	188,56	192,92
	γ _a (kN/m ³ )	γ _n (kN/m ³ ) 14,66 18,35		20,27	21,04	21,80
4	Y _{bulk} (kN/m ³ )	25,65	28,60	25,50	26,10	26,60
nese Cod	γ _{dry} (kN/m ³ )	13,50	13,00	17,00	18,00	19,00
o Japa	$\mathbf{D}_{50}$		0,002	0,049	1,900	0,007
ding t	FC		66	76	ন	89
Accord	S	0.25	1,00	1,00	1,00	1,00
C-I	<b>ə</b>	0.00	1,20	0,50	0,45	0,40
T L09	h (m)	1.20	3,20	1,80	3,60	0,20
faction Analyses of SP	Layer Description	HE	CLAY: Brown tan silty clay to clayey silt. Red oxidation points in samples indicating oxidation of ferric minerals	SANDY SILT: Gray low plasticity sandy silt interbedded with gray silty clay with traces of fine sand. Thin gray clay layer at approximately 5.15 m.	SAND: Gray sand to silty sand of variable gradation interspersed with thin layers of silty clay. Variable gravel content in samples S-C1-6B and S-C1-7 (10 % - 20 %)	ML: Gray low plasticity clayey silt with fine sand
7 Lique	Depth (m)	1,20	4,40	6,20	9,80	10,00
Table A.9	Test ID	SPT C-1				

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					uo	
	End Condition	F	r	8	No Liquefacti	a
	F_L	15,14	1,44	5,22	300,01	5,84
	L	0,23	0,43	0,41	0,41	0,38
	r _d	0,99	0,93	0,91	0,91	0,86
	R	3,50	0,61	2,17	123,66	2,24
	RL	3,50	0,61	2,17	123,66	2,24
	N	38,91	28,28	36,01	70,55	36,20
	c ₂	4,83	4,83	4,28	1.56	4,83
	c,	3,85	3,85	3,35	1,56	3,85
	SPT (N)	4	4	٢	34	8
	σ' (kN/m ² )	6,69	40,86	54.57	59,51	95,03
	σ (kN/m²)	6,69	80,10	106,56	116,40	182,34
	γ _n (kN/m ³ )	13,39	18,35	20,36	19,68	21,27
	Y _{bulk} (kN/m ³ )	27,60	28,60	28,80	25,60	27,00
nese Cour	$\gamma_{\rm dry}^{\gamma_{\rm dry}}$ (kN/m ³ )	12,00	13,00	16,00	16,00	18,00
nder o	D ₅₀	0,013	0,008	0,008	0,357	0,004
n Hun	FC	26	97	87	38	97
ACCUL	ŝ	0,25	1,00	1,00	1,00	1,00
3	ల	1,30	1,20	0,80	0,60	0,50
1 1.05	h (m)	0,50	4,00	1,30	0,50	3,10
laction Analyses of 54	Layer Description	CLAYEY SILT: Dark brown clayey silt with uniform color. Moist, soft consistency.	CLAYEY SILT: Brown clayey silt to high plasticity silty clay. Traces of fine sand	CLAYEY SILT: Olive gray claycy silt with fine sand to sandy silt interbedded with clay seams. Very thin lamination at about 5.25 m.	SW-SM: Well graded gray sand with silt. Approximately 8% gravel content.	CLAYEY SILT: Alternating strata of gray sitty clay and clayey silt.
o rudac	Depth (m)	0,50	4,50	5,80	6,30	9,40
I abic A.y	Test ID	SPT C-2			L	1

	End Condition	1	ı	No Liquefaction	E	•		
-	د ۲		0,83	5,83	20,23	22,05		
	ц.		0,36	0,36	0,36	0,35		
	,p T		16'0	16,0	0,90	0,85		
	×		0,30	2,12	7,34	7,73		
	$\mathbf{R}_{\mathrm{L}}$		0,30	2,12	7,34	7,73		
	Na		19,43	35,87	43,80	44,17		
	c ₂		3,39	1,50	4,06	4,28		
	¹		2,55	1.54	3,15	3,35		
	SPT (N)		Ŷ	18	=	13		
	σ' (kN/m²)	17,59	63,84	65,82	76,69	113,36		
	σ (kN/m²)	17.59	108,97	112,91	133,59	201,65		
	Yn (kN/m ³ )	14,66	19,86	19,68	20,68	21,27		
	Y _{bulk} (kN/m ³ )	25,65	26,40	25,60	27,20	27,00		
nese Code	γ _{dry} (kN/m ³ )	13,50	16,00	16,00	17,00	18,00		
Japa	$\mathbf{D}_{\mathrm{S0}}$		0,180	0,090	0,027	0,033		
ding to	FC		12	37	83	87		
Accor	s	0,25	00'1	1,00	1.00	1,00		
5 C-3	ۍ (	0,90	0,65	0,60	0,60	0,50		
T Log	h (m)	1,20	4,60	0,20	1,00	3,20		
faction Analyses of SF	Layer Description		SILT: Brown silt to clayey silt with traces of fine sand interspersed with strata of brown silty sand to sandy silt	SM: Gray silty fine sand	SILTY CLAY: Gray silty clay to clayey silt with some fine sand	CLAY AND SILT: Gray low plasticity silt with sand interbedded with gray high plasticity clay. Red oxidation zone towards the upper portion of sample S- C3-6. The clay loses strength when remolded		
9 Lique	Depth (m)	1,20	5,80	6,00	7,00	10,20		
Table A.9	Test ID	SPT C-3			4			

End Condition	-	1
E ^r		0,65
Г		0,35
r _d		0,93
R		0,23
R _L		0,23
z		11,27
c ²		2,89
¹ o		2,10
SPT (N)		£
σ' (kN/m ² )	17,59	56,72
σ (kN/m²)	17,59	92,04
γ _n (kN/m ³ )	14,66	20,68
Y _{butk} (kN/m ³ )	25,65	27,20
Y _{dry} (kN/m ³ )	13,50	17,00
D ₅₀		0,030
ړ ۲		62
s	0,25	1,00
e	0,90	0,60
h (m)	1,20	3,60
Layer Description	Fill	CLAYEY SILT: Brown silty clay/clayey silt to sandy silt/silty sand
Depth (m)	1,20	4,80
Test ID	SPT C-4	

Table A.100 Liquefaction Analyses of SPT Log C-4 According to Japanese Code

	End Condition		3	•	;	No Liquefaction
			0,92	1,12	64152,12	2,19
	<u> </u>		0,29	0,32	0,32	0,33
	L. D		0,94	0,91	16'0	0,89
	æ		0,27	0,36	20813,82	2,37
	RL		0,27	0,36	20813,82	2,37
	N		15,72	23,28	190,85	36,53
	C ₂		4,78	4,78	4,94	0,00
	¢1		3,80	3,80	3,95	1,00
	SPT (N)		5	4	40	34
	σ' (kN/m²)	32,26	47,19	68,29	73,04	86,52
	σ (kN/m²)	32,26	62,89	103,61	112,28	137,54
	γ _n (tcN/m ³ )	14,66	19,15	20,36	21,68	21,04
le	γ _{bulk} (kN/m ³ )	25,65	27,55	28,8	28,80	26,10
anese Coo	γ _{dry} (kN/m ³ )	13.50	14,50	16	18,00	18,00
to Jap	D ₅₀		0,005	0.002	0,017	0,700
rding	FC	1	96	96	66	4
Accol	s	0.25	1,00		1,00	1,00
2 C-5	<b>.</b>	0.00	0,90	0.8	0,60	0,45
PT Lo	h (m)	2.20	1,60	2	0,40	1,20
faction Analyses of SPT	Layer Description	II.	CL: Brown silty clay w/ red oxidized zones	CL: Grav silty clav	SILT: Grav clayev silt	SAND: Gray fine to coarse sand with traces of gravel. Fine gravel content in S-C5- 7 = 8%
01 Ligu	Depth (m)	2.20	3,80	5.80	6.20	7,40
Table A.1	Test ID	SPT C-5				

Table A.102 Liquefaction Analyses of SPT Log C-6 According to Japanese Code

End Condition	F	4	-	No Liguefaction
FL		0,84	364,91	4,71
<u>ب</u>		0,33	0,33	0,34
ŗ		0,96	0,96	0,96
۲		0,27	121,56	1,61
$\mathbf{R}_{\mathrm{L}}$		0,27	121,56	1,61
N.		16,51	70,34	34,25
°2		4,50	4,94	1,94
5		3,55	3,95	1,70
SPT (N)		2	10	12
σ' (kN/m ² )	14,66	29,88	32,05	36,64
σ (kN/m²)	14,66	43,61	47,75	56,26
γ _n (kN/m ³ )	14,66	20,68	20,68	21,27
γ _{bulk} (kN/m ³ )	25,65	27,20	27,20	27,00
γ _{ůr} , (kN/m ³ )	13,50	17,00	17,00	18,00
$\mathbf{D}_{50}$		0,015	0,003	0,080
ĿĊ		16	99	45
s	0,25	1,00	1,00	1,00
e	0,90	0,60	0,60	0,50
h (m)	1,00	1,40	0,20	0,40
Layer Description	Fill	ML: Brown silt to silt with sand w/ red oxidized zoncs	CH: Brown high nasticity silty clav.	SILTY SAND: Brown silty sand
Depth (m)	1,00	2,40	2,60	3,00
Test ID	SPT C-6			

	End Condition	1	ı	•
	Ъ Г		1,12	1,69
	L		0,33	0,35
	్		0,96	0,94
	x		0,37	0,60
	RL		0,37	0,60
	z		23,41	28,10
	c ²		3,78	4,94
	ť		2,90	3,95
	SPT (N)		4	4
	σ' (kN/m²)	14,66	29,88	45,09
	σ (kN/m²)	14,66	43,61	72,56
	۲ _n ((k/N/m ³ )	14,66	20,68	20,68
	Y _{bulk} (kN/m ³ )	25,65	27,20	27,20
anese Cod	γ _{dry} (kN/m ³ )	13.50	17,00	17,00
to Jap:	Dsa		0,026	0,003
rding	FC		78	66
Accol	s	0,25	1,00	1,00
е С-7	<u>ہ</u>	0,90	0,60	0,60
PT Lo	h (m)	1,00	1,40	1,40
staction Analyses of SI	Layer Description	611	ML.: Brown low plasticity silt with sand to sandy silt. Soil has red oxidized points	CLAY: Brown high plasticity silty clay w/ red oxidized points
103 Liau	(m)	1.00	2,40	3,80
Table A.	Test ID	SPT C-7		

	End Condition	•	,	•		1	No Liquefaction	ł
	L F		0,55	0,61	0,62	9,60	1,33	1,61
	J		0,38	0,39	0,40	0,39	0,37	0,36
	ŗ		79,0	0,97	0,95	0,94	0,87	0,84
	~		0,21	0,24	0,25	3,78	0,49	0,58
	RL		0,21	0,24	0,25	3,78	0,49	0,58
	Z.		9,70	12,56	13,35	39,39	26,64	27,91
	c ₂		3,94	3,39	3,83	4,39	00'0	4,67
	c1		3,05	2,55	2,95	3,45	1,000	3,70
	SPT (N)		pana -	5	5	7	27	٢
	σ' (kN/m²)	5,86	19,68	24,03	34,70	46,37	100,30	117,09
	σ (kN/m²)	5,86	33,41	41,69	62,17	83,65	184,66	215,19
	γ _n (kN/m ³ )	14,66	19,68	20,68	20,48	21,48	21,04	21,80
de	γ _{butk} (kN/m ³ )	25,65	25,60	27,20	26,35	27,90	26,10	26,60
anese Co	$\gamma_{dry}$ (kN/m ³ )	13,50	16,00	17,00	17,00	18,00	18,00	19,00
to Jar	$\mathbf{D}_{50}$		0,011	0,035	0,032	0,026	1,170	0,007
rding	FC		×	71	79	89	4	94
Acco	s	0,25	00'1	1,00	1,00	1,00	1,00	1,00
PE D-1	ల	06,0	0,60	0,60	0,55	0,55	0,45	0,40
PT Lo	h (m)	0,40	1,40	0,40	1,00	1,00	4,80	1,40
cfaction Analyses of Sl	Layer Description	Fill	CL: Black to dark gray claycy silt with some fine sand. The soil has organic odor but not related to soil composition. Probably due to nearby septic tank	ML: Dark gray to black sandy silt	CH: Brown silty clay with traces of red oxidized spots. Does not soften when remoulded	ML: Brown silt with traces of fine sand and red oxidized spots.	SAND: Well graded gray sand to well graded sand with fine gravel. Gravel content is inhomogeneous and varies from 3% to 24%. FC in all recovered samples is < 6%	MH: High plasticity silty clay with traces of fine sand
04 Liqu	Depth (m)	0,40	1,80	2,20	3,20	4,20	00'6	10,40
Table A.1	Test ID	SPT D-1		fra 100	<b>▲</b>	<u></u>	<del>, , , , , , , , , , , , , , , , , , , </del>	

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	End Condition		I	r	No Liquefaction	
	F _L		1,33	0,75	1,27	
	L		0,27	0,34	0,35	
	r		0,97	0,94	0,89	
	ĸ		0,36	0,25	0,44	
	R		0,36	0,25	0,44	
	z		23,24	14,02	25,66	
	c ₂		4,44	3,39	00'0	
	- ¹		3,50	2.55	00'1	
	SPT (N)		ŗ	÷	24	
	σ' (kN/m²)	19,06	24,49	51,30	87,26	
	σ (kN/m²)	19,06	29,40	79,75	147,10	
e	رد m/N/j) (k/h ³ )	14,66	20,68	20,98	21,04	
	γ _{bułk} (kN/m ³ )	25,65	27,20	27,13	26,10	
anese Cot	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00	
to Jap	$\mathbf{D}_{50}$		0,024	0,030	0,970	
-ding	FC		90	17	2	
Accol	Ś	0,25	1,00	1,00	1,00	
g D-2	ల	0,90	0,60	0,55	0,45	
PT Lo	h (m)	1,30	0,50	2,40	3,20	
efaction Analyses of Si	Layer Description		CLAYEY SILT: Gray clayey silt to silty clay with fine sand and traces of shells. Strong organic odor, but not due to soil composition	CLAYEY SILT: Brown clayey silt to silty clay with traces of fine sand and red oxidized spots to sandy silt	SAND: Gray well to poorly graded sand with low silt content (< 6%) and varying fine gravel content (< 16%)	
05 Liqu	Depth (m)	1,30	1,80	4,20	7,40	
Table A.1	Test ID	SPT D-2		8		

¢ ¢ **C**07 : 10
ſ	E			T	ion
	End Conditie		B	E	No Liquefact
	ц ц		0,98	103,19	1,24
ľ	۲		0,29	0,30	0,31
	ŗ		0,94	0,93	0,93
	~		0,29	31,03	0,38
	RL		0,29	31,03	0,38
	Na		18,05	55,49	24,06
	c ^z		2,44	4,78	0,00
	c1		1,88	3,80	1,00
	SPT (N)		6	10	61
	σ' (kN/m ² )	32,26	51,82	56,29	63,03
	σ (kN/m²)	32,26	69,48	77,87	90,50
	$\gamma_{\rm H}$ (k/M ³ )	14,66	20,68	20,98	21,04
de	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	26,10
anese Cor	γ _{dry} (kN/m ³ )	13,50	17,00	17,50	18,00
to Jap	D ₅₀		0,066	0,011	1,500
rding	FC		54	96	4
Acco	S	0,25	1,00	1,00	1,00
5 D-3	e	0,90	0,60	0,55	0,45
PT LO	h (m)	2,20	1,80	0,40	0,60
efaction Analyses of S	Layer Description	II.J	SILT: Brown sandy silt to low plasticity silt with traces of fine sand	CLAYEY SILT: Brown low plasticity clayey silt	SAND: Well graded gray sand with traces of gravel and silt
06 Liqu	Depth (III)	2,20	4,00	4,40	5,00
Table A.1	Test ID	SPT D-3		<u>,,, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,</u>	

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	End Condition	1	Liquefaction	I	•	No Liquefaction	8
	د. يت		0,66	1,21	0,83	2,12	9,68
	L		0,33	0,36	0,37	0,36	0,36
	r ⁴		0,97	0,95	0,93	0,87	0,86
	×		0,22	0,43	0,31	0,77	3,49
	В _г		0,22	0,43	0,31	0,77	3,49
	N N		10,52	25,42	20,41	29,81	38,90
	c,		0,00	3,61	4,78	0,89	4,83
	1 ₂		1,00	2,75	3,80	1,32	3,85
	SPT (N)		9	ŝ	£	22	6
	σ' (kN/m ² )	14,66	26,43	36,48	52,92	98,76	100,94
	σ (kN/m²)	14,66	39,18	59,04	92,16	177,24	181,38
	$\gamma_n$ (kN/m ³ )	14,66	18,86	19,86	19,48	21,27	20,68
le	Y _{bulk} (kN/m ³ )	25,65	26,10	26,40	24,80	27,00	27,20
anese Cod	(kN/m ³ )	13,50	14,50	16,00	16,00	18,00	17,00
to Jap	$\mathbf{D}_{\mathrm{S0}}$		0,510	0,037	0,005	0,267	0,014
rding	FC		5	75	96	26	67
Acco	ŝ	0,25	1,00	1,00	1,00	00,1	1,00
g E-1	<b></b>	0,0	0,80	0,65	0,55	0,50	0,60
PT Lo	h (m)	1.00	1,30	1,00	1,70	4,00	0,20
efaction Analyses of S	Layer Description		SP: Poorly graded, medium to fine brown clean sand	SILT AND SAND: Interbedded strata of brown low plasticity sandy silt and clayey silt with brown medium sand	SILTY CLAY: Brown clayey silt/silty clay. Traces of organics and oxidation veins	SAND: Gray fine to medium sand interbedded with gray low plasticity silt deposits. FC in this stratum varies from 3% to 61%	CLAY: Gray clay with traces of fine sand
07 Liqu	Depth (m)	1,00	2,30	3,30	5,00	6,00	9,20
Table A.1	Test ID	SPT E-1		<u>d - on ann - in air a' h dù airdeann</u>	<u></u>		

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	End Condition	ſ	Liquefaction
	L F		0,64
	L		0,33
	rd		0,96
	Ľ		0,21
	RL		0,21
	"N		9,84
	c ₂		0,00
	I'D		1,00
	(N)		9
	σ' (kN/m²)	14,66	33,00
	σ (kN/m²)	14,66	48,69
	γ _a (kN/m ³ )	14,66	21,27
le	Y _{bulk} (kN/m ³ )	25,65	27,00
anese Coo	γ ^{dry} (ltN/m ³ )	13,50	18,00
to Jap	D.50		0,460
rding	ĿC		5.
Accol	S	0,25	1,00
E-1B	э	0,90	0,50
T Log	h (m)	1,00	1,60
action Analyses of SP	Layer Description	Fil	SP-SM: Olive gray fine to medium sand with silt
<b>18 Liquef</b>	Depth (m)	1.00	2,60
Table A.10	Test ID	SPT E-1B	

Code	
ipanese C	Contraction of the second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second second se
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Accordi	
g E-1B	THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER WATCHING THE OWNER W
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	End Condition	F	Liquefaction	ŀ	Ŧ	No Liquefaction
	FL		0,71	2,24	0,83	898,00
			0,35	0,36	0,38	0.38
	ŗ		0,96	0,95	0,92	0,91
	~		0,25		0,31	337,36
	R _L		0,25	0,82	0.31	337,36
	Na		13,39	30,21	20.57	84,73
	c ²		0,00	3,72	4,94	4,67
	c _I		1,00	2,85	3,95	3,70
	SPT (N)		∞	9	Э	17
	σ' (kN/m ² )	14,66	30,95	39,00	57,75	62,33
	σ (kN/m²)	14,66	48,61	64,50	101,89	110,40
	$\gamma_n \\ (kN/m^3)$	14,66	18,86	19,86	19,68	21,27
lc	γ _{bulk} (kN/m ³ )	25,65	26,10	26,40	25,60	27,00
anese Cod	γ _{dry} (kN/m ³ )	13,50	14,50	16,00	16,00	18,00
to Jap:	$\mathbf{D}_{50}$		0,420	0,036	0,003	0,007
rding	FC		4	77	99	94
Accol	s	0.25	1,00	1,00	1.00	1,00
g E-2	9	0,90	0,80	0,65	0.60	0,50
PT Lo	h (m)	1,0	1,80	0,80	1,90	0,40
faction Analyses of SPT	Layer Description	Fill	SP: Poorly graded fine to medium brown sand. FC <= 5%	ML: Brown silt to sandy silt with red oxidized points	CLAY: Gray silty clay	SILT AND SAND: Gray silt with sand to sandy silt/silty sand
09 Liqu	Depth (m)	1.00	2,80	3,60	5,50	5,90
Table A.1	Test ID	SPT E-2				

