CORNERSTONE
EARTH GROUP

Type of Services	**Design-Level Geotechnical Investigation**
Project Name	**Pacific Station Santa Cruz**
Location	**Pacific Avenue and Maple Alley** **Santa Cruz, California**
Client	**First Community Housing**
Client Address	**75 East Santa Clara Street, Suite 1750** **San Jose, California**
Project Number	**1198-2-1**
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DRAFT

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TABLE OF CONTENTS

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SECTION 1: INTRODUCTION

This geotechnical report was prepared for the sole use of First Community Housing for the Metro Pacific Station North in Santa Cruz, California. The location of the site is shown on the Vicinity Map, Figure 1. For our use, we were provided with the following documents:

- A set of conceptual plans titled “Pacific Station General Deck,” prepared by Mithun, dated February 4, 2021.
- A set of as-built plans titled “Maple Alley/Parking Lot 12, Downtown Alley Project, Santa Cruz, California,” prepared by Joni L. Janecki & Associates, Inc., dated March 14, 2003.

1.1 PROJECT DESCRIPTION

Based on the plans and information provided, the project will include redeveloping the approximately 2-acre, three-parcel site for a new residential mixed-use development. The residential project will also incorporate the existing Metro bus facility/station. The new at-grade building will be seven stories and likely be of steel- and wood-frame construction. The ground floor will include the Metro station, retail, offices, bike parking, trash and mechanical rooms, and residential lobby. Elm Alley will pass through, splitting the residential and commercial sides. The second floor will primarily be for commercial office and residential. The remaining floors will be for residential units, including a rooftop open space, community room, and lounge. The bus passenger boarding area will occupy the remainder of the site. The bus area will be covered with solar canopy structures. Appurtenant utilities, bioretention basins, and landscaping are also planned for development.

Cuts and fills up to about 1 to 3 feet are expected for the at-grade building. Structural loads are not available at this time; however, structural loads are expected to be typical for similar mid-rise structures.

1.2 SCOPE OF SERVICES

Our scope of services was presented in our proposal dated March 19, 2021 and consisted of field and laboratory programs to evaluate physical and engineering properties of the subsurface soils, engineering analysis to prepare recommendations for site work and grading, building foundations, flatwork, retaining walls, and pavements, and preparation of this report. Brief descriptions of our exploration and laboratory programs are presented below.

1.3 EXPLORATION PROGRAM

Field exploration consisted of two borings drilled on April 26 and 27, 2021 with truck-mounted, hollow-stem auger drilling equipment and three Cone Penetration Tests (CPTs) advanced on April 21 and 30, 2021. The borings were drilled to depths of about 56 to 80 feet; the CPTs were advanced to depths of approximately 51 to 83 feet before encountering practical refusal. Seismic shear wave velocity measurements were collected from all three CPTs. Borings EB-1 and EB-2 were advanced adjacent to CPT-1 and CPT-3, respectively, for direct evaluation of physical samples to correlated soil behavior.

The borings and CPTs were backfilled with cement grout in accordance with local requirements; exploration permits were obtained as required by local jurisdictions. The approximate locations of our exploratory borings are shown on the Site Plan, Figure 2. Details regarding our field program are included in Appendix A.

1.4 LABORATORY TESTING PROGRAM

In addition to visual classification of samples, the laboratory program focused on obtaining data for foundation design and seismic ground deformation estimates. Testing included moisture contents, dry densities, grain size analyses, washed sieve analyses, and Plasticity Index tests. Details regarding our laboratory program are included in Appendix B.

1.5 CORROSION EVALUATION

Three samples from our borings from depths from approximately 2 to 8 feet were tested for saturated resistivity, pH, and soluble sulfates and chlorides. JDH Corrosion Consultants prepared a brief corrosion evaluation based on the laboratory data, which is attached to this report in Appendix C. In general, the on-site soils can be characterized as corrosive to buried metal, and non-corrosive to buried concrete.

1.6 ENVIRONMENTAL SERVICES

Environmental services were not requested for this project. If environmental concerns are determined to be present during future evaluations, the project environmental consultant should review our geotechnical recommendations for compatibility with the environmental concerns.

SECTION 2: REGIONAL SETTING

2.1 REGIONAL SEISMICITY

While seismologists cannot predict earthquake events, geologists from the U.S. Geological Survey have recently updated (in 2015) earlier estimates from their 2014 Uniform California Earthquake Rupture Forecast (Version 3; UCERF3) publication. The estimated probability of one or more magnitude 6.7 earthquakes (the size of the destructive 1994 Northridge earthquake) expected to occur somewhere in the San Francisco Bay Area has been revised (increased) to 72 percent for the period 2014 to 2043 (Aagaard et al., 2016). The faults in the region with the highest estimated probability of generating damaging earthquakes between 2014 and 2043 are the Hayward (33%), Calaveras (26%), and San Andreas Faults (22%). In this 30-year period, the probability of an earthquake of magnitude 6.7 or larger occurring is 22 percent along the San Andreas Fault and 33 percent for the Hayward Fault.

The faults considered capable of generating significant earthquakes are generally associated with the well-defined areas of crustal movement, which trend northwesterly. The table below presents the State-considered active faults within 25 kilometers of the site.

Table 1: Approximate Fault Distances

Fault Name	Distance	
	(miles)	(kilometers)
Zayante Vergeles	8.6	13.9
San Gregorio	11.0	17.7
San Andreas	11.7	19.1
Sargent	15.5	25.0

A regional fault map is presented as Figure 3, illustrating the relative distances of the site to significant fault zones.

SECTION 3: SITE CONDITIONS

3.1 SITE BACKGROUND

We reviewed historical aerial imagery provided online by Historical Aerials (http://www.historicaerials.com) and Google Earth Pro (2020). A summary of pertinent surface changes at and near the site is as follows:

- 1952: The project site is occupied by numerous buildings and three asphalt concrete parking lots located off Front Street.
- 1956: The previous building on the southern portion of the project site has been demolished and the area appears under construction.

- 1968: The existing parking lot and building adjacent to Maple Alley have been constructed. The previous buildings on the 425 Front Street parcel have been removed and the parcel is occupied by an asphalt concrete bus parking lot.
- 1982: Most of the previous development has been removed, much of the project site is occupied by asphalt concrete pavement.
- 1993: The existing Metro Transit building and the existing passenger loading/unloading area is constructed.
- 2016: The project site appears to remain relatively unchanged.

We understand that a Land Use Covenant (LUC) had been placed on the 425 Front Street parcel by the Department of Toxic Substance Control (DTSC). The parcel has reportedly been capped by 3 feet of clean fill and that the LUC, dated February 28, 2011, restricts disturbance of the cap without review and approval by the DTSC.

3.2 SURFACE DESCRIPTION

Based on the provided parcel map, the approximately 2.1-acre site is comprised of five parcels. The northernmost parcel, Parcel 1, is occupied by an asphalt concrete parking lot and used as bus parking for the Metro. Parcels 2 and 3 comprise the middle of the site and are currently occupied by the single-story at-grade Santa Cruz Metro station, asphalt and concrete drive aisles, and bus passenger boarding areas. Parcel 4 is in the southeast corner of the overall site, bordering Front Street and Maple Alley, and is occupied by an at-grade two-story building. Parcel 5 is in the southwest corner, bordering Pacific Avenue and Maple Alley, and consists of an asphalt concrete public parking lot. The site is relatively level but graded to drain to existing storm drainage facilities.

At our exploration locations, surface pavements generally consisted of 7 to 8 inches of asphalt concrete over 3 to 4 inches of aggregate base. Based on visual observations overall, the existing pavements are in fair condition, with areas of moderate transverse cracking. Considering the multiple individual properties, each parcel may have a different pavement section.

3.3 SUBSURFACE CONDITIONS

Below the surface pavements, our explorations generally encountered existing undocumented fill underlain by interbedded native alluvial soil to the maximum depths explored during this investigation. A more detailed description of the subsurface conditions is presented in the following sections.

3.3.1 Undocumented Fills

Below the surface pavements, our borings generally encountered approximately 7 to 8 feet of undocumented fill. The fills were highly variable in content and generally consisted of very dense silty gravel with sand and soft to stiff sandy lean clay and sandy silt with gravel. A 14-inch-thick concrete slab was encountered in Boring EB-1 at a depth of about 2½ feet. Fill was encountered above and below this buried slab.

3.3.2 Alluvial Soils

Below the undocumented fill in exploratory Boring EB-1, the native alluvial soils consisted of medium stiff to stiff silt with sand to a depth of about 11 feet below existing site grades, followed by medium dense silty sand to about 15 feet. The silty sand is underlain by soft silt with sand to about 17½ feet, medium dense to dense well-graded sand with silt to about 27 feet, and dense to very dense poorly graded sand with silt to stiff sandy silt to the maximum depth explored of 80 feet below existing site grades.

At Boring EB-2, the fill is underlain by native alluvial soils consisting of medium stiff sandy silt to about 9½ feet below existing site grades, followed by medium dense to dense poorly-graded sand with silt to poorly-graded sand with gravel to a depth of about 48 feet. The poorly-graded sand was underlain by moderately hard siltstone to the terminal depth of our boring of approximately 56½ feet.

3.3.3 Plasticity/Expansion Potential

We performed five Plasticity Index (PI) tests on representative samples. Test results were used to evaluate expansion potential of surficial soils, and the plasticity of the fines in potentially liquefiable layers. The results of both the surficial PI tests and the PI tests in the potentially liquefiable layers indicated the material to be non-plastic.

3.3.4 In-Situ Moisture Contents

Laboratory testing indicated that the in-situ moisture contents within the upper 10 feet range from 10 to 15 percent over the estimated laboratory optimum moisture.

3.4 GROUNDWATER

Groundwater was encountered in both of our borings at depths ranging from about 7 to 9 feet below current grades. CPT pore pressure measurements indicated groundwater depths of about 4½ feet below current grades. All measurements were taken at the time of drilling and may not represent the stabilized levels that can be higher than the initial levels encountered.

We also reviewed groundwater data available online from the website GeoTracker, https://geotracker.waterboards.ca.gov/. Nearby monitoring well data indicates that groundwater has been measured at depths of approximately 6½ to 7 feet below existing grade at wells located at 325 Front Street and 1018 Pacific Avenue (approximately 100 feet to the south and 50 feet to the north, respectively) on between 2004 and 2012.

Based on the above, we recommend a design groundwater depth of 5 feet below current site grades. Fluctuations in groundwater levels occur due to many factors including seasonal fluctuation, underground drainage patterns, regional fluctuations, and other factors.

3.5 IN-SITU WATER INFILTRATION

As discussed, bioretention basins are being proposed as part of the site development. To estimate the infiltration rate of the in-situ soils, we performed two in-situ field infiltration tests using a Guelph permeameter by SoilMoisture Equipment Corp., Model #2800, in general accordance with ASTM D5126. Generally, the Guelph permeameter is a constant head device, which uses two water-filled chambers to measure infiltration rate in a shallow borehole. A constant head level is established in the borehole and the rate of water outflow into the surrounding soil is noted. The rate of flow when it reaches a steady state, or constant rate, is used to determine an approximate infiltration rate for that location and depth.

The approximate location of the field infiltration tests (P-1 and P-2) are shown on the Site Plan, Figure 2. The infiltration tests were performed at approximate depths of 2½ and 4 feet below existing site grades, respectively. The test results are summarized in Table 2.

Table 2: In-Situ Field Guelph Permeameter Test Results

Location	Depth Below Existing Grade (ft)	Infiltration Rate (in/hr)
P-1	2½	0.3
P-2	4	2.1

3.5.1 Reliability of Field Test Data

Test results may not be truly indicative of the long-term, in-situ infiltration. Other factors including stratifications, heterogeneous deposits, overburden stress, disturbance, organic content, depth to groundwater, and other factors can influence test results. In addition, for stratified soils such as those encountered at the site, the average horizontal infiltration is typically greater than the average vertical infiltration.

3.5.2 Findings and Recommendations

Based on our findings, the soil at the locations tested and at depths of about 2½ and 4 feet below existing grade have infiltration rates ranging from about 0.3 to 2.1 inches per hour. Based on our test results, the in-situ field tests indicated generally a low to moderate infiltration rate at the depths and locations tested.

We recommend the above estimate be confirmed in the field at the time of construction, as required. In addition, the project civil engineer should review the above information and provide additional recommendations as deemed necessary.

3.5.3 General Comments and Design Considerations

As discussed, the tests were performed at discrete locations and depths. In addition, some disturbance in preparing the test also can occur. Therefore, the above results can vary significantly and may not be representative over the entire site. Localized areas/depths with higher or lower permeable materials can increase or decrease the actual infiltration rates. Therefore, we recommend the potential for variations be considered when evaluating the soil infiltration capacity or performance.

SECTION 4: GEOLOGIC HAZARDS

4.1 FAULT SURFACE RUPTURE

As discussed above several significant faults are located within 25 kilometers of the site. The site is not located within a State-designated Alquist Priolo Earthquake Fault Zone. As shown in Figure 3, no known surface expression of fault traces is thought to cross the site; therefore, fault surface rupture hazard is not a significant geologic hazard at the site.

4.2 ESTIMATED GROUND SHAKING

Moderate to severe (design-level) earthquakes can cause strong ground shaking, which is the case for most sites within the Bay Area. A peak ground acceleration (PGA_M) was estimated following the Site Specific Response analysis procedure presented in Chapter 21, Section 21.1 of ASCE 7-16 and Supplement No.1, and is summarized in Appendix D.

4.3 LIQUEFACTION POTENTIAL

The site is not currently mapped by the State of California but is within a zone mapped as having a high liquefaction potential by the City of Santa Cruz. Our field and laboratory programs addressed this issue by testing and sampling potentially liquefiable layers to depths of at least 50 feet, performing visual classification on sampled materials, evaluating CPT data, and performing various tests to further classify soil properties.

4.3.1 Background

During strong seismic shaking, cyclically induced stresses can cause increased pore pressures within the soil matrix that can result in liquefaction triggering, soil softening due to shear stress loss, potentially significant ground deformation due to settlement within sandy liquefiable layers as pore pressures dissipate, and/or flow failures in sloping ground or where open faces are present (lateral spreading) (NCEER 1998). Limited field and laboratory data are available regarding ground deformation due to settlement; however, in clean sand layers settlement on the order of 2 to 4 percent of the liquefied layer thickness can occur. Soils most susceptible to liquefaction are loose, non-cohesive soils that are saturated and are bedded with poor drainage, such as sand and silt layers bedded with a cohesive cap.

4.3.2 Analysis

The nonlinear effective stress analyses to evaluate liquefaction potential was conducted by our technical partner Dr. Robert Pyke, G.E. using his program TESS2, which has been used on recent projects with initially large predicted liquefaction settlement and ground improvement costs including River Islands and Thornton Middle School and a development project in South

San Francisco on Tanforan Avenue. A detailed discussion of our liquefaction assessment for the project site is presented in Dr. Pyke's letter report which is attached to this report as Appendix D. We performed the nonlinear effective stress analyses to quantitively evaluate to liquefaction potential and settlement consistent with current engineering practice to perform quantitative liquefaction analyses. We note that multiple TESS2 runs were performed using 5 earthquake time histories as input motions in the soil models. The results of our analyses indicated that there is potential for liquefaction in loose to medium dense sand layers between 11 and 27 feet. Based on review of the explorations, this potentially liquefiable layer is variable across the site. The consequences of liquefaction in these layers would be settlement on the order of 1 to 3 inches and potential lateral spreading. Further discussion of the non-linear effective stress analysis and liquefaction and seismic settlement evaluation are presented in Appendix D.

4.3.3 Summary

Our updated analyses indicate that several layers could potentially experience liquefaction triggering that could result in soil softening and post-liquefaction total settlement ranging from approximately 1 to 3 inches. As discussed in SP 117A, differential movement for level ground sites over deep soil sites will be up to about two-thirds of the total settlement. In our opinion, differential settlements are anticipated to be on the order of ⅔ to 2 inches between independent foundation elements, or over a horizontal distance of 30 feet along continuous foundations. Additionally, the site would be potentially impacted by lateral spreading due to its close proximity to the San Lorenzo River. To mitigate the liquefaction settlement and lateral spreading, we recommend ground improvement consisting of drilled displacement columns and or vibro-replacement stone columns to a depth of 25 feet. These ground improvement methods will also increase the bearing capacity of the soils and reduce static settlement for shallow footing foundations or mat foundations. Geotechnical recommendations for ground improvement discussed in the "Conclusions" and "Foundations" sections of this report.

4.3.4 Ground Deformation and Surficial Cracking Potential

The methods used to estimate liquefaction settlements assume that there is a sufficient cap of non-liquefiable material to prevent ground rupture or sand boils. For ground rupture to occur, the pore water pressure within the liquefiable soil layer will need to be great enough to break through the overlying non-liquefiable layer, which could cause significant ground deformation and settlement. The work of Youd and Garris (1995) indicates that the 7-foot thick non-liquefiable cap is insufficient to prevent ground rupture; therefore, additional settlement and differential movement may occur during a seismic event at the site unless the near surface soils are improved. Ground rupture potential will be mitigated following installation of ground improvement. Additional discussion of ground improvement in presented in the "Foundations" section of this report.

4.4 LATERAL SPREADING

Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water; typically lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. As failure tends to propagate as block failures, it is difficult to analyze and estimate where the first tension crack will form.

Although the San Lorenzo Creek is approximately 300 feet from the edge of the site, it appears, based on our analysis, that the potential for lateral spreading is high and could potentially result in lateral movement without ground improvement. As discussed above, we recommend ground improvement to mitigate lateral spreading. Additional discussion of ground improvement is presented in the "Foundations" section of this report.

4.5 SEISMIC SETTLEMENT/UNSATURATED SAND SHAKING

Loose unsaturated sandy soils can settle during strong seismic shaking. We evaluated the potential for seismic compaction of the loose unsaturated soils in the upper 5 feet based on the work by Pradel (1998). Our analyses indicate that this area of the site could experience minor dry sand settlement of movement after strong seismic shaking. This settlement will be mitigated by the recommended over-excavation and re-compaction to mitigate ground disturbance from ground improvement and undocumented fill.

4.6 TSUNAMI/SEICHE

The terms tsunami or seiche are described as ocean waves or similar waves usually created by undersea fault movement or by a coastal or submerged landslide. Tsunamis may be generated at great distance from shore (far field events) or nearby (near field events). Waves are formed, as the displaced water moves to regain equilibrium, and radiates across the open water, similar to ripples from a rock being thrown into a pond. When the waveform reaches the coastline, it quickly raises the water level, with water velocities as high as 15 to 20 knots. The water mass, as well as vessels, vehicles, or other objects in its path create tremendous forces as they impact coastal structures.

Tsunamis have affected the coastline along the Pacific Northwest during historic times. The Fort Point tide gauge in San Francisco recorded approximately 21 tsunamis between 1854 and 1964. The 1964 Alaska earthquake generated a recorded wave height of 7.4 feet and drowned eleven people in Crescent City, California. For the case of a far-field event, the Bay area would have hours of warning; for a near field event, there may be only a few minutes of warning, if any.

A tsunami or seiche originating in the Pacific Ocean would lose some of its energy passing around the northern tip of the Monterey bay. The site is approximately ½ mile inland from the Pacific Ocean shoreline, is mapped by the California Geologic Survey as being within a tsunami inundation area (CGS, 2009). Although the site is approximately 12 to 14 feet above mean sea level, the potential for inundation due to tsunami or seiche is considered moderate.

4.7 FLOODING

Based on our internet search of the Federal Emergency Management Agency (FEMA) flood map public database, the site is located within Zone A99; areas to be protected from 1% annual chance flood event by a federal flood protection system under construction, no Base Flood Elevations determined. We recommend the project civil engineer be retained to confirm this information and verify the base flood elevation, if appropriate.

SECTION 5: CONCLUSIONS

5.1 SUMMARY

From a geotechnical viewpoint, the project is feasible provided the concerns listed below are addressed in the project design. Descriptions of each concern with brief outlines of our recommendations follow the listed concerns.

- Potential for liquefaction-induced settlements
- Redevelopment considerations
- Potential for lateral spreading
- Presence of undocumented fill
- Shallow groundwater
- Soil corrosion potential

5.1.1 Potential for Static and Liquefaction-Induced Settlements

As discussed, our liquefaction analysis indicates that there is a very high potential for liquefaction of localized sand layers during a significant seismic event. Although the potential for liquefied sands to vent to the ground surface through cracks in the surficial soils is moderate, our analysis indicates that liquefaction-induced settlement on the order of approximately 1 to 3 inches could occur, resulting in differential settlement up to ⅔ to 2 inches. In addition to liquefaction induced settlement, our static settlement analysis indicates a total static settlement of 1 to 2 inches with ½ to 1 inches of differential settlement over a distance of 30 feet. To mitigate the potential for significant differential movement and ground deformation, we recommend the structure be supported on shallow foundations overlying ground improvement. Should shallow footings overlying ground improvement be selected and the ground improvement be installed primarily under spread footings and not under the slabs-on-grade, we anticipate that some slab settlement or deflection may occur following a design-level earthquake. The slabs should be designed to tolerate some deflection where the slabs transition from on-footing support to ground-only support. Otherwise, slab settlement can be mitigated by including additional ground improvement elements beneath slab-on-grade areas. As an alternative to conventional shallow footings, the building can be supported on a rigid mat foundation underlain by ground improvement. A discussion of recommended mitigation options is presented in the “Foundations” sections of this report. A further discussion of the slab-on-grade is presented in the “Concrete Slabs and Pedestrian Pavements” section of this report.

5.1.2 Redevelopment Considerations

As discussed, the site is currently occupied by existing buildings, pavements, and appurtenant flatwork, site fixtures, and landscaping. We understand that all of the existing improvements will be demolished for the construction of the new building. Potential issues that are often associated with redeveloping sites include demolition of existing improvements, abandonment of existing utilities, and undocumented fills. In addition, as previously discussed, the 425 Front Street parcel has been placed under a Land Use Covenant; therefore, we recommend that the project environmental engineer provide direction regarding any excavation activities that may take place within this parcel. Please refer to the "Earthwork" section below for further recommendations.

5.1.3 Potential for Lateral Spreading

As discussed, our analysis indicates that the proximity of San Lorenzo River and potential for liquefaction could theoretically result in lateral spreading at or near the site ranging from several inches up to two feet. Lateral spreading is horizontal/lateral ground movement of relatively flat-lying soil deposits towards a free face such as an excavation, channel, or open body of water. Typically, lateral spreading is associated with liquefaction of one or more subsurface layers near the bottom of the exposed slope. With the installation of ground improvement beneath the planned building, in our opinion, lateral spreading would be adequately mitigated for the building. For the planned bus terminal parking, some ground cracking could occur that may require pavement repairs following a design level earthquake. A discussion of recommended ground improvement mitigation options is presented in the "Foundations" section of this report.

5.1.4 Undocumented Fill

We encountered approximately 7 to 8 feet of undocumented fill in our explorations and anticipate that fill may exist across much of the site due to previous development and grading. Additionally, installation of ground improvement may disturb the upper few feet of soil at the site. As the proposed structure will be supported on either shallow footings or mat foundation overlying ground improvement, in our opinion a complete over-excavation and removal of existing fill is not required for the structure; however, we recommend that the upper 2 feet fill be re-compacted after the ground improvement has been completed to repair any damages that may have occurred and provide uniform support for the slab-on-grade in the unimproved areas. Further recommendations for mitigation of the existing fills are presented in the "Earthwork" section of this report.

5.1.5 Shallow Groundwater

Shallow groundwater was measured at depths ranging from approximately 7 to 9 feet below the existing ground surface. On the website GeoTracker, a high groundwater level of approximately 6½ feet was noted to be encountered on a site 100 feet to the south. As discussed above, we recommend a design groundwater depth of 5 feet below existing site grades. Our experience with similar sites in the vicinity indicates that shallow ground water could significantly impact grading and underground construction. These impacts typically consist of potentially wet and unstable pavement subgrade, difficulty achieving compaction, and difficult underground utility installation. Dewatering and shoring of utility trenches may be required in some isolated areas of the site. Detailed recommendations addressing this concern are presented in the "Earthwork" section of this report.

5.1.6 Soil Corrosion Potential

A preliminary soil corrosion screening was performed by JDH Corrosion Consultants based on the results of analytical tests on samples of the near-surface soil. In general, the JDH report concludes that the corrosion potential for buried concrete is non-corrosive. In addition, the corrosion potential for buried metallic structures, such as metal pipes, is considered corrosive. JDH recommends that special requirements for corrosion control be made to protect metal pipes. A more detailed discussion of the site corrosion evaluation is presented in Appendix C. As the preliminary soil corrosion screening was based on the results of limited sampling, consideration may be given to collecting and testing additional samples from the upper 5 feet for sulfates and pH to confirm the classification of corrosive to mortar coated steel and concrete.

5.2 PLANS AND SPECIFICATIONS REVIEW

We recommend that we be retained to review the geotechnical aspects of the project structural, civil, and landscape plans and specifications, allowing sufficient time to provide the design team with any comments prior to issuing the plans for construction.

5.3 CONSTRUCTION OBSERVATION AND TESTING

As site conditions may vary significantly between the small-diameter borings performed during this investigation, we also recommend that a Cornerstone representative be present to provide geotechnical observation and testing during earthwork and foundation construction. This will allow us to form an opinion and prepare a letter at the end of construction regarding contractor compliance with project plans and specifications, and with the recommendations in our report. We will also be allowed to evaluate any conditions differing from those encountered during our investigation and provide supplemental recommendations as necessary. For these reasons, the recommendations in this report are contingent of Cornerstone providing observation and testing during construction. Contractors should provide at least a 48-hour notice when scheduling our field personnel.

SECTION 6: EARTHWORK

6.1 SITE DEMOLITION

All existing improvements not to be reused for the current development, including all foundations, flatwork, pavements, utilities, and other improvements should be demolished and removed from the site. Recommendations in this section apply to the removal of these improvements, which are currently present on the site, prior to the start of mass grading or the construction of new improvements for the project.

Cornerstone should be notified prior to the start of demolition and should be present on at least a part-time basis during all backfill and mass grading as a result of demolition. Occasionally, other types of buried structures (wells, cisterns, debris pits, etc.) can be found on sites with prior development. If encountered, Cornerstone should be contacted to address these types of structures on a case-by-case basis.

6.1.1 Demolition of Existing Slabs, Foundations and Pavements

All slabs, foundations, and pavements should be completely removed from within planned building areas.

As an owner value-engineered option, existing slabs, foundations, and pavements that extend into planned flatwork, pavement, or landscape areas may be left in place provided there is at least 3 feet of engineered fill overlying the remaining materials, they are shown not to conflict with new utilities, and that asphalt and concrete more than 10 feet square is broken up to allow subsurface drainage. Future distress and/or higher maintenance may result from leaving these prior improvements in place. A discussion of recycling existing improvements is provided later in this report.

Special care should be taken during the demolition and removal of existing floor slabs, foundations, utilities and pavements to minimize disturbance of the subgrade. Excessive disturbance of the subgrade, which includes either native or previously placed engineered fill, resulting from demolition activities can have serious detrimental effects on planned foundation and paving elements.

Existing foundations are typically mat-slabs, shallow footings, or piers/piles. If slab or shallow footings are encountered, they should be completely removed. If drilled piers are encountered, they should be cut off at an elevation at least 60-inches below proposed footings or the final subgrade elevation, whichever is deeper. The remainder of the drilled pier could remain in place. Foundation elements to remain in place should be surveyed and superimposed on the proposed development plans to determine the potential for conflicts or detrimental impacts to the planned construction. Following review, additional mitigation or planned foundation elements may need to be modified.

6.1.2 Abandonment of Existing Utilities

All utilities should be completely removed from within planned building areas. For any utility line to be considered acceptable to remain within building areas, the utility line must be completely backfilled with grout or sand-cement slurry (sand slurry is not acceptable), the ends outside the building area capped with concrete, and the trench fills either removed and replaced as engineered fill with the trench side slopes flattened to at least 1:1, or the trench fills are determined not to be a risk to the structure. The assessment of the level of risk posed by the particular utility line will determine whether the utility may be abandoned in place or needs to be completely removed. The contractor should assume that all utilities will be removed from within building areas unless provided written confirmation from both the owner and the geotechnical engineer.

Utilities extending beyond the building area may be abandoned in place provided the ends are plugged with concrete, they do not conflict with planned improvements, and that the trench fills do not pose significant risk to the planned surface improvements.

The risk for owners associated with abandoning utilities in place include the potential for future differential settlement of existing trench fills, and/or partial collapse and potential ground loss into utility lines that are not completely filled with grout.

6.2 SITE CLEARING AND PREPARATION

6.2.1 Site Stripping

The site should be stripped of all surface vegetation, and surface and subsurface improvements to be removed within the proposed development area. Demolition of existing improvements is discussed in the prior paragraphs. A detailed discussion of removal of existing fills is provided later in this report. Surface vegetation and topsoil should be stripped to a sufficient depth to remove all material greater than 3 percent organic content by weight. Based on our site observations, surficial stripping should extend about 4 inches below existing grade in vegetated areas.

6.2.2 Tree and Shrub Removal

Trees and shrubs designated for removal should have the root balls and any roots greater than ½-inch diameter removed completely. Mature trees are estimated to have root balls extending to depths of 2 to 4 feet, depending on the tree size. Significant root zones are anticipated to extend to the diameter of the tree canopy. Grade depressions resulting from root ball removal should be cleaned of loose material and backfilled in accordance with the recommendations in the “Compaction” section of this report.

6.3 RE-COMPACTION OF UNDOCUMENTED FILLS

As the building will be supported on ground improvement elements, we recommend that the upper 2 feet of the existing fill be over-excavated following the ground improvement installation to re-compact areas disturbed by the ground improvement process and to provide a uniform support for the proposed slab-on-grade or mat foundation. Depending on the final building pad elevation and foundation type, the depth of the over-excavation may be modified. Provided the fills meet the “Material for Fill” requirements below, the fills may be reused when backfilling the excavations. Based on review of the samples collected from our borings, it appears that the fill may be reused. If materials are encountered that do not meet the requirements, such as debris, wood, trash, those materials should be screened out of the remaining material and be removed from the site. Backfill of excavations should be placed in lifts and compacted in accordance with the “Compaction” section below.

Fills extending into planned pavement and flatwork areas may be left in place provided they are determined to be a low risk for future differential settlement and that the upper 12 inches of fill below pavement subgrade is re-worked and compacted as discussed in the “Compaction” section below.

6.4 TEMPORARY CUT AND FILL SLOPES

The contractor is responsible for maintaining all temporary slopes and providing temporary shoring where required. Temporary shoring, bracing, and cuts/fills should be performed in accordance with the strictest government safety standards. On a preliminary basis, the upper 10 feet at the site may be classified as OSHA Site C materials.

Excavations performed during site demolition and fill removal should be sloped at 2:1 (horizontal:vertical) within the upper 5 feet below building subgrade. Actual excavation inclinations should be reviewed in the field during construction, as needed. Excavations below building subgrade and excavations in pavement and flatwork areas should be sloped in accordance with OSHA soil classification requirements.

6.5 UNDERPINNING ADJACENT BUILDINGS

Depending on the proximity of the new building to the property lines with adjacent existing structures, underpinning of adjacent buildings may need to be considered if excavations for new footings will extend below adjacent existing footings. Once the final building layout is confirmed, we should provide additional recommendations as needed.

We recommend that a pre-construction survey and construction monitoring program be developed and implemented to evaluate the effects of the foundation construction on adjacent existing improvements. This may include pre-construction photos, videos, and or surveys to document the adjacent properties prior to construction. All sensitive improvements should be located and monitored for horizontal and vertical deflections and distress cracking based on a pre-construction survey. The monitoring frequency should be established and agreed to by the project team prior to start of construction.

6.6 SUBGRADE PREPARATION

After site clearing and demolition is complete, and prior to backfilling any excavations resulting from fill removal or demolition, the excavation subgrade and subgrade within areas to receive additional site fills, slabs-on-grade and/or pavements should be scarified to a depth of 6 inches, moisture conditioned, and compacted in accordance with the “Compaction” section below.

Due to the sandy soils likely to be encountered at the subgrade elevation, we recommend that subgrade compaction and proof rolling be performed within 24 hours of capillary break layer or slab-on-grade construction.

6.7 WET SOIL STABILIZATION GUIDELINES

Native soil and fill materials, especially soils with high fines contents such as clays and silty soils, can become unstable due to high moisture content, whether from high in-situ moisture contents or from winter rains. As the moisture content increases over the laboratory optimum, it becomes more likely the materials will be subject to softening and yielding (pumping) from construction loading or become unworkable during placement and compaction.

As discussed in the "Subsurface" section in this report, the in-situ moisture contents are about 10 to 15 percent over the estimated laboratory optimum in the upper 10 feet of the soil profile. The contractor should anticipate drying the soils prior to reusing them as fill. In addition, repetitive rubber-tire loading will likely de-stabilize the soils.

There are several methods to address potential unstable soil conditions and facilitate fill placement and trench backfill. Some of the methods are briefly discussed below. Implementation of the appropriate stabilization measures should be evaluated on a case-by-case basis according to the project construction goals and the site conditions.

6.7.1 Scarification and Drying

The subgrade may be scarified to a depth of 6 to 9 inches and allowed to dry to near optimum conditions, if sufficient dry weather is anticipated to allow sufficient drying. More than one round of scarification may be needed to break up the soil clods.

6.7.2 Removal and Replacement

As an alternative to scarification, the contractor may choose to over-excavate the unstable soils and replace them with dry on-site or import materials. A Cornerstone representative should be present to provide recommendations regarding the appropriate depth of over-excavation, whether a geosynthetic (stabilization fabric or geogrid) is recommended, and what materials are recommended for backfill.

6.7.3 Chemical Treatment

Where the unstable area exceeds about 5,000 to 10,000 square feet and/or site winterization is desired, chemical treatment with kiln-dust or cement may be more cost-effective than removal and replacement. Recommended chemical treatment depths will typically range from 12 to 18 inches depending on the magnitude of the instability.

6.8 MATERIAL FOR FILL

Due to the LUC placed upon the 425 Front Street parcel, we recommend that the project environmental engineer provide direction regarding the re-use of spoils or improvements from the parcel.

6.8.1 Re-Use of On-site Soils

From a geotechnical viewpoint, on-site soils with an organic content less than 3 percent by weight may be reused as general fill. General fill should not have lumps, clods or cobble pieces larger than 6 inches in diameter; 85 percent of the fill should be smaller than 2½ inches in diameter. Minor amounts of oversize material (smaller than 12 inches in diameter) may be allowed provided the oversized pieces are not allowed to nest together and the compaction method will allow for loosely placed lifts not exceeding 12 inches.

6.8.2 Re-Use of On-Site Improvements

We anticipate that significant quantities of asphalt concrete (AC) grindings and aggregate base (AB) will be generated during site demolition. From a geotechnical viewpoint, if the AC grindings are mixed with the underlying AB to meet Class 2 AB specifications, they may be reused within the new pavement and flatwork structural sections (provided crushed rock is not required due to the proximity to ground water). AC grindings may not be reused within the habitable building areas. Laboratory testing will be required to confirm the grindings meet project specifications.

If the site area allows for on-site pulverization of PCC and provided the PCC is pulverized to meet the "Material for Fill" requirements of this report, from a geotechnical viewpoint, it may be used as select fill within the building areas, excluding the capillary break layer; as typically pulverized PCC comes close to or meets Class 2 AB specifications, the recycled PCC may likely be used within the pavement structural sections. PCC grindings also make good winter construction access roads, similar to a cement-treated base (CTB) section.

6.8.3 Potential Import Sources

Non-expansive material should be inorganic with a Plasticity Index (PI) of 15 or less, and not contain recycled asphalt concrete where it will be used within the habitable building areas. To prevent significant caving during trenching or foundation construction, imported material should have sufficient fines. Samples of potential import sources should be delivered to our office at least 10 days prior to the desired import start date. Information regarding the import source should be provided, such as any site geotechnical reports. If the material will be derived from an excavation rather than a stockpile, potholes will likely be required to collect samples from throughout the depth of the planned cut that will be imported. At a minimum, laboratory testing will include PI tests. Material data sheets for select fill materials (Class 2 aggregate base, ¾-inch crushed rock, quarry fines, etc.) listing current laboratory testing data (not older than 6 months from the import date) may be provided for our review without providing a sample. If current data is not available, specification testing will need to be completed prior to approval.

Environmental and soil corrosion characterization should also be considered by the project team prior to acceptance. Suitable environmental laboratory data to the planned import quantity should be provided to the project environmental consultant; additional laboratory testing may be required based on the project environmental consultant's review. The potential import source should also not be more corrosive than the on-site soils, based on pH, saturated resistivity, and soluble sulfate and chloride testing.

6.9 COMPACTION REQUIREMENTS

All fills, and subgrade areas where fill, slabs-on-grade, and pavements are planned, should be placed in loose lifts 8 inches thick or less and compacted in accordance with ASTM D1557 (latest version) requirements as shown in the table below. In general, clayey soils should be compacted with sheepsfoot equipment and sandy/gravelly soils with vibratory equipment; open-graded materials such as crushed rock should be placed in lifts no thicker than 18 inches consolidated in place with vibratory equipment. Each lift of fill and all subgrade should be firm and unyielding under construction equipment loading in addition to meeting the compaction requirements to be approved. The contractor (with input from a Cornerstone representative) should evaluate the in-situ moisture conditions, as the use of vibratory equipment on soils with high moistures can cause unstable conditions. General recommendations for soil stabilization are provided in the "Subgrade Stabilization Measures" section of this report.

Table 3: Compaction Requirements

Description	Material Description	Minimum Relative[1] Compaction (percent)	Moisture[2] Content (percent)
General Fill (within upper 5 feet)	On-Site Soils	90	>1
General Fill (below a depth of 5 feet)	On-Site Soils	95	>1
Trench Backfill	On-Site Soils	90	>1
Trench Backfill (upper 6 inches of subgrade)	On-Site Soils	95	>1
Crushed Rock Fill	¾-inch Clean Crushed Rock	Consolidate In-Place	NA
Flatwork Subgrade	On-Site Soils	90	>1
Flatwork Aggregate Base	Class 2 Aggregate Base[3]	90	Optimum
Pavement Subgrade	On-Site Soils	95	>1
Pavement Aggregate Base	Class 2 Aggregate Base[3]	95	Optimum
Asphalt Concrete	Asphalt Concrete	95 (Marshall)	NA

1 – Relative compaction based on maximum density determined by ASTM D1557 (latest version)
2 – Moisture content based on optimum moisture content determined by ASTM D1557 (latest version)
3 – Class 2 aggregate base shall conform to Caltrans Standard Specifications, latest edition, except that the relative compaction should be determined by ASTM D1557 (latest version)

6.10 TRENCH BACKFILL

Utility lines constructed within public right-of-way should be trenched, bedded and shaded, and backfilled in accordance with the local or governing jurisdictional requirements. Utility lines in private improvement areas should be constructed in accordance with the following requirements unless superseded by other governing requirements.