	End Condition	ł	ŀ	ß	ı	ı	No Liquefaction
	FL		2,78	4,13	10,64	7,03	10,15
	Г		0,36	0,38	0,37	0,35	0,35
	r _d		0,96	0,93	0,87	0,82	0,81
	R		1,01	1,56	3,93	2,47	3,55
	R _L		1,01	1,56	3,93	2,47	3,55
	Na		31,54	34,06	39,65	36,78	39,00
	c ₂		3,72	4,50	3,33	4,83	1,11
	¹ o		2,85	3,55	2,50	3,85	1,40
	SPT (N)		6	6	14	0	33
-	σ' (kN/m²)	11,73	33,85	51,48	92,03	132,24	134,64
	σ (kN/m²)	11,73	55,43	89,74	167,56	244.07	248,43
	$\left  \begin{array}{c} \gamma_n \\ (kN/m^3) \end{array} \right $	14,66	19,86	20,18	20,48	20,68	21,80
e	Y _{bulk} (kN/m ³ )	25,65	26,40	26,40	26,35	27,20	26,60
anese Cod	Y _{dry} (kN/m ³ )	13,50	16,00	16,50	17,00	17,00	19,00
o Jap:	$\mathbf{D}_{50}$		0,039	0,014	0,069	0,011	0,100
ding 1	FC		77	16	70	26	30
Accor	S	0,25	1,00	1,00	1,00	1,00	1,00
5 F-1	G	0,90	0,65	0,60	0,55	0,60	0,40
PT Log	(ա) կ	0.80	2.20	1,70	3,80	3,70	0,20
efaction Analyses of S	Layer Description	Fill	ML: Brown low plasticity sandy silt to silt	CL: Brown low plasticity silty clay to clayey silt with traces of fine sand	SILT AND SAND: Gray sandy silt to silty sand. FC of recovered samples varies from 35% to 77%	CLAY: Gray silty clay to clayey silt with traces of fine sand. LL of recovered samples varies from 38 to 57	SM: Gray silty fine sand
10 Liqu	Depth (m)	0,80	3,00	4,70	8,50	12,20	12,40
Table A.1	Test ID	SPT F-1	<u></u>				

	End Condition	1	1	ŧ	ţ	ı	
	د س		2,15	7,89	-, <u>-</u> 20,	2,72	
	ŗ		0,35	0,36	0,36	0,35	
	ŗ		0,95	0,93	0,89	0,86	
	R		0,76	2,86	0,38	0,96	
	RL		0,76	2,86	0,38	0,96	
	N		29,74	37,67	24,01	31,23	
	c ³		4,28	4,50	2,94	4,94	
	ا ت		3,35	3,55	2,15	3,95	
	SPT (N)		Ś	7	6	~	
	σ' (kN/m²)	14,66	41,04	56,25	84,51	106,69	
	σ (kN/m²)	14,66	65,56	94,51	148,28	189,09	
	$\gamma_n$ (k/N/m ³ )	14,66	20,36	20,68	20,68	21,48	
e	γ _{butk} (kN/m ³ )	25,65	28,80	27,20	27.20	27,90	
anese Coc	$\gamma_{dry}$ (kdN/m ³ )	13,50	16,00	17,00	17,00	18,00	
to Jap	D ₅₀		0,013	0,007	0,089	0,005	
rding	ĔĊ		87	16	63	66	
Accol	Ś	0,25	1,00	1,00	1,00	1,00	
3 G-1	0	0,90	0,80	0,60	0,60	0,55	
PT Log	h (m)	1,00	2,50	1,40	2,60	1,90	
efaction Analyses of SI	Layer Description	Fill	CLAYEY SILT: Interbedded strata of olive brown to brown clayey silt with traces of fine sand and brown sandy silt	CLAY: High plasticity gray silty clay	SILT AND SAND: Gray silt and sandy silt to silty sand. FC varies from 22% to 90%. 4 mm red silty clay to clayey silt seam found at approx. 7.2 m	MH: High plasticity gray clayey silt. Softens when remoulded. Red oxidized 5 mm-thick seam at approx. 9.2 m	
11 Liqu	(m) (m)	1.00	3,50	4,90	7,50	9,40	
Table A.1	Test ID	SPT G-1			In	<u>Le y ann an ann an an ann an an an Ann Ann an Ann An</u>	

	End Condition		1	1	ı	E .	B	ß	1
	۲ لئا		2,34	26,15	20,53	30,48	3,20	1,84	60,59
	Ľ		0,34	0,35	0,36	0,36	0,35	0,34	0,33
	ца Г		0,94	0,93	06'0	0,88	0,87	0,83	0,78
	۲		0,80	9,12	7,32	10,84	I,13	0,63	20,07
	R		0,80	9,12	7,32	10,84	1,13	0,63	20,07
	Z ^r		30,10	45,36	43,79	46,64	32,21	28,55	51,59
	C,		3,44	4,22	4,39	4,94	4,39	4,94	4,50
	د ^ا		2,60	3,30	3,45	3,95	3,45	3,95	3,55
	SPT (N)		٢	6	10	10	∞	٢	
	σ' (kN/m²)	19,06	45,20	51,72	77,33	89,29	96,76	126,64	157,58
	σ (kN/m²)	19,06	70,71	83,12	132,27	155,02	169,35	226,70	286,09
	γ _n (kN/m ³ )	14,66	19,86	20,68	20,48	20,68	20,48	20,48	20,48
le	Y _{budk} (tkN/m ³ )	25,65	26,40	27,20	26,35	27,20	26,35	26,35	26,35
anese Co	γ _{dry} (kN/m ³ )	13,50	16,00	17,00	17,00	17,00	17,00	17,00	17,00
to Jap	D ₅₀		0,034	0,013	0,007	0,001	0,029	0,005	0,014
rding	FC		72	86	89	66	89	66	16
Acco	Ś	0,25	1,00	1,00	1,00	1,00	1,00	1,00	1,00
5-7 10-72	e	0,90	0,65	0,60	0,55	0,60	0,55	0,55	0,55
PT Log	h (m)	1,30	2,60	0,60	2,40	1,10	0,70	2,80	2,90
efaction Analyses of S	Layer Description	E	ML: Brown low plasticity silt with fine sand to sandy silt	CH: Gray high plasticity silty clay with traces of fine sand	ML: Gray low plasticity clayey silt to silt with sand. Red clay seams from approximately 6.15 m to 6.2 m	CH: Soft gray, high plasticity siltv clav	ML: Gray clayey silt with traces of fine sand	CLAY: Gray silty clay to clayey silt. Some shells at approx. 10.3 m	ML: Interbedded strata of gray low plasticity silt with sand and gray claycy silt. Some red clay scams
12 Liqu	Depth (m)	1.30	3,90	4,50	6,90	8,00	8,70	11,50	14,40
Table A.1	Test ID	SPT G-2			<u> </u>		- <b></b>		<u> </u>

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	E						
	End Conditio	Ŧ	1				
	FL		5,22				
	ت		0,24				
	Ľ		0,95				
	R		1,24				
	$R_{\rm L}$		1,24				
	N		32,76				
	c ₂		2,89				
	ſĴ		2,10				
	SPT (N)		10				
	σ' (kN/m²)	43,99	48,57				
	σ (kN/m²)	43,99	52,49				
	γ _n (kN/m ³ )	14,66	21,27				
<u>ه</u>	γ _{bulk} (kN/m ³ )	25,65	27,00				
anese Cod	γ _{dry} (kN/m ³ )	13,50	18,00				
to Jan	D50		0,050				
adib:	FC		62				
Accor	s	0.25	1,00				
3	6	06.0	0,50				
PT 1,09	h (m)	3.00	0,40				
ofaction Analyses of Sl	Layer Description	Fill	SANDY SILT: Red brown sandy silt. Very similar to the soil seen at the surface (ejecta) in Yagcioglu apartments				
13 L ion	Depth (m)	3.00	3,40				
Labla A 1	Test ID	SPT G-3					

	End	1	,	quefaction	¢	,	,	quefaction	\$	3
_	F		0,88	0,86 Li	1,16	50,02	2,04	0,54 Li	4,36	1,65
-	<u>د</u>		0,34	0,37	3,38	9,38	0,36	0,36	0,36	0,35
	ŗ		0,98	0,96	0,92	16'0	0,86	0,85	0,84	0,83
	В		0,30	0,32	0,44	18,81	0,74	0,19	1.55	0,58
	RL		0,30	0,32	0,44	18,81	0,74	0,19	1,55	0,58
ľ	Z.		19,19	20,66	25,52	51,04	29,57	8,13	34,04	27,91
f	c ³		3,61	0,28	4,94	3,89	4,67	0,00	4,67	4,89
	5 C		2,75	1,10	3,95	3,00	3,70	1,00	3,70	3,90
	SPT (N)		3	П	<del></del>	13	۲	6	6	2
	σ' (kN/m²)	8,80	19,67	30,34	59,38	69,25	104,77	116,01	120,35	129,05
	σ (kN/m²)	8,80	29,48	49,96	104,51	123,20	189,14	210,18	218,45	235,00
	γ _n (kN/m ³ )	14,66	20,68	20,48	20,98	20,77	21,27	21,04	20,68	20,68
le	y _{bulk} (kN/m ³ )	25,65	27,20	26,35	27,13	26,25	27,00	26,10	27,20	27,20
anese Cor	γ _{dry} (kN/m ³ )	13,50	17,00	17,00	17,50	17,50	18,00	18,00	17,00	17,00
to Jap	$\mathbf{D}_{50}$		0,038	0,190	0,008	0,045	0,007	0,300	0,020	0,001
rding	FC		75	15	66	80	94	6	94	98
Acco	s	0,25	1,00	1,00	1,00	1,00	1,00	1,00	1,00	1,00
g H-I	<b>ə</b>	0.90	0,60	0,55	0,55	0,50	0,50	0,45	0,60	0,60
PT Lo	h (m)	0,60	1,00	1,00	2,60	0,90	3,10	1,00	0,40	0,80
efaction Analyses of S	Layer Description	11:4	CL: Dark gray to black clay with sand	SM: Gray to brown silty sand	CLAY: Brown, grading to grayclayey silt to silty clay	ML: Gray low plasticity silt with sand	CLAYEY SILT: Gray highplasticity silty clay to clayey silt interspersed with thin layers of silty sand to sandy silt	SP-SM: Gray fine to medium sand with silt	ML: Gray clayey silt	CH: Dark gray stiff high plasticity clay
14 Liqu	Depth (m)	0,60	1,60	2,60	5,20	6,10	9.20	10,20	10.60	11,40
Table A.1	Test ID	SPT H-I		<del></del>	i,,	3	<u>de - , , , , , , , , , , , , , , , , , , </u>		-	

	End Condition	,	•	4	I	No Liquefaction
	ت تتر		46,93	0,87	3,38	24,78
	im.		0,34	0,37	0,37	0,37
	<b>1</b> 2		0,98	0,96	0,92	16'0
	ĸ		15,97	0,32	1,27	9,23
	R		15,97	0,32	1,27	9,23
	ľ		49,68	20,96	32,85	45,45
	c ₂		4,94	2,94	4,61	0,00
	c,		3,95	2,15	3,65	1,00
	SPT (N)		9	5	9	38
	σ' (kN/m²)	8,80	19,67	30,84	60,63	70,74
	σ (kN/m²)	8,80	29,48	50,46	105,76	124,70
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,27	21,04
2	Y _{bulk} (kN/m ³ )	25,65	27,20	27,13	27,00	26,10
anese Cod	γ _{dry} (kN/m ³ )	γ _{dry} (kN/m ³ ) 13,50		17,50	18,00	18,00
to Jap	D ₅₀		0,001	0,021	0,015	0,290
ding	FC		66	63	93	7
Accol	S	0,25	1,00	1,00	1,00	1,00
E	ల	0,90	0,60	0,55	0,50	0,45
PT Lo	р (Ш) 4	0,60	1,00	1,00	2,60	0,90
quefaction Analyses of SPT Log I-1	Layer Description	Fill	CH: Gray high plasticity silty clay	SANDY SILT: Brown sandy silt	CLAYEY SILT: Gray clayey silt to silty clay with traces of fine sand	SP-SM: Fine to medium gray poorly graded sand with silt
115 Liqu	Depth (m)	0,60	1,60	2,60	5,20	6,10
Table A.)	Test ID	SPT I-I				

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	End Condition		1	I	No Liquefaction		
	ц Ц		1,26	0,83	10,44		
-	Ц		0,36	0,37	0,35		
	٦ _م		0,95	0,93	0,84		
	R		0,46	0,30	3,64		
	R _L		0,46	0,30	3,64		
	N.		25,93	19,73	39,16		
	5		4,44	4,72	3,11		
Ì	5		3,50	3,75	2,30		
	SPT (N)		<del></del>	m	8		
	σ' (kN/m²)	11.73	39,99	56,33	122,80		
	σ (kN/m²)	11,73	65,49	95,57	218,93		
	γ _n (kN/m ³ )	14,66	20,68	21,48	21,27		
c	Y _{bulk} (kN/m ³ )	25,65	27,20	27,90	27,00		
nese Cod	γ _{dry} (kN/m ³ )	13,50	17,00	18,00	18,00		
o Japa	$\mathbf{D}_{50}$		0,015	0,005	0,083		
ding t	FC		06	95	66		
Accor	s	0.25	1,00	00'1	00,1		
J-L g	<u>ہ</u>	0,90	0,60	0,55	0,5(		
PT Lo	(m) (m)	0,80	2,60	1,40	5,80		
efaction Analyses of S	Layer Description	Fill	ML: Brown to gray clayey silt with traces of fine sand to silt with sand. Red oxidized zones throughout the stratum	CH: Gray high plasticity silty clay with traces of fine sand. Wood pieces found at approximately 3.9 m and 4.7 m	SILT AND SAND: Interbedded strata of gray low plasticity clayey sitt and silty fine sand		
16 Liqu	Depth (m)	0,80	3,40	4,80	10,60		
Table A.1	Test ID	I-f LdS					

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	End Condition	3	t	ı	No Liquefaction	ł
	L F		0,92	0,86	41,68	20,96
	r		0.35	0,36	0,36	0,35
	T _a		0,95	0,92	0,89	0,87
	В		0,32	0,31	14,89	7,38
	R _L		0,32	0,31	14,89	7,38
	z		21,07	20,20	49,12	43,84
	c ²		3,17	4,94	3,72	5,00
	ū		2,35	3,95	2,85	4,00
	(N)		Ŷ	ŝ	15	10
	σ' (kN/m²)	14,66	40,75	60,85	88,36	103,04
	σ (kN/m²)	14,66	64,29	102,06	153,10	179,56
	γ _n (kN/m ³ )	14,66	20,68	20,98	21,27	22,04
le	γ _{bulk} (kN/m ³ )	25,65	27,20	27,13	27,00	27,55
anese Coo	^{ل طری} (kN/m ³ )	13,50	17,00	17,50	18,00	19,00
to Jap	D ₅₀		0,070	0,002	0,037	0,002
rding	FC		67	66	4	100
Accol	s	0,25	1,00		1,00	1,00
g J-2	ల	0.00	0,60	0,55	0,50	0,45
PT Lo	h (m)	1,00	2,40	1,80	2,40	1,20
efaction Analyses of S	Layer Description	Fill	ML: Brown low plasticity clayey silt with fine sand to sandy silt. Silt layers alternate with silty clay/clayey silt	CH: Gray high plasticity silty clay with traces of brown roots. Does not soften when remoulded	SILT AND SAND: Alternating strata of gray silty fine sand and low plasticity clayey silt to sandy silt. Traces of wood at approximately 7.2 m. Seaming of gray silty clay with sandy silt in S-J2-6	CLAY AND SAND: Interbedded strata of high plasticity, gray silty clay and silty fine sand
17 Liqu	Depth (m)	1.00	3,40	5,20	7,60	8,80
Table A.1	Test ID	SPT J-2		Ayr - ya (o ya fala ya da ba da ba da ba da ba da ba da ba da ba da ba da ba da ba da ba da ba da ba da ba da b		

	End Condition	-	E .	-	t	4
	ت ت		4,10	5,59	58,52	4,37
	-1		0,33	0,34	0,35	0,34
	r		0,94	0,93	0,89	0,86
	2		1,34	1,89	20,24	1,50
	RL		1,34	1,89	20,24	1,50
	z		33,20	35,21	51,66	33,84
	c ₂		4,33	4,89	3,22	4,83
	13		3,40	3,90	2,40	3,85
	SPT (N)		9	6	19	8
	σ' (kN/m²)	21,99	49,16	60,03	88,29	108,40
	σ (kN/m²)	21,99	73,69	94,37	148,13	185,90
	γ _n (kN/m ³ )	14,66	20,68	20,68	20,68	20,98
¢,	γ _{bulk} (kN/m ³ )	25,65	27,20	27,20	27,20	27,13
anese Cod	Y _{dry} (kN/m ³ )	13,50	17,00	17,00	17,00	17,50
to Japa	Ds0		0,020	0,003	0,043	0,002
ding I	FC		8	98	68	97
Accor	s	0,25	00,1	1,00	1,00	1,00
1-3	2	0.00	0,60	0,60	0,60	0.55
PT Lot	h (m)	1.50	2,50	1,00	2,60	1,80
efaction Analyses of S	Layer Description	ĿЦ	ML: Brown to gray clayey silt to silt with fine sand. Transition from brown to gray occurs at approx. 2.5 m	CH: Gray high plasticity silty clay	ML: Gray low plasticity silt with cond to candy silt	CH: Gray silty clay
18 Liau	Depth (m)	1.50	4,00	5,00	7,60	9,40
Table A.1	Test ID	SPT J-3				

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) Code	$ \frac{dry}{(lm^3)} \left[ \frac{\gamma_{hulk}}{(kN/m^3)} \frac{\gamma_n}{(kN/m^3)} \frac{\sigma}{(kN/m^2)} \frac{\sigma}{(kN/m^2)} \frac{SPT}{(N)} \frac{c_1}{(N)} \frac{c_2}{(N)} \frac{c_3}{c_1} \frac{R_L}{R_L} \frac{R}{R_L} \frac{L}{R} \frac{L}{L} \frac{End}{F_L} \frac{End}{R_L} \frac{End}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}{R_L} \frac{R}$	,50         25,65         14,66         14,66         14,66         -	,00 27,20 20,68 58,09 37,49 6 2,65 3,50 28,48 0,63 0,95 0,34 1,83 -	,00 26,35 20,48 92,90 55,63 5 3,30 4,22 26,36 0,48 0,48 0,36 1,33 -
	c ²	<b>_</b>	5 3,5(	0 4,22
	cı		2,65	3,3(
	SPT (N)		ę	2°
	σ' (kN/m²)	14,66	37,49	55,63
	σ (kN/m²)	14.66	58,09	92,90
	Y _n (kN/m ³ )	14,66	20,68	20,48
e	Ybulk (kN/m ³ )	25,65	27,20	26,35
anese Cod	γ _{dry} (kN/m ³ )	13,50	17,00	17,00
to Jap	D50		0,032	0,010
guib.	г. С		73	86
Accol	s s	0,25	1,00	1,00
g J-4	ల	0,90	0,60	0,55
IPT Log	h (m)	1,00	2,10	1,70
faction Analyses of S	Layer Description	Fill	ML: Brown and gray claycy silt to brown low plasticity sandy silt. FC varies from	SILTY CLAY: High plasticity gray silty clay/clayey silt interspersed with gray
9	(m)	1,00	3,10	4,80
119 Liqu	<u> </u>	-		

	End Condition	ß	T	No Liquefaction	2
*	ر ۲		3,04	1,65	13,82
	Ц		0,37	0,36	0,35
	ŗ		0,92	0,87	0,86
	R		1,12	0,59	4,89
	$\mathbf{R}_{\mathrm{L}}$		1,12	0,59	4,89
	Z.		32,16	28,04	41,06
	²		4,61	0,67	3,94
	5		3,65	1,24	3,05
	SPT (N)		6	22	13
	σ' (kN/m²)	11,73	63,90	97,48	109,47
	σ (kN/m²)	11,73	66'011	172,04	193,84
	γ _n (kN/m ³ )	14,66	20,68	21.80	21,80
0	Y _{bułk} (kN/m ³ )	25,65	27,20	26,60	26,60
mese Cod	Y _{dry} (kN/m ³ )	13,50	17,00	19,00	19,00
o Japa	D58		),015	0,075	0,005
ding t	FC		6	22	8
Accor	s	0,25	0,1	1,00	1,00
K-1	ల	0,90	0,60	0,40	0,40
PT Log	h (m)	0,80	4,80	2,80	1,00
efaction Analyses of S.	Layer Description	Fill	CLAY AND SILT: Brown low plasticity clayey silt/silty clay with traces of fine sand. S-K1-1 is dark gray and has a light odor, probably due to a nearby septic tank. Transition to gray color occurs at	SILTY SAND: Gray silty sand to sand with silt	ML: Gray low plasticity silt to sandy silt
20 Liau	Depth (m)	0,80	5,60	8,40	9,40
Table A.I.	Test ID	SPT K-1			

APPENDIX B

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(C90H keley U rods. 3)	emarks											
E PT-A3 ant to Creatius ) incio, U. C. Ber ad method. AV ovacs et al. 198					E.				· E			
9487 14 to C B. Sc cathe per K	01Q	 					0.0		₹ ⁷	0.0		
<ul> <li>N 30.3</li> <li>h respectade, ec nade, ec / and R.</li> <li>liey and liey and ammer (</li> </ul>	(mm) 0čU				0.003		2 0.045		0.012	0.057		0.29
77922 77922 stom n b. Bray De, pu ety Ha	(%) urt Z >				36		>10		18	<b>0</b>		
ID: SP1 on: -0 c on: -0 c on: Cus on: Cus on: Rop pe: Safe	(%) uni 5 >				61		16		3	5		
Test Sevatinat Juipme Aginee C Syste ner Tyi	anı 27 > 22nî %		06	94	100	87	74	92	61	70	58	<del>ي</del>
S Coc E ing Eq ible E SP1 Hamr	Plasticity Index		<u>6</u>	53	ŝ	53	9	28	50			
GF Drill Spons	ımLI biupLI		4	53	65	46	29	55	47	30	29	
å	Moisture (%) Moisture		38	39	30	37	29	44	39	27	27	24
	s رادکیاری (ادکم) Torvane (ادکم)			28	20	22	23	25	26			
(ey	Pocket Pen (kPa)				140	80	70	80	75	450	275	300
ling Performance in Adapazari, Tur Cumhuriyet District, Adapazari S.) diameter tricone bit diameter tricone bit of 1.5 m	Description	ASPH: Boring performed through asphalt and subgrade of Tul street	FILL: Materials transition from a brown to gray gravelly sand to red silly clay of hard	consistency	CH: Brown, moist, sticky, high pasticity silty clay without visible sand particles. S-A14 shows darker tones and some fine to medium sand content		ML: Gray silt with sand. Field description: ML	ML: Brown, low plasticity silt with fine sand and some red clay points	CH: High plasticity gray clay with low sand content (traces). At 5.3 m a thin fine sand seam was identified. Sample A1-7 exhibits some sand seams	ML: Gray sandy silt. Increasing sand content with depth		SP: Medium to fine poorty graded gray sand
1 Bulk treets [isi, A. 0m 06 0m 06	Energy Rado (%)		37	46	42	57	53	55	90	65	75	64
ure and akin S akin S aknoloj sh with VL=0.9 vL=0.9 ad to a	(m) dignəl bofi		4.27	5.80	5.80	7.32	7.32	8.84	8.84	10.37	11.89	11.89
ind Fail in and Y to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B. Sa to B.	Casing Depth (m)											
Vame: Grou : Site A - Ti : Site A - Ti : Site A - Ti : 2000 g by: Rodoll py: Rodoll :: ZETAS (Z Wethod: Rol the Elevati solid flight au	Tq2 Tq2 Tq2		1-3-3	3-2-5	2-3-4	1-2-2	2-2-2	1-2-1	1-1-2	6-9-9	6-9-10	11-20-23
Project 1 Location Date: Juu Field Loi Operatoi Drilling 1 Water Ta Notes: S	גפנסעפוץ/ גפנסעפוץ/		18/45	40/45	31/45	36/45	40/45	45/45	39/45	37/45	41/45	41/45
AETU AETU A B B B B B B B B B B B B B B B B B B	Sample Type Sample Vo.		S-A1-1	S-A1-2	S-A1-3	S-A1-4	S-A1-5	S-A1-6	S-A1-7	S-A1-8	S-A1-9	S-A1-10
CB-BYU-U TAS-SaU-U oint Researc ponsored by Ponsored by SF, Caltrar	naca		WL	MH/CH	Н	5		5 <del>5</del>	OL/ML	WL	ML	<del>م</del> ۲۰۰۰
DE SZO	(m) succinque			ſ	144 1	¥\$		14.	(-).j.			<u>]</u>
L	(m) -[co2 4100(]		ی۔ سیالی		· ~		<b>⊄</b> ⊥⊥∟⊒	പ്പ	<u></u>	► 	~~~	പ്പ

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A3 to Crealius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks									At approximately 7.15 m, an 8-cm thick stratum of	black, fibrous material (Peat) was identified in th sample	
487°E to CPT- livalent 3. Sanci athead er Kova	D10 (mm)		t	ŧ	<2µm	T	0.001	1	<2µm	0.001	0.08	0.1
V 30.39 respect and R. E and R. E mmer (p	D50 (mm)		1	1	0.001	1	0.018	ŧ	0.007	0.026	0.12	0.33
F-A2 77922% m with tom mth stom mth stom mth tom with tom with tom with tom with tom with tom with to to be to be to han to to to to to to to to to to to to to	(%) turi 7 >		;	1	57	1	5	1	30	<del>1</del> 3		1
D: SP B: 40.1 D: SP D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D: 5 c D:	(%) uut 5 >		1	I	75	1	8	, <b>.</b>	42	20	a	
Test rudinate ilevatio nginee Syste ner Typ	m4 27 > 25nñ %		74	86	100	85	63	35	66	85	æ	<u> </u>
S Coo E E ling Eq sible Ei SPT Hamn	Plasticity Index		8	<u> </u>	23	25	2	20	52	<del>;</del>	:	
GP Drill sspons	Liquid Limit		9	35	51	49	35	43	51	39	1	<b>.</b>
ŭ	Moisture Content (%)		37	36	44	37	34	44	43	33	33	52
00	⁵ u Torvan¢ (kPa)		10	<del>1</del> 8	48	53	35	31	37	36	· · · · · · · · · · · · · · · · · · ·	
rkey 06/28/0	Роскет Рел (кРа) Роскет Рел (кРа)		150	75		120	160		75	170	380	320
ing Performance in Adapazari, Tu Cumhuriyet District, Adapazari S.) s.) diameter tricone bit diameter tricone bit lepth of 1m	Description	ASPH: Asphalt of Yakin Street.		ML: Brown clayey suit to suity clay with some red oxidation points and some fine sand	CH: Brown high plasticity silty clay to clayey silt. Some fine	to medium sand in a silly clay matrix was observed in the wash water	ML: Brown/gray clayey silt with traces of fine sand	CH: Gray silty clay of medium to high plasticity. Sticky to the	fingers. Softens when remoulded	ML: Gray clayey silt with some fine sand	SP-SM: Poorly graded gray fine sand with sitt. Gravel content ~ 8% in sample S-A2- 10	
d Build Brreets, Jjisi, A. 1 9 cm- 1 70m C	Energy Ratio (%)		37	53	3	52	65	1	65	7 60	0	، ۲
fure an Yakin S ancio eknolo MT = 0 as usei	Rod Length (m)		4.27	5.80	•	7.32	7.32	,	8.84	10.3	11.8	12.8
ul and ul and fo B. S femin T tary we lon: G	Dcasing (m) (nqod			,I	2.55	3.35	4.15	4.95	5.95	6.95	8,45	9.95
Name: Grot 1: Site A - T ne 24, 2000 g by: Rodol r: ZETAS (2 Method: Ro able Elevatl ai Solid flight ai	TTS TTS		1-2-1	1-2-2		2-1-1	2-3-4		1-1-2	ې بې س	12-20-16	7-10-15
Project I Location Date: Ju Field Lo Operato Drilling I Water Ta Notes: S	Κετονεηγ/ Ματονεηγ/		28/45	42/45	42/42	40/45	28/45	42/42	39/45	32/45	38/45	38/45
CLA	Sample Type and No.		S-A2-1	S-A2-2	SH-A2-3	S-A2-4	S-A2-5	SH-A2-6	S-A2-7	S-A2-8	S-A2-9	S-A2-10
JCB-BYU-Ui 2TAS-SaU-M Joint Research Sponsored by NSF, Caltran CEC, PG&E	SOSO			WL	CHMH	CL/CH	ž NE	ᄫ	MH/CH	WF	WS-dS	WS-dS
	Depth Scale (m)		-	~	<u>II</u>	<i>J.J.</i> 0	21 *	<u>ل ل</u>	<u>) ] ]</u>	×	<u> </u>	<u> </u>
L		ب ب آ	<u> </u>		<u></u>	نسب	<u>i</u>	<u>ii.</u>	มไม		പ്പപ്പ	

Page 1 of 1

Legend S: Spit Spoon (SPT) SH: Shelby tube

T-A3 to Crealius XC90H io, U. C. Berkeley method. AWJ rods. tcs et al. 1983)	Remarks					A 3 cm-thick fine sand seam at 20 cm above the tip of the sampler					
487°E ot to CP uivalent B. Sanc cathead er Kova	(mm) 01C		*	T	≈2µm	F 3	0.004		I		0.08
N 30.35 h resperade, equ and R. I ey and c mmer (p	(mm) 0čC		)	ŧ	0.005	1.1	0.024	F	Ŧ		0.22
r-A3 77922° cm wit storn m storn m b. Bray De, puti ety Har	(%) uni 2 >		,	1	35	t	en .	ŧ	I		
D: SP 38: 40.1 38: 40.1 14 14 14 14 14 14 14 14 14 14 14 14 14	(%) m4 č >		1	1	50	ı 	<u><u></u></u>	I	3		<u> </u>
Test I rdinate llevatic uipme nginee Syste ter Typ	mų č7 > 25ni %		ı	66	66	79	91	96	88		<del>6</del>
S Coo E E Ing Eq Ble Ef SPT Hamm	Plasticity Index		Ŧ	33	33	9	<u>ہ</u>	5	æ		1
Drill GP	յւтե հարել		ı	61	59	3	38	43	37		
l &	Moisture Content (%)		;	65	38	30	66	42	34		23
	u ⁸ Torvane (kPa)		3	61	47	12	18	30	3		ı
/08	Pocket Pen (kPa) 94	· · · ·		170	150	20	80	40	170		360
ing Performance in Adapazari, Tu Cumhuriyet District, Adapazari S.) S.) b6/26/00, 0.70 m 06/28, 0.72 m 0 lepth of 1.8 m	Description	Filt: Asphalt, subgrade and fill consisting of dark brown clayey gravelly sand.		CH: Brown, high plasticity silty clay. At about 2 m there is a layer of brown fine sandy silt		ML: Gray low plasticity clayey silt with fine sand.				SAND: Gray poorly graded sand with silt and traces (8%) of fine rounded gravel	
d Build Streets, A. jisi, A. .87 m d to a c	Energy Ratio (%)		47	55	43	56	s	62	1 61		9 65
rakin S rakin S ancio eknolo M. = 0 M. = 0 as usei	Rod Length (m)		4.27	5,80	5.80	7.32	3	8.84	10.3		11.8
Ind Fai Ind and ' fo B. S fo B. S fo B. S fo B. S for S for C for C for C	Depth (m)						4.45	5,55	6.45		8.45
Name: Grot 1: Site A - Ti ne 26, 2000 g by: Rodol r: ZETAS (Z Method: Roi able Elevati solid flight au	SPT 515 cm		2-1-2	1-2-3	1-2-2	2-3-2	1	2-2-2	3-4-10		7-18-24
Project I Location Date: Ju Field Lo Operato Drilling I Water Ta Notes: 5	لددەبدىץ (כm) لاددەبدىץ/		0/45	25/45	28/45	34/45	42/42	38/45	38/45		35/45
LETU B B B B B B B B B B B B B B B B B B B	Sample Type and No.	-	S-A3-1	S-A3-2	S-A3-3	S-A3-4A S-A3-4B	SH-A3-5	S-A3-6	S-A3-7		S-A3-8
CB-BYU-U CTAS-SaU-N Joint Researc Sponsored by NSF, Cattrar CEC, PG&E	naca		,	5 J J J	<u>き</u>	N N	¥	W	WF	<u> </u>	SP-SM
	Depth Scale (m)				e S	¥	ci ci	 	~		
			1. C	-,-		7 .	71	📅 .			

			u Iaj	1	រ ថ្មី	. 19 19		2 2 2	d 6.6			of 2
90H ley rods.	narks		@ 1.65 m a, Residi	0 2.45 m	a, Nesiu	@ 3.45 m a, Resid		mple was a denth c	id attemp obtained of a sar			Page 1
alius XC Berke d. AWJ I. 1983)	Ren		- Vane ( = 16 kP	- Vane (	14 67 1	= 15 kP		ly no sai arad at	a secon le was o h the aid er.			
T-A3 to Crea methou tos et al			Shear Peak	4 kPa Shear	9 kPa	Shear Peak 5 kPa		Initial	m. m samp m with catch			-
487°E tho CP Jivalent B. Sanc Sathead er Kova	(mm) 01G		842 842 842	<2µm	,	<2µm	~2µm	2µm	22µm		0.185	
N 30.39 h respectade, equand R. F and R. F ey and c nmer (p	(mm) 02O		0.017 0.006	0.02	I	0.017	0.004	0.007	0.018		0.3	
T-A4 77922° Cm with stom m Stom m Stom m Stom m D. Bray De, pull ety Har	(%) um Z >		24 34	25	•	18	42	37	32		•	_
D: SP D: SP D: -14 D: Cus Trs: J. C Trs: J. C Be: Saf	(%) mų č >		35 455	32	1	24	56	43	35		F	_
Test I redinate redinate levatic uipme nginee Syste rer Typ	mul 27 > 22nd %		80 94	66	•	67	88	92	99	 	8	:
S Coo Ing Eq sible El SPT Hamn	Plasticity Index		11	24	2	10	52	4	1		3	_
GF	1 Initial Limit		34 42	48	<u> </u>	36	49	38	25	1	ı	
Ĕ	Moisture Content (%)		33	35	5	32	30	37	25	ì	18	!
	n ² Torvanc (kPa)		44	32	26		27	1			1	<u>-</u>
irkey	Pocket Pen (kPa)		75	09	20	<b>`</b>	/	£			1 	_
ling Performance in Adapazari, Tu Cumhuriyet District, Adapazari S.) diameter tricone bit	Description	FILL: Asphalt, pavement and fill on Yakin Street	CL: Low to high plasticity, brown silty clay to clayey silt with traces of fine sand. Soil is	highly inhomogeneous, showing variable FC		ML: Brown low plasticity silt	with traces of fine sand CL: Low to high plasticity gray silty clay to clayey slit with	traces of fine sand		SANUT SILT: Cray tow plasticity sandy slit	SAND: Gray poorly to well graded sand with sitt. 22% gravel content in S-A4-9, very low (< 5%) in other samples.	_
d Build Streets, Jjisi, A. h 9 cm-	Energy Rado (%)		L #	*	1	51	23	7 59	09	20	, Q	<u>.</u>
llure an Yakin S ancio Teknolo ash witi WL = C	Rod Length (m)		3 1	1	ł	7.32	8.84	10.3	C T T	o. 	12.8	:
und Fai ul and lfo B, S femin 1 tary we ton: G	Casing Depth (m)		<u>, 10</u>	1.2	1.2	4.05	4.95	6.45	ц с г	р. В.	9.45	1
Vame: Grou I: Site A - T Iy 24, 2000 g by: Rodo fr: ZETAS (2 Method: Rc	Blows/15 cm SPT		1 1	1	1	0 0 0 0	3-1-2	6-5-11	1 2 7 7 8		24-38-36	:
Project 1 Location Date: Ju Field Lo Operato Orilling Water T	Γςειδάμ (cm) Κετονείλ		39/42	33/42	41/42	30/45	28/45	1		0.470	40/45	1 1
CCLA	Sample Type and No.		SH-A4-1A SH-A4-1B	SH-A4-2	SH-A4-3	S-A4-4	S-A4-5	S-A4-6	1	7-94-S	S-A4-8	1
CB-BYU-U IAS-SaU-M int Research ponsored by SF, Caltran	naca		CLML	ರ	1	ž	CLMH	ь		۲ ۲	WS-dS	
	Lidnology			717	14		(H)	11111	11111	<u>:                                    </u>	0	
	Depth Scale (m)		- c	NI LEFERI	<u></u>	4	<u>ເດ</u>	<u>o</u>	<b>&gt;</b>	) <b>O</b>	╼ ┶┶┶┶┶┶┶┷	<u> </u>

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A3 o Crealius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remncks		BW rods were used for the SPT at 15 m
487°E. tt to CPT iivatent t 3. Sanci athead i er Kovao	(mm) 01Q	0.074	2µm
N 30.39 h respec ade, equ and R. E ey and c mmer (p	(mm) 05Q	0.61	~2µm
-A4 7922° Ccm wit tom m tom m bray e, pull e, pull	(%) titut 2 >	1 1	73
D: SPT s: 40.7 n: -14 ( n: Cusl s: J. D. m: Rop m: Rop e: Safe	(%) uuri 5 >	3 B	98
Test I rdinate levatio uipmer igineei Syster rer Typ	шц č7 > гэлй %	10	100
S Cool ng Eq ble En SPT Hamm	Plasticity Index	5 E	45
GP, Drilli sponsi	imi.I biupi.I	1 1	69
Rei	Moisture (%) (%)	16	37
	u ^s Torvane (kPa)	I 1	53
key	Pocket Pen (kPa) 9u	3 E	250
ng Performance in Adapazari, Tu Dumhuriyet District, Adapazari S.) 21. 7/25/00	Description		CH: Gray, high plasticity stiff clay.
Buildi reets,C si, A. 3 9 cm-c	Energy Ratio (%)	62 54	
rre and akin St ncio knoloji h with L = 0.1	(m) drgna.l boX	14.94	17.92
nd Failt I and Y o B. Sa emin Te any was on: GW	Casing Depth (m)	10.95 12.45	14.95
Vame: Grou I: Site A - Tu y 24, 2000 g by: Rodolf r: ZETAS (Zc Wethod: Roti tole Elevatic	Blows/15 cm SPT	14-18-20	4.4.7
Project N Location Date: Jul Field Lot Operator Drilling N Water Ta Notes:	Γευβιή (cm) Γευδιή (cm)	39/45	26/45
CLA IETU h	Sample Type	S-A4-9 S-A4-10 S-A4-10	S-A4-11
CB-BYU-U TAS-SaU-M oint Researcl ponsored by ISP, Caltrau SEC, PG&E	naca	MS-WS SP-SM	H
C N S TEG	Tichology	· · · · · · · · · · · · · · · · · · ·	1111
	Depth Scale (m)	13 12	15 14

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B3 Crealius XC90H U. C. Berkeley ethod. AVVJ rods. . et al. 1983)	Remarks										0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
224°E to CPT-I ivalent to t. Sancio, athead m er Kovacs	(mm) 01G		~2µm	0.014 <2µm	0.05 0.018	0.06 <2µm	\$	0.21	0.17		<2µm
V 30.40( h respec ade, equ and R. B ey and c mmer (pe	(mm) 05D		0.012	0.05 0.007	0.17 0.07	0.13	0.5	5	0.6		0.001
B1 85139 ccm with tom m Bray e, pull ety Hat	< 5 http://ww		28	<10% 33	- <10%	15	8	Ŧ	I		59
D: SPT s: 40.7 n: -22 n: -22 s: J. D m: Rop e: Safé	(%) wrf <u>ç</u> >		33	<15% 44	- <15%	33	L	t	2		68
Test I dinate levatio levatio gineer Syster er Typ	шті <u>57</u> > гэпіі %		96	82 93	21 59	14 66	29	Ŷ	ŝ		100
S Cool ng Equ ble En SPT Hamm	Plasticity Index		1	¥ 1	L 3		,	r	ŧ		40
GP. Drilli sponsi	Liquid Limit		37	31	, <u>,</u>	27 -	1	a	i		62
Re	Моізпис Сопепе (%)		32	32 31	24 30	27 23	4	A A	2		35
	Torvanc (kPa) Su										38
apazan	Роскес Реп (кРа) Чи		50	60 70	250 250 110	150					200
ing Performance in Adapazari, Tu irak Street,Karaosman District, Ac S.) S.) diameter tricone bit 3/05/00, Caved in at 3.05 m 07/08 of 1 m	Description	Fill: Rubble from demolition of building B1. Brown sandy silty clay	CLAYEY SILT: Olive gray clayey silt with traces of fine sand. S-C2-B is gray brown clayey silt. The brown tones	may be due to oxidation of ferric minerals	SAND AND SIL T: Brown low plasticity silt to silty fine sand. FC of recovered samples varies from 14% to 66%		SIL TY SAND: Gray sand mixtures grading with depth from sandy sult to sand with silt and sand with silt and fine to	coarse graver. Joinent Joinent is irregularly variable from 2% to 27%. The shape of the gravel particles is variable from flat and elongated to well proportioned angular and rounded		CH: Stiff gray molst high plasticity stity clay. Wash water shows traces of shells.	
d Build nd Yap jisi, A 1 9 cm- 1 3 m 06	Energy Rado (%)			49	63 63	88	8 8	66	<u></u>		5 67
ure an Ave. a ancio eknolo Sh with ML = 3 ed to a	(m) drgnəri boX		5.80	5.80	7.32	8.84	8.84	10.3	11.8		13.4:
Ind Fail Jyudibi fo B. S. emin T emin T ans. G. uner us	کمینیوں (m) Depth (m)		1.55	2.55	3.35	4.15	4.95	6.15	7,95		10.45
lame: Grou : Site B - Kiu y 4, 2000 by: Rodol by: Rodol r: ZETAS (Z Method: Ro the Elevati fight a	Blows/15 cm		+ + + + + 	2-1-2	2-5-3	4-3-6	10-12-14	9-13-16	9-15-17		3-3-5
Project N Location Date: Jul Field Log Operator Dritting N Mater Ta Notes: S	Recovery/ Length (cm)		31/45	32/45	41/45	27/45	30/45	21/45	18/45		35/45
	Sample Type		S-81-1	S-B1-2A	S-81-28 S-81-3A S-81-38	S-B1-4A	S-B1-5	S-B1-6	S-B1-7		S-B1-8
JCB-BYU-U JCB-BYU-U Joint Researc Sponsored by NSF, Caltrat CEC, PG&E	SDSU		W	ž	W S	WS	EFFEFE	WS- MS- HEFEFEFEFEFEFEFEFEFEFEFEFEFEFEFEFEFEFEF	WS-ds	HEE 22	5
32	Depth Scale (m)	0	8∦:H:;;:H:;;: ∾	H::::H	<u>ຢ</u> ູ່ຟີຟີຟີ ຕ	:)::[])) *	<u>۳۲۲۲۲۲</u> ۵	9 ► <u>666666666666666666666666666666666666</u>	@ <u>EFFFFFF</u>	о <del>С</del> Н <u>АН</u>	202 E
L		با آسیسی ل	<u></u>		للسبيل	LLL.	بتنابه	<u>ata a da da da da da da da da da da da da </u>	<u>u d d d d d</u>	1111111	11.11

1.11

Legend S: Spit Spoon (SPT) SH: Shelby tube

T-B3 to Creatius XC90H io, U. C. Berkeley method. AVVJ rods. acs et al. 1983)	Remarks	SPT-81-11 was peformed using BW rods and donut hammer	
024°E the CP uivalent 3. Sanc athead er Kove	(mm) 01C	0.037	tr ™t
1 30.40 respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respected respecte	D50 (mm)	0 0 0	0.001
-B1 -B1 ccm with ccm with tom ma tom ma fray a bray a bray a bray a bray a	< 7 inu (%)	40%	58
D: SPT 5: 40.7 11: -22 5: J. D 11: Cus 11: Cus 11: Cus 11: Cus 12: Safe	(%) uni 5 >	<15%	80
Test I rdinate levatio uipmer igineei Systei ter Typ	auy 77 > 220A %	ê	100
S Cool Ing Eq Ible Er SPT Hamm	Plasticity Index	1	34
GP Drill spons	timi.I biupi.I		58
Ř	Moisture Content (%)		37
1.000	u ² Torrane (dPa)		
iapaza	Pocket Pen (kPa) 9 <i>u</i>	170	220
ng Performance in Adapazari, Tu rak Street,Karaosman District, A S.) (05/00, Caved in at 3.05 m 07/00 of 1 m	Description	CLAY AND SAND: Interbedded thin strata of gray silty sand to sandy silt and gray silty clay to clayey silt CH: Moist gray high plasticity silty clay. Very thin (< 1 cm) red oxidized seams found in S-B1-11	
I Bulldi I Bulldi Isi, A. 3 9 cm-t depth	Energy Ratio (%)	64 83	
Ave. a Ave. a ancio eknoloj Sh with ML = 3,	(m) thgnal box	16.46 17.99	
Ind Fail Jyudibi fo B. St emin T tary wa uger us	Depth (m) Casing	10.45	10.45
i Site B - K Site B - K 7 4, 2000 J by: Rodol J hy: Rodol Method: Ro Method: Ro olid flight a	TY2 SPT TP 21/2wolff	7-5-8	3-5-7
Project N Location Date: July Date: July Field Log Operator Drilling N Water Ta Notes: S	Κετονειγ/ Γεηξιή (cm)	32/45	27/45
ETU	Sample Type and No.	S-B1-9 S-B1-10	S-B1-11
2B-BYU-U (AS-SaU-M sint Research sonsored by: SF, Caltran EC, PG&E	nacs	S	Ho
D Laz S C S S C	Limology	13311 1211 1311	<u> </u>
L	Depth Scale (m)		¥.