All utility lines should be bedded and shaded to at least 6 inches over the top of the lines with crushed rock (⅜-inch-diameter or greater) or well-graded sand and gravel materials conforming to the pipe manufacturer's requirements. Open-graded shading materials should be consolidated in place with vibratory equipment and well-graded materials should be compacted to at least 90 percent relative compaction with vibratory equipment prior to placing subsequent backfill materials.

General backfill over shading materials may consist of on-site native materials provided they meet the requirements in the "Material for Fill" section, and are moisture conditioned and compacted in accordance with the requirements in the "Compaction" section.

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

6.11 SITE DRAINAGE

Ponding should not be allowed adjacent to building foundations, slabs-on-grade, or pavements. Hardscape surfaces should slope at least 2 percent towards suitable discharge facilities; landscape areas should slope at least 3 percent towards suitable discharge facilities. Roof runoff should be directed away from building areas in closed conduits, to approved infiltration facilities, or on to hardscaped surfaces that drain to suitable facilities. Retention, detention or infiltration facilities should be spaced at least 10 feet from buildings, and preferably at least 5 feet from slabs-on-grade or pavements. However, if retention, detention or infiltration facilities are located within these zones, we recommend that these treatment facilities meet the requirements in the Storm Water Treatment Design Considerations section of this report.

6.12 LOW-IMPACT DEVELOPMENT (LID) IMPROVEMENTS

The Municipal Regional Permit (MRP) requires regulated projects to treat 100 percent of the amount of runoff identified in Provision C.3.d from a regulated project's drainage area with low impact development (LID) treatment measures onsite or at a joint stormwater treatment facility. LID treatment measures are defined as rainwater harvesting and use, infiltration, evapotranspiration, or biotreatment. A biotreatment system may only be used if it is infeasible to implement harvesting and use, infiltration, or evapotranspiration at a project site.

Technical infeasibility of infiltration may result from site conditions that restrict the operability of infiltration measures and devices. Various factors affecting the feasibility of infiltration treatment may create an environmental risk, structural stability risk, or physically restrict infiltration. The presence of any of these limiting factors may render infiltration technically infeasible for a proposed project. To aid in determining if infiltration may be feasible at the site, we provide the following site information regarding factors that may aid in determining the feasibility of infiltration facilities at the site.

- Locally, seasonal high ground water is not mapped in the area but was encountered as high as 6 feet below grade in our borings, and therefore is expected to be at least 10 feet below the base of the infiltration measure.
- In our opinion, infiltration locations within 5 feet of the buildings would create a geotechnical hazard.
- Highly infiltrating native soils, such as sand and gravel, may not be protective of groundwater at a project site where infiltration devices are implemented.
- Local Water District policies or guidelines may limit locations where infiltration may occur, require greater separation from seasonal high groundwater, or require greater setbacks from potential sources of pollution.

6.12.1 Storm Water Treatment Design Considerations

If storm water treatment improvements, such as shallow bio-retention swales, basins or pervious pavements, are required as part of the site improvements to satisfy Storm Water Quality (C.3) requirements, we recommend the following items be considered for design and construction.

6.12.1.1 General Bioswale Design Guidelines

- If possible, avoid placing bioswales or basins within 10 feet of the building perimeter or within 5 feet of exterior flatwork or pavements. If bioswales must be constructed within these setbacks, the side(s) and bottom of the trench excavation should be lined with 10-mil visqueen to reduce water infiltration into the surrounding expansive clay.
- Bioswales constructed within 3 feet of proposed buildings may be within the foundation zone of influence for perimeter wall loads. Therefore, where bioswales will parallel foundations and will extend below the “foundation plane of influence,” an imaginary 1:1 plane projected down from the bottom edge of the foundation, the foundation will need to be deepened so that the bottom edge of the bioswale filter material is above the foundation plane of influence.
- The bottom of bioswale or detention areas should include a perforated drain placed at a low point, such as a shallow trench or sloped bottom, to reduce water infiltration into the surrounding soils near structural improvements, and to address the low infiltration capacity of the on-site clay soils.

6.12.1.2 Bioswale Infiltration Material

- Gradation specifications for bioswale filter material, if required, should be specified on the grading and improvement plans.
- Compaction requirements for bioswale filter material in non-landscaped areas or in pervious pavement areas, if any, should be indicated on the plans and specifications to satisfy the anticipated use of the infiltration area.
- If bioswales are to be vegetated, the landscape architect should select planting materials that do not reduce or inhibit the water infiltration rate, such as covering the bioswale with grass sod containing a clayey soil base.
- Due to the relatively loose consistency and/or high organic content of many bioswale filter materials, long-term settlement of the bioswale medium should be anticipated. To reduce initial volume loss, bioswale filter material should be wetted in 12-inch lifts during placement to pre-consolidate the material. Mechanical compaction should not be allowed, unless specified on the grading and improvement plans, since this could significantly decrease the infiltration rate of the bioswale materials.
- It should be noted that the volume of bioswale filter material may decrease over time depending on the organic content of the material. Additional filter material may need to be added to bioswales after the initial exposure to winter rains and periodically over the life of the bioswale areas, as needed.

6.12.1.3 Bioswale Construction Adjacent to Pavements

If bio-infiltration swales or basins are considered adjacent to proposed parking lots or exterior flatwork, we recommend that mitigative measures be considered in the design and construction of these facilities to reduce potential impacts to flatwork or pavements. Exterior flatwork, concrete curbs, and pavements located directly adjacent to bio-swales may be susceptible to settlement or lateral movement, depending on the configuration of the bioswale and the setback between the improvements and edge of the swale. To reduce the potential for distress to these improvements due to vertical or lateral movement, the following options should be considered by the project civil engineer:

- Improvements should be setback from the vertical edge of a bioswale such that there is at least 1 foot of horizontal distance between the edge of improvements and the top edge of the bioswale excavation for every 1 foot of vertical bioswale depth, or
- Concrete curbs for pavements, or lateral restraint for exterior flatwork, located directly adjacent to a vertical bioswale cut should be designed to resist lateral earth pressures in accordance with the recommendations in the “Retaining Walls” section of this report, or concrete curbs or edge restraint should be adequately keyed into the native soil or engineered to reduce the potential for rotation or lateral movement of the curbs.

SECTION 7: 2019 CBC SEISMIC DESIGN CRITERIA

We developed site-specific seismic design parameters in accordance with Chapter 16, Chapter 18 and Appendix J of the 2019 California Building Code (CBC) and Chapters 11, 12, 20, and 21 and Supplement No. 1 of ASCE 7-16.

7.1 SITE LOCATION AND PROVIDED DATA FOR 2019 CBC SEISMIC DESIGN

The project is located at latitude 36.970835° and longitude -122.024665°, which is based on Google Earth (WGS84) coordinates at the approximate center of the site at 920 Pacific Avenue in Santa Cruz, California. We have assumed that a Seismic Importance Factor (I_e) of 1.00 has been assigned to the structure in accordance with Table 1.5-2 of ASCE 7-16 for structures classified as Risk Category II.

7.2 SITE CLASSIFICATION – CHAPTER 20 OF ASCE 7-16

Code-based site classification and ground motion attenuation relationships are based on the time-weighted average shear wave velocity of the top approximately 100 feet (30 meters) of the soil profile (V_{S30}).

As discussed in Section 3, our explorations generally encountered medium dense to very dense sands with varying amounts of silt and siltstone to a depth of 83 feet, the maximum depth explored. Shear wave velocity (V_S) measurements were performed while advancing CPT-1 and CPT-3, resulting in a time-averaged shear wave velocity for the top 30 meters (V_{S30}) of approximately 187 to 207 meters per second. In accordance with Table 20.3-1 of ASCE 7-16, we recommend the site be classified as Soil Classification D, which is described as a "stiff soil" profile and assumes that ground improvement will be performed as recommended in this report. Because we used site specific data from our explorations and laboratory testing, the site class should be considered as "determined" for the purposes of estimating the seismic design parameters from the code outlined below. Site Response Analysis considered a V_{S30} of 187 to 207 m/s (613 to 679 ft/s).

We note that if ground improvement is not implemented the site will fall under the criteria of Site class E or F and the seismic design parameters presented in Section 7.3 and Appendix C of this report will no longer be valid. If the site cannot be classified as Soil Classification D as discussed above, our analysis will have to be revised.

7.3 SITE RESPONSE ANALYSIS

Following Section 11.4.8 of ASCE 7-16, our technical partner, Robert Pyke, PhD., GE performed a Site Response Analysis (SRA) in accordance with Chapter 21, Section 21.1. The details of the SRA are presented in Appendix D. The recommended MCE Spectrum is tabulated in Table 2 of Appendix D.

The recommended seismic design parameters based on the SRA are summarized in Table 4.

When using the Equivalent Lateral Force Procedure, ASCE 7-16 Section 21.4 allows using the spectral acceleration at any period (T) in lieu of S_{D1}/T in Eq. 12.8-3 and $S_{D1}T_L/T_2$ in Eq. 12.8-4. The site-specific spectral acceleration at any period may be calculated by interpolation of the spectral ordinates in Table 2, Appendix D. We note that the recommended MCE spectrum apply to structures founded at the ground surface.

Table 4: Site-Specific Design Acceleration Parameters

Parameter	Value
S_{DS}	0.87
S_{D1}	0.83
S_{MS}	1.30
S_{M1}	1.25

SECTION 8: FOUNDATIONS

8.1 SUMMARY OF RECOMMENDATIONS

In our opinion, due to the high potential for static and seismic settlement, the proposed structure should be supported on shallow foundations over ground improvement provided the recommendations in the "Earthwork" section and the sections below are followed.

8.2 SHALLOW FOUNDATIONS

8.2.1 Conventional Footings

Provided ground improvement is performed in accordance with recommendations in this report, continuous and/or spread footings should bear on uniformly spaced ground improvement elements, be at least 24 inches wide, and extend at least 24 inches below the lowest adjacent grade. Lowest adjacent grade is defined as the deeper of the following: 1) bottom of the adjacent interior slab-on-grade, or 2) finished exterior grade, excluding landscaping topsoil.

Bearing pressures will be dependent on the final ground improvement technique and spacing; however, substantial improvement in bearing capacity and reduction in settlement would be expected. On a preliminary basis, we expect allowable bearing pressures of at least 4,000 psf for combined dead plus live loads would be feasible with a one-third increase for all loads, including wind and seismic.

Ground improvement and the replacement of disturbed near-surface soils as engineered fill would be designed to reduce total settlement due to static and seismic conditions to a tolerable level as discussed below.

8.2.2 Lateral Loading

Lateral loads may be resisted by friction between the bottom of footing and the supporting subgrade, and by passive pressures generated against footing sidewalls. An ultimate frictional resistance of 0.45 applied to the footing dead load, and an ultimate passive pressure based on an equivalent fluid pressure of 400 pcf may be used in design. The structural engineer should apply an appropriate factor of safety (such as 1.5) to the ultimate values above. Where footings are adjacent to landscape areas without hardscape, the upper 12 inches of soil should be neglected when determining passive pressure capacity.

8.2.3 Conventional Footing Construction Considerations

Where utility lines will cross perpendicular to strip footings, the footing should be deepened to encase the utility line, providing sleeves or flexible cushions to protect the pipes from anticipated foundation settlement, or the utility lines should be backfilled to the bottom of footing with sand-cement slurry or lean concrete. Where utility lines will parallel footings and will extend below the "foundation plane of influence," an imaginary 1:1 plane projected down from the bottom edge of the footing, either the footing will need to be deepened so that the pipe is above the foundation plane of influence or the utility trench will need to be backfilled with sand-cement slurry or lean concrete within the influence zone. Sand-cement slurry used within foundation influence zones should have a minimum compressive strength of 75 psi.

Footing excavations should be filled as soon as possible or be kept moist until concrete placement by regular sprinkling to prevent desiccation. A Cornerstone representative should observe all footing excavations prior to placing reinforcing steel and concrete. If there is a significant schedule delay between our initial observation and concrete placement, we may need to re-observe the excavations.

8.2.4 Hydrostatic Uplift and Waterproofing

Where the structure will extend below the design groundwater level, including bottoms of elevator pit, they should be designed to resist potential hydrostatic uplift pressures. Retaining walls extending below design groundwater should be waterproofed and designed to resist hydrostatic pressure for the full wall height. Where portions of the walls extend above the design groundwater level, a drainage system may be added as discussed in the "Retaining Wall" section.

In addition, the portions of the structures extending below design groundwater should be waterproofed to limit moisture infiltration, including slab areas, all construction joints, and any retaining walls. We recommend that a waterproof specialist design the waterproofing system.

8.2.5 Reinforced Concrete Mat Foundations

Provided ground improvement is performed in accordance with recommendations in this report, as an alternative to shallow footings, the proposed structure may be supported on a mat foundation bearing on uniformly spaced ground improvement elements and designed in accordance with the recommendations below. Reinforced concrete mat foundations should be designed in accordance with the 2019 California Building Code.

On a preliminary basis, the mat should be designed for a maximum *average* allowable bearing pressure of 2,000 psf for dead plus live loads; at column or wall loading, the maximum localized bearing pressure should be limited to 4,000 psf. When evaluating wind and seismic conditions, allowable bearing pressures may be increased by one-third. These pressures are net values; the weight of the mat may be neglected for the portion of the mat extending below grade. Top and bottom mats of reinforcing steel should be included as required to help span irregularities and differential settlement. If the actual average areal bearing pressure is higher than presented above, or if there are other aspects of design not accounted for in this report, please notify us so that we may revise our recommendations.

8.2.6 Mat Modulus of Soil Subgrade Reaction

The modulus of soil subgrade reaction is a model element that represents the response to a specific loading condition, including the magnitude, rate, and shape of loading, given the subsurface conditions at that location. Design experts recommend using a variable modulus of soil subgrade reaction to provide a more accurate soil response and prediction of shears and moments in the mats. This will require at least one iteration between our soil model and the structural SAFE (or similar) analysis for the mat. We have assumed that the average areal mat pressure will be approximately 1,000 to 1,200 psf. Based on this assumed pressure, we calculated a preliminary modulus of subgrade reaction value for the mat foundation for unimproved ground.

For preliminary SAFE runs (or equivalent analysis), we recommend an initial modulus of soil subgrade reaction of 5 pounds per cubic inch (pci) for the mat foundation. As discussed above, the modulus of soil subgrade reaction is intended for use in the first iteration of the structural SAFE analysis for the mat design. As noted, this value represents the assumed soil response due to static and seismic deflection before ground improvement elements are considered. Updated modulus values for improved ground should be provided by the design-build contractor based on the type of ground improvement and estimated spacing.

8.2.7 Hydrostatic Uplift and Waterproofing

Mat foundations that extend below the recommended design groundwater level of 5 feet, should be designed to resist potential hydrostatic uplift pressures. Basement walls extending below design groundwater should be designed to resist hydrostatic pressure for the full wall height. Where portions of the walls extend above the design groundwater level, a drainage system may be added as discussed in the “Retaining Wall” section.

In addition, the portions of the structures extending below design groundwater should be waterproofed to limit moisture infiltration, including mat foundation, all construction joints, and any basement retaining walls. We recommend that a waterproofing specialist design the waterproofing system.

8.3 GROUND IMPROVEMENT

As discussed above, conventional shallow footings or a rigid mat foundation supporting the mixed-use building may be used in combination with ground improvement. We recommend that ground improvement be performed in the upper 25 feet over the building footprint to mitigate liquefaction settlement and lateral spreading. Ground improvement can be used to improve the subsurface soils such that the total combined static and seismic settlements are reduced to less than 1½ inches with ½ to ¾ inches differential settlement over a horizontal distance of 30 feet, enabling the structures to be supported on spread footings. Ground improvement should provide adequate confining improvement around all foundations. Ground improvement options should also include an increase in allowable bearing pressures and should reduce settlement to within the tolerances stated above. Our analysis indicates that performing ground improvement below 25 feet will amplify the site response beneath the building to above code levels and is not needed.

8.3.1 General

Ground improvement should consist of densification techniques to improve the ground's resistance to liquefaction, reduce static settlement, and improve bearing capacity and seismic performance. Densification techniques could potentially consist of vibro replacement (i.e. stone columns), grouted displacement columns (i.e. CLSM), or similar densification techniques. Considering the close proximity to existing commercial properties and the potential presence of impacted soil at the 425 Pacific Street parcel, we assume that drilled displacement columns would be the preferred ground improvement method. The intent of the ground improvement design beneath the proposed building would be to increase the density of the potentially liquefiable sands within 25 feet from the surface by laterally displacing and/or densifying the existing in-place soils.

Drilled displacement columns are formed in displaced soil cavities and displace liquefiable and compressible soil with cemented Controlled Low Strength Material. CLSM column ground improvement can mitigate liquefaction and settlement of heavy foundations and slabs. CLSM columns are ideal for sensitive project sites such as those near critical structures that require low noise and no vibration construction methods, unreinforced masonry walls, occupied offices, sensitive soil (e.g. Bay Mud), and hazardous/contaminated soil sites where deep ground improvement is required.

The upper 2 feet of the working pad will likely need to be re-compacted after ground improvement installation, due to surface disturbance, potential localized ground heave and removal and re-compaction of undocumented fill. For this reason, we do not recommend preparation of the building pad or the construction of utilities prior to ground improvement.

The diameter of these ground improvement elements would be 24 to 30 inches and spacing would be proposed by the ground improvement contractors based on their experience and documented case histories of improvement performed on other projects with similar soil conditions which we would review as part of their submittal. The spacing would be estimated to improve the sands to obtain a post treatment $(N_1)_{60cs}$ of at least 20 to 25 blows/foot. The spacing would also be selected to reduce the total static settlement to 1½ inches with a differential settlement of ¾ inches over a horizontal distance of 30 feet. We would recommend a modulus test at the on-set of construction to verify that the ground improvement will control the static settlement. This recommendation is predicated on our working with and reviewing the ground improvement contractor's submittal documentation on their proposed spacing and installation methodology and case histories from other similar projects. We would also independently observe installation in the field and prepare a signed and stamped close-out letter with confirms that installed ground improvement meets our recommendations.

8.3.2 Ground Improvement Design Guidelines

We recommend that the ground improvement design include, but not be limited to: 1) drawings showing the ground improvement layout, spacing and diameter, 2) the foundation layout plan, 3) proposed ground improvement length, 4) top and bottom elevations, 5) case histories showing pre and post improvement $(N_1)_{60cs}$ or Q_{C1cs} values for projects with similar site conditions, 6) estimate of static settlement and modulus to meet settlement goals. We recommend that all displacement columns be capped with a minimum 6-inch-thick compacted gravel pad to facilitate load transfer and to decouple the footings from underlying ground improvement elements. The actual gravel pad thickness should be confirmed by the design-build contractor. We should be retained to review the ground improvement contractor's plan and densification estimates prior to construction, and to review and confirm that the contractor's ground improvement design will satisfactorily meet the design criteria based on the previous performance testing. Ground improvement would generally be constructed as follows: 1) clear the site of existing demolition debris, 2) mass grading to the building pad subgrade elevation, 3) install the ground improvement on the approved layout, and 4) over-excavation and re-compact top of building pad, as required, prior to construction of remainder of pad and the foundations.

The degree to which the soil density is increased will depend on the improvement method and spacing. Even though the above methods are designed to mitigate different existing soil conditions, ground improvement should provide an additional increase in bearing capacity and soil stiffness at the individual improvement locations.

8.3.3 Ground Improvement Performance Testing

Foundation areas must meet the above total settlement criteria, which will include all settlement estimated from static loads. Analysis of settlement for static loading should include compression within the treatment area due to structural loads, and seismic settlement estimated for below the zone of treatment. Ground improvement must also provide adequate support for the design bearing capacity.