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Legend S: Spit Spoon (SPT) SH: Shelby tube

Page 2 of 2

33 Creatius XC90H U. C. Berkeley ethod. AWJ rods. et al. 1983)	Itemarks											
024°E t to CPT-I lvalent to 'Sancio, athead m ar Kovacs	(mm) 01CI		~2µm		0.005	0 15	0.15	2			0.22	0.21
I 30.400 respect de, equ ind R. B y and cr imer (pe	(mm) 05G		0.014		0.038	۲ م	0.48	2			1.0	0.9
-B2 B513°N cm with cm mat tom ma tom ma tom ma tom ma e, putle	(%) mu 2 >		21		4		1				ı	3
C: SPT 3: 40.7 3: J. D 5: J. D 5: Safe	(%) uni 5 >		30		8						ŧ	1
Test II dinate evatio gineer Syster er Typ	тц č7 > гэлд %		87		6	Ľ	ט ע	,			e	4
S Coor ng Equ ble En SPT	Plasticity Index		18		6		J 1				1	L
GPA	ımi.I biupi.I		42		37		<b>a</b> 1				1	,
Re	Moisture Content (%)		34		33	40	0 00	3			<del></del>	15
	^{5 ц} Тогулис (kPa)											
apazar	Pocket Pen (kPa)											
ing Performance in Adapazari, Tu rak Street,Karaosman District, Ac S.) 17/08/00	Description	Fill: Dark brown well graded sand with fine gravel	CLAYEY SILT: Brown clayey silt with fine sand and red oxidized zones			SANDY SILT: Gray sandy slit	upper 2 m of the layer. Gravel content in recovered samples	is variable from 0% in S-B2-5 to 12 % in S-B2-7				
l Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Build I Buil	Energy Rado (%)		24	51	54	8	20 L	ß				67
Ave. and Ave. and ancio eknoloj Sh with VL = 1.	k (m) digaal box		4.27	5.80	7.32	7.32		8.84	9.77		11.29	11.85
nd Fail Jyudibi o B. Sc emin T emin T on: GV on: GV	Casing Depth (m)		1.35	2.15	2.95	3.85		4.65	5.45		6.95	7.95
lame: Grou : Site B - Ku y 5, 2000 j by: Rodolf j by: Rodolf by: ZETAS (Z Aethod: Rol hole Elevati colid flight au	Blows/15 cm		1-2-1	1-2-1		4-8-3		9-9-10	9-14-17		9-14-16	11-15-16
Project N Cocation Date: Jul Date: Jul Date: Jul Date: Jul Date: Jul	Γευδάν (cm) Κεςονειγ/		31/45	0/45	35/45	35/45		27/45	0/45		15/45	15/45
CLA CCLA	Sunple Type and No.		S-B2-1	S-B2-2	S-B2-3	S-B2-4A	S-B2-4B	S-B2-5	S-B2-6	······	S-B2-7	S-B2-8
CB-BYU-U TAS-SaU-M oint Research iponsored by JSF, Caltrau JSC, PG&E	naca		ت ات		¥		SP-SM	WS-dS			SW	MS
DH SZO	Lithology		A	H	::::H	<u> :  . '.</u>		<u> </u>				· · · ·
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treallus XC90H reallus XC90H L. C. Berkeley hod. AWJ rods. tt al. 1983)	Remarks										
221°E t to CPT- ivalent to . Sancio, athead m ar Kovacs	(mm) 0†G		<u> </u>	<2µm		- ≺2µm	3	0.001	<del></del>		
N 30.397 respect ade, equ and R. B and R. B sy and c mmer (pe	(mm) 02C		3	тц2>		0.027	1	1.07	2.8	200 0	1000
-C1 78370°1 stom ma tom ma be, bulk	(%) uni 7 >		۱.	67		, <del>**</del>			\$	2	75
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	(%) m4 č >		1	84		, <del>e</del>	I	4, 7	l	Ę	¥
rdinate rdinate levatic upmer Syster rer Typ	mu 27 > 250î %		66	66		80 80	67	53	<del></del>	0	80
S Coo Ing Eq Ible Er SPT Hamm	Plasticity Index		17	42		ω,	¥ .	2 2	1		<u>۱</u>
GF Drill Spons	imil biupil		44	64		36	26	. 3	<b>f</b>	ç	2
Re	Moisture Content (%)		40	42		35 29	28	. S	4	ç	3
	u ² Тогчале (kPa)		4	32	24	23	23	1 1	ŧ	ç	3
key	Pocket Pen (kD2)		30	120	100	180	170	- 180	ı		<u> </u>
ing Performance in Adapazari, Tu istrict, Adapazari S.) S.) diameter tricone bit 36/28, 1.56 m 07/08, 1.53 m 07/19	Description	Fill: Dark brown clayey fill	CLAY: Brown tan silty clay to clayey silt. Red oxidation points in samples indicating oxidation of ferric minerals			SANDY SILT: Gray low	plasticity sandy silt interbedded with gray silty clay with traces of fine sand. Thin	gray cray layer at approximately 5.15 m. SAND: Gray sand to silty sand of variable gradation	interspersed with thin tayers or sity clay. Variable gravel content in samples S-C1-6B and S-C1-7 (10 % - 20 %)		ML: Gray low plasticity clayey
1 Build Iklal D 15i, A. 9 cm- 17om C	Energy Ratio (%)		ţ	47	1	63 63	64	20	ŝ		5
reet, ts reet, ts incio eknoloj sh with ML = 1. 1 away	Rod Length (m)		5.80	5.80	,	7.32	8.84	8.84	10.37		11.8
VIL5 T	Casing Depth (m)		tt	1	2.0	4.15	5.0	5.95	7.3		9.45
lame: Grou : Site C - B( e 26, 2000   by: Rodoll   by: Rodoll : ZETAS (Z   tethod: Rot ble Elevati pproximatel	Blows/15 حتى Blows/15 حتى			1-2-2	E	2-3-5	2-5-9	5-12-30	7-13-7		3-3-8
Project N Location: Date: Jun Field Log Operator Drilling N Water Tal Notes: Aj	Γευδιμ (cm) Κεςονειγ/		43/45	35/45	40/42	33/45	35/45	40/45	38/45		36/45
	Sample Type and No.		S-01-1	S-C1-2	SH-C1-3	S-C1-4A S-C1-4A	S-C1-5	S-C1-6A S-C1-6B	S-C1-7		S-C1-8
B-BYU-U AS-SaU-M nt Research onsored by F, Caltrau 3C, PG&E	naca		ML/CL	Ĥ		ML	ML	MS-WS ML	SP		MF
CENS SET	Lithology		V////	m	M		: ::::::::::::::::::::::::::::::::::::	; ; <b> </b> ;			
_, _, <u>,,</u> ,	Depth Scale (m)		- <u>N</u>	<del>ر</del> ا ـ ا ـ ا	<b>)</b>	₩ <u>↓</u>	sç L	<b>0</b>	► 8	<b>ത</b>	<b>1</b> 1

T-C4 to Creatius XC90H io, U. C. Berkeley method. AWJ rods. tcs et al. 1983)	Remarks	Located near the sediment ejecta							Black fibrous wood chip at approx. 6.5 m		
221°E t to CP irivalent 3. Sanc athead er Kove	(mm) 01C		5	0.003		<2µm	Ŧ	<2µm 0.15	1	~2µm	<2µm
4 30.39 h respec ade, equ and R. F and R. F y and c nmer (p	D50 (mm)		F	0.013		0.003	F	0.014	5 1	0.006	0.002
CC2 B370 Cm with Cm me tom me bray C Bray C Bray C Bray C Bray C Bray C Bray C Bray C Bray C C C C C C C C C C C C C C C C C C C	(%) uni 2 >		l	ස	ı	41	ı	24 -	ı	40	49
D: SPT n: -11- n: -11- s: J. D n: Rop e: Safé	(%) mu č >		- <b>1</b>	22		60	ŧ	34	3	48	60
Test I Test I levatio levatio uipmei ugineei Systei er Typ	mu 27 > 22nd %	1	26	94	66	66	87	24	92	66	66
S Coo E E Ing Eq Ible Er SPT Hamm	Plasticity Index		15	15	45	28	15	14	*	26	
GP Drill sspons	Liquid Limit		40	42	74	73	42	27	34	49	37
Å	Moisture Content (%)		37	43	41	26	33	26	58	38	36
	² Тогталс (кРа)		20	45	72	53					20
rkey V03	Pocket Pen (kP2)		20	80	170	85	230		300	130	280
ng Performance in Adapazari, Ti strict, Adapazari S.) S.) Jiameter tricone bit 16/28/00, 1.59 m 07/08, 0.98 m 0 of 1.6 m	Description	CLAYEY SILT: Dark brown clayey silt with uniform color. Moist, soft consistency.	CLAYEY SILT: Brown clayey silt to high plasticity silty clay. Traces of fine sand				CLAYEY SILT: Olive gray clayey silt with fine sand to sandy silt interbedded with	ciay seams. very unin lamination at about 5.25 m.	SW-SM: Well graded gray sand with silt. Approximately 8% gravel content	CLAYEY SILT: Alternating strata of gray sifty clay and clayey silt.	
1 Build Iklal D Isl, A. 9 cm- depth	Encrgy Rado (%)		54	ı	69	1	73	70	75	65	4
eet, Ist eet, Ist incio sh with VL = 1.	(m) frogna (m)		4.27	I	7.32	1	8.84	8.84	10.37	10.37	13.42
ind Failt Sluk Str o B. Sa emin To emin To on: GV	Depth (m)			2.4	3.2	4.05	4.85	5.65	6.45	7.5	8.9
Vame: Grou I: Site C - Brou ne 27, 2000 g by: Rodoll r: ZETAS (Z Wethod: Rol vable Elevati Solid flight au	Tq2 Blowsf15 cm		4 2 4	1	2-2-4	I	2.4-3	5-15-19	2-5-6		4-3-4
roject N ocation late: Jur lefd Lo perato rilling 1 Vater Ta lotes: S	Γευβίμ (cm) Κετονειγ/		38/45	42/42	35/45	40/42	36/45	38/45	36/45	35/45	43/45
	Sample Type and No.		S-C2-1	SH-C2-2	S-C2-3	SH-C2-4	S-C2-5	S-C2-6A	S-C2-6B S-C2-7	S-C2-8	S-C2-9
ICB-BYU-U CTAS-SaU-M Joint Research Sponsored by: NSP, Caltran CEC, PG&E			CLML	MLCL	F	Ħ	MLCL	W	WF-SW-SW	CLCH	W.
	Uepth Scale (m)		H:  :H:  :H:	<u>i Hili</u>	<u>н:: :Н:</u> ] თ	:H:[]:H	ц <u>і:н:¦;:н:</u> го	; <u>;</u> :н[. ,	. <del></del>	:;;:H:;;:H:; ► ~~	::H::::H::::H
L		آنبيب			<u>lı</u>	പ്പ	പ്പ		<u>ī                                    </u>	<u> </u>	ىلىبىد

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Legend S: Spit Spoon (SPT) SH: Shelby tube

-C4 to Creatius XC90H io, U. C. Berkeley method. AWJ rods. ics et al. 1983)	Remarks		An attempt to obtain a Shelby tube sample at 1.5 m failed	-		Traces of shells in sample S.C.3.3		Traces of wood fragments in sample S-C3-5		
221°E to CPT ivatent 3. Sanc athead er Kova	(mm) 01G				1	ŧ	0.001	<2µm	ŧ	<2µm
V 30.39 respect ade, equ and R. E and R. E sy and c nmer (p	D50 (mm)				0.18	1	õ.09	0.027		0.033
T-C3 78370°t 78370°t 78370°t from me stom me stom me stom me to Pray from from from me	(%) uni 7 >		····		1	1	10	16	t	15
ID: SP es: 40.1 mt: -2 o mt: Cus mt: Cus m: Rop be: Saf	(%) unt 5 >				ł	a	, <del>m</del>	53	ŧ	18
Test ordination clevatic puipme nginee f Syste ner Typ	m4 č7 > 220îî %				28	88	97 37	83	88	75
S Coo E E fing Eq sible E SP1 Hamn	Plasticity Index				t	5	. 20	1	36	I
Brill GF	imi.I biupi.I				3	40	45	31	67	28
Œ	Moisture Content (%)				27	38	234	3	42	55
	u ² Torvarc (kPa)								23	
rkey	Pocket Pen (kPa) 9 <i>u</i>				06	130	250		20	370
ing Performance in Adapazari, Ti strict, Adapazari S.) S.) diameter tricone bit <i>t/108/</i> 2000 5 m	Description	Fill: The boring was drilled through a thin concrete slab on grade under which lles a gray sitty sandy fill	SILT: Brown silt to clayey silt with traces of fine sand interspersed with strata of brown silty sand to sandy silt				SM: Gray silty fine sand	SILTY CLAY: Gray silty clay to clayey silt with some fine sand	CLAY AND SILT: Gray low plasticity silt with sand interbedded with gray high plasticity totay. Red oxidation zone towards the upper portion of sample S-C3-6. The clay loses strength when remolded	
1 Build liklal D 9 cm- 30 m (	Energy Rado (%)		د 	1	67	66	99	····· /	8	65
ure and eet, ist ancio eknoloj sh with AL = 1.	(m) dignəl boli			3	7.32	8.84	8.84	10.37	10.37	13.42
Ind Fail olick Str fo B. Sa femin T tary wa tary wa uger to	Casing Depth (m)			2.8	3.75	4.55	5,45	6.65	7.65	9.75
Name: Ground Street Comparison State C - B ne 27, 2000 g by: Rodol r: ZETAS (Z Method: Ro able Elevati Solid flight a	Blows/15 cm			3	3-3-4	2-2-1	3-10-8	3-4-7	1-3-2	2-7-14
roject l ocation late: Ju letd Lo porato prilling Vater T lotes: 3	Length (cm) Recovery/			42/42	38/45	43/45	38/45	36/45	35/45	45/45
	Sample Type and No.			SH-C3-1	S-C3-2	S-C3-3	S-C3-4A S-C3-4A S-C3-4B	S-C3-5	-C3-6 S	S-C3-7
JCB-BYU-U JCB-BYU-U ZTAS-SaU-M Joint Research Sponsored by NSF, Caltran CEC, PG&E	DSCS			. [ . ] . [ . ] .	WS			E C		J W
	(m) גואסייסטיי ד) געסייסטיי				<u></u>			:H:;;:H		2 2

-C4 to Creatius XC90H io, U. C. Berkeley method. AWJ rods. cs et al. 1993)	Remarks		Sand catcher was used to aid sample recovery	Sand catcher was used	Sand catcher was used	Sand catcher was used
221°E to CPT Jivalent 3. Sanci athead er Kova	(mm) 01C			<2µm		0.003 <2µm
v 30.39 respect ade, equ and R. F and c nmer (p	D20 (mm)			0.003		0.07 0.018
-C4 B370°I m with tom m tom m . Bray e, pull et Har	< 2 inn (%)			46		14 29
D: SPT s: 40.7 n: -2 cl n: -2 cl n: -2 cl n: -2 cl s: J. D n: Rop n: Rop	(%) mul č >			57		15 35
Test II rdinate levatio levatio gineer Syster Syster er Typ	m4 27 > 2007 %			66		51 83
S Cool ng Eq ble En SPT Hamm	Plasticity Index			52		F 3
GP Drilli spons	ımi.1 biupi.1			45		30
ß	Moisture Content (%)			42		29 34
	и ² Тотчалс (к ^Р а)			31		24
key	Pocket Pen (kPa)			60		50 50
ng Performance in Adapazari, T strict, Adapazari S.) B/03/00 B/03/00	Description	Fill: The boring was drilled through a thin (~5 cm) concrete slab on the west entrance of building C2	CLAYEY SILT: Brown silty clay/clayey silt to sandy silt/silty sand			
klal Di klal Di si, A. 3 9 cm-4 4 m 0	Encrgy Ratio (%)		84	47	61	62
ure and eet, Isti ay sh with VL = 0.	(m) drgnal boH		4.27	5.80	7.32	8.84
Ind Failt Bluk Stru- ra Batur emin Te tary was on: GV	منامع (m) tuqəU		1.45	2.45	3.45	4.35
ame: Grou : Site C - B / 19, 2000 I by: M. Bou : ZETAS (Z flethod: Ro	Blows/15 cm		2-1-2	3-1-1	2-1-1	3-2-3
roject N ocation ate: July leld Log perator rilling h Vater Ta lotes:	Γευδιμ (cm)		0/45	29/45	0/45	27/45
	Sample Type and No.			S-C4-1		S-C4-2A S-C4-2B
CB-BYU-U TAS-SaU-M oint Research iponsored by ISF, Caltran ISF, Caltran	naca		st	ರ		<u>k</u> r
	Lithology		₩:[]:H:[	H	H	<u>H:</u> H:
	Depth Scale (m)		· · · · ·	4 C	<del>ກ</del> 	4 1