Verification testing should include at least two modulus tests within the building footprint. To validate the parameters selected for a specific project, a modulus load test is performed on a test pier typically constructed in locations chosen in coordination with the geotechnical engineer. Modulus tests are conducted to a pressure equal to at least 150% of the maximum design top of CLSM column stress to assure a reasonable level of safety which supports long term settlement control and demonstrates that the ground improvement element has adequate strength. Performing modulus testing beyond the limit state top of pier stress meets the intent of the building code with respect to shallow foundation support. Modulus testing should be performed in general accordance with ASTM D1143.

We recommend that at least two test array including pre- and post-installation CPT testing be performed. Performance testing typically consists of CPTs performed within each test array to confirm soil strength and density increases were achieved to meet the settlement criteria. We should observe and monitor installation of the test arrays and production ground improvement on a full-time basis and review the post-test array settlement analyses provided by the contractor.

SECTION 9: CONCRETE SLABS AND PEDESTRIAN PAVEMENTS

For the conventional footing alternative, should ground improvement only be installed under the footings and not under the slabs-on-grade, some slab settlement or deflection may occur following a design-level earthquake. The slabs should be designed to tolerate some deflection where the slabs transition from on-footing support to ground-only support. Since seismic settlement could theoretically range from approximately 1 to 3 inches, some loss of support could occur below the slab on-grade that results in voids beneath the slab and localized cracking at transition areas. If required, these voids could be fill with grout following an earthquake. The following options may be considered if it is desired to reduce potential slab distress:

- The overall thickness of the slab-on-grade may be increased.
- The slab-on-grade can be designed with increased reinforcement.
- The slab-on-grade can be designed with more close spaced construction or control joints to help reduce the extent of future cracking.

9.1 INTERIOR SLABS-ON-GRADE

As the Plasticity Index (PI) of the surficial soils is 15 or less, the proposed slabs-on-grade may be supported directly on subgrade prepared in accordance with the recommendations in the “Earthwork” section of this report. If moisture-sensitive floor coverings are planned, the recommendations in the “Interior Slabs Moisture Protection Considerations” section below may be incorporated in the project design if desired. If significant time elapses between initial subgrade preparation and slab-on-grade construction, the subgrade should be proof-rolled to confirm subgrade stability, and if the soil has been allowed to dry out, the subgrade should be re-moisture conditioned to near optimum moisture content.

The structural engineer should determine the appropriate slab reinforcement for the loading requirements and considering the expansion potential of the underlying soils. For unreinforced concrete slabs, ACI 302.1R recommends limiting control joint spacing to 24 to 36 times the slab thickness in each direction, or a maximum of 18 feet.

9.2 INTERIOR SLABS MOISTURE PROTECTION CONSIDERATIONS

The following general guidelines for concrete slab-on-grade construction where floor coverings are planned are presented for the consideration by the developer, design team, and contractor. These guidelines are based on information obtained from a variety of sources, including the American Concrete Institute (ACI) and are intended to reduce the potential for moisture-related problems causing floor covering failures, and may be supplemented as necessary based on project-specific requirements. The application of these guidelines or not will not affect the geotechnical aspects of the slab-on-grade performance.

- Place a minimum 15-mil vapor retarder conforming to ASTM E 1745, Class C requirements or better directly below the concrete slab; the vapor retarder should extend to the slab edges and be sealed at all seams and penetrations in accordance with manufacturer's recommendations and ASTM E 1643 requirements. A 4-inch-thick capillary break, consisting of crushed rock should be placed below the vapor retarder and consolidated in place with vibratory equipment. The mineral aggregate shall be of such size that the percentage composition by dry weight as determined by laboratory sieves will conform to the following gradation:

Sieve Size	Percentage Passing Sieve
1"	100
¾"	90 – 100
No. 4	0 – 10
No. 200	0 – 5

- The concrete water:cement ratio should be 0.45 or less. Mid-range plasticizers may be used to increase concrete workability and facilitate pumping and placement.
- Water should not be added after initial batching unless the slump is less than specified and/or the resulting water:cement ratio will not exceed 0.45.
- Polishing the concrete surface with metal trowels is not recommended.
- Where floor coverings are planned, all concrete surfaces should be properly cured.
- Water vapor emission levels and concrete pH should be determined in accordance with ASTM F1869-98 and F710-98 requirements and evaluated against the floor covering manufacturer's requirements prior to installation.

9.3 EXTERIOR FLATWORK

Exterior concrete flatwork subject to pedestrian and/or occasional light pick up loading should be at least 4 inches thick and supported on at least 4 inches of Class 2 aggregate base overlying subgrade prepared in accordance with the "Earthwork" recommendations of this report. Flatwork that will be subject to heavier or frequent vehicular loading should be designed in accordance with the recommendations in the “Vehicular Pavements” section below. To help reduce the potential for uncontrolled shrinkage cracking, adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness. Flatwork should be isolated from adjacent foundations or retaining walls except where limited sections of structural slabs are included to help span irregularities in retaining wall backfill at the transitions between at-grade and on-structure flatwork.

SECTION 10: VEHICULAR PAVEMENTS

10.1 ASPHALT CONCRETE

The following asphalt concrete pavement recommendations tabulated below are based on the Procedure 608 of the Caltrans Highway Design Manual, estimated traffic indices for various pavement-loading conditions, and on a design R-value of 25. The design R-value was chosen based on engineering judgement considering the variable soil conditions. We have also included pavement structural section alternatives for chemical-treated (e.g. cement) subgrade soil with an estimated R-value of 50 for your consideration. If it is desired to chemical-treat, we recommend the upper 12 inches of subgrade soil be treated. Additional testing will need to be performed to determine the appropriate cement percentage to be mixed with the subgrade soil.

Table 5: Asphalt Concrete Pavement Recommendations (Untreated Subgrade)

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
4.0	2.5	5.0	7.5
4.5	2.5	6.0	8.5
5.0	3.0	6.5	9.5
5.5	3.0	8.0	11.0
6.0	3.5	8.5	12.0
6.5	4.0	9.5	13.5
7.0	4.0	11.0	15.0
7.5	4.5	11.5	16.0
8.0	5.0	12.0	17.0
8.5	5.0	14.0	19.0
9.0	5.5	14.5	20.0
9.5	6.0	15.0	21.0
10.0	6.5	16.0	22.5

*Caltrans Class 2 aggregate base; minimum R-value of 78

Table 6: Asphalt Concrete Pavement Recommendations (Chemical-Treated Subgrade)

Design Traffic Index (TI)	Asphalt Concrete (inches)	Class 2 Aggregate Base* (inches)	Total Pavement Section Thickness (inches)
4.0/4.5	2.5	4.0	6.5
5.0/5.5	3.0	4.0	7.0
6.0	3.5	4.0	7.5
6.5	4.0	4.0	8.0
7.0	4.0	4.5	8.5
7.5	4.5	5.0	9.5
8.0	5.0	5.0	10.0
8.5	5.0	6.5	11.5
9.0	5.5	6.5	12.0
9.5	6.0	7.0	13.0
10.0	6.5	7.0	13.5

*Caltrans Class 2 aggregate base with minimum R-value of 78; minimum chemical-treated subgrade R-value assumed to be 50

Frequently, the full asphalt concrete section is not constructed prior to construction traffic loading. This can result in significant loss of asphalt concrete layer life, rutting, or other pavement failures. To improve the pavement life and reduce the potential for pavement distress through construction, we recommend the full design asphalt concrete section be constructed prior to construction traffic loading. Alternatively, a higher traffic index may be chosen for the areas where construction traffic will use the pavements.

10.2 PORTLAND CEMENT CONCRETE

The exterior Portland Cement Concrete (PCC) pavement recommendations tabulated below are based on methods presented in the American Concrete Institute (ACI) design manual (ACI, 330R-01) for parking lots. Pavement alternatives have been provided as an anticipated Average Daily Truck Traffic (ADTT) is not known. An allowable ADTT should be chosen that is greater than what is expected for the pavement area.

Table 7: PCC Pavement Recommendations

Traffic Category	Allowable Daily Truck Traffic (ADTT)	Minimum PCC Thickness[1] (inches)	Class 2 Aggregate Base (inches)
A: Auto parking only -	10	6	6

Table 7 continues

Table 7: PCC Pavement Recommendations (Continued)

Traffic Category	Allowable Daily Truck Traffic (ADTT)	Minimum PCC Thickness[1] (inches)	Class 2 Aggregate Base (inches)
B: Bus parking/drive aisles -	25	6½	6
B: Bus parking/drive aisles -	300	7	6

[1]Subgrade design R-Value = 25

The PCC thicknesses above are based on a concrete compressive strength of at least 3,500 psi. Adequate expansion and control joints should be included. Consideration should be given to limiting the control joint spacing to a maximum of about 2 feet in each direction for each inch of concrete thickness.

10.2.1 Stress Pads for Trash Enclosures

Pads where trash containers will be stored, and where garbage trucks will park while emptying trash containers, should be constructed on Portland Cement Concrete. We recommend that the trash enclosure pads and stress (landing) pads where garbage trucks will store, pick up, and empty trash be increased to a minimum PCC thickness of 8 inches over 6 inches of aggregate base. The compressive strength, underlayment, and construction details should be consistent with the above recommendations for PCC pavements.

SECTION 11: LIMITATIONS

This report, an instrument of professional service, has been prepared for the sole use of First Community Housing specifically to support the design of the Pacific Station Santa Cruz project in Santa Cruz, California. The opinions, conclusions, and recommendations presented in this report have been formulated in accordance with accepted geotechnical engineering practices that exist in Northern California at the time this report was prepared. No warranty, expressed or implied, is made or should be inferred.

Recommendations in this report are based upon the soil and ground water conditions encountered during our subsurface exploration. If variations or unsuitable conditions are encountered during construction, Cornerstone must be contacted to provide supplemental recommendations, as needed.

First Community Housing may have provided Cornerstone with plans, reports and other documents prepared by others. First Community Housing understands that Cornerstone reviewed and relied on the information presented in these documents and cannot be responsible for their accuracy.

Cornerstone prepared this report with the understanding that it is the responsibility of the owner or his representatives to see that the recommendations contained in this report are presented to other members of the design team and incorporated into the project plans and specifications, and that appropriate actions are taken to implement the geotechnical recommendations during construction.

Conclusions and recommendations presented in this report are valid as of the present time for the development as currently planned. Changes in the condition of the property or adjacent properties may occur with the passage of time, whether by natural processes or the acts of other persons. In addition, changes in applicable or appropriate standards may occur through legislation or the broadening of knowledge. Therefore, the conclusions and recommendations presented in this report may be invalidated, wholly or in part, by changes beyond Cornerstone's control. This report should be reviewed by Cornerstone after a period of three (3) years has elapsed from the date of this report. In addition, if the current project design is changed, then Cornerstone must review the proposed changes and provide supplemental recommendations, as needed.

An electronic transmission of this report may also have been issued. While Cornerstone has taken precautions to produce a complete and secure electronic transmission, please check the electronic transmission against the hard copy version for conformity.

Recommendations provided in this report are based on the assumption that Cornerstone will be retained to provide observation and testing services during construction to confirm that conditions are similar to that assumed for design, and to form an opinion as to whether the work has been performed in accordance with the project plans and specifications. If we are not retained for these services, Cornerstone cannot assume any responsibility for any potential claims that may arise during or after construction as a result of misuse or misinterpretation of Cornerstone's report by others. Furthermore, Cornerstone will cease to be the Geotechnical-Engineer-of-Record if we are not retained for these services.

SECTION 13: REFERENCES

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Vicinity Map

Pacific Station Santa Cruz
Santa Cruz, CA

Project Number	1198-2-1
Figure Number	Figure 1
Date	May 2021
Drawn By	RRN

Legend

- Approximate location of exploratory boring (EB)
- Approximate location of cone penetration test (CPT)
- Approximate location of infiltration test (P)

0 40 80
APPROXIMATE SCALE (FEET)

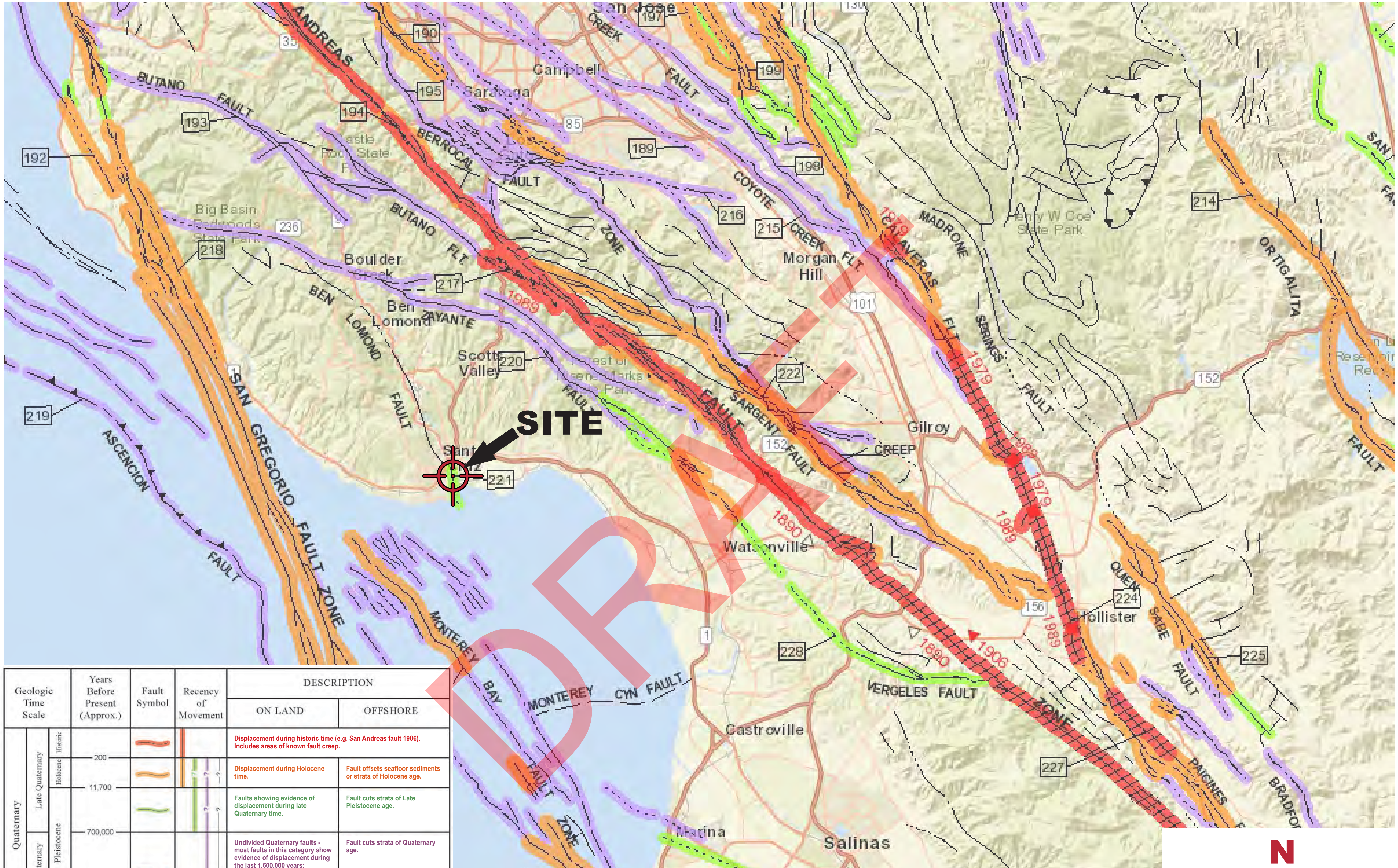
Base by Google Earth, dated 09/26/2021
Overlay by Mithūn, Ground Floor Plan, dated 02/02/2021

Project Number 1198-2-1
Figure Number Figure 2
Drawn By RRN
Date May 2021

Site Plan

Pacific Station Santa Cruz
Santa Cruz, CA

CORNERSTONE EARTH GROUP



Geologic Time Scale			Years Before Present (Approx.)	Fault Symbol	Recency of Movement	DESCRIPTION: ON LAND	DESCRIPTION: OFFSHORE
Quaternary	Late Quaternary	Historic				Displacement during historic time (e.g. San Andreas fault 1906). Includes areas of known fault creep.	
		Holocene	200		? ?	Displacement during Holocene time.	Fault offsets seafloor sediments or strata of Holocene age.
		Pleistocene	11,700		? ?	Faults showing evidence of displacement during late Quaternary time.	Fault cuts strata of Late Pleistocene age.
	Early Quaternary		700,000		?	Undivided Quaternary faults - most faults in this category show evidence of displacement during the last 1,600,000 years; possible exceptions are faults which displace rocks of undifferentiated Pilo-Pleistocene age.	Fault cuts strata of Quaternary age.
Pre-Quaternary			1,600,000 – 4.5 billion (Age of Earth)			Faults without recognized Quaternary displacement or showing evidence of no displacement during Quaternary time. Not necessarily inactive.	Fault cuts strata of Pliocene or older age.

Base by California Geological Survey - 2010 Fault Activity Map of California (Jennings and Bryant, 2010)

Project Number 1198-2-1

Figure Number Figure 3

Drawn By RRN

Date May 2021

Regional Fault Map

Pacific Station Santa Cruz
Santa Cruz, CA

CORNERSTONE EARTH GROUP

APPENDIX A: FIELD INVESTIGATION

The field investigation consisted of a surface reconnaissance and a subsurface exploration program using truck-mounted, hollow-stem auger drilling equipment and 20-ton truck-mounted Cone Penetration Test equipment. Two 8-inch-diameter exploratory borings were drilled on April 26 and 27, 2021 to depths of 56½ to 80 feet. Three CPT soundings were also performed in accordance with ASTM D 5778-95 (revised, 2002) on April 21 and 30, 2021, to depths ranging from about 51 to 83½ feet. The approximate locations of exploratory borings [and CPTs] are shown on the Site Plan, Figure 2. The soils encountered were continuously logged in the field by our representative and described in accordance with the Unified Soil Classification System (ASTM D2488). Boring logs, as well as a key to the classification of the soil and bedrock, are included as part of this appendix.

Boring and CPT locations were approximated using existing site boundaries and other site features as references. Boring and CPT elevations were not determined. The locations of the borings and CPTs should be considered accurate only to the degree implied by the method used.

Representative soil samples were obtained from the borings at selected depths. All samples were returned to our laboratory for evaluation and appropriate testing. The standard penetration resistance blow counts were obtained by dropping a 140-pound hammer through a 30-inch free fall. The 2-inch O.D. split-spoon sampler was driven 18 inches and the number of blows was recorded for each 6 inches of penetration (ASTM D1586). 2.5-inch I.D. samples were obtained using a Modified California Sampler driven into the soil with the 140-pound hammer previously described. Unless otherwise indicated, the blows per foot recorded on the boring log represent the accumulated number of blows required to drive the last 12 inches. The various samplers are denoted at the appropriate depth on the boring logs.

The CPT involved advancing an instrumented cone-tipped probe into the ground while simultaneously recording the resistance at the cone tip (q_c) and along the friction sleeve (f_s) at approximately 5-centimeter intervals. Based on the tip resistance and tip to sleeve ratio (R_f), the CPT classified the soil behavior type and estimated engineering properties of the soil, such as equivalent Standard Penetration Test (SPT) blow count, internal friction angle within sand layers, and undrained shear strength in silts and clays. A pressure transducer behind the tip of the CPT cone measured pore water pressure (u_2). Graphical logs of the CPT data are included as part of this appendix.

Field tests included an evaluation of the unconfined compressive strength of the soil samples using a pocket penetrometer device. The results of these tests are presented on the individual boring logs at the appropriate sample depths.

Attached boring and CPT logs and related information depict subsurface conditions at the locations indicated and on the date designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at these boring and CPT locations. The passage of time may result in altered subsurface conditions due to environmental changes. In addition, any stratification lines on the logs represent the approximate boundary between soil types and the transition may be gradual.

UNIFIED SOIL CLASSIFICATION (ASTM D-2487-10)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

OTHER MATERIAL SYMBOLS

Poorly-Graded Sand with Clay	Sand
Clayey Sand	Silt
Sandy Silt	Well Graded Gravelly Sand
Artificial/Undocumented Fill	Gravelly Silt
Poorly-Graded Gravelly Sand	Asphalt
Topsoil	Boulders and Cobble
Well-Graded Gravel with Clay	
Well-Graded Gravel with Silt	

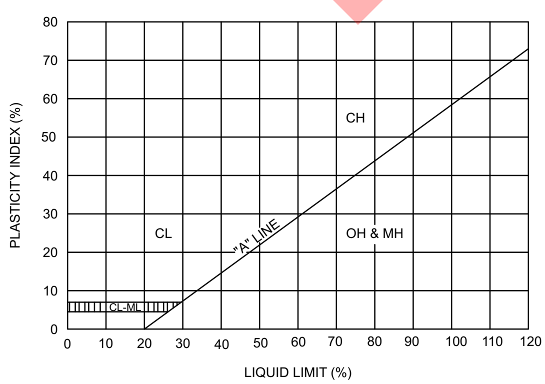
SAMPLER TYPES

SPT	Shelby Tube
Modified California (2.5" I.D.)	No Recovery
Rock Core	Grab Sample

ADDITIONAL TESTS

CA	CHEMICAL ANALYSIS (CORROSIVITY)	PI	PLASTICITY INDEX
CD	CONSOLIDATED DRAINED TRIAXIAL	SW	SWELL TEST
CN	CONSOLIDATION	TC	CYCLIC TRIAXIAL
CU	CONSOLIDATED UNDRAINED TRIAXIAL	TV	TORVANE SHEAR
DS	DIRECT SHEAR	UC	UNCONFINED COMPRESSION
PP	POCKET PENETROMETER (TSF)	(1.5)	(WITH SHEAR STRENGTH IN KSF)
(3.0)	(WITH SHEAR STRENGTH IN KSF)	UU	UNCONSOLIDATED UNDRAINED TRIAXIAL
RV	R-VALUE		
SA	SIEVE ANALYSIS: % PASSING #200 SIEVE		
▼	WATER LEVEL		

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / FOOT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	STRENGTH** (KSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 2	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 4	0.25 - 0.5
MEDIUM DENSE	10 - 30	MEDIUM STIFF	4 - 8	0.5-1.0
DENSE	30 - 50	STIFF	8 - 15	1.0 - 2.0
VERY DENSE	OVER 50	VERY STIFF	15 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

** UNDRAINED SHEAR STRENGTH IN KIPS/SQ. FT. AS DETERMINED BY LABORATORY TESTING OR APPROXIMATED BY THE STANDARD PENETRATION TEST, POCKET PENETROMETER, TORVANE, OR VISUAL OBSERVATION.

CORNERSTONE EARTH GROUP

LEGEND TO SOIL DESCRIPTIONS

Figure Number A-1

BORING NUMBER EB-1

CORNERSTONE EARTH GROUP

PROJECT NAME Pacific Station Santa Cruz
PROJECT NUMBER 1198-2-1
PROJECT LOCATION Santa Cruz,CA

DATE STARTED 4/27/21 **DATE COMPLETED** 4/27/21
GROUND ELEVATION **BORING DEPTH** 80 ft.
DRILLING CONTRACTOR Exploration Geoservices Inc.
LATITUDE 36.971146° **LONGITUDE** -122.024997°
DRILLING METHOD Mobile B-56, 8 inch Hollow-Stem Auger
GROUND WATER LEVELS:
LOGGED BY BCG
∇ **AT TIME OF DRILLING** 18 ft.
NOTES
▼ **AT END OF DRILLING** 7 ft.

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE
	0	8 inches asphalt concrete over 4 inches aggregate base						
		Silty Gravel with Sand (GM) [Fill] very dense, moist, gray and brown, fine to coarse subangular to subrounded gravel, fine to medium sand	50 3"	MC				
			50 2"	MC				
		14 inches concrete						
	5	**Sandy Lean Clay (CL) [Fill]** stiff, moist, dark gray and brown mottled, fine sand, some fine subangular gravel, low plasticity	29	MC-3B	99	21		
		Silt with Sand (ML) stiff to medium stiff, moist, brown and gray mottled, fine sand, low plasticity	12	MC-4B	84	34		76
	10		22	MC-5C	85	33		
		Silty Sand (SM) medium dense, wet, gray and brown, fine sand 71% Sand, 22% Silt, 7% Clay	26	MC-6B	90	31		29
		some organics	26	MC-7B	65	43		
	15	**Silt with Sand (ML)** soft, moist, gray, fine sand, some organics 27% Sand, 60% Silt, 13% Clay NP = nonplastic	30	SPT-8		44	NP	73
		Well Graded Sand with Silt (SW-SM) medium dense to dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel 17% Gravel, 78% Sand, 5% Silt, 3% Clay	21	SPT-9B		14		8
	20		24	SPT				
			60	MC-11B	110	17		8
		becomes very dense	50 6"	SPT				
	25	1% Gravel, 92% Sand, 4% Silt, 3% Clay NP = nonplastic	31	SPT-13		16	NP	7

Continued Next Page

CORNERSTONE EARTH GROUP

PROJECT NAME Pacific Station Santa Cruz
PROJECT NUMBER 1198-2-1
PROJECT LOCATION Santa Cruz,CA

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

UNDRAINED SHEAR STRENGTH, ksf: ○ HAND PENETROMETER; △ TORVANE; ● UNCONFINED COMPRESSION; ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL (1.0, 2.0, 3.0, 4.0)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE
		Silty Sand (SM) dense, moist, gray, fine to coarse sand, some fine subrounded gravel	38	SPT-14		16		15
	30	becomes loose	16	MC				
		becomes medium dense	54	MC-15B	112	18		13
			19	SPT				
	35	6% Gravel, 72% Sand, 16% Silt, 6% Clay	26	SPT-17		19		22
		Silty Sand (SM) dense to very dense, moist, gray, fine sand	36	SPT-18		25		40
	40		80	SPT-19		24		
		Poorly Graded Sand with Silt (SP-SM) very dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel	50/6"	MC-20C	109	18		
	45		68	SPT				
			50/6"	SPT-22		14		
	50							
		92% Sand, 3% Silt, 5% Clay	55	SPT-23		21		8
	55							

Continued Next Page

BORING NUMBER EB-1

CORNERSTONE EARTH GROUP

PROJECT NAME Pacific Station Santa Cruz

PROJECT NUMBER 1198-2-1

PROJECT LOCATION Santa Cruz,CA

UNDRAINED SHEAR STRENGTH, ksf: ○ HAND PENETROMETER; △ TORVANE; ● UNCONFINED COMPRESSION; ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL (scale 1.0, 2.0, 3.0, 4.0)

ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE	UNDRAINED SHEAR STRENGTH, ksf
		Poorly Graded Sand with Silt (SP-SM) very dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel	50/6"	SPT-24		22			
	60								
		Silty Sand (SM) medium dense, moist, gray, fine to medium sand	29	SPT-25		22		20	
	65								
		Sandy Silt (ML) stiff, moist, gray, fine sand, low plasticity	28	SPT-26		28			
	70								
			45	SPT-27		28			
	75								
		Poorly Graded Sand with Silt (SP-SM) dense, wet, gray brown, fine to coarse sand	51	SPT-28		19			
	80	Bottom of Boring at 80.0 feet.							
	85								

BORING NUMBER EB-2

CORNERSTONE EARTH GROUP

PROJECT NAME Pacific Station Santa Cruz
PROJECT NUMBER 1198-2-1
PROJECT LOCATION Santa Cruz,CA

DATE STARTED 4/26/21 **DATE COMPLETED** 4/26/21
DRILLING CONTRACTOR Exploration Geoservices Inc.
DRILLING METHOD Mobile B-61, 8 inch Hollow-Stem Auger
LOGGED BY BCG
NOTES

GROUND ELEVATION **BORING DEPTH** 56.4 ft.
LATITUDE 36.970412° **LONGITUDE** -122.024737°
GROUND WATER LEVELS:
▽ **AT TIME OF DRILLING** 9 ft.
▼ **AT END OF DRILLING** 8 ft.

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

DESCRIPTION

DEPTH (ft)	DESCRIPTION
0	7 inches asphalt concrete over 3 inches aggregate base
	Sandy Silt with Gravel (ML) [Fill] hard, moist, brown and gray mottled, fine to medium sand, fine to coarse subrounded gravel, low plasticity NP = nonplastic
	Sandy Lean Clay (CL) [Fill] medium stiff, moist, dark gray with brown mottles, fine sand, some subangular fine gravel, low plasticity
	Sandy Silt (ML) medium stiff, moist, gray, fine sand NP = nonplastic
	Poorly Graded Sand with Silt (SP-SM) medium dense to dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel 4% Gravel, 90% Sand, 2% Silt, 4% Clay
	Poorly Graded Sand with Gravel (SP) medium dense to dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel 15% Gravel, 81% Sand, 2% Silt, 2% Clay
	5% Gravel, 91% Sand, 2% Silt, 2% Clay

Continued Next Page

N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE
38	MC-1A	89	29	NP	
6	MC-2		26		
3	SPT-3		28		
18	MC-4C	84	31	NP	
36	MC-5C	105	14		
48	SPT-6		17		6
30	SPT-7		15		5
24	SPT				
58	MC-9B	106	18		5
20	SPT-10				4
32	SPT				
45	MC				
35	SPT-13		13		4

UNDRAINED SHEAR STRENGTH, ksf
○ HAND PENETROMETER
△ TORVANE
● UNCONFINED COMPRESSION
▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL
1.0 2.0 3.0 4.0

BORING NUMBER EB-2

CORNERSTONE EARTH GROUP

PROJECT NAME Pacific Station Santa Cruz

PROJECT NUMBER 1198-2-1

PROJECT LOCATION Santa Cruz,CA

This log is a part of a report by Cornerstone Earth Group, and should not be used as a stand-alone document. This description applies only to the location of the exploration at the time of drilling. Subsurface conditions may differ at other locations and may change at this location with time. The description presented is a simplification of actual conditions encountered. Transitions between soil types may be gradual.

UNDRAINED SHEAR STRENGTH, ksf: ○ HAND PENETROMETER; △ TORVANE; ● UNCONFINED COMPRESSION; ▲ UNCONSOLIDATED-UNDRAINED TRIAXIAL; 1.0 2.0 3.0 4.0

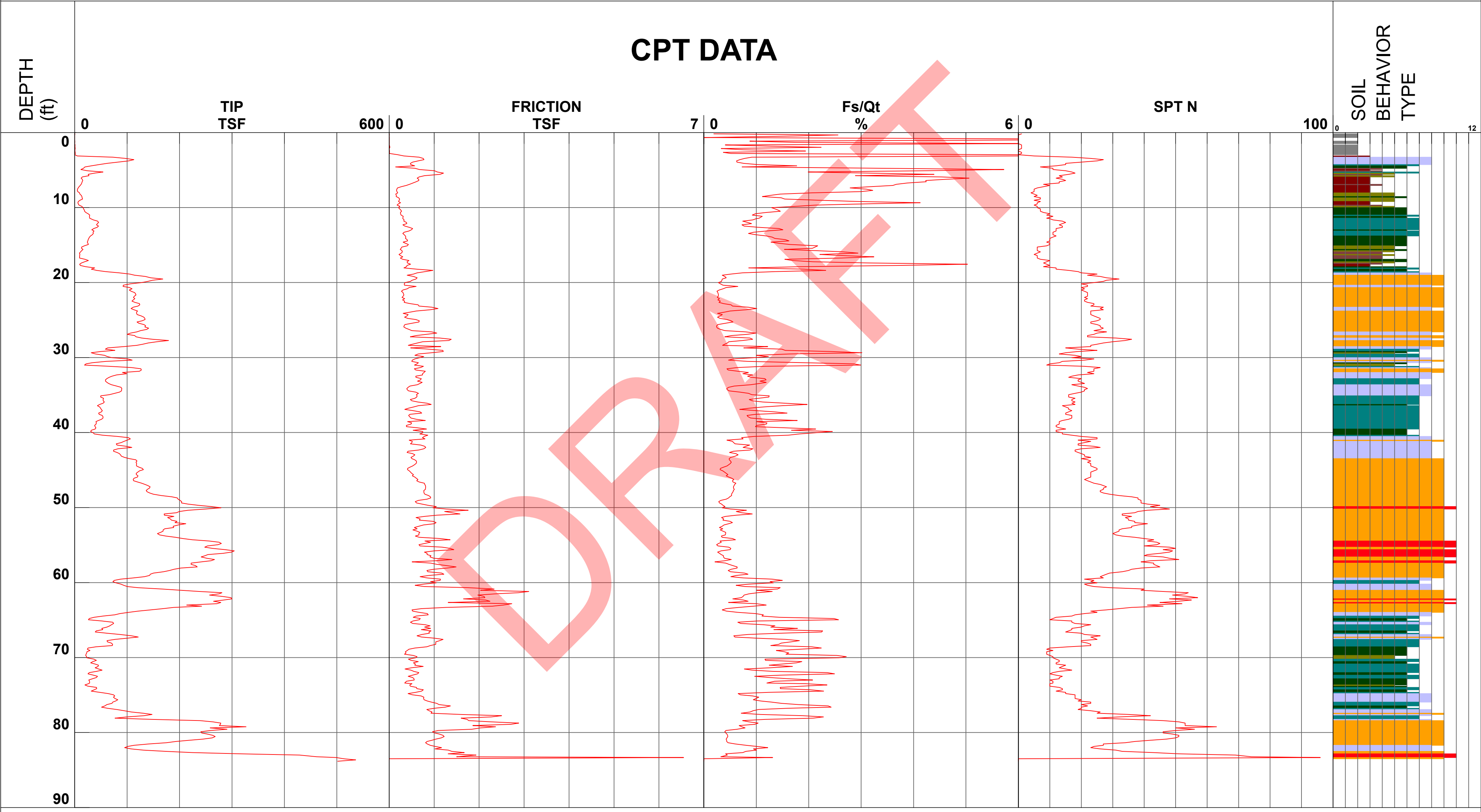
ELEVATION (ft)	DEPTH (ft)	DESCRIPTION	N-Value (uncorrected) blows per foot	SAMPLES TYPE AND NUMBER	DRY UNIT WEIGHT PCF	NATURAL MOISTURE CONTENT	PLASTICITY INDEX, %	PERCENT PASSING No. 200 SIEVE
		Poorly Graded Sand with Silt (SP-SM) very dense, wet, gray brown, fine to coarse sand, some fine subangular to subrounded gravel	50	SPT				
	30	**Poorly Graded Sand with Gravel (SP)** medium dense to dense, wet, gray brown, fine to coarse sand, some fine subrounded gravel	51	MC-15B	124	13		9
		39% Gravel, 55% Sand, 3% Silt, 3% Clay	36	SPT-16		10		6
			43	SPT-17		11		
	35		32	SPT-18		22		6
	40	becomes very dense	50 6"	MC-19B	113	13		
			50 6"	SPT-20		16		
	45		50 6"	SPT-21		15		
		Siltstone moderately strong, moderately hard, moderate to deep weathering, gray, moderate plasticity	50 6"	SPT-22		38		
	50							
			50 6"	SPT				
	55		50 5"	SPT-24		61		
		Bottom of Boring at 56.4 feet.						

Cornerstone Earth Group

Project	Pacific Station Santa Cruz	Operator	BH-OO	Filename	SDF(536).cpt
Job Number	1198-2-1	Cone Number	DDG1587	GPS	
Hole Number	CPT-01	Date and Time	4/30/2021 8:11:18 AM	Maximum Depth	83.82 ft
EST GW Depth During Test		7.00 ft			

Net Area Ratio .8

CPT DATA

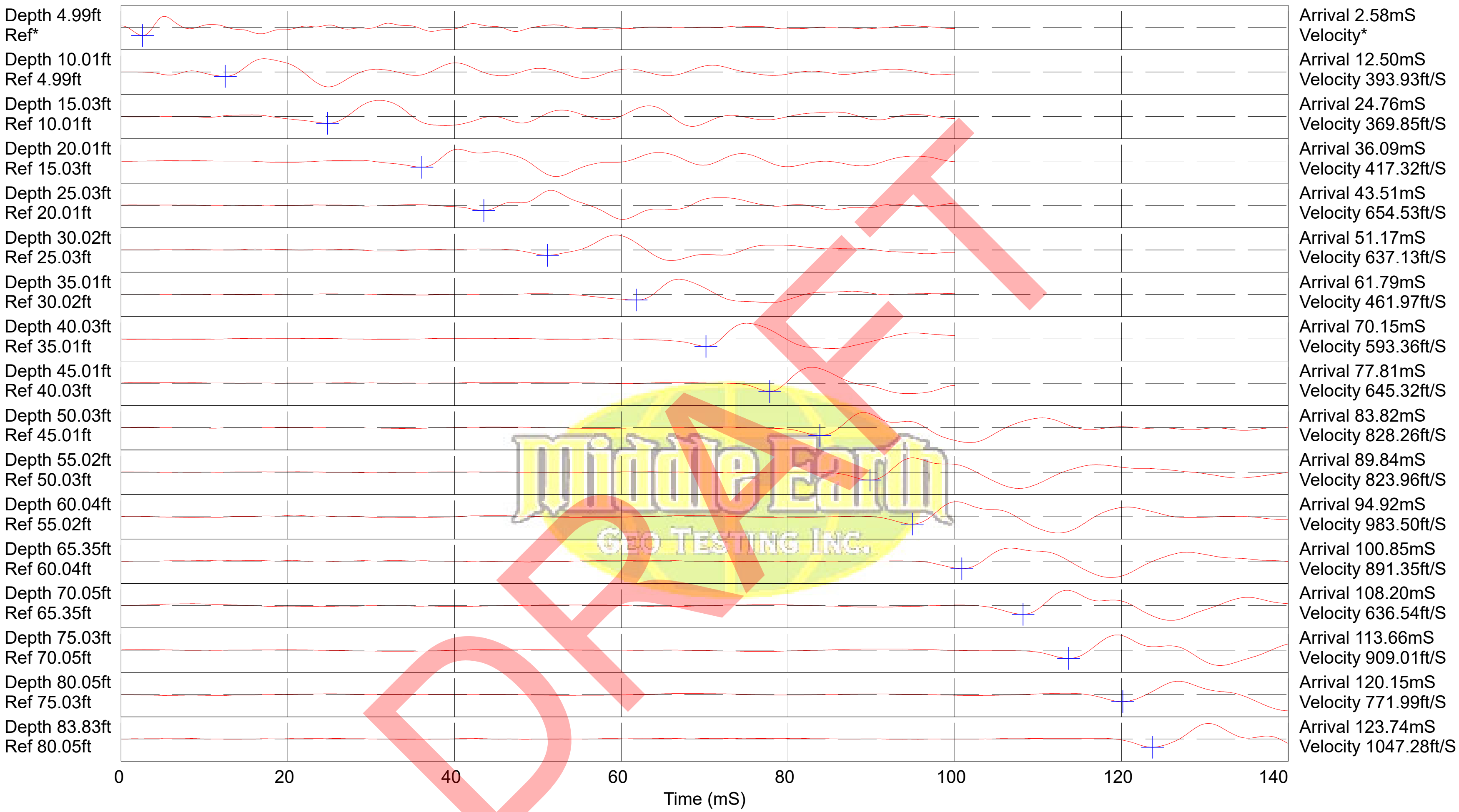


1 - sensitive fine grained	4 - silty clay to clay	7 - silty sand to sandy silt	10 - gravelly sand to sand
2 - organic material	5 - clayey silt to silty clay	8 - sand to silty sand	11 - very stiff fine grained (*)
3 - clay	6 - sandy silt to clayey silt	9 - sand	12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