Page 1 of 1

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T-C4 to Crealius XC90H io, U. C. Berkeley method. AWJ rods. tos et al. 1983)	Remarks	Vane shear test at 1.25 m. First reading = 2.5 kPa. Average second reading = 3.5 kPa. Although the test was performed correctly. the first reading must be	wrong		Sand catcher was used for S-C5-2. One blow was	sufficient to drive the rods > 45 cm at 1.9 m. No sample	was recovered. The sample was reinserted at 2.3 m and driven 45 cm. No sample	was recovered			
	221°E ct to CP uivalent B. Sanc cathead er Kova	(mm) 01G				т,22µп		ŧ	<2µm	<2µm	0.2
	N 30.35 h resper ade, equ and R. I ey and c nmer (p	D50 (mm)				0.005		1	0.002	0.017	0.7
	F-C5 78370° cm wit ttom m . Bray e, pull- e, pull- aty Har	(%) uni 2 >				38			50	25	1
	D: SP1 35: 40.7 11: Cus 11: Cus 11: Cus 12: J. D 12: Safé	(%) uni 5 >				50		•	70	3	
	Test I rdinate levatio ulpmei upmei ugineei Systei er Typ	mui 27 > 22nh %				96		6	100	66	4
	S Coo E E Ing Eq Ible Er SPT Hamm	Plasticity Index				24		21	18	\$	L
	GP Drill ispons	المتعاقبة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة المتعاومة ا				44	1	48	42	36	1
	Re	Moisture Content (%)				<del>4</del>		41	40	37	4
		u ⁸ Тогчалс (kPa)	·····		<u> </u>						
	irkey	Pocket Pen (kPa) 9 <i>u</i>			1	40					
Performance in Adapazari, Turk ict, Adapazari	ing Performance in Adapazari, Ti istrict, Adapazari S.) diameter tricone bit 8/03/00	Description	Fill: Top soil of garden area on the east side of building C2. Wash water shows a fine to coarse sub-angular to sub- rounded colorful clean sand at 1.8 m		CL: Brown silty clay w/ red oxidized zones		CL: Gray silty clay			SILT: Gray clayey silt	SAND: Gray fine to coarse sand with traces of gravel. Fine gravel content in S-C5-7 = 8%
	d Build likial D. jisi, A. 19 cm-1 ed in 06	Еленду Капо (%)	l		1	56	F	1	64	, 67	9 67
	irreet, is irreet, is ancio eknolo ish with ble cavit	Rod Length (m)	F		5.80	7.32		1	8.84	10.37	11.85
	Ind Fai Idluk Stai Idluk Stai Io B. S Idluk Stai Io B. S Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Stai Idluk Sta	Depth (m) Casing			1.75	2.85		4.25	5.05	5.95	6.95
	Name: Grot n: Sile C - B ly 27, 2000 g by: Rodol r: ZETAS (Z Method: Ro able Elevati	TcIS تمم Biows/15 حمم	L BACKERST					1 1	1-1-3	6-17-23	14-17-17
	Project   Locatior Date: Ju Diete: Ju Operato Drilling   Water Ta Notes: 1	Γευξιτή (cm) Γευξιτή	02/0	0/45	0/45	27/45		44/50	38/45	40/45	22/45
	CLLA AffETU AffETU	Sample Type Sand No.	SH-C5-1		S-C5-2	S-C5-3		SH-C5-4	S-C5-5	S-C5-6	S-C5-7
	CB-BYU-U TAS-SaU-A oint Researc ponsored by ISF, Caltrau ISF, Caltrau	naca			1	<u>ਰ</u>		ರ	5		<del>کل ا</del>
	D Z Z Z Z Z Z	Lithology			M	114	M	$\langle l \rangle$	H		· · · · · ·
		Depth Scale (m)	0,	_ <b>N</b>		<u>ო</u>	4		នា	မှ	

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.C4 o Crealius XC90H , U. C. Berkeley nethod. AWJ rods. s et al. 1983)	Remarks				-	
221°E t to CPT. ivalent to ivalent to athead m er Kovac	(mm) 01C		<2µm	<2µm	~22µm 0.01	
V 30.39% 1 respectade, equ and R. B and R. B and cr	D50 (mm)		0.014	0.015	0.003	
C6 8370°I cm with torn m torn m . Bray e, pull ety Har	(%) mu 2 >		25	20	44 <10%	
D: SPT s: 40.7 nr16. nr. Cus s: J. D s: J. D nr. Rop n: Rop	(%) umi <u>ç</u> >		30	28	57 <15%	
Test II dinate levatio lipmen gineer Systen er Typ	mu č7 > 25nñ %		94	87	99 45	
S Coor ng Equ ble En SPT Hamm	Plasticity Index		ł	,	33	
GP	1 Imia Limit		40	31	36	
A A	Moisture Content (%)		÷.	36	45 32	
	^{2 ע} דסרעפתכ (ג ^ק ב)				47	
key	Pocket Pen (kPa) 9 <i>u</i>		60	60	20	
ng Performance in Adapazari, Tu strict, Adapazari s.) B/03/00 8/03/00	Description	Fill: Top soil and brown clayey fill in east yard of building C2	ML: Brown silt to silt with sand w/ red oxidized zones		CH: Brown high plasticity silty clay.	SILTY SAND: Brown silty sand
klal Dit klal Dit si, A. S 9 cm-d	Energy Ratio (%)		48	53	65	I
rre and eet, Isti ncio sh with VL = 0.4	(m) ngua Length (m)		4.27	5.80	7.32	
nd Failt Sluk Str 0 B. Sa emin Te entin Te on: GV	یندیک Depth (m)		0.95	1.50	1.50	
Name: Grou 1: Site C - B( 1y 27, 2000 9 by: Rodoli 1: ZETAS (Z Method: Rol able Elevati	Tris Tris Tris			1-0-1	24-6	
roject l ocation late: Ju leid Lo perato brilling Vater T	Kecovery/ Length (cm)		28/45	41/45	35/45	
	Sample Type and No.		S-C6-1	S-C6-2	S-C6-3A S-C6-3B	
CB-BYU-U TAS-SaU-N loint Researc sponsored by VSF, Caltrau CEC, PG&I	sosn		WI	ML	H N H H H H H H H H H H H H H H H H H H	
DH SZO	Lithology		8			
					<b>م</b>	ר ר.

		r	~~~~				
	-C4 o Creallus XC90H , U. C. Berkeley nethod. AWJ rods. s et al. 1983)	Remarks					
21°E to CPT-( valent to Sancio, thead me		D10 (mm)		<2µm	<2µm	<2µm	<2µm
N 30.39	h respec ade, equ and R. B ey and c mmer (pe	(um) 02Q		0.017	0.034	0.004	0.002
-C7 83709	cm with tom m . Bray e, pult	(%) uri z >		23	18	40	53
0: SPT s: 40.7	n: -14 nt: Cus s: J. D n: Rop e: Safe	(%) mų č >		29	22	58	20
Test ID: GPS Coordinates: Elevation: Drilling Equipment: sponsible Engineers: SPT System: Hammer Type:		uti 57 > 250A %		84	72	66 66	66
		Plasticity Index		1		28	43
		imi.I biupi.I		34	33	49	65
	В. В	Moisture Content (%)		33	33	17	38
		⁵ u Torvane (kPa)					
key		Pocket Pen (kPa) 9 <i>u</i>		0/	40	100	
ing Performance in Adapazari, Tu Istrict, Adapazari	S.) diameter tricone bit 8/03/00	Description	Fill: Top soil and brown clayey fill in east yard of building C2	ML: Brown low plasticity silt with sand to sandy silt. Soil	has red oxidized points	CLAY: Brown high plasticity slity clay w/ red oxidized points	
d Build	jisi, A. 19 cm- ed in, 0	Energy Ratio (%)		20	51	20	62
ure and eet, Isl	ancio eknoloj sh with le cave	(т) ліда÷і boЯ		4.27	5.80	7.32	7.32
nd Fail	lo B. Sa emin T. tary wa on: Ho	Casing Depth (m)		0.95	1.50	0.95	0.95
lame: Grour : Site C - B0 y 27, 2000 J by: Rodolfd : ZETAS (Ze Alethod: Rott ble Elevatio		mə či/əwəld SPT		1-1-3	1-2-1	1-1-2	2-2-3
Project N ocation	Jate: Jul Tield Log Dperatol Orilling Nater Ta Notes:	Γευξιμ (cm) Κετονειλ		33/45	38/45	40/45	33/45
CLA		Sample Type and No.		S-C7-1	S-C7-2	S-C7-3	S-C7-4
B-BYU-U	AS-SaU-N int Researc ponsored by SF, Caltrar EC, PG&I	naca		ML	WL	сг/сн	сн
n	CI & S N D	Vgolonhil					Ħ
		Depth Scale (m)	<u></u>			» ا ب ا	<b>)</b>



+ SPT-D2
| rt-D1<br>to Creatius XC90H<br>sio, U. C. Berkeley<br>I method. AVU rods.<br>acs et al. 1983)              | Remarks                         |                                         |                                                                                                                                 |                                                                         |        |                                                                                                |                                                                       |                                                                                                                                                                                 |           |                                                            |            |
|-----------------------------------------------------------------------------------------------------------|---------------------------------|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|--------|------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|------------------------------------------------------------|------------|
| 828°E<br>st to CP<br>Jivalent<br>3. Sanc<br>sathead<br>er Kove                                            | (mm) 01G                        |                                         | ~2µm                                                                                                                            | 1 \$                                                                    | <2µm   | 1                                                                                              | 0.24                                                                  | 0.33                                                                                                                                                                            | 0.16      |                                                            | 2µm        |
| V 30.40<br>h respectade, equal and R. I<br>and R. I<br>and C numer (p                                     | D20 (mm)                        |                                         | 0.011                                                                                                                           | 0.06                                                                    | 0.004  | 1                                                                                              | <del></del>                                                           | 1.7                                                                                                                                                                             | 0.7       |                                                            | 0.007      |
| T-D1<br>7692991<br>ccm will<br>stom me<br>D. Bray<br>D. Bray<br>pe, pulle<br>fety Har                     | (%) uni Z >                     |                                         | 30                                                                                                                              | Ŧ 1                                                                     | 36     | 1                                                                                              | 1                                                                     |                                                                                                                                                                                 | 1         |                                                            | 34         |
| D: SP<br>as: 40<br>nt: -10<br>rs: J. D<br>m: Roj<br>be: Saf                                               | (%) mų č >                      |                                         | 37                                                                                                                              | 1 3                                                                     | 54     |                                                                                                | ŧ                                                                     | a                                                                                                                                                                               | ;         |                                                            | 42         |
| Test<br>ordinate<br>elevatic<br>luipme<br>nginee<br>Syste<br>ner Typ                                      | шті 57 > гэлд %<br>:            |                                         | 8                                                                                                                               | 71<br>59                                                                | 66     | 89                                                                                             | 4                                                                     | ო                                                                                                                                                                               | ŝ         |                                                            | 94         |
| S Coo<br>E<br>ing Eq<br>tible E<br>SPT<br>Hamn                                                            | Plasticity Index                |                                         | 4                                                                                                                               | 1 1                                                                     | 56     |                                                                                                | 2                                                                     | 3                                                                                                                                                                               | 5         |                                                            | 25         |
| GF<br>Drill<br>sspons                                                                                     | Liquid Limit                    |                                         | 33                                                                                                                              | 28<br>29                                                                | 50     | 28                                                                                             |                                                                       | ŧ                                                                                                                                                                               | L         |                                                            | 56         |
| Ř                                                                                                         | Moisture<br>Content (%)         |                                         | 30                                                                                                                              | 32 30                                                                   | 38     | 34                                                                                             | 15                                                                    |                                                                                                                                                                                 |           |                                                            | 34         |
|                                                                                                           | ⁵ и<br>Тогуалс (кРа) | <br>                                    | ŧ                                                                                                                               | j t                                                                     | 42     | ۲                                                                                              | 1                                                                     | \$                                                                                                                                                                              | t         |                                                            | 57         |
| rkey                                                                                                      | Pocket Pen (kPa)                |                                         | 9                                                                                                                               | 5 1                                                                     | 10     | L                                                                                              | 5                                                                     | J                                                                                                                                                                               | )<br>     | 1                                                          | 220        |
| ing Performance in Adapazari, Tu<br>ahmediye District, Adapazari<br>S.)<br>S.)<br>6/29/00, 1.70m 06/29/00 | Description                     | Fill: Sandy clayey subgrade of sidewalk | CL: Black to dark gray clayey<br>silt with some fine sand. The<br>soil has organic odor but not<br>related to soil composition. | Probably due to nearby septic<br>tank<br>Mit : Dark grav to black sandy | sitt   | CH. Brown siny clay with<br>traces of red oxidized spots.<br>Does not soften when<br>remoulded | ML: Brown silt with traces of<br>fine sand and red oxidized<br>spots. | SAND: Well graded gray sand<br>to well graded sand with fine<br>gravel. Gravel content is<br>inhomogeneous and varies<br>from 3% to 24%. FC in all<br>recovered samples is < 6% |           | MH: High plasticity silty clay<br>with traces of fine sand |            |
| d Build<br>Çukur<br>Jisi, A.<br>.68m 0                                                                    | Energy Rado (%)                 |                                         | 41                                                                                                                              | 53                                                                      | 53     | 63                                                                                             | 64                                                                    | 67                                                                                                                                                                              | 66        |                                                            | 2 75       |
| Street,<br>Street,<br>ancio<br>eknolo<br>eknolo<br>ML = 1                                                 | (m) rhgaəl bofi                 |                                         | 4.27                                                                                                                            | 5.80                                                                    | 7.32   | 7.32                                                                                           | 8.84                                                                  | 10.3                                                                                                                                                                            | 10<br>13. |                                                            | 13,4;      |
| Ind Fail<br>leydan<br>ffo B. S.<br>femin T<br>tary wa<br>ton: G                                           | رمعing<br>Depth (m)             |                                         | 1.05                                                                                                                            | 1.85                                                                    | 2.65   | 3.4                                                                                            | 4.45                                                                  | ي<br>4                                                                                                                                                                          | 7.5       |                                                            | <u> </u>   |
| Name: Gro<br>I: Sile D - A<br>ne 28, 2000<br>g by: Rodo<br>r: ZETAS (2<br>Method: Rc<br>able Elevat       | TS 21/swolff                    |                                         | 1-0-1                                                                                                                           | 2-1-1                                                                   |        | 3-3-4                                                                                          | 8-11-12                                                               | 9-12-12                                                                                                                                                                         | 10-14-18  |                                                            | 3-3-4      |
| Project I<br>Location<br>Date: Ju<br>Tield Lo<br>Derato<br>Drilling I<br>Nater Ta<br>Notes:               | רכטעפנא (כש)<br>ארכטעפנא/       |                                         | 26/45                                                                                                                           | 39/45                                                                   | 36/45  | 40/45                                                                                          | 12/45                                                                 | 10/45                                                                                                                                                                           | 31/45     |                                                            | 36/45      |
|                                                                                                           | Sample Type<br>ond No.          |                                         | S-D1-1                                                                                                                          | S-D1-2A<br>S-D1-2B                                                      | S-D1-3 | S-D1-4                                                                                         | S-D1-5                                                                | S-D1-6                                                                                                                                                                          | S-D1-7    |                                                            | S-D1-8     |
| UCB-BYU-U<br>ETAS-SaU-M<br>Joint Research<br>Sponsored by<br>NSF, Caltran<br>NSF, Caltran                 | DISCS                           |                                         | 5<br>////                                                                                                                       | wr<br>Wr                                                                | CHICL  | ¥                                                                                              | sw<br>Sw                                                              | MS                                                                                                                                                                              | WS-MS     |                                                            | MH/CH      |
| - N                                                                                                       | Depth Scale (m)                 |                                         | ·······                                                                                                                         |                                                                         |        | о<br>О                                                                                         | ₹<br>↓                                                                | μη τρ<br>μητικί μι                                                                                                                                                              | ► 8<br>   | 6<br>                                                      | 2<br>2<br> |

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Page 1 of 1

Legend S: Spit Spoon (SPT) SH: Shelby tube

.D.1 to Crealius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks						
828°E to CPT- rivalent 1 3. Sanci athead er Kova	(mm) 01 <b>U</b>		Zµm	2pm	<2µm 0.15	0.25	0.13
N 30.40 respect ade, eqt and R. I ey and c mmer (p	(mm) 02C		0.02	0.021	1.2	1.3	0.4
F-D2 76929° from with stom m 0. Bray be, puli ety Har	(%) uni 2 >		ţ,	, <del>1</del> 0	20	1	1
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rkey	Боскет Реп (кРа) Чи	110	, 6	04 20	1 \$	t	
ing Performance in Adapazari, Tu ahmediye District, Adapazari S.) (108/00 ulding	Description	Fill: Hard brick and brown fill material. The soild flight auger had difficulty, maybe due to a spread footing of the collapsed building	CLAYEY SILT: Gray clayey sitt to sitty clay with fine sand and traces of shells. Strong organic odor, but not due to	soil composition CLAYEY SILT: Brown clayey silt to silty clay with traces of	tine sand and red oxidized spots to sandy silt SAND: Gray well to poorly	graded saild with row sill content (< 6%) and varying fine gravel content (< 16%)	
Çukura Çukura jisi, A.	Επετgy Κλάο (%)		, ;	51 54	65	65	1
Street, Street, ancio eknolo eknolo of coltaj	(m) dagaa ka (m)		1	5.80 7.32	8.84	8.84	10.37
ind Fall leydan fo B. S: emin T emin T tary wa on: Hc	Baings (m) diga	1.25	2.05	2.05 3.15	4.05	5.15	7.00
tame: Grou :: Site D - M ne 29, 2000 j by: Rodol j by: Rodol z: ZETAS (Z Method: Ro the Elevati ton for	Blows/15 cm SPT	1	, ,	1-2-1	3-9-9	9-12-12	10-13-17
Project N Location Date: Jur Field Log Operator Drilling N Water Ta Notes: E	Γευδιγ (ctu) Κετολειλ	42/42	42/42	41/45 37/45	36/45	29/45	30/45
4 16TU 4 15 10 15 15 15 15 15 15 15 15 15 15 15 15 15	Sample Type and No.	R-D3-L	SH-D2-2	S-D2-3 S-D2-4	S-D2-5A S-D2-5B	S-D2-6	S-D2-7
CB-BYU-U CB-BYU-U TAS-SaU-N foint Rescarc 5ponsored by VSF, Caltrar CEC, PG&E	naca		MLCL	CL/ML CL/ML	Wr-SM SW-SM	SW	SW-SM
	Depth Scale (m)		H[]H]];	HHH	- <u> </u>	40	9 1
L	<u> </u>	سفيتنا	سللب	للمنأسب	يلي لي الم		LITILI