CPT-01 | Cornerstone Earth Group | Pacific Station Santa Cruz



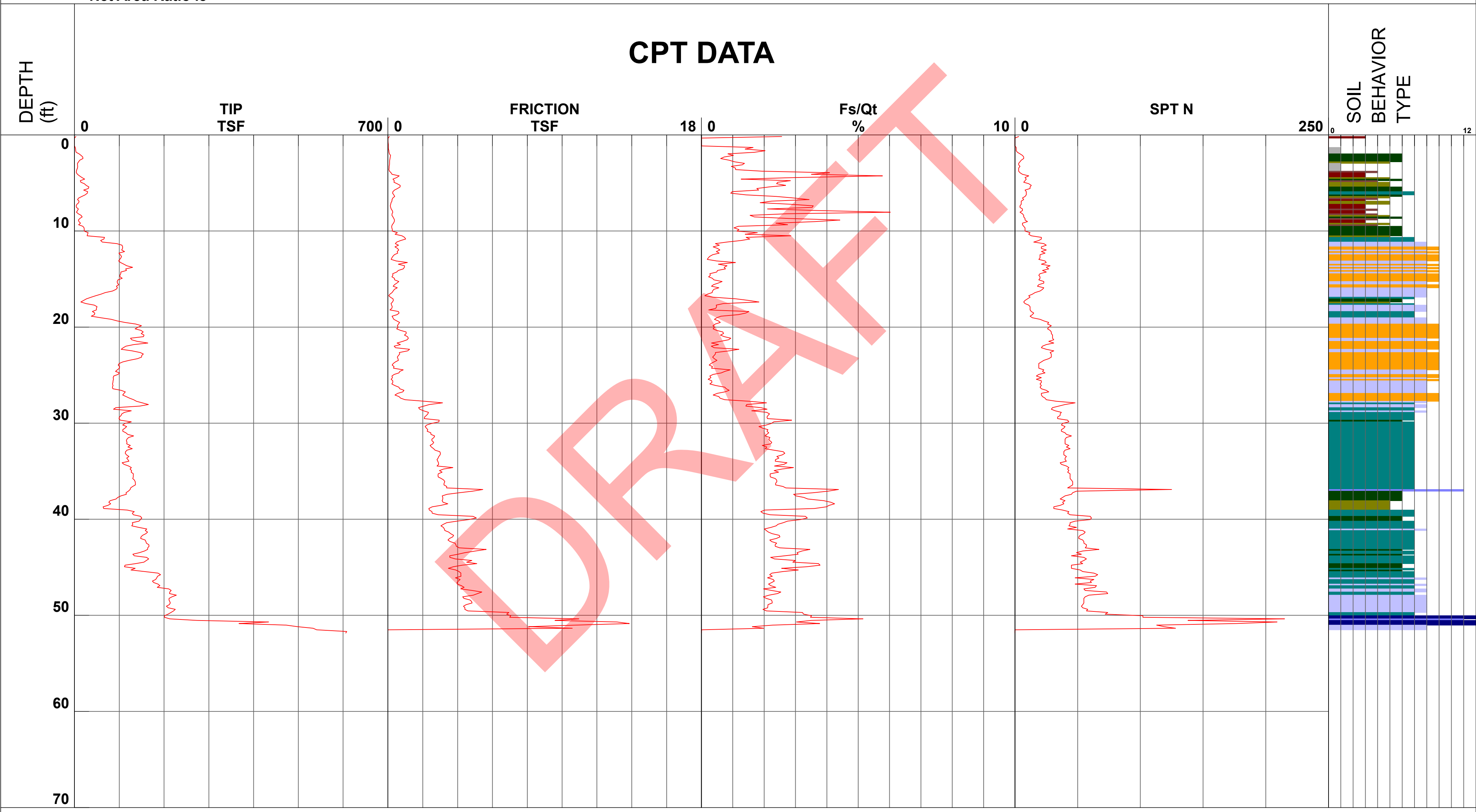
Hammer to Rod String Distance (ft): 5.83
* = Not Determined

COMMENT:

Cornerstone Earth Group

Project	Pacific Station Santa Cruz	Operator	JM-ZG	Filename	SDF(313).cpt
Job Number	1198-2-1	Cone Number	DDG1596	GPS	
Hole Number	CPT-02	Date and Time	4/21/2021 8:03:46 AM	Maximum Depth	51.84 ft
EST GW Depth During Test		8.00 ft			

Net Area Ratio .8



- 1 - sensitive fine grained
- 2 - organic material
- 3 - clay
- 4 - silty clay to clay
- 5 - clayey silt to silty clay
- 6 - sandy silt to clayey silt
- 7 - silty sand to sandy silt
- 8 - sand to silty sand
- 9 - sand
- 10 - gravelly sand to sand
- 11 - very stiff fine grained (*)
- 12 - sand to clayey sand (*)

Cone Size 15cm squared

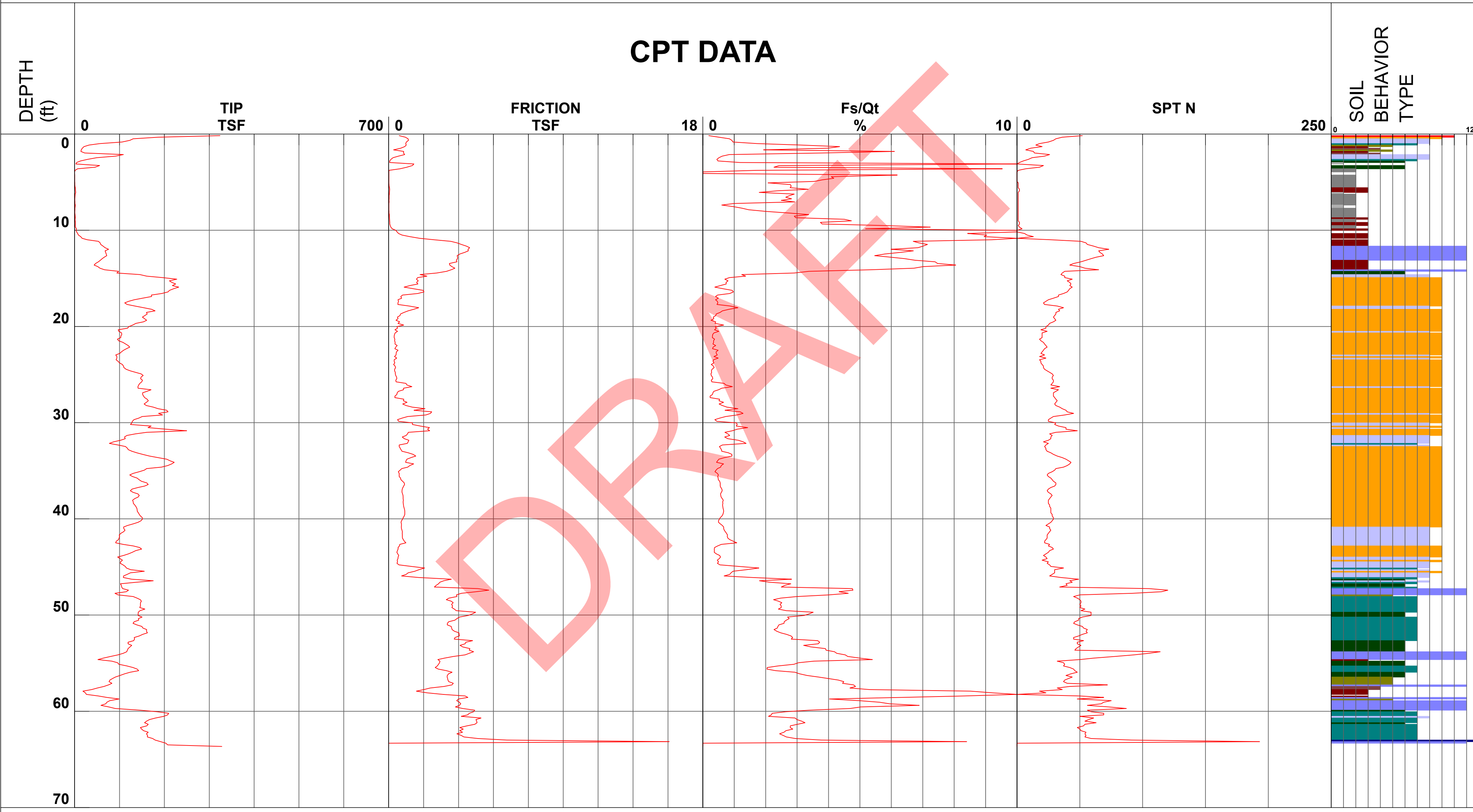
S*Soil behavior type and SPT based on data from UBC-1983

Cornerstone Earth Group

Project	Pacific Station Santa Cruz	Operator	JM-ZG	Filename	SDF(314).cpt
Job Number	1198-2-1	Cone Number	DDG1596	GPS	
Hole Number	CPT-03	Date and Time	4/21/2021 9:08:09 AM	Maximum Depth	63.65 ft
EST GW Depth During Test		8.00 ft			

Net Area Ratio .8

CPT DATA



1 - sensitive fine grained
2 - organic material
3 - clay
4 - silty clay to clay
5 - clayey silt to silty clay
6 - sandy silt to clayey silt
7 - silty sand to sandy silt
8 - sand to silty sand
9 - sand
10 - gravelly sand to sand
11 - very stiff fine grained (*)
12 - sand to clayey sand (*)

Cone Size 15cm squared

S*Soil behavior type and SPT based on data from UBC-1983

APPENDIX B: LABORATORY TEST PROGRAM

The laboratory testing program was performed to evaluate the physical and mechanical properties of the soils retrieved from the site to aid in verifying soil classification.

Moisture Content: The natural water content was determined (ASTM D2216) on 40 samples of the materials recovered from the borings. These water contents are recorded on the boring logs at the appropriate sample depths.

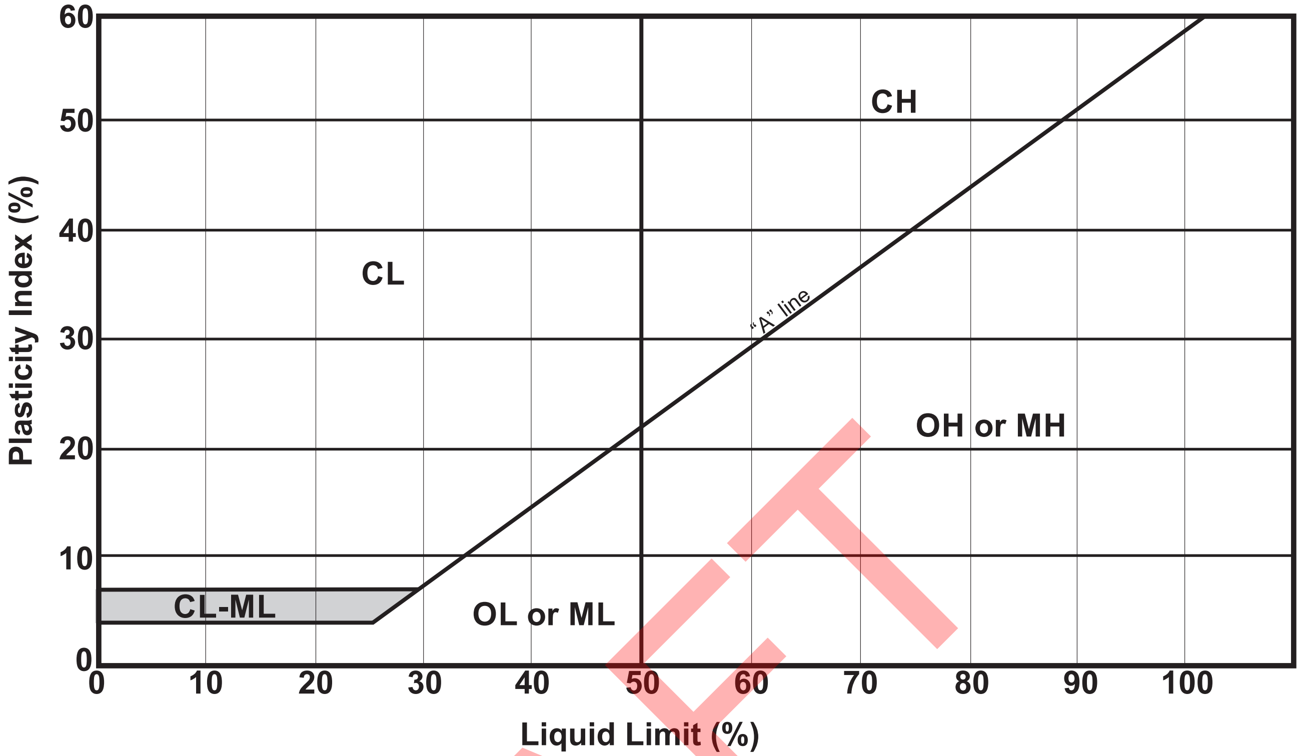
Dry Densities: In place dry density determinations (ASTM D2937) were performed on 14 samples to measure the unit weight of the subsurface soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Washed Sieve Analyses: The percent soil fraction passing the No. 200 sieve (ASTM D1140) was determined on 10 samples of the subsurface soils to aid in the classification of these soils. Results of these tests are shown on the boring logs at the appropriate sample depths.

Grain Size Analyses: The particle size distribution (ASTM D422) was determined on 10 samples of the subsurface soils to aid in the classification of these soils and determining the percent silt and clay. Results of these tests are shown on the boring logs at the appropriate sample depths.

Plasticity Index: Four Plasticity Index determinations (ASTM D4318) were performed on samples of the subsurface soils to measure the range of water contents over which this material exhibits plasticity. The Plasticity Index was used to classify the soil in accordance with the Unified Soil Classification System and to evaluate the soil expansion potential. Results of these tests are shown on the boring logs at the appropriate sample depths.

Plasticity Index (ASTM D4318) Testing Summary



Symbol	Boring No.	Depth (ft)	Natural Water Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index	Passing No. 200 (%)	Group Name (USCS - ASTM D2487)
	EB-1	15.0	44	determined nonplastic			73	Silt with Sand (ML)
	EB-1	25.0	16	determined nonplastic			7	Well Graded Sand with Silt (SW-SM)
	EB-2	1.0	29	determined nonplastic			—	Sandy Silt (ML) [Fill]
	EB-2	8.0	31	determined nonplastic			—	Sandy Silt (ML)

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Plasticity Index Testing Summary

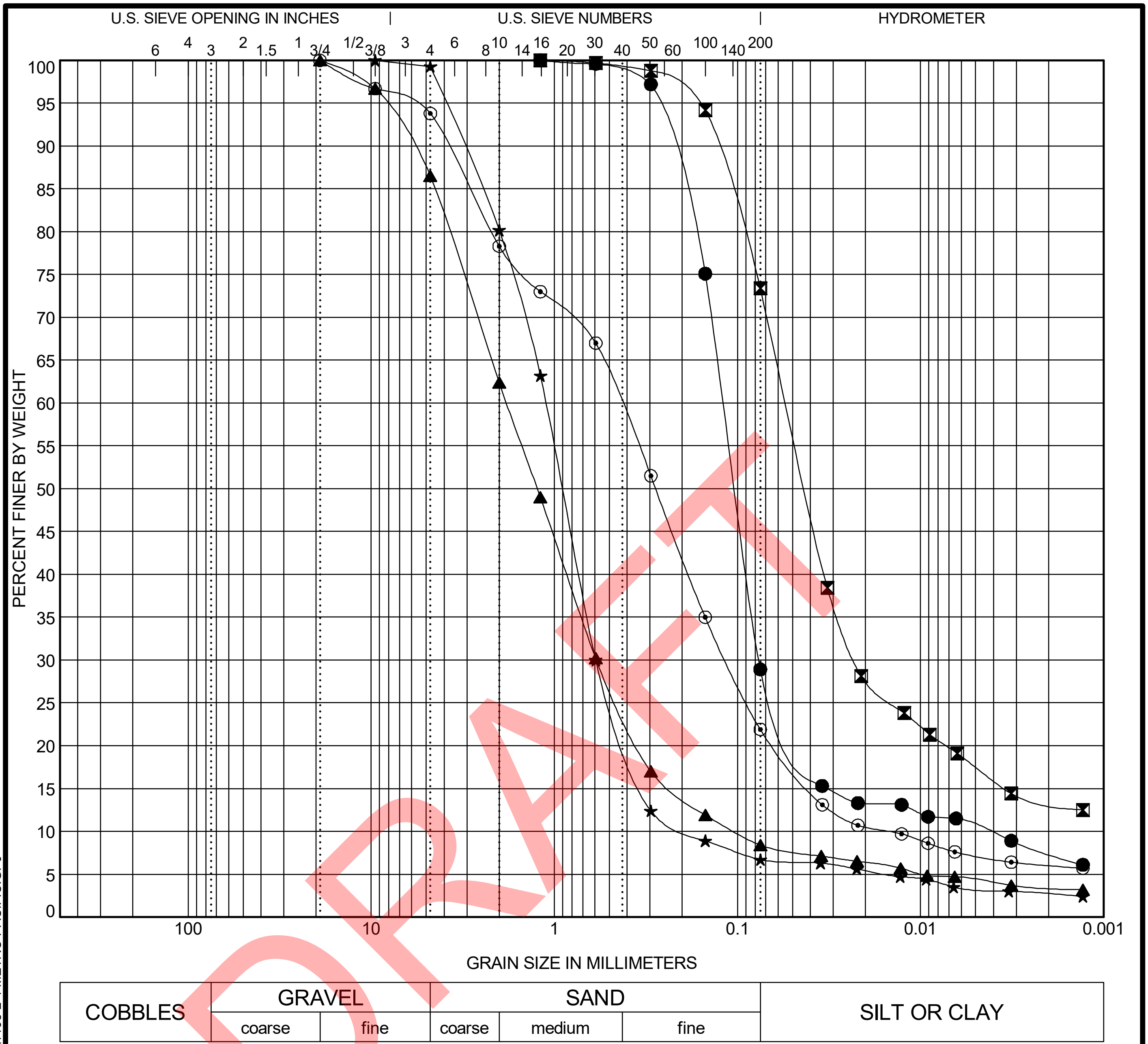
Pacific Station Santa Cruz Santa Cruz, CA

Project Number 1198-2-1

Figure Number Figure B1

Date May 2021

Drawn By FLL



	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	**EB-1**	**11.0**	**Silty Sand (SM)**				**11.33**	**27.9**
⧗	**EB-1**	**15.0**	**Silt with Sand (ML)**					
▲	**EB-1**	**17.0**	**Well Graded Sand with Silt (SW-SM)**				**1.84**	**17.7**
★	**EB-1**	**25.0**	**Well Graded Sand with Silt (SW-SM)**				**1.70**	**6.0**
⊙	**EB-1**	**35.0**	**Silty Sand (SM)**				**2.04**	**29.0**

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt / %Clay
●	**EB-1**	**11.0**	**1.191**	**0.12**	**0.076**	**0.004**	**0.0**	**71.1**	**22 / 7**
⧗	**EB-1**	**15.0**	**1.191**	**0.054**	**0.023**		**0.0**	**26.6**	**60 / 13**
▲	**EB-1**	**17.0**	**19.05**	**1.823**	**0.588**	**0.103**	**13.5**	**78.1**	**5 / 3**
★	**EB-1**	**25.0**	**9.525**	**1.114**	**0.594**	**0.186**	**0.7**	**92.6**	**4 / 3**
⊙	**EB-1**	**35.0**	**19.05**	**0.434**	**0.115**	**0.015**	**6.2**	**71.9**	**16 / 6**