UCBANULUCIA TUCBANULUCIA Intersection Intersection Particle STAT Reserved Intersection Particle STAT Reading Factore in Adapazari Intersection Intersection Reserved Particle Static Adapazari Particle STAT Reading Factore In Adapazari Intersection Intersection Responsible Engineers: J.D. Bray and R.B. Sanda Static Statisme Network Table Elevation: Tetra Responsible Adapted Static Network Table Elevation: Tetra Responsible Network Table Elevation: Statisme Network Table Elevation: Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Statisme Network Table Elevation: OWL = 2.28 m, 060/400     Description Adapted Factore Distribution Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution     Description Adapted Factore Distribution   <	T-D1 to Creatius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks			No sample was recovered at 2.9 m. In a second attempt the rods sank 25	cm (3.15 m) and the sampler was driven 45 cm		
UCB-MULUCIA Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruction Instruc	828°E ct to CP livalent 3. Sanci athead er Kova	D10 (mm)		,	<2µm	0.002	0.002	
UCE-BYTU-UCLA         Froject Name: Ground Failure and Building Performance in Adapazari         Text D: STT-D3           ZETAKS-BUL-METU         Date: JUS 5, 2000         Date: JUS 5, 2000         Date: JUS 5, 2000           Jain Research         Field Log by: Rodolio B. Sancio         Date: JUS 5, 2000         Date: JUS 5, 2000           Jain Research         Field Log by: Rodolio B. Sancio         Date: JUS 5, 2000         Date: JUS 5, 2000           Jain Research         Field Log by: Rodolio B. Sancio         Datation: ZETAS (Zamin Teknologis), A. S.)         Research for the montanes: 47.5529m           NSF, Culturas         Dollarder: ZETAS (Zamin Teknologis), A. S.)         Responder (Rodo yung)         Responder (Rodo yung)           NSF, Culturas         Dollarder: ZETAS (Zamin Teknologis), A. S.)         Responder (Rodo yung)         Responder (Rodo yung)           NSF, Culturas         Vater Table Elevation: GML = 2.28 m, 06/04/00         Read Lin (Rodo yung)         Proverser/10           Dentified Equitaries: 4.100         Mater Table Elevation: GML = 2.28 m, 06/04/00         Reado print of culturas: 4.75 µm         Readoung the formation of culturas: 4.75 µm           Dentified Equitaries: 4.75 µm         Second mater (Rodo yung)         Proverser/10         Proverser/10         Proverser/10           Discription         Barned (Rodo yung)         Proverser/10         Proverser/10         Proverser/10	V 30.40 h respe- ade, equ and R. E and R. E nmer (p	D20 (mm)		1	0.07	0.062	0.011	
UCE-RYL-UCLA       Project Name: Ground Faiture and Building Performance in Adapazari, Turkey       CER Coordinates: 40. Test 20. May 28, 2000         Distribution: Distribution: Distribution: Distribution: Distribution: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsould by: Sponsoul	D3 (6929 th cm wit tom ma tom ma tom wit bary ( Bray ( e, pullé ety Han	< 2 µm (%)		1	9	10	<b>с</b> я,	
Total       Project Name: Ground Failure and Building Performance in Adapazari, Turkey       Test Value Matter Jug 26, Stourd Failure and Building Performance in Adapazari, Turkey       Total Locations       Sponsortinat       Elevation         ZETNS-SaU-METU       Derat Jug 26, Stourd Failure and Building Performance in Adapazari       Deratinat       Bevalue Status       Sponsortinat       Elevation         Jeint Research       Flad Log by: Rodolfo B. Sancio       Sponsortinat       Elevation       Sponsortinat       Elevation         Sponsortination       Flad Log by: Rodolfo B. Sancio       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Science       Depati Scien	D: SPT 55: 40.7 7: +16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -16 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17 7: -17	(%) uni ç >		a	17	4	œ.,	
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UCB-BYT-UCLA       Project Name: Ground Failure and Building Performance in Adapazari       Urkey         ZETXASSAU-METU       Location: Sile D - Moydan Street, Cukurahmediye District, Adapazari       District, Adapazari       Offer and Sile D - Moydan Street, Cukurahmediye District, Adapazari         Jerostation:       Field Log by: Rodolfo B. Sancio       Sponsored ty:       District, Adapazari       Cit       District, Adapazari       Cit       District, Adapazari       Cit       Cit         Sponsored ty:       District, District       District, Adapazari       District, Adapazari       District, Adapazari       Cit       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       District       Distric<	S Coo E E ing Eq sible El SPT Hamn	Plasticity Index	· · · · · · · · · · · · · · · · · · ·	ŧ	<u>د</u>	۱	, 4	
VCB-BYU-UCLA       Project Name: Ground Failure and Building Performance in Adapazani, Turkey         ZETNAS-SuU-METU       Location: Sile D - Meydan Street, Cukurahmediye District, Adapazani, Turkey         ZETNAS-SuU-METU       Location: Sile D - Meydan Street, Cukurahmediye District, Adapazani, Turkey         Joint Research       Departor: Status       Valuation Status         Nistr, Caluans       Operator: STETAS (Zemin Teknologist, A S.)         Sponsored by:       Notes:         Operator:       CEC, Proces         Nistr, Caluans       Watter Table Elevation: GNL = 2.28 m, 08/04/00         Displat Scale (m)       Notes:         Natures:       Scala         Displat Scale (m)       Method Scale (m)         Displat Scale (m)       Notes:         Natures:       Nature         Displat Scale (m)       Notes:         Displat Scale (m)       Mediato         Displat Scale (m)       Notes:         Displat Scale (m)       Notes:         Displat Scale (m)       Mediato         Displat Scale (m)       Mediato         Displat Scale (m)       Scale (m)	GF Drill spons	timi.I biupi.I		ı	30	31	32	-
UCB-BYU-UCLA     Project Name: Ground Failure and Building Performance in Adapazari, ZETAS-SuU-METU     Project Name: Ground Failure and Building Performance in Adapazari, Lecation: Site D. Meydan Street, Cukurahmediye District, Adapazari       ZETAS-SuU-UCLA     Location: Site D. Meydan Street, Cukurahmediye District, Adapazari       Joint Research     Field Log by: R. Rodolo B. Sancio       Sponsored by:     Operator: ZETAS (Zemin Teknolojisi, A. S.)       Sponsored by:     Operator: ZETAS (Zemin Teknolojisi, A. S.)       Sponsored by:     Operator: GNL = 2.28 m, 08/04/00       Diffing Method: Rotary wash with 9 cm-diameter fricone bit     Description       Diffing Method: Rotary wash with 9 cm-diameter fricone bit     Mecoverty, 00       District Jadapazari     Secoverty, 00       District Jadapazari     Secoverty, 00       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secoverty, 00       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR)       District Jadapazari     Secondor (GR	Å	Moisture Content (%)		;	30	27	30	-
UCB-BYU-UCLA ZETAS-Salt-METU Joint Reservet     Project Name: Ground Failure and Building Performance in Adapazari, Turkey       ZETAS-Salt-METU Joint Reservet     Location: Sile D - Meydan Street, Cukurahmediye District, Adapazari Failet July 28; Rootolo B. Sancio       Joint Reservet     Elect July 28; Rootolo B. Sancio       Sponsored by: NSP, Calitrans     Depth Street, Cukurahmediye District, Adapazari       Valer     Depth Street, Park District, Park (Elevation: GWL = 228 m, 08/04/00       Sponsored by: NSP, Calitrans     Depth Street, Park District, Park (Elevation: GWL = 228 m, 08/04/00       Depth Street, Park Notes:     Depth Street, Park District, Park (Elevation: GWL = 228 m, 08/04/00       Depth Street, Park Notes:     Depth Street, Park District, Park (Elevation: GWL = 228 m, 08/04/00       Depth Street, Park Notes:     Depth Street, Park District, Park (Elevation: GWL = 228 m, 08/04/00       Depth Street, Park Notes:     Depth Street, Park District, Street, Park District, Street, Park       2     Sum Street, Park District, Street, Park       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3     -     -       3		u ² Torvane (kPa)		, 1	*	1	1 4	
UCB-BYU-UCIA ZETAS-SaU-METU Detailure and Building Performance in Adapazari, Tu ZETAS-SaU-METU Detailure Biel Log by: Rodolo B. Sancio Joint Research Sponsored by: NSF, Calternis Depti CEC, PCAE Depti CEC, PCAE Depti CEC, PCAE Depti CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00     Destrict, Adapazari Adapazari Teled Log by: Rodolo B. Sancio Sponsored by: NSF, Calternis Depti CEC, PCAE Nater Table Elevation: GWL = 2.28 m, 08/04/00       0     Sponsored by: NSF, Calternis NSF, Calternis Depti CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00     Description Depti Calternis Noter Table Elevation: GWL = 2.28 m, 08/04/00       1     Depti CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00     Description Calternis CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00       1     Depti CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00     Description CEC, PCAE Noter Table Elevation: GWL = 2.28 m, 08/04/00       2     Principic Type CEC, PCAE     Depti Calternis Depti Calternis CEC, PCAE     Description Calternis Calternis Calternis CEC, PCAE       3     Principic Type CEC, PCAE     Noter Table Elevation: GWL = 2.28 m, 08/04/00     Description Calternis Calternis Calternis CEC, PCAE     Description Calternis Calternis CEC, PCAE       2     Principic Type CEC, PCAE     Soluti Table Calternis Calternis CEC, PCAE     Description Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Calternis Cal	irkey	Роскес Рел (кРз) - Роскес Рел (кРз)		<u>،</u>	ı	<u> </u>	150	
UCB-BYU-UCLA     Project Name: Ground Failure and Build       ZETAS-SaU-METU     Location: Sile D - Meydan Street, Cukura       ZETAS-SaU-METU     Date: July 26, 2000       Joint Research     Field Log by: Rodolfo B. Sancio       Sponsored by:     NSF, Caltrans       NSF, Caltrans     Operator: ZETAS (Zemin Teknolojisi, A. Sonsored by: Nodolfo B. Sancio       Sponsored by:     Deprin Sile D - Meydan Street, Cukura       NSF, Caltrans     Operator: ZETAS (Zemin Teknolojisi, A. Sonsored by: Nodolfo B. Sancio       NSF, Caltrans     Drilling Method: Rotary wash with 9 cm-       NSF, Caltrans     Water Table Elevation: GWL = 2.28 m, M. Sonsored       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       Nater Table Elevation: GWL = 2.28 m, M. Borws/15 cm       M     S-D3-1       0.0     ML       N     S-D3-3       1     ML       2     S-S       1     ML       2     S-S       1     ML       2     S-S       1     ML       2     S-S       1     ML       2     S       1     ML       1     S       1     S       2     S       1     S       1     S	ng Performance in Adapazari, Tu ahmediye District, Adapazari S.) 38/04/00 38/04/00	Description	Fill: The soll in the wash water is a medium to coarse sand that is pressumed to be fill for a neighboring pipe.	SILT: Brown sandy slit to low plasticity slit with traces of fine	sand		CLAYEY SILT: Brown low plasticity clayey silt	samu: weil graded gray sam with traces of gravel and silt
UCB-BYU-UCLA     Project Name: Ground Failure and ZETAS-SaU-METU     Project Name: Ground Failure and Location: Site D - Meydan Street, Joint Research       Joint Research     Joint Research     Field Log by: Rodolfo B. Sancio Sponsored by: NSF, Caltrans     Date: July 26, 2000       Sponsored by: NSF, Caltrans     Operator: ZETAS (Zemin Teknoloj Sponsored by: NSF, Caltrans     Dilling Method: Rotary wash with Water Table Elevation: GWL = 2.       NSF, Caltrans     NSF, Caltrans     Nample Type       NSF, Caltrans     Nater Table Elevation: GWL = 2.       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Notes:       NSF, Caltrans     Sponsored by: Nater Table Elevation: GWL = 2.       NSF, Caltrans     Notes:       NML     S-D3-1       NML     S-D3-3       NML     S-D3-3       NML     S-D3-3       NML     S-D3-3       NSF     S-D3-3       NSF     S-D3-3       NSF     S-D3-3       S-D3-4     32/45       S-D3-4     32/45       S-D3-4     32/45       S-D3-4     32/45	Cukura Cukura Isi, A. 28 m,	Energy Ratio (%)		53	29	55	57	T
UCB-BYU-UCLA     Project Name: Ground Fail       ZETAS-SaU-METU     Location: Site D - Meydan 1       ZETAS-SaU-METU     Date: July 26, 2000       Joint Research     Field Log by: Rodolfo B. St       Sponsored by:     Operator: ZETAS (Zemin T       Sponsored by:     Date: July 26, 2000       Joint Research     Field Log by: Rodolfo B. St       Sponsored by:     Date: July 26, 2000       Joint Research     Field Log by: Rodolfo B. St       Sponsored by:     Drepth Scale (m)       NSF, Caltrans     Water Table Elevation: GV       NSF     Date: July 26, 2000       Dispth Scale (m)     Dispth Scale (m)       NSF     Date: July 26, 2000       Dispth Scale (m)     Dispth for (m)       NSF     Date: July 26, 2000       Dispth Scale (m)     Dispth for (m)       Dispth Scale (m)     Dispth for (m)       NSF     Dispth for (m)       Dispth Scale (m)     Site (m)       NK     S-D3-1       Dispth for (m)     Site (m)       NK     S-D3-3A       H     S-D3-3A       Site (m)     Site (m)       Site (m)     Site (m)       Site (m)     Site (m)       Site (m)     Site (m)       Site (m)     Site (m)       Site (m)     Si	ure and Street, incio eknoloj sh with VL = 2.	(m) dignəl box		5.80	7.32	7.32	8.84	
CEB-BYU-UCLA     Project Name: Grouter Site D - W       UCB-BYU-UCLA     Location: Site D - W       Joint Research     Flid Log by: Rodol       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Operator: ZETAS (Z       Sponsored by:     Dspth Scale (m)       Dspth Scale (m)     0       ML     S-D3-3       ML     S-D3-3       ML     S-D3-3       ML     S-D3-3       S-D3-3     40/45       S-D3-3     3-6.4       S-D3-3     3-6.4       S-D3-3     3-6.4       S-D3-3     3-6.4       S-S-D3-3     3-6.4	Ind Fail leydan ( fo B. St tary wa tary wa ion: GV	Casing Depth (m)		2.15	2.85	3.75	4.5	
UCB-BYU-UCLA UCB-BYU-UCLA UCB-BYU-UCLA Joint Research Sponsored by: NSF, Caltrans NSF, Caltrans CEC, PG&F Noterato Notes: Ind No. Depth Scale (m) NSF, Caltrans Nater Ta Notes: Ind No. Depth Scale (m) Notes: Ind No. Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date: Juli Date:	lame: Grot site D - M y 26, 2000 a by: Rodol by: Rodol r: ZETAS (2 Method: Ro	Blows/15 cm SPT		3-2-2	2-2-2	3-6-4	7-6-13	
¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹	roject 7 cocation bate: Jul ield Lo perato prilling 7 Vater Te lotes:	Κετονεηγ\ Length (cm)		0/45	25/45	40/45	32/45	
¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹ ¹		Sample Type and No.		S-D3-1	S-D3-2	S-D3-3A	S-D3-3B S-D3-4	at a state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the state of the
φ         φ         Debrit Scale (m)	UCB-BYU-U ETAS-SaU-N Joint Researc Sponsored by NSP, Caltrar CEC, PG&E	DISCS			<b>X</b>	¥ : :	SW SW	
	- N	Depth Scale (m)	ф <del>г</del> (	221 ·   ·	<u>. 1. [.]</u>	<u>  ·   ·</u> ▼	<u>нн ·</u>	ۍ ا



KAVAKLAR Avenue

o CPT-E2



f Creatius XC90H U. C. Berkeley sthod. AWJ rods. et al. 1983)	Remarks										
518°E to CPT-E1 ivalent to Sancio, athead me	(mm) 01G		0.2			22µm 22µm	. 5	<2µm 0.06		0.2	<2µm
v 30.40 respect ade, equ and R. B sy and c nmer (pe	(mm) 02O		0.51	0.06	a	005	0.08 0.4	0.048 0.2		0.6	0.014
-E1 77778°f m with toom ma toom ma built e, built e, pullt	(%) uni 2 >		,	20	•	33 33 37	8 8	<del></del> ,		1	24
D: SP1 5: 40.7 5: J. D 5: J. D 6: Safe	(%) mu č >		3	58 - 7	1	540 545 53	. I. I.	, <del>1</del> 6			31
Test I levatio levatio levatio lipmer gjneer Syster Syster	auy 77 > 22nîî %		2	60 20	66	8998 8998	47 7	61		ო	62
S Cool ng Equ ible Err SPT Hamm	Plasticity Index		1		22	3332	¢ 5	1 1		\$	12
GP	ımil biupil		ı	33 33	52	55 55 55 55 55 55 55 55 55 55 55 55 55	J 3	26		1	39
S	Moisture Content (%)		23	8 3	49		33	18		51	8
	Тогчале (кРа) 5 и		r		30	50					
key 8/04/0	Pocket Pen (kPa) 9u			125	09	10	80	-450	280	100	125
ing Performance in Adapazari, Tu District, Adapazari S.) S.) diameter tricone bit 7/03/00, 46 cm 07/08/00, 0.34 m epth of 0.8 m	Description	Fill: Brown sandy fill with rubble (bricks and concrete) and some fines. Black clayey soil with slight smell.	SP: Poorly graded, medium to fine brown clean sand	SILT AND SAND: Interbedded strata of brown low plasticity sandy silt and clayey silt with brown medium sand	SILTY CLAY: Brown clayey silvsilty clay. Traces of	organics and oxidation veins	SAND: Gray fine to medium sand interbedded with gray low plasticity silt deposits. FC in this stratum varies from 3%	%10.01			CLAY: Gray clay with traces of
d Build Tigcilar jisi, A. 19 cm- 0 cm 0 d to a d	Energy Rado (%)							7	a		
ure an Ave. Bray eknolo sh with ML = 7 ML = 7	(m) dignə.l boğ		4.27	5.80	7.32		8.84	10.3	11.8	11.8	
Ind Fai avaklar nan D. emin T emin T fary wa on: G\ on: G\	gnitaD Depth (m) (m)		1.55	2.85	3.65	4,45	5.35	6.35	7.35	8.08	
Jame: Grou i: Site E - Ki y 3, 2000 j by: Jonatt r: ZETAS (Z Aethod: Rol tible Elevati iolid flight au	Blows/15 cm SPT		2-2-4	2-2-3	1-2-1	1	3-4-5	5-13-19	9-16-18	4 8-	
roject h ocation ate: Jul ield Loi peratou rilling h ater Ta	Γευδεμ (ετα) Βεεσολειλ		34/45	36/45	41/45	35/42	45/45	41/45	40/45	45/45	
A DE O E O E O E O E O E O E O E O E O E	Sample Type and No.		S-E1-1	S-E1-2A S-E1-2B	S-E1-3	SHE SHE AB AB AB AB AB AB AB AB AB AB AB AB AB	S-E1-58 S-E1-58	오~년1-6A 년 -6B	S-E1-7	S-E1-8A	S-E1-8B
ICB-BYU-UC ICB-BYU-UC ICB-BYU-UC Joint Research Sponsored by: NSP, Caltrans CEC, PG&E	DISCS			W F	MH/CH	555 	- <u>M</u> d S S S	ML-SM		ۍ ک	Cr.
	Depth Scale (m)				<u>.::::н.</u> :	<u>;:н:;;</u> :н	 	<i>.</i>	· · ·	· · ·	 ത
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e1 o Creallus XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks			
518°E o CPT-E ivalent t . Sancio athead t athead t	(mm) 01G			0.1
4 30.40 espect t de, equ and R. E and R. E iy and c nmer (pe	D20 (mm)		~	0.46
-E1B 7778% 1 with r tom me tom me bray ( Bray ( e, pulfe sty Han	(%) uni 2 >			
D: SPT 5: 40.7 n: 0 cn 11: Cusi 5: J. D n: Rop e: Safe	(%) turi ç >			
Test If dinate evatiou ilpmen gineer Systen er Typ	m4 č7 > 25nB %			5
S Coor ng Equ Ible En SPT Hamm	Plasticity Index			I
GP	Liquid Limit			:
Re	Moisture Content (%)			5
	^s Тогтапс (kPa)			
key	Pocket Pen (kPa) 91			
ng Performance in Adapazari, Tur District, Adapazari S.) Irino8/00 of 0.8 m	Description	Fill: Dark clayey soil and rubble	SP-SM: Olive gray fine to medium sand with silt	
Buildi gcilar si, A. 3 9 cm-o	Energy Ratio (%)	]	<u> </u>	
Ave., Ti Ave., Ti iray ish with AL = 0.4 it to ad	Kod Length (m)			5.80
avaklar , avaklar , an D. E emin Te ary was on: GW	Casing Depth (m)			2.15
Jame: Grou :: Site E - Ki y 3, 2000 3 by: Jonath :: ZETAS (Zi Method: Rot tole Elevath iolid flight au	Blows/15 cm SPT			2-3-3
Project N Location Date: Jul Sield Loc Deratoi Drilling M Mater Ta	Length (cm) Recovery/			37/45
	Sample Type and No.			S-E18-1
B-BYU-U( (AS-SaU-M oint Research ponsored by: SF, Caltran EC, PG&E	nacs			MS-9S
	Lithology		· ·	•••
	Depth Scale (m)		<u>~</u>	<b>N</b>

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Legend S: Spit Spoon (SPT) SH: Shelby tube

	-E1 to Creatius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks							
	518°E to CPT livalent 3. Sancl athead er Kova	(mm) 01CI		0.1	0.18	0.001	~2µm ~2µm		
	V 30.40 respect ade, equ and R. E and R. E sy and c nmer (p	(mm) 05Cl		0.28	0.56	0.018	0.002		0.003
1	-EC 77778°f m with tom me bray e, pulk et, pulk	(%) uni Z >		L.	. !	17	51 48		49 1505
		(%) mų č >		1	,	22 14	70 58		800 400 200 200 200 200 200 200 200 200 2
	lest 1 levatio levatio levatio uipmei igineei Systei er Typ	m4 č7 > 22nA %		ស	7	94 59	66 66		9000 40000
	S Cool ng Equ ble En Hamm	Plasticity Index			1	1 ‡	234		55
	GP Drilli spons	limid biupid		7	•	31	62		2243 2243
	Re	Μοίετιτε (%) Τοητεπτ		24	13	34 35	39		31 27
		u ² Torvane (kPa)							
	key	Pocket Pen (kPa) 9 <i>u</i>			8	110	·•		120
	ing Performance in Adapazari, Tur District, Adapazari S.) 18/04/00 18/04/00	Description	Fill: Bricks from the foundation of the collapsed building. Maybe a septic tank as evidenced by the dark color of the wash water.	SP: Poorly graded fine to medium brown sand. FC <= 5%		ML: Brown silt to sandy silt with red oxidized points	CLAY: Gray silly clay		SILT AND SAND: Gray silt with sand to sandy silt/silty sand
	1 Build Tigcilar Isi, A. 9 cm- 35 m (	Energy Rado (%)		ទះ	52	64	62		67
	Urre an Ave., ¹ ancio eknoloj sh with VL = 0.	(m) ngasi box		4.13	4.13	5.65	7.17		8.70
	nd Fail waklar o B. Sc emin T emin T on: GV	Casing Depth (m)		1.55	2.3	3.05	3.95		5.35
	Name: Grou I: Sile E - Ka Iy 26, 2000 g by: Rodolf r: ZETAS (Zi Method: Rot able Elevati	Blows/15 cm SPT		4-5-7	3-2-1	3-3-3 -3-3-3	2-1-2		5-6-11
	roject I ocatior ate: Ju eld Lo perato perato fater Ti ater To otes:	Γευξιή (cm) Γευξιή (cm)		33/45	40/45	40/45	37/45		40/45
		Sunple Type and No.		S-E2-1	S-E2-2A	S-E2-28 S-E2-3	S-E2-4A S-E2-4B		85555 675555 675555 67555 67555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 75555 755555 75555 75555 75555 75555 75555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 755555 7555555
	CB-BYU-U IAS-SaU-M int Research ponsored by SP, Caltrar EC, PG&E	sosn		SP-SM	SP	k k	55	1. 19 La 18	CL ML SM/ML
		Ygolodii.1		<u></u>				111	和
		Depth Scale (m)	0				4	<b>10</b>	° LLL



r.F3 to Crealius XC90H o, U. C. Berkeley method. AVVJ rods. cs et al. 1983)	Remarks								Thin brown organic seam at approx. 7.35 m	Wood fragments were found in the sample at approx. 8.1	E	
795°E ct to CP Jivalent 1 B. Sanci sathead er Kova	(mm) 01G	0.004	0.007	<2µm	Zµm	2µm 2µm	0.013	mit2 .	0.013	<2µm	<2µm <2µm	21m 21m 21m
V 30.40 h respected ade, equ and R. I and R. I ey and c mmer (p	(ww) 05C	0.06	0.048	0.008	0.008	0.019 0.041	0.07	0.05	0.085	0.034	0.005	0.019 0.007
F-F1 cm with stom m D. Bray De, pulk	< 7 inn (%)	~	<u>თ</u>	38	27	44	ß	15	<10%	13	- 26	22
ID: SP on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28 on: -28	(%) mu č >		*	42	40	<u>5</u> 5	ß	20	<15%	17	20	40
Test ordinat Elevatione inginee C Syste ner Tyj	m4 č7 > 22nît %	72	68	92	67	85 77	51	72 35	42	74	00 60 00	80 100
PS Coc lling Ec sible E Spie Hamr	Plasticity Index		2		19	, <u></u>	ŧ	F 1	t	•	71 72	29
Dril Bril	Liquid Limit	28	27	31	47	35	28	28	*	31	57	29.03
Œ	Moisture Content (%)	32	28	33	37	31 28	27	34 28	26	29	338	53 53
	Su Torvanc (kPa)				28						22	
Irkey	Роскеt Реп (кРа) Р				75	·					170	
ling Performance in Adapazari, T tin District, Adapazari S.) diameter tricone bit 07/21/00, caved in 08/04/00 -F1	Description	Filt: Hole is driled through fill and rubble of the foundation of the building that was located to the north of building F1	ML: Brown low plasticity sandy slit to silt		CL: Brown low plasticity silty clay to clayey silt with traces of fine sand	CH T AND CAND. Crav candy	Sill to silv sand. FC of recovered samples varies from 35% to 77%				CLAY: Gray silty clay to clayey silt with traces of fine sand. LL of recovered samples varies from 38 to 57	
4 Build Yenig Yenig 1 Build 1 Build 1 Build 1 Build 1 Build 1 Build	Επετεγ Κατίο (%)	9	57	51	54	64	67	59	59	57	61	02
ure an Street, ancio eknolo sh with ML = 1.	(m) drgn5.l boX	4 27	5.80	5.80	7.32	8.84	8.84	10.37	10.37	11.89	11.85	13.42
ind Fall inmez fo B. Sc emin T emin T ary wa on: GV	gnizsO (m) diqəU	0 95	1.75	2.55	3.45	4.45	5.35	6.15	6.95	7.95	8.95	9.95
Vame: Grou N 20, 2000 g by: Rodol r: ZETAS (Z Method: Ro able Elevati	Blows/15 cm SPT	202	3-2-2	2-3-2	2-1-2	2-3-6	5-7-7	3-7-7	4-4-9	5-6-7	2-4-7	с. 4 С,
roject I ate: Jul ate: Jul eld Lo perato perato fater Ta	Γςετονειγ/ Γετονειγ/	38/45	32/45	32/45	32/45	36/45	35/45	33/45	45/45	34/45	37/45	31/45
	Sample Type and No.	T L J	S-F1-2	S-F1-3	S-7- 4-	S-F1-5A S-F1-5A	S-F1-6	S-F1-7A S-F1-7B	S-F1B	S-F1-9	S-F1-10A S-F1-10B	S-F1-11A S-F1-11B
B-BYU-UK AS-SaU-M int Research int Research onsored by: BF, Catrani	SOSU	2	W I	WL	ML/CL	ರತ	W .	ML	SM	ML	CLML	ML CH/MH
	Lithology				$\overline{U}\overline{U}$	///						11111
	Depth Scale (m)	le	<b>7</b>	. <b></b>	<u>м</u> .	4 1 1 1 1 1 1	ир 	<b>0</b> 	<u>, , , , , , , , , , , , , , , , , , , </u>		6 	-1 - <del>1</del>
						213						