CORNERSTONE EARTH GROUP

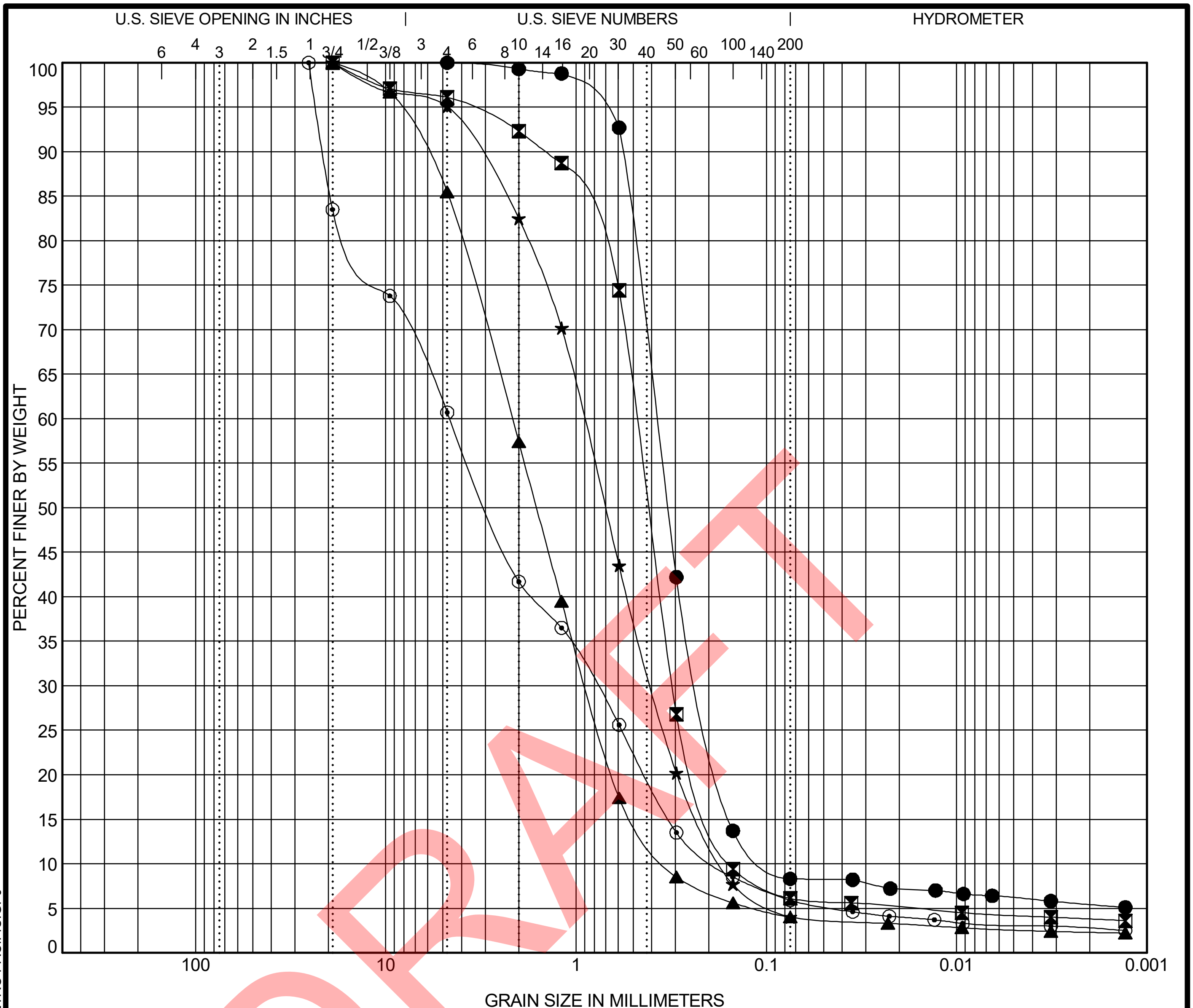
GRAIN SIZE DISTRIBUTION

Project: Pacific Station Santa Cruz

Location: Santa Cruz,CA

Number: 1198-2-1

US GRAIN SIZE - CORNERSTONE 0812.GDT - 5/10/21 11:58 - P:\DRAFTING\GINT FILES\1198-2-1 METRO PACIFIC.GPJ



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification		Classification	LL	PL	PI	Cc	Cu
● EB-1	53.5	Poorly Graded Sand with Silt (SP-SM)				1.39	4.1
⊠ EB-2	11.0	Poorly Graded Sand with Silt (SP-SM)				1.31	3.1
▲ EB-2	19.0	Well Graded Sand (SW)				1.08	6.5
★ EB-2	25.0	Poorly Graded Sand (SP)				1.02	5.4
⊙ EB-2	31.0	Poorly Graded Sand with Silt (SP-SM)				0.73	25.0

Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt / %Clay
● EB-1	53.5	4.75	0.379	0.222	0.093	0.0	91.7	3 / 5
⊠ EB-2	11.0	19.05	0.482	0.311	0.154	3.9	90.0	2 / 4
▲ EB-2	19.0	19.05	2.167	0.883	0.334	14.5	81.5	2 / 2
★ EB-2	25.0	19.05	0.913	0.398	0.17	4.9	91.1	2 / 2
⊙ EB-2	31.0	25.4	4.601	0.787	0.184	39.3	54.8	3 / 3

CORNERSTONE EARTH GROUP

GRAIN SIZE DISTRIBUTION

Project: Pacific Station Santa Cruz

Location: Santa Cruz,CA

Number: 1198-2-1

CORNERSTONE EARTH GROUP

APPENDIX C: RESULTS OF PRELIMINARY SOIL CORROSIVITY EVALUATION

May 27, 2021

Cornerstone Earth Group, Inc.
1220 Oakland Boulevard, Suite 220
Walnut Creek, California 94596

Attention: **John R. Dye, P.E., G.E.**
Principal Engineer

Subject: **Site Corrosivity Evaluation**
Metro Pacific Station
Santa Cruz, CA
Project: 1198-2-1

Dear John,

In accordance with your request, we have reviewed the laboratory soils data for the above referenced project site. Our evaluation of these results and our corresponding recommendations for corrosion control for the above referenced project foundations and buried site utilities are presented herein for your consideration.

Soil Testing & Analysis

Soil Chemical Analysis

Three (3) soil samples from the project site were chemically analyzed for corrosivity by **Cornerstone Earth Group**. Each sample was analyzed for chloride and sulfate concentration, pH, resistivity at 100% saturation and moisture percentage. The test results are presented in Cornerstone Earth Group Test Summary dated 5/11, 12/2021. The results of the chemical analysis were as follows:

Soil Laboratory Analysis

Chemical Analysis	Range of Results	Corrosion Classification*
Chlorides	31 - 54 mg/kg	Non-corrosive*
Sulfates	112 - 332 mg/kg	Non-corrosive to Mildly Corrosive**
pH	6.2 – 7.1	Mildly Corrosive to Non-corrosive *
Moisture (%)	20.7 – 30.7 %	Not-applicable
Resistivity at 100% Saturation	1,381 – 2,579 ohm-cm	**Corrosive to Moderately Corrosive***

* With respect to bare steel or ductile iron.
** With respect to mortar coated steel

Discussion

Reinforced Concrete Foundations

Due to the low levels of water-soluble sulfates found in these soils, there is no special requirement for sulfate resistant concrete to be used at this site. The type of cement used should be in accordance with California Building Code (CBC) for soils which have less than 0.10 percent by weight of water soluble sulfate (SO_4) in soil and the minimum depth of cover for the reinforcing steel should be as specified in CBC as well.

Underground Metallic Pipelines

The soils at the project site are generally considered to be “corrosive” to ductile/cast iron, steel and dielectric coated steel based on the saturated resistivity measurements. Therefore, special requirements for corrosion control are required for buried metallic utilities at this site depending upon the critical nature of the piping. Pressure piping systems such as domestic and fire water should be provided with appropriate coating systems and cathodic protection, where warranted. In addition, all underground pipelines should be electrically isolated from above grade structures, reinforced concrete structures and copper lines in order to avoid potential galvanic corrosion problems.

LIMITATIONS

The conclusions and recommendations contained in this report are based on the information and assumptions referenced herein. All services provided herein were performed by persons who are experienced and skilled in providing these types of services and in accordance with the standards of workmanship in this profession. No other warrantees or guarantees, expressed or implied, is provided.

We thank you for the opportunity to be of service to **Cornerstone Earth Group** on this project and trust that you find the enclosed information satisfactory. If you have any questions, or if we can be of any additional assistance, please feel free to contact us at (925) 927-6630.

Respectfully submitted,

Brendon Hurley
JDH CORROSION CONSULTANTS, INC.
Field Technician

Mohammed Ali., P.E.
JDH Corrosion Consultants, Inc.
Senior Corrosion Engineer

CC: File 2021170

Corrosivity Tests Summary

CORNERSTONE EARTH GROUP

Job Number	1198-2-1	Date Tested	5/11,12/2021
Job Name	Metro Pacific Station	Tested By	BBA, FL
Location	Santa Cruz, CA		

Sample I.D.			Soil Visual Description	Moisture Content %	pH	Temp. at Testing C°	Resistivity (Ohm-cm) Corrected to 15.5 C°		Chloride Dry Wt. mg/kg	Sulfate Dry Wt. mg/kg
Boring	Sample No.	Depth, ft.					As Received	Saturated		
				ASTM D2216	ASTM G51		G57	ASTM G57	ASTM D4327	ASTM D4327
EB-1	3A	5.5	Dark Gray Sandy Lean Clay (CL) [Fill]	20.7	7.1	23.7	-	2,579	54	112
EB-2	1B	1.5	Gray Brown Sandy Silt with Gravel (ML) [Fill]	28.7	6.2	24.4	-	1,381	34	332
EB-2	4B	7.5	Dark Gray Sandy Lean Clay (CL) [Fill]	30.7	6.8	25.0	-	1,634	31	237

CORNERSTONE EARTH GROUP

APPENDIX D: SITE SPECIFIC RESPONSE ANALYSIS AND NON-LINEAR EFFECTIVE STRESS LIQUEFACTION ANALYSIS

Robert Pyke, Consulting Engineer

May 24, 2021

Stephen Olsen P.E / John Dye P.E., G.E.
Cornerstone Earth Group, Inc.
1259 Oakmead Parkway
Sunnyvale, California 94085

Re: 920 Pacific Avenue
Santa Cruz, California
Earthquake Ground Motions, Liquefaction and Settlement

Dear Stephen / John,

At your request I have conducted evaluations of the potential for earthquake-induced liquefaction and settlement of this site using nonlinear effective stress site response analyses. Results are shown for the existing free-field conditions and for future conditions assuming ground improvement to a depth of about 25 feet.

The site is located in Santa Cruz with representative co-ordinates being latitude 36.9708 and longitude -122.0247. The site lies in an area of active seismicity with numerous active faults, but the seismic hazard is dominated by the real possibility of an earthquake with a magnitude up to 7.8 on the San Andreas fault at a distance of 18.2 km.

The location of various borings and CPT soundings and the subsurface conditions at the site are described in more detail in your companion geotechnical report. Bedrock was not encountered by your borings and CPT soundings performed within the building footprints, however based on available geologic maps we have estimated that the depth to Tertiary mudstone is in the order of 150 feet. Based on data reported by Geovision (2018), I have assumed a shear wave velocity of 2500 ft/sec or 760 m/sec for the mudstone, which happens to be the boundary between Site Classes C and B.

Measured shear wave velocities are available from three SCPT soundings as shown in Figure 1.

1310 Alma Avenue, No. 201, Walnut Creek, CA 94596
Telephone 925.323.7338 E-mail bobpyke@attglobal.net

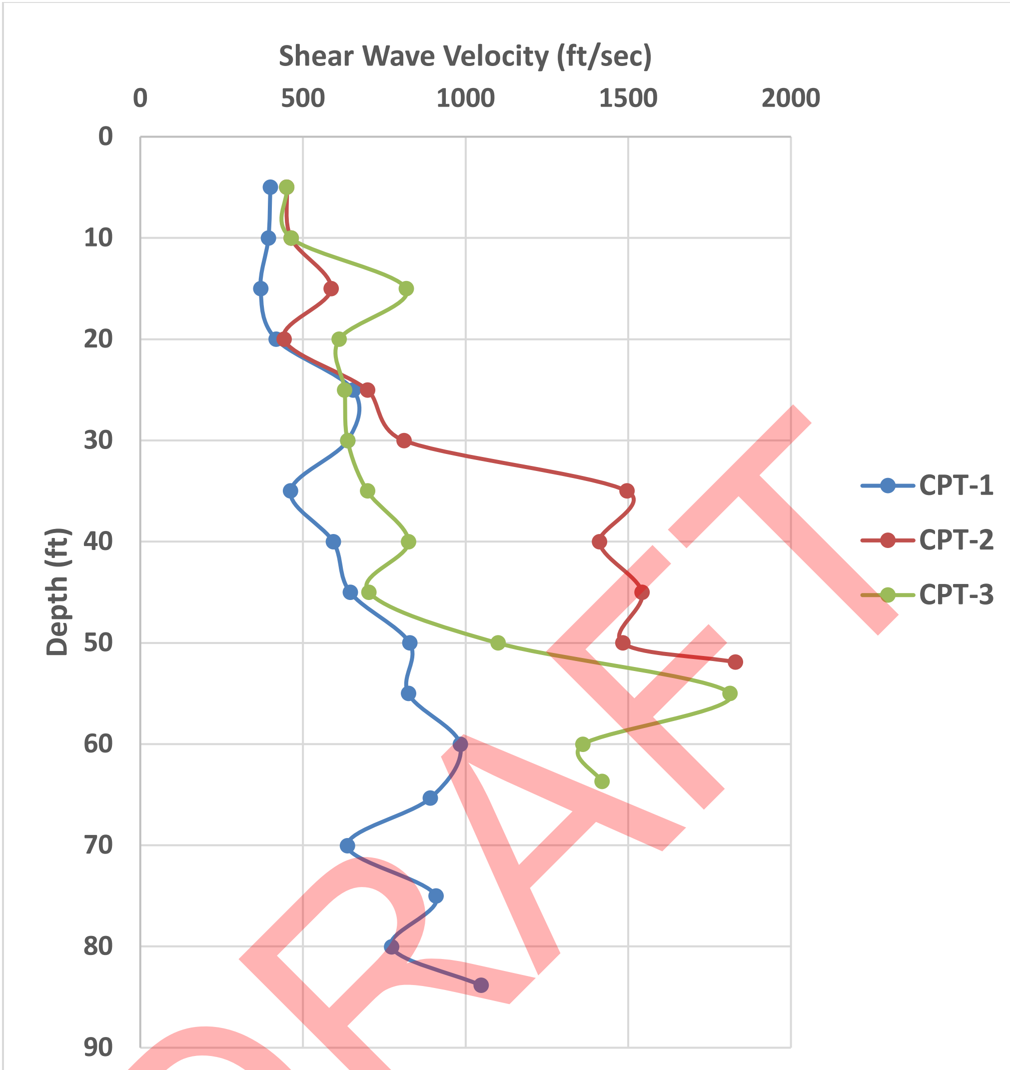


Figure 1 – Shear Wave Velocity Profiles

The weighted average shear wave velocity over the top 30 meters, or 100 feet, V_{s30}, places the site in Site Class D according to ASCE 7-16 and the 2019 CBC, except that because of the potential for liquefaction the site might be classified as Site Class F. In any case a site-specific seismic hazard analysis and / or a site-specific site response analysis is required to determine the longer period ground motions for use in design. On the basis of previous experience which has shown that site-specific hazard analyses for Site Class D sites in the Bay Area tend to be conservative – because of the variability of such sites the standard deviation based on data recorded in similar tectonic regions worldwide is quite large the hazard analysis results, whether governed by probabilistic or deterministic criteria, tend to be conservative – I have conducted nonlinear effective stress site response analyses which take into account the particular soil conditions at this site, rather than using ground motion data averaged over the entire site class.

Earthquake Input Motions

In order to conduct site response analyses, I have developed a target response spectrum and matching acceleration histories in the Tertiary mudstone. Figure 2 shows risk-adjusted, maximum direction response spectra for this location and the Site Class B/C boundary determined using both probabilistic and deterministic approaches. The probabilistic spectrum was obtained using the USGS web site https://earthquake.usgs.gov/hazards/interactive/ (detailed results are provided in Appendix A) and the deterministic spectrum was obtained using the predominant source and magnitude, a magnitude 7.8 earthquake on the San Andreas fault at a distance of 18.2 km, obtained from the de-aggregation of seismic hazard on that web site and equal weighting of four of the five ground motion prediction equations (GMPEs) (excluding that of Idriss) using the NGAWest2 spreadsheet which is downloadable from https://peer.berkeley.edu/peer-nga-west2-research-program-releases-excel-file-five-horizontal-ground-motion-prediction. The risk adjustment factors were obtained from the SEA/OSHPD web site https://seismicmaps.org/ and the adjustment to "maximum direction" spectra was made using the factors suggested by Shahi and Baker (2014). As expected, the deterministic spectrum falls below the probabilistic spectrum and therefore governs. The deterministic spectrum for Site Class B is also shown for comparison.

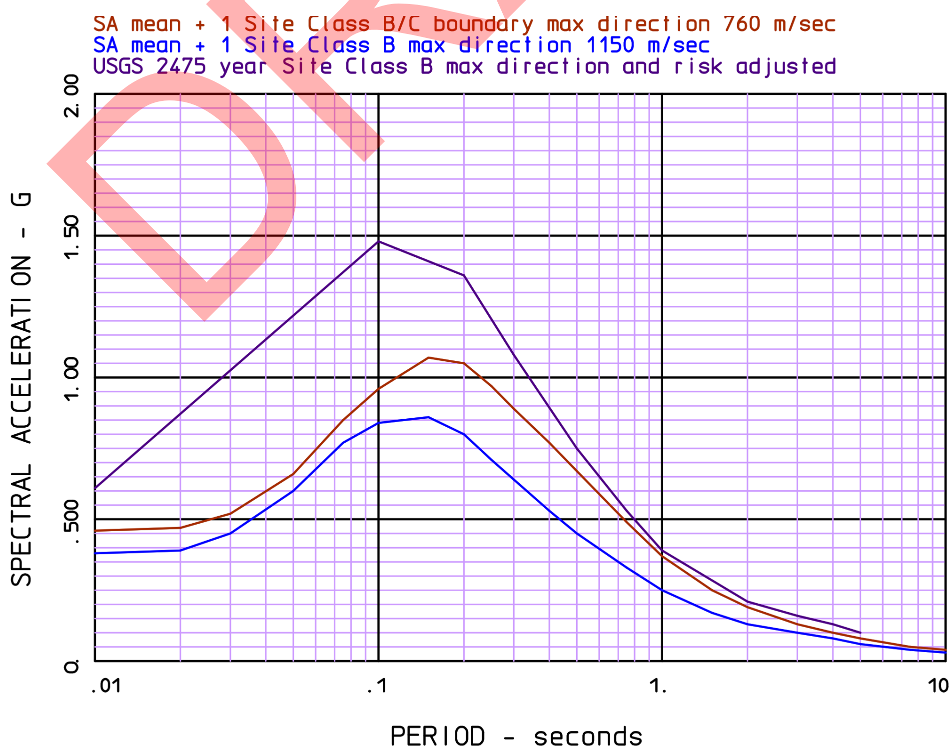


Figure 2 – ASCE 7-16 Site Class B Response Spectra

The target spectrum for matching acceleration histories that is shown subsequently in Figure 3 is slightly different from the deterministic spectrum shown in Figure 2 because the analysis is carried out with mean values rather than artificial "maximum rotated" values. But the target spectrum was then increased by 10 percent in accord with Section 16.2.3.3 of ASCE 7-16 because I used spectral matching rather than scaling.

ASCE 7-16 requires the use of a minimum of five input motions for site response analyses, and, while it is not clear whether this means five single components or five pairs of components, for good measure I have used both horizontal components of each of five records that were generated by strike slip earthquakes such as may be expected on the San Andreas fault and two records from the Loma Prieta earthquake, which was a thrust event, as listed in Table 1.

I then modified the recorded motions so that they matched the target spectrum using the frequency domain program TINKER. The matches obtained to the target spectrum are shown in Figure 3. Plots of the individual time histories before and after matching have been saved and can be provided on request.

Table 1 – Selected Earthquake Records

Earthquake	Record Name	Station Name	Year	M_w	R (km)	V_{s30} (m/s)
Imperial Valley	IV02	El Centro 9	1940	6.95	6.09	213.4
Imperial Valley	IVEC4	El Centro 4	1979	6.53	7.05	208.9
Landers	JOS	Joshua Tree	1992	7.28	11.03	379.3
Kobe	NIS	Nishi-Akashi	1995	6.90	7.08	609.0
Kocaeli	YAR	Yarimca	1999	7.51	4.83	297.0
Loma Prieta	UC2	UCSC	1989	6.93	18.51	713.59
Loma Prieta	LOB	UCSC Lick Obs	1989	6.93	18.41	713.59

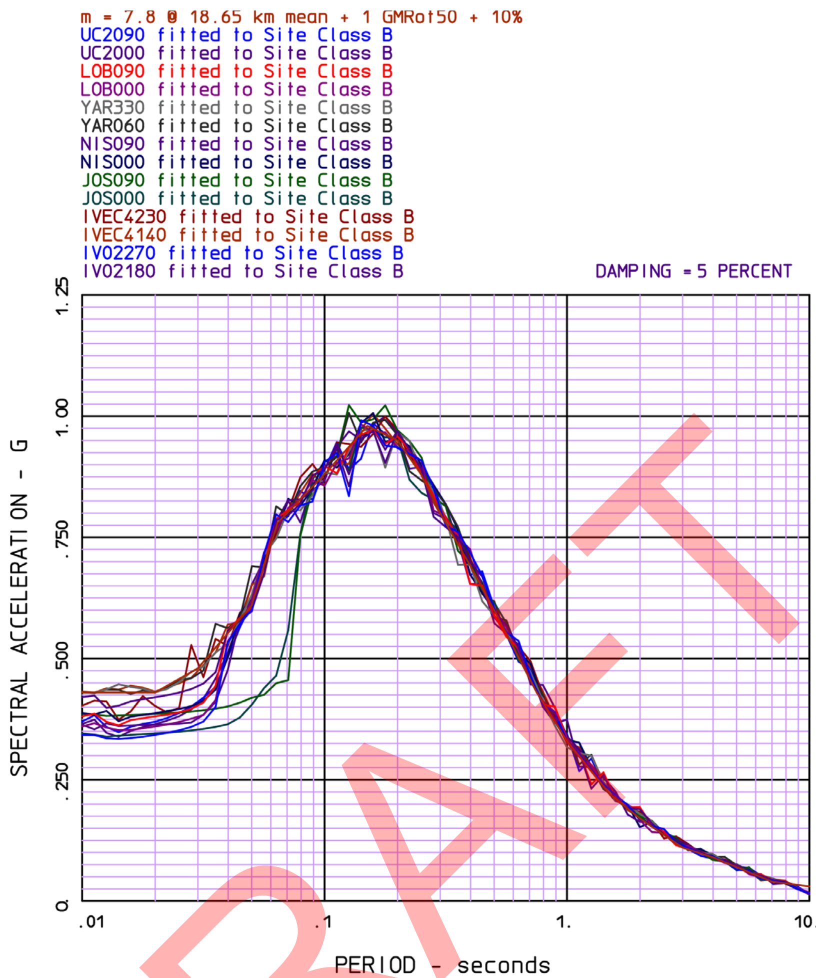


Figure 3 – Fit to Target Response Spectrum

Nonlinear Effective Stress Analyses

The first formal analyses of the potential for earthquake-induced liquefaction were developed at the University of California, Berkeley, in the late nineteen sixties. These analyses involved conducting "equivalent linear" site response analyses, extracting the histories of shear stresses in relevant layers, and comparing those shear stress histories with laboratory data obtained, usually, from cyclic triaxial tests. In spite of containing a number of simplifications and hence approximations, at that time very few engineers could conduct such analyses and so simplified methods of analysis, which worked backwards from the estimated peak ground surface acceleration, were developed, first for just the occurrence of liquefaction, and subsequently for seismic settlement and lateral spreading.

However, in recent years there has been growing recognition that simplified methods for evaluating the potential for liquefaction and hence settlement and lateral spreading due to earthquakes can be excessively conservative. This is particularly true of methods based on

CPT penetration resistance which tend to add additional conservatism. The reasons for this excessive conservatism have not been well or widely understood, and until very recently there has been no practical alternative to using these simplified methods. However, now Pyke (2015), Boulanger et al. (2016), Pyke (2019a), Pyke and North (2019) and Crawford et al. (2019), my presentation on estimating lateral spreading displacements, Pyke (2019b), and my technical note on estimating seismic settlements, Pyke (2020a),and have spelled out the reasons that simplified analyses of liquefaction, settlement and lateral spreading are generally quite conservative.

These publications provide several examples including a case history involving Lum Elementary School in Alameda CA, in which excessive conservatism led to particularly adverse social impacts. Pyke (2019 (a)) and Pyke and North (2019) also describe an improved method for evaluating liquefaction and settlement which uses bi-directional, nonlinear effective stress site response analyses as embodied in the computer program TESS2. The estimates of settlement made by TESS2 are based on data from Pyke (1973) but site-specific data can be substituted if it is available or acquired. Pyke (2019 (b)), also describes how TESS2 can be used to make improved estimates of lateral spreading. These improved analyses are consistent with an emerging consensus, see for example Ntritsos et al. (2018), Cubrinovski (2019), Hutabarat and Bray (2019), Kramer (2019) and Olson et al. (2020), that nonlinear effective stress site response analyses are necessary to understand case histories of liquefaction, let alone to make forward predictions. They also provide the most accurate method for conducting site-specific seismic hazard and/or site response analyses such as are generally required for Site Classes D, E and F under ASCE 7-16 and the 2019 CBC.

Evaluation of the Potential for Liquefaction

Any evaluation of the potential for liquefaction, and hence seismic settlement and lateral spreading, should start not with analysis of any kind but by asking the question: “is there any record of liquefaction of similar soils in a similar tectonic environment? See Pyke (1995, 2003, 2015) and Semple (2013). For the Santa Cruz site the short answer is “maybe” with respect to the sands found at some locations in EB-1 and EB-2, but in order to make an appropriate judgement regarding the amount of excess pore pressure development that is included in the TESS2 analyses, the following factors were considered.

<u>Clay content</u>. The boring logs for EB-1 and EB-2 do not show clayey materials below the surficial fill layer but there is some indication from the CPTs and in data from adjacent sites that there may be lenses of more clayey material. It is not practical to define the horizontal limits of this material but its possible existence on the site should be taken into account in monitoring ground improvement as it should not be expected to show a positive response to normal ground improvement techniques.

SPT blowcounts. The SPT blowcounts recorded in EB-1 and EB-3 corrected for hammer energy and normalized for overburden pressure as recommended by Boulanger and Idriss (2014) are shown in Figure 4 as a function of the parameter Ic, which is an indictor of fines content, measured in the companion cone sounding. The correction of the measured blowcounts to obtain these numbers is shown in the table in Appendix B. The corrected blowcounts for EB-1 are shown by blue dots and those for EB-2 are shown by red dots. It may be seen that the corrected blowcounts measured in the more recent alluvium are in the order of 15-25. The occasional higher values likely result from the presence of gravel.

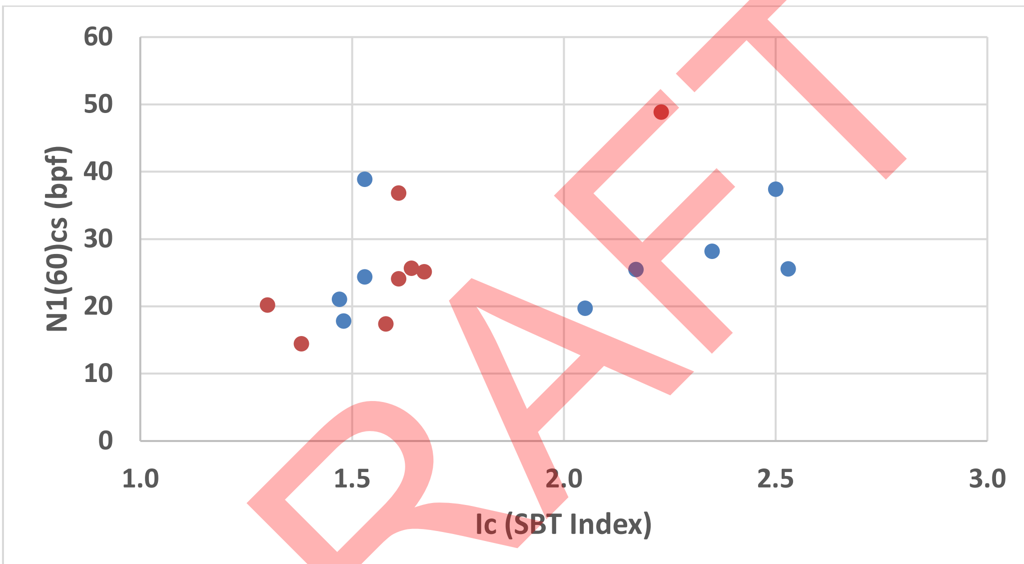


Figure 4 – Normalized SPT Blowcounts v Fines Content EB-1 and EB-2

SPT Blowcounts Interpreted from CPT. Robertson and Wride (1998) and Robertson and Shao (2010) provide procedures for normalizing cone tip resistance for overburden pressure and for converting the cone tip resistance to an SPT blowcount. Robertson and Wride (1998) also suggested a fines correction in terms of I_c, the soil behavior type index. They actually provided a range for the conversion factor, K_c, but the average of that range has been used both in correcting the SPT data shown in Figure 4 and the CPT data shown in Figures 5 and 6. Only CPT data in the depth range from 11 to 27 feet is shown in Figures 5 and 6. It may be seen that the interpreted SPT blowcounts obtained from the CPT tip resistance are slightly higher than the normalized and corrected SPT blowcounts and the greatest weight should be given to the SPT values.

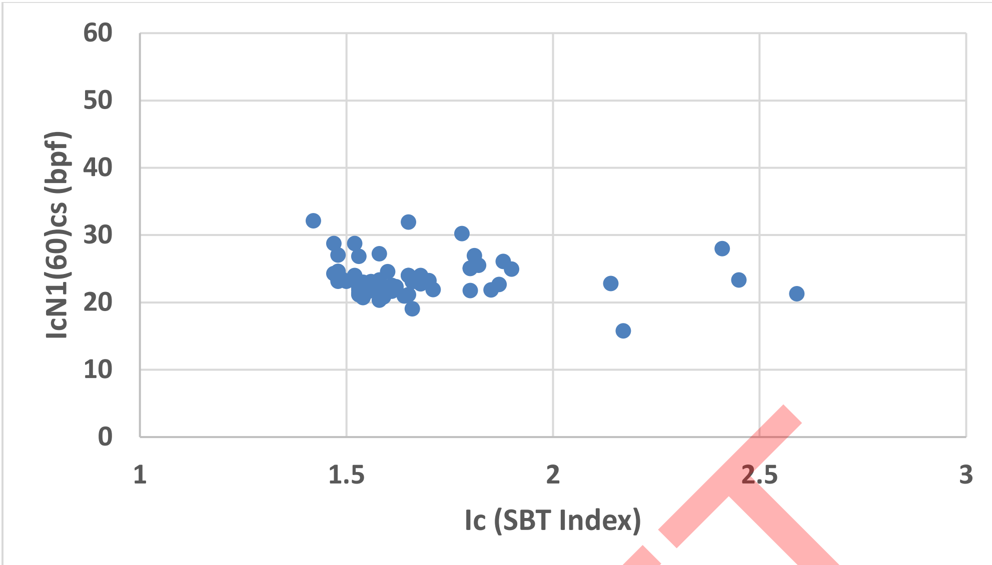


Figure 5 – SPT Blowcounts Interpreted from CPT-1

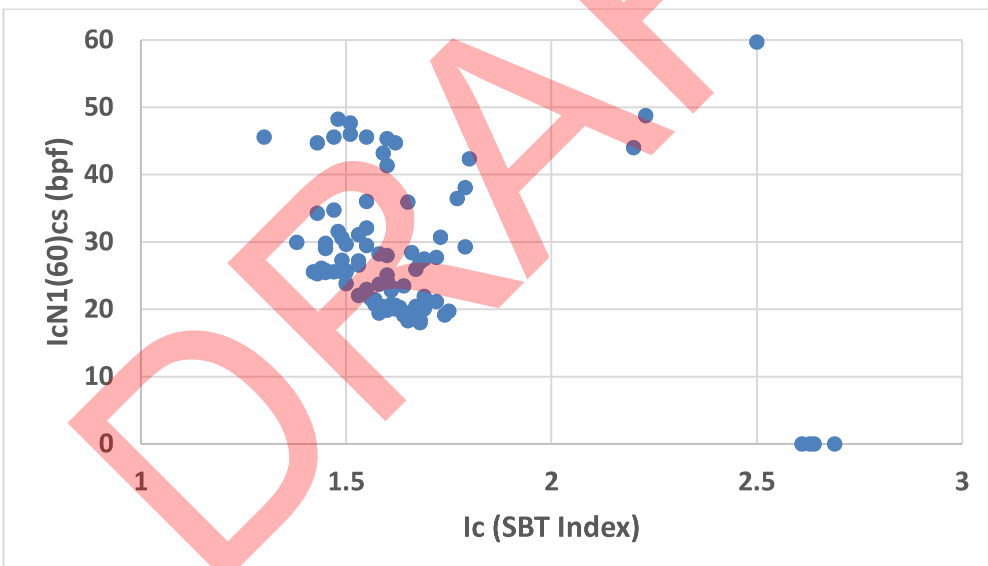


Figure 6 – SPT Blowcounts Interpreted from CPT-3

Measured shear wave velocities. Multiple publications starting with Andrus and Stokoe (2000) indicate that the occurrence of liquefaction in sands with a shear wave velocity of greater than about 700 ft/sec is unlikely. The three shear wave velocities measured in the most recent alluvium below a depth of 20 feet, when normalized for overburden pressure, are generally in the order of 500-600 fps, so this stratum is indicated to be at least moderately susceptible to liquefaction and seismic settlement. The measurements in the alluvium deeper than about 20 feet are generally in the order of 600-700 fps, indicating that while some excess pore pressure development in this stratum is possible, complete liquefaction and large seismic settlements are less likely.

<u>Choice of Input parameters to TESS2</u>. The magnitude of the excess pore pressures that are developed in TESS2 are controlled by specifying values of tau/sigma, the cyclic stress ratio causing liquefaction in 10 cycles assuming uniform cycles of loading such as are applied in laboratory tests. Values of this ratio for use in the analyses were selected using the above data and Figure 6.2 in Boulanger and Idriss (2014).

TESS2 Analyses and Results

I conducted site response analyses using the new nonlinear site response analysis program TESS2. TESS2 employs the same explicit finite difference solution of the one-dimension wave propagation problem and the same HDCP soil model as were used in the earlier program TESS (Pyke, 1979, 1993, 2004). TESS has been verified and validated in a number of studies including Kwok et al. (2007) and Stewart et al. (2008). Various issues involved in the conduct of nonlinear site response analyses are discussed in Pyke (2020b).

In conventional "equivalent linear" analyses of site response it is necessary to specify the shear wave velocity, or the shear modulus at small strains, G_{max}, for each layer along with a "modulus reduction curve", and a modulus reduction curve of this kind can also be used as the "backbone" curve for constructing simple nonlinear models of shear stress – shear strain behavior. Pyke et al. (1993) constructed a consistent family of shear modulus reduction curves in terms of the reference strain, which is equal to τ_{max}, the asymptotic value of the shear stress at large strains, divided by G_{max}, the shear modulus at small strains. The value of τ_{max} may be much greater than the conventional shear strength under monotonic loading as a result of both cyclic and rate of loading effects. For a plain hyperbola the reference strain is equal to the shear strain at which G/G_{max} equals 0.5. Typical modulus reduction curves in terms of reference strain are shown in Figure 7.

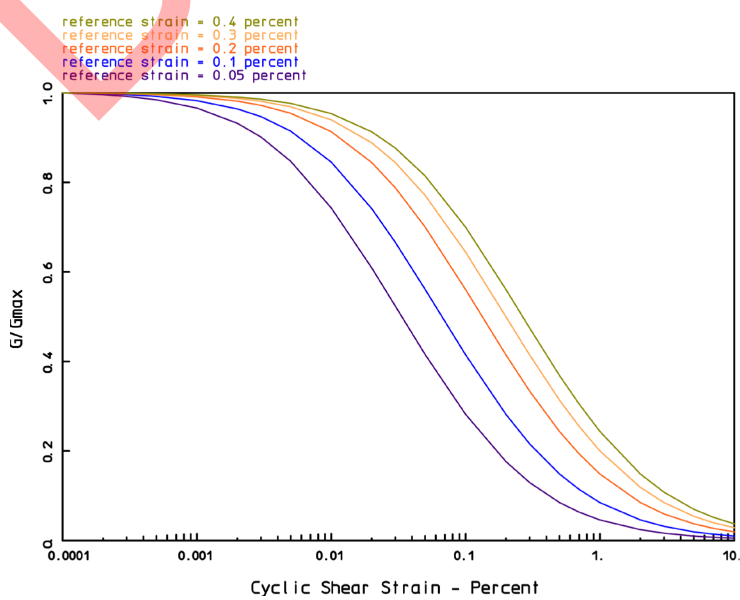


Figure 7 – Modulus Reduction Curves as a Function of Reference Strain

The modulus reduction curve for a reference strain of 0.1 percent closely matched the upper bound of the modulus reduction curves for sands given by Seed and Idriss (1971) which is widely accepted as a good representation of the modulus reduction curve for relatively young, clean sands. Clayey soils exhibit less nonlinearity than sands and have modulus reduction curves with larger reference strains. For instance, young Bay Mud, a silty clay, has a reference strain of about 0.3 percent.

The new program, TESS2, runs two horizontal components of motion simultaneously and, if appropriate, adds the excess pore pressures generated by each component in accordance with the recommendation of Seed et al. (1978). Seismic settlements are computed as described by Pyke (2019a), using data from Pyke (1973) factored as necessary for the particular site conditions.

I have made a number of runs with TESS2 using all seven two-component input motions for a 150 feet deep profile in order to explore the effect on the computed ground surface motions of the soil properties and possible ground improvement to a depth of about 25 feet. These runs were labelled as follows:

eb1 – free-field analysis for EB-1 / CPT-1
eb1i – free-field analysis for improved condition
eb2 – free-field analysis for EB-2 / CPT-3
eb2i – free-field analysis for improved condition

The details of the assumed input parameters and summaries of the results for these runs are shown in the printed outputs from TESS2 that are included in Appendix C. A table showing the maximum responses for each of the input motions precedes the standard printed output from TESS2 for each of the runs.

Plots of surface response spectra are shown in Figures 8-11. The mapped spectra acceleration parameters and the corresponding MCE spectral acceleration parameters for Site