-F3 o Creatius XC90H o, U. C. Berkeley method. AWJ rods. ss et al. 1993)	Remarks	
795°E t to CPT livalent to 3. Sancic athead r er Kovac	(mm) 01G	0.001
v 30.40 h respec ade, equ and R. E ey and c mmer (pe	D20 (mm)	0.19
77148° 77148° cm with tom m tom m tom m tom m tom m tom m ety Har	(%) uni 2 >	<u> </u>
D: SP1 5: 40.7 7: -28 7: -28 7: -28 7: -28 7: -28 7: -28	(%) uni ç >	- 53
Test I dinate levatio lipmer gineer Syster er Typ	mų č7 > 25nii %	300
S Cool ng Eqt ble En SPT Hamm	Plasticity Index	ę,
CP4 Drilli Sponsi	ımi.I bivpi.I	888
Re	Moisture Content (%)	29 25
	u ⁸ Torvane (kPa)	
key	Pocket Pen (kPa) 9 <i>u</i>	
ng Performance in Adapazari, Tu n District, Adapazari S.) Jiameter tricone bit 7/21/00, caved in 08/04/00 F1	Description	SM: Gray silly fine sand
Yenigü Yenigü Isi, A. S 9 cm-c 64 m 0 1 CPT-	Energy Ratio (%)	54
ure and Street, Incio sh with M_ = 1.	Kod Length (m)	14.94
nd Fait innez ( o B, Sa amin Tc any wat on: GV	Casing Depth (m)	11.95
ame: Grou : Site F - St 20, 2000 by: Rodolf by: Rodolf lethod: Rot ble Elevati ocated appr	Tej2 متم کالا	4-13-20
Project N: Location: Date: July Field Log Dreator: Drilling M Nater Tat Notes: Lo	Γευδιή (cm) Κετονειγ/	37/45
	Sample Type	S-F1-128 S-F1-128
3B-BYU-U (AS-SaU-N int Research int Research intsored by SF, Caltrar EC, PG&E	02C2	ML/CL
	Lithology	
	Depth Scale (m)	]: <b>1</b> 2

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Legend S: Spit Spoon (SPT) SH: Shelby tube

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											·
G1 to Crealius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks		Roots were found in sample S-G1-1								
896°E to CPT- ivalent t t. Sancl t. Sancl athead	(mm) 01G		<2µm	1	t	<2µm	<2µm	, <2µm	1	<2µm	a
J 30.40( respect ide, equ and R. B and R. B iy and c imer (pe	(mm) 05G		0.013	1	L	0.005	0.009 '	0.028 0.15	ş	0.005	ŝ
-G1 7450°N m with tom ms tom ms tom ms tom ms ety Ham	(%) uni 2 >		26	1	1	40	32	6 , 7	\$	34	,
D: SP1 3: 40.7 3: 40.7 3: 40.7 3: 40.7 3: 40.7 3: 40.7 5: 5 40.7 5: 5 5: 40.7 5: 5 6: 5 7: 5 7: 5 7: 5 7: 5 7: 5 7: 5 7: 5 7	(%) uni ç >		35	i	a	20	42	25	I	20	
Test I redinate llevatio ulpmei nginee Systei ner Typ	% ۲۵۹۵ < 75 بس		97	69	95	67	84	90 22	67	66	66
S Coo E E Sible Ei SPT Hamm	Plasticity Index		16	I	I	33	25	F I	<b>t</b>	53	22
GF Drill espons	Liquid Limit	 	4	29	33	23	48 25	34	27	85	52
Ř	Moisture Content (%)		35	32	36	38	30	34	27	36	34
	Torvane (kFa)	ļ			<u></u>	30				34	54
rkey	Pocket Pen (kPa)		20	200	8	100	120	120		150	120
ing Performance in Adapazari, Ti gun District, Adapazań S.) S.) 17/08/00, 0.41 m 08/04 Japth of 1 m	Description	Fill: 20 cm of topsoil followed by a dark brown to black clayey silt with sand	CLAYEY SILT: Interbedded strata of ofive brown to brown clayey silt with traces of fine sand and brown sandy silt			CLAY: High plasticity gray silty clay	SILT AND SAND: Gray silt	waries from 22% to 90%. 4 war red silty clay to clayes silt seam found at approx. 7.2 m		MH: High plasticity gray clayey silt. Softens when remoulded. Red oxidized 5 mm-thick seam at approx. 9.2 m	
I Build I, Yeni, Isi, A. 9 cm- 67 m (	Energy Rado (%)		20	5	55	1	67	61	9 62	964	5 70
lure and r Stree ancio eknoloj AL = 0. as used	(m) drgn5d box		4.27	5.80	7.32	7.32	8.84	10.3	11.85	11.8	13.4
Ind Fai lasircila fo B. Si ternin T tary wa lon: G/ uger w	Casing (m) diqeD		1.45	2.25	3.05	3.95	4.75	5.55	6.95	7.95	8.95
Name: Grot 1: Site G - H 1y 5, 2000 g by: Rodol r: ZETAS (Z Method: Ro able Elevati Solid flight a	Blows/15 cm SPT		1-1-2	2-3-4	2-2-2	1-2-2	2-3-6	4-3-5	5.4.6	2-3-3	2-3-4
Project Cocation Date: Ju Field Lo Dperato Drilling Nater T	אפכסעפרזי/ בפרסעפרזי/		33/45	38/45	32/45	33/45	36/45	40/45	31/45	33/45	30/45
ETA	sqrT siqmed and No.		S-G1-1	S-G1-2	S-G1-3	S-G1-4	S-G1-5A S-G1-5B	S-G1-6A S-G1-6B	S-G1.7	S-G1-8	S-G1-9
CB-BYU-UC TAS-SaU-MI oint Research ponsored by: ESP, Caltrans ESP, Caltrans	səsn		CL/ML	W	W.	H	ರಕ	SMR	W	HW	MH/CH
DEN SZO	(m) sures indec		.п.н.п.н	<u>H</u> H	н:Дін	/////	//				
	Denth Scale (m)		<u> </u>	<b>N</b>   1 7 1	പ്പ	4	<b>ي</b> ساب ا		$\sim$		പ്പ

Page 1 of 1

Legend S: Spit Spoon (SPT) SH: Shelby tube

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1 Crealius XC90H U. C. Berkeley ethod. AWJ rods. et al. 1983)	Remarks												Page 1 of 2
396°E to CPT-G ivalent to :. Sancio, athead m sr Kovacs	(mm) 01G		1	<2µm	0.003	0.002 <2µmZ	, I	- 2µm	t m €	2pm 2pm	Zµm 22µm	} 7	
V 30.408 respect t and R. B and R. B sy and cc nmer (pe	(mm) 0čU		1	0.04	0.028	0.003	1	0.007 °	0.001	0.029	0.007	τυς c	
-G2 7450°1 form mith form mith bray e, pulls et Har	(%) uni Z >		ŧ	18	9	9 40	\$	20	69	8	90 90 90 90	Ť	
D: SPT s: 40.7 n: -3 cr h: Cusi s: J. D s: J. D n: Rop n: Rop e: Safe	(%) uuti <u>5</u> >		1	22	4	17 68	E E	43	85	21	45 40	ă	
Test II dinate evatiou nipmen gineer Systen er Typ	m4 27 > 22nd %		1	65	78	62 62	75	66 67	66	89	66 66	ĉ	
S Coor El ng Equ ble En SPT Hamm	Plasticity Index		\$	t	~	<u>5</u> 8	\$	۰. ۳	3	1	18 24	ç	
GP( Drillin sponsi	ımi.I biupi.I			25	33	37 60	30	44 26	58	36	43	ŭ	
Re	Moisture Content (%)		1	29	5	ល់ក	34	37 28	47	36	39 33	5	
	⁵ u Torvane (kPa)							24	25		35	u u	
key (04	Pocket Pen (kPa) 9u			75			75	110	09		120	с с с	
ng Performance in Adapazari, Tu run District, Adapazari S.) S.) Jiameter tricone bit 7/08/00, 0.45 m 07/14, 0.44 m 05 lepth of 1.3 m	Description	Fill: Rubble from sidewalk. Black clayey sand with strong odor, probably due to a nearby septic tank	ML: Brown low plasticity silt with fine sand to sandy silt			CH: Gray high plasticity silty clay with traces of fine sand	ML: Gray low plasticity clayey silt to silt with sand. Red clay seams from approximately 6.15 m to 6.2 m		CH: Soft gray, high plasticity silty clay	ML: Gray clayey silt with traces of fine sand	CLAY: Gray silty clay to clayey silt. Some shells at approx. 10.3 m		
For A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series A Series	Energy Ratio (%)		· · · · · · · · · · · · · · · · · · ·	58			09	66	1	, , ,	5	ŭ	
' Streel ' Streel aknoloj sh with VL = 0.	Rod Length (m)		3.67	5.80	1		8.84	10.37	2	11 20		5 7	
nd Fail asircitat o B. Se emin Tr emin Tr ary wa on: GV	Casing Depth (m)		1	2.45	3.25		5.15	5.95	7.45	8.45	9,45	U C C	
tame: Grou :: Site G - H; y 6, 2000 j by: Rodolf i by: Rodolf r: ZETAS (Z) Method: Rot tole Elevati abild flight au	Blows/15 cm SPT		1-2-2	3-4-5	********		2.3.3	2-6-7		2 4 4		بر ج 1990 - 1990	þe
oject N coject N ate: Jul eld Loy perato filling f ater Ta	Γευβιν (ειπ) Κεεσαειγ/		0/45	35/45	80/90		40/45	35/45	41/40	22/45	42/42	0714£	tu nelby tu
	Sample Type and No.		S-G2-1	S-G2-2	CH C2-30	SH-62-38 SH-62-38	S-G2-4	S-G2-5A S-G2-5B	SH-G2-6	s C2 7A	S-G2-7B S-G2-7B SH-G2-8	ې د ن	SPT) SH: St
UCB-BYU-U( JETAS-SaU-M Joint Research Sponsored by: NSF, Caltran CEC, PG&E	USCS Trimology		•	T W	ž		W	WL	₽ <u>₹</u>		Cr Crwr		egend : Spit Spoon (
N	Depth Scale (m)	0 7	N		, יייי	4	یں بالدیا			80	5 	÷	י ייי :
h		- سنستستساب	~	استامت فسنفسف									

G1 o Crealius XC90H o, U. C. Berkeley method. AWJ rods. ss et al. 1983)	Remarks	
896°E to CPT- livalent t 3. Sancio athead r er Kovac	(mm) 01C	mut 2- mut 2- mut 2-
N 30.40 respect ade, equ and R. E ey and c mmer (p	(mm) 05O	0.001
F-G2 m with m with tom m tom m b. Bray be, pull ety Hau	(%) und 2 >	35 - 55
D: SP 2: 2: 40.1 2: 5: 40.1 7: 5: 5: 0 7: 7: 5: 5 7: 5: 5 7: 5 7: 5 7: 5 7: 5	(%) uuri 5 >	
Test I rdinate levatio levatio uipmen sgineer Syster ter Typ	mµ č7 > 20nî %	98 76 97 99
S Coo Ing Eq Ible Eq SPT Hamr	Plasticity Index	18 19
CP Brill Spons	imil biupil	51 26 47
ar Se	Moisture Content (%)	32 289 31
	^{n s} Тогчалс (kPa)	ទួ
key /04	Pocket Pen (kPa) 9u	200 320 175
ng Performance in Adapazari, Tu jûn District, Adapazari S.) diameter tricone bit 77(08/00, 0.45 m 07/14, 0.44 m 06 lepth of 1.3 m	Description	ML: Interbedded strata of gray low plasticity silt with sand and gray clayey silt. Some red clay seams
L Yenid L Yenid Isi, A. 9 cm- 45 m C	Energy Rado (%)	69 69 70
ure and Street Incio eknoloj sh with VL = 0.	(m) drgno.l boX	14.94
nd Fail asircilar o B. Sa emin To ary wa on: GV	Casing Depth (m)	10.95 11.95 13.95
Name: Grou n: Site G - H ly 6, 2000 g by: Rodolf n: ZETAS (Zi Method: Rot able Elevatu auto flicht au	Blows/15 cm	2-4-5 5-10-15 3-4-7
roject ocation ate: Ju leld Lo perato rilling vater T.	Recovery/ Length (cm)	37/45 39/45 37/45
	sanple Type	S-G2-109 S-G2-109 S-G2-109 S-G2-109 S-G2-11
CB-BYU-U TAS-SaU-N oint Researc ponsored by ISF, Cattrar ISF, Cattrar	naca	CH/CL WL
NHX SZO	Lithology	
	Depth Scale (m)	

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D10 (mm) D10 (mm) D10 (mm)	
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S D D D D D D D D D D D D D D D D D D D	
۲ کمیندسد Content (%)	
u ² Torvanc (kPa)	
Pocket Pen (kP2)	
ng Performance in Adapazari, Tur din District, Adapazari S.) Jiameter tricone bit n building footprint Description Description Fill: Concrete and brick rubble from the demolition of buildings G2 and G3. The SFA and rock coring bits were used to drill through hard material sANDY SILT: Red brown	sandy silt. Very similar to the soil seen at the surface (ejecta) in Yagcioglu apartments
Encring Ratio (%) 0 C. A. Build	
Rod Length (m) C. P. a. a. a. a. a. a. a. a. a. a. a. a. a.	
Depth (m) Vasing allow Vasical all Failt Casing allow Vasical Vasical Depth (m) Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasical Allow Vasica	
Blows/15 cm Blows/15 cm dilled to the total	
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Sample Type	
UCB-BYU-U Joint Research NSF, Caltrar CEC, PG&E Lithology	
0 Debry 2cupe (m)	



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9487°E ct to CPT-H1 uivalent to Crealius XC90H B. Sancio, U. C. Berkeley cathead method. AWJ rods. ber Kovacs et al. 1983)	Remarks														
	(mm) 01C		Ş	ud7>		0.002	<2µm	<2µm 0.009	0.005	<2µm	<2µm	<2µm	0.08	ш1 С7	<2µm
N 30.39 h respec ade, equ and R. f ey and c mmer (p	(mm) 0čU		0000	0.038	0.19	0.009	0.002	0.013 0.045	0.04	0.008	0.008	0.004	0.3	0.02	0.001
r-H1 cm with stom m b. Bray be, puth ety Han	(%) mu; 2 >		č	1Z		10	20	14	ß	18	20	34	ŧ	5	55
ID: SP es: 40 nrt: Cue rrs: J. C m: Rop be: Saf	(%) mu č >		6	08	<b>1</b>	29	7	25 8	10	34	38	23		20	20
Test rudinate flevatio luipme nginee Syste ner Typ	m4 27 > 22nd %		ł	75	13	86	100	60 80	80	66 13	66	86	0	94	38
S Coo E ling Eq Sible El SPT Harrin	Plasticity Index			53	ı	17	37	Ļ,	F	51	22	32	1	<u>Б</u>	46
GF Drill espons	Liquid Limit			4	1	43	70	31 40	33	32	49	89		37	2
Ē	Moisture Content (%)			59	31	43	45	33	31	33 38	38	42	28	38	38
	и ² (гЧл) эпетоТ			40		35	39			32	50	ů.			80
rkey	Pocket Pen (kPa)			80		09	190			75	60	190			170
Performance in Adapazari, Turke strict, Adapazari atrict, Adapazari atricone bit meter tricone bit meter tricone bit age	Description	Asphalt: Pavement of Kinali street	Fill: Black sandy fill	CL: Dark gray to black clay with sand	SM: Gray to brown silty sand	CLAY: Brown, grading to gray clayey silt to silty clay		Mi · Crow how nactionity silt with	sand	CLAYEY SILT: Gray high plasticity silty clay to clayey silt interspersed with thin layers of silty sand to sandy	sit		SP-SM: Gray fine to medium sand with slit	ML: Gray clayey silt	CH: Dark gray stiff high plasticity clay
d Build agcitar Jisi, A. 19 cm- 72 m 0 fit in	Επετεγ Κατό (%)			44	58	42	55	22 22	55	60	9 60	60	2	59	4 60
lure an reet, Ya ancio eknolo ish with ML = 1	(m) rhgnəri boli			4.27	5.80	5.80	7.32	8.84	8.84	10.3	11.8	11.8	13.4		14.9
Ind Fai Indi St Ifo B. S Cemin T Itary we Ion: G	Depth (m)			÷	2.15	2.9	3.75	4.85	5.65	6,45	7.25	8.45	9,85		10.9
Jame: Grou i: Site H - K y 21, 2000 g by: Rodol r: ZETAS (Z Method: Ro tible Elevat Aerlical scal	Blows/15 cm SPT			2-2-1	3-7-4	1-2	121	2-2-3	4-5-8	2-2-5	2-4-4	2 .9 .4	9-9- 9-		2-3-4
Project 1 Location Date: Jul Field Loy Operator Notes: V	Γευδιμ (cm) Γεουτειγ			22/45	33/45	39/45	41/45	38/45	38/45	38/45	32/45	31/45	45/45		39/45
ETU	Sample Type and No.			S-H1-1	S-H1-2	S-H1-3	S-H1-4	S-H1-5A	S-H1-6	S-H1-7A S-H1-7B	S-H1-8	S-H1-9	S-H1-10A	S-H1-10B	S-H1-11
ICB-BYU-UK CTAS-SaU-M joint Research Sponsored by VSP, Cattran VSP, Cattran	naca		77	ರ <u>XX.</u>	NS SM	CL/ML	CHIMH	ರತ 7777	¥ ¥	k M	CL/MH	H	WS-dS	ML	ъ
	Litholow			XX.		<u>VII</u>	<u>////</u>			⊒:;::H::[:I	4: <u>[</u> ][H] -	:H::::H::::H	<u> </u>		<u>الر م</u> ج
L			<u> </u>		1111				ر مارساسا	Ī	11.1			<u></u>	<u> </u>

Legend S: Spit Spoon (SPT) SH: Sheiby tube

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to Creallus XC90H io, U. C. Berkeley method. AWJ rods. scs et al. 1983)	Remarks										
246°E livatent t 3. Sanci athead t er Kovao	(mm) 01G				24µm 24µm	2µm 2µm	EE ₽	Ш. Ш.	0.087	0.081	0.10
N 30.39 ade, equ and R. E and c nmer (p	(mm) 05G		mµt≻		0.036	0.019 0.021	0.006	0.010	0.30	0.25	0.32
1-32 7651°1 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 109 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 1000 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100 m 100	(%) uni 2 >		61		22 16	20 18	39 22	27	1	1	,
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Test I rdinate levatio uipme iginee Systei rer Typ	uni 57 > 25nîî %		66		64 19	89 96	94	96	æ	6	ŝ
S Coo E Ing Eq SPT Hamr	Plasticity Index		48		1 1	12	33	\$	1	2	
GP Drill sspons	Liquid Limit		73		29	66 9 9	333	33	ı	I	
ž	Moisture Content (%)	37			3020	38	3023	30	23	21	19
	Torvanc (kPa)		40		17	24	29	30			
	Pocket Pen (kPa)		160		20	20	20	20			
jations, Adapazari, Turkey S.) diameter tricone bit 7/11/00, 0.76 m 07/19	Description	Fill: Top soil and black silly clay with organic odor	CH: Gray high plasticity silty clay	SANDY SILT: Brown sandy silt		CLAYEY SILT: Gray clayey silt to silty clay with traces of fine sand			SP-SM: Fine to medium gray poorly graded sand with silt		
investi -32 jisi, A. 71 m C	Επεηγ Καύο (%)		54	57	09	53	63	7 62	<u>,</u>	;	· ·
action CPT-1 ancio eknolo ksh with ML =0.	Rod Length (m)		4.27	5.80	7.32	8.84	8.84	10.37	11.8	11.8	11,85
Liquet th from fo B. S. fo B. S. tary we tary we on: G'	Depth (m)		0.95	1.95	2.75	3.95	4.75	5.95	6.95	7.85	8.75
Vame: CPT i: 1.5 m nor y 10, 2000 g by: Rodol r: ZETAS (Z Method: Ro	Tq2 Tq2 Tq2		2-2-4	3-2-4	2-1-3	2-2-2	2-4-5	ភ-ភ្- ភ្-ភ្- ភ	8-15-13	13-21-20	12-20-23
roject I ocatior ate: Jul ield Lo iperato rilling I fater Ts otes:	Length (cm) Recovery/		29/45	0/45	43/45	36/45	34/45	30/45	37/45	31/45	30/45
	Sample Type and No.		S-1-32-1	S-1-32-2	S-1-32-3A S-1-32-3B	S-1-32-4A S-1-32-4B S-1-32-4B	S-1-32-5A S-1-32-5B	S-1-32-6	S-1-32-7	S-1-32-8	S-1-32-9
JCB-BYU-U STAS-SaU-M Joint Research Sponsored by: NSF, Caltran CEC, PG&E	Dicorate		5 8/ /	<u>Д: :</u> :		MLCL	E	W	WS-dS	WS-dS	SP-SM
	Depth Scale (m)	0	- -	<u>]:∃:</u> ∾	<u>ਰ: ਰੋ</u> : ਅ	<u> ;;;;;H;;;;</u> ;H; ₩	 ம	н:[]:Н:[]:Н Ф	· · ·	 	
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J2 to Creatius XC90H sio, U. C. Berkeley i method. AWJ rods. acs et al. 1983)	Remarks											
1077°E to CPT- uivalent B. Sanc cathead er Kova	(mm) 010		<2µm	1	-22µm	<2µm	3	<0.08	2	<0.08 <2µm	0.002	<0.08
N 30.41 respect ade, eq and R. ey and ( mmer (p	(mm) 05C	<u> </u>	0.01	1	0.02	0.005	1	0.12	1	0.13 0.003	0.013	0.15
T-J1 77518° m with stom m D. Bray pe, pull fety Ha	(%) unt 2 >		25	1	26	37	1	1	t	: 4	4 #	,
D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP D: SP	(%) uni 5 >	ļ	35	<u> </u>	32	20	\$	ŧ		, 28	<del>0</del>	
Test Test Ilevati luipme nginee Syste ner Tyj	тц č7 > гэпд %		67	63	92 76	96	94	18	88	14 99	5	19
S Coc B E B E S E S P T Amn	Plasticity Index		15	10	~ '	29	32	ı		16	E	i
Drill GF	imi I biupi I		43	37	35 29	55	62	t	28	, 4 9	00	
Č	Моізгиге Сопепт (%)		36	36	32	40	4	25	24	28 37	÷	53
08/04	⁵ u Torvane (kPa)					26	43					
urkey 0.41 m	Pocket Pen (kPa)		9	120		06	80	300	450	230	210	
ing Performance in Adapazari, T District, Adapazari S.) diameter tricone bit 6/30, 0.7 m 07/08, 0.76 m 07/14, depth of 1.2 m	Description	Fill: 5 cm-thick concrete stab followed by brown clayey sand	ML: Brown to gray clayey silt with traces of fine sand to silt with sand. Red oxidized zones throughout the stratum			CH: Gray high plasticity silty clay with traces of fine sand.	Wood pleces found at approximately 3.9 m and 4.7 m	SILT AND SAND: Interbedded strata of gray low plasticity clavev sill and sillv fine sand				
nd Bulk enigûn jisi, A. h 9 cm d to a	Energy Ratio (%)		44	52	20	25	59	66	7 65	7 67 67		,
ilure ar reet, Ye ancio Teknolo ash wit WL = ( as use	(m) Argna Length (m)		4.27	5.80	5.80	7.32	8.84	8,84	10.3	10.3		13.4
und Fa irak Sti fro B. S Zemin ⁻ Zemin ⁻ ton: G ion: G wuger w	Casing (m) drg2D		·		2.75	3.55	4.35	5.15	5.95	6.75	8.3	10.15
Name: Gro n: Site J - Ç ine 29, 2000 g by: Rodo r: ZETAS ( Method: Rc able Elevat	Blows/15 cm SPT		4 L L 4 4	1-2-3	1-3-3		1-2-2	6-7-6	6-12-16	5-5-7	5 5 5 7	9-15-12
Project Location Date: Ju Field Lo Operato Orilling Water T	Κετονετy/ Γεπgτh (cm)		35/45	34/45	38/45	38/45	36/45	41/45	42/45	43/45	36/45	40/45
	Sample Type and No.		S-J1-1	S-J1-2	S-J1-3A S-J1-3B	S-J1-4	S-J1-5	S-J1-6	S-J1-7	S-J1-8A S-J1-8B	S-11-9	S-J1-10
UCB-BYU-U UCB-BYU-U Jeint Researc Sponsored by NSP, Caltrat CEC, PG&E	DICCS		WL/COL	W	W.	5 7 4	CHMH	SM SM	WL	SM ML/MH	WL WL	SM
8	Depth Scale (m)		<u>ج</u>	2	e e	4		ы G	ю С	► ►	ය ග	9 9

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-J2 to Crealius XC90H o, U. C. Berkeley method. AWJ rods. cs et al. 1983)	Remarks								
07.7°E to CPT Jivalent B. Sanci athead er Kova	(mm) 01C		\$	ł	<2µm	<0.07	<2µm <2µm	<2µm	~2µm
N 30.41 respect ade, equ and R. ey and ( mmer (p	(mm) 02C		Ł	0.07	22µm	60.0	0.006 0.038	0.013	<2µm
T-J2 77518° 310m m stom m 510m m stom m stom m ety Ha	(%) m1 2 >		3	1	68	3	36 18	25	22 22
D: SP es: 40.1 nt: Cus rs: J. D m: Roj be: Saf	(%) फ्रा ç >		<u> </u>	1	80	ı	47 21	31	70
Test redinate lievatic lupme nginee Syste ner Typ	त्वम् २८ > २३०७ %		81	23	66	39	02 70	86	ŝ
S Coo Ing Eq sible El SPT Hamm	Plasticity Index		Ŧ	1	*	3	, 10	;	40
Drill GF	Liquid Limit		32	28	75		37 26	36	99
Ř	Moisture Content (%)		32	33	48	26	35 24	32	40
	и ² (еЧя) эпечтоТ				30	·		48	
rikey 7/14	Pocket Pen (kPa)		20	230	100	310	130	110	120
ing Performance in Adapazari, Tu District, Adapazari S.) S.) Mameter tricone bit diameter tricone bit epth of 1 m	Description	Fill: Electric power line burried at 0.5 m	ML: Brown low plasticity clayey silt with fine sand to sandy silt. Silt layers alternate with silty clay/clayey silt		CH: Gray high plasticity silty clay with traces of brown roots. Does not soften when remoulded	SILT AND SAND: Atternating strata of gray silty fine sand	and by presents of word at approximately 7.2 m. Seaming of gray sitty clay with sandy sitt in S-J2-6		CLAY AND SAND: Interbedded strata of high plasticity, gray sity clay and sity fine sand
d Build nigûn 1 jisi, A. 1 9 cm- 1 to a d	במכוצי אגעס (%)		20	62	29	65	<ul><li>63</li><li>63</li></ul>	9 61	9 65
lure an eet, Ye anclo eknolo sh with ML = 0 as used	(m) dignal boli		5.80	7.32	7.32	8.84	10.37	11.85	11.85
fo B. Streemin Tak fo B. Streemin T emin T tary wa on: GV	ցոiss Depth (m)		1.75	2.65	4.00	5.15	6.25	7.05	8.35
Vame: Grou I: Site J - Çi ne 30, 2000 g by: Rodol r: ZETAS (Z Method: Ro able Elevati Solid flight al	Blows/15 cm SPT		1-2-1	244	1-1-2	3-8-7	2-5-12	3-0-5 5-	2-6-4
Project I Location Date: Ju Field Lo Derato Drilling   Mater Ta Votes: \$	κετονετy/ Έεηξιή (cm)		32/45	35/45	44/45	36/45	39/45	35/45	33/45
	Sample Type and No.		S-J2-1	S-J2-2	S-J2-3	S-J2-4	S-J2-5A S-J2-5B	S-J2-6	S-J2-7A
CB-BYU-U TAS-SaU-N loint Researc jponsored by VSF, Caltrau	naca		W	WL	H H	WS SW	WL WL	WL	G
	Lithology				<u>VJ-JJ</u>				副中国人
	1 1-1 - 100 - derant				4	ິດ 	0	► 	<b>~</b>

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T-J2 to Creatius XC90H io, U. C. Berkeley method. AWJ rods. scs et al. 1983)	Remarks		A Sheiby tube sample was attempted at 1.8 m. No sample was recovered						
077°E tto CP livalent 3. Sanc athead er Kove	(mm) 01CI			탄탄	41 Lm	1	2µm 22		~2µm
v 30.41 respect ade, equ and R. E sy and c nmer (p	D50 (mm)			0.01 0.029	0.003	\$	0.043		0.002
r7518°r 77518°r 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh 50m multh	(%) uni 7 >			30 24	46		53	·	20
ID: SP es: 40.1 nrt: Cus rrs: J. C rrs: J. C pe: Saf	(%) uni ç >			30	83	ı	25		65
Test Test indinate levatic luipme nginee f Syste ner Typ	m4 כֿל > צאמ אַ			98 78	68	72	64		61
PS Coc IIng Ec Sible E SP1 Hamr	Plasticity Index				99		•		33
B Dril espon	imi.I biupi.I	·		, <u>0</u> ,	95	<u></u>	28		61
œ	Moisture Content (%)			30 28 28	41	32	40		36
	u ² Torvane (kPa)				40				56
rkey	Pocket Pen (kPa) 9 <i>u</i>		10	200 70	20	130	400		150
ing Performance in Adapazari, Tu District, Adapazari S.) S.) diameter tricone bit /08/00, 0.8 m 07/14 of 1 m	Description	Fill: Drilled through the concrete slab between buildings J1 and J2. Without prior knowledge, the boring was drilled through the buildings septic tank	ML: Brown to gray clayey slit to slit with fine sand. Transition from brown to gray occurs at approx. 2.5 m		CH: Gray high plasticity silty clay	ML: Gray low plasticity silt with sand to sandy silt		CH: Gray sitty clay	
d Build nigûn l jisi, A. 1 9 cm- . 7 m 0	Energy Ratio (%)						~~~~		
ture an eet, Ye Bray eknolo eknolo ML = 0	(m) dıgnə.l bofi			7.32		10.3	10.3		11.8
und Fal irak Str han D, Cemin T tary wa ton: G' uger us	(m) (m) (m)		1.75	3.45	4.55	5.45	6.45		8.95
Name: Grou n: Site J - Ç ly 3, 2000 g by: Jonat r: ZETAS (Z Method: Ro able Elevati	Blows/15 cm SPT			2-3-3		4-2-4	6-13-18		2-3-5
Project   Location Date: Ju Field Lo Operato Drilling Water Ti Notes: \$	Γςυβιμ (cm) Κετονειγ/		0/42 38/45	36/45	42/42	41/45	37/45		34/45
DCLA METU ch yy: E E	Sample Type sand No.		SH-J3-1	S-J3-2A S-J3-2B	S-J3-3	S-J3-4	S-J3-5		S-J3-6
CB-BYU-I [AS-SaU- int Reseau int Reseau sonsored b SF, Calter EC, PG&	naca			ĒZ	B	ž	ML		ક
	γβοίοτμεί				11				S.L
	Depth Scale (m)		N 03	<u> </u>	+ 	10 ( 1.(.))	р <u>~</u>		

2 Creatius XC90H , U. C. Berketey tethod. AWJ rods. s et al. 1983)	Remarks						
077°E o CPT-J: livalent to 3. Sancio athead m er Kovac	(mm) 01G		~2µm ~2µm	2µm	22µm 22µm	22µm 22µm	<2µm
V 30.411 espect t ade, equ and R. B and R. B y and c nmer (pe	(mm) 05D		0.008	0.05	0.041	0.005	0.002
F-J4 77518°N n with r stom me o. Bray i be, pulle ety Han	(%) uni Z >		36 20	23	13	2052	46
D: SP1 55: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.0 75: 40.0 75: 40.0 75: 40.0 75: 40.0 75: 40.0 75: 40.0 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 40.7 75: 4	(%) wri ç >		233	26	22 22	23 23	02
Test I rdinate lievatic uipme nginee Syste rer Typ	mı 27 > 25nîî %		67	<b>2</b> 0	65 87	97 79	66
S Coo E Ing Eq tible Er SPT Hamr	Plasticity Index		<u>6</u> '	ı	11	26	34
GF Drill sspons	Timi I biupi I		300	33	35	50 32	72
Ř	Moisture Content (%)		ňň	29	38 32	38	40
	u ² Тогчалс (kPa)					35	75
irkey	Pocket Pen (kPa)		120		150	180	175
Ing Performance in Adapazari, Ti District, Adapazari S.) diameter tricone bit 3/04/00	Description	Fill: Borehole drilled through 5 cm-thick concrete slab behind building J1	ML: Brown and gray clayey sift to brown low plasticity sandy silt. FC varies from 56% to a1%.		SILTY CLAY: High plasticity	gray silty clay/clayey silt interspersed with gray silt with sand	<b>4</b>
d Build nigün I jisi, A. 9 cm-	Energy Rado (%)		38	46	34	20	60
ture an eet, Ye ancio eknolo Sh with ML = 0	(m) dignə İ boM		4.27	5.80	5.80	8.84	8.84
f Failur k Stree B. San nin Tek y wash r: GWI							
Ind F fo B. fo B.	Casing Depth (m)			1.95	2.75	3.55	4.35
Hame: Ground F Site J - Çirak S y 25, 2000 J by: Rodolfo B z ZETAS (Zemin Acthod: Rotary w the Elevation: 0	Depth (m) Casing Plows/15 cm		1-2-1	1-3-2 1.95	2.4-6 2.75	2-2-2 3.55	2-2-3 4.35
Project Name: Ground F Location: Sile J - Çirak S Date: July 25, 2000 Field Log by: Rodolfo B Operator: ZETAS (Zemin Drilling Method: Rotary w Water Table Elevation: 0 Notes:	Icepth (m) Casing SPT SPT Terestry Casing		27/45 1-2-1	35/45 1-3-2 1.95	35/45 2-4-6 2.75	33/45 2-2-2 3.55	32/45 2-2-3 4.35
Project Name: Ground F ICLA Location: Site J - Çirak S AETU Date: July 25, 2000 Pl Field Log by: Rodolfo B Prodolfo B Prilling Method: Rotary was Water Table Elevation: 0 Notes:	Sample Type and No. Length (cm) SPT Blows/15 cm Casing		S-J4-1A 27/45 1-2-1 S-J4-1B 27/45	S-J4-2 35/45 1-3-2 1.95	S-J4-3A 35/45 2-4-6 2.75 S-J4-3B	S-J4-4A 33/45 2-2-2 3.55 S-J4-4B 33/45 2-2-2 3.55	S-J4-5 32/45 2-2-3 4.35
CB-BYU-UCLA CB-BYU-UCLA TAS-SaU-METU Date: July 25, 2000 oint Research Project Name: Ground Fi Date: July 25, 2000 Pater: July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July 25, 2000 Pater July	USCS Sample Type Sample Type Sample Type Length (cm) Length (cm) USCS		ML S-J4-1A 27/45 1-2-1 ML S-J4-1B	ML S-J4-2 35/45 1-3-2 1.95	ML S-J4-3A 35/45 2-4-6 2.75 ML S-J4-3B	CH/CL S-J4-4A 33/45 2-2-2 3.55	MH S-J4-5 32/45 2-2-3 4.35
UCB-BYU-UCLA UCB-BYU-UCLA ZETAS-SaU-METU Joint Research Sponsored by: Caltrans NSP, Caltrans Nater Table Elevation: 0 CEC, PG&E Notes:	Lithology Digpth (m) Sample Type Sample Type Icength (cm) Sample Type Sample Type JGepth (m)		ML S-J4-1A 27/45 1-2-1 ML S-J4-1B 27/45	ML S-J4-2 35/45 1-3-2 1.95	ML S-J4-3A 35/45 2-4-6 2.75	王王 王王 ML S-J4-4A 33/45 2-2-2 3.55 5-34-4B 33/45 2-2-2 3.55	тт МН S-J4-5 32/45 2-2-3 4.35





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K1 5 Creatius XC90H 4, U. C. Berkeley nethod. AWJ rods. s et al. 1983)	Remarks										
4°E to CPT- livatent to 3. Sancic athead r athead r	(mm) 01G		<2µm		<2µm	0.002	<2µm	<2µm <0.07	0.08	<0.07	<2µm
30.403 respect ade, equ and R. E and R. E y and c mmer (pe	(mm) 02D		0.004		0.028	0.019	0.003	0.02	0.024	0.1	0.005
-K1 775°N Iom ma bom ma Bray 8 e, pulle sty Ham	< 2 jum (%)		40		25	Ø	47	21	3		41
ID: SP1 D1: 5P1 D1: +2 ( D1: +2 ( D1: +2 ( D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1: 5P1 D1:	(%) mu č >		54		29	17	09	30	1 	3	50
Test ordinatu Elevatic Juipme nginee Syste ner Tyj	шті 57 > гэлд %		66 6		85	95	86	88 84	8	55	<u></u>
PS Coc ling Ec sible E SPI Hamr	Plasticity Index		53		Ø	14	21	÷.		1	ų 0
Dril G	Liquid Limit		46		35	41	46	37	3		37
D2	Moisture		39		34	36	39	33	23	3	29
	n _s		26			24	36	_,			36
urkey	Pocket Pen (kPa)		20		30	40	70				190
ing Performance in Adapazari, T illar District, Adapazari S.) diameter tricone bit //26/00	Description	Fill: Clayey fill	CLAY AND SILT: Brown low plasticity clayey sitt/sitty clay with traces of fine sand. S-K1- 1 is dark gray and has a light	odor, probably due to a nearby septic tank. Transition to gray color occurs at approx. 5.5 m				SILTY SAND: Gray silty sand to sand with silt			ML: Gray low plasticity slit to sandy slit
d Build le, Tigc jisi, A. 19 cm-	Επειεγ Καύο (%)		μ. Δ	53	53	55	62	20	65	0 <u>7</u> 0	5 66
lure an Avenu ancio eknolo ssh witt WL = 0	(m) ngasi box		4.27	5.80	7.32	7.32	8.84	8.84	10.3	11.8	13.43
Ind Fai avaklar fo B. S (emin T (emin T tary we fon: G	gniss⊃ Dend (m)		1.05	2.05	2.95	3.75	4.55	5.45	5.5	8.0	9.0
Vame: Gro N 26, 2000 g by: Rodol r: ZETAS (2 Wethod: Ro	Blows/15 حس SPT		-1-2	1-2-2	2-2-3	1-2-1	2-1-2	2-9-11	10-13-17	2-6-3	4-8-5
Project I Locatior Date: Jul Field Lo Operato Drilling I Water Ta Notes:	Γευξιή (cm) Κετονειγ/		26/45	0/45	38/45	38/45	34/45	38/45	40/45	43/45	34/45
	Sunple Type snd No.		S-K1-1	S-K1-2	S-K1-3	S-K1-4	S-K1-5	S-K1-6A S-K1-6B	S-K1-7	S-K1-8	S-K1-9A
JCB-BYU-U JCB-BYU-U Joint Researc Sponsored by NSP, Caltrar CEC, PG&E	DISCS		с П		WL	ML/CL	ы С	WLEE	WS-ds	WS EEEEEEEE	Ŵ
Z Z	Depth Scale (m)			N	en			G.		HFFFFFF	<u>б</u>
L	L	سب آ		, Ì i i i	ี่มีม	سأحد	J. L.	LLLL		ببليلي	Ĩ

## BIOGRAPHY

Emre SERDAR was born in Nicosia on 31.05.1979. He had graduated from primary and secondary school in Nicosia, Cyprus. Then he entered to Turkish Maarif College in 1990. He had obtained his bachelor's degree from the Civil Engineering Department of Istanbul Technical University in 2001. After graduation, he continued his Master Program in Istanbul Technical University, Civil Engineering Faculty, Soil Mechanics and Geotechnical Engineering Department. He is still working as a Quality Managing Director & Technical Chief in Darem Trading Ltd. in Cyprus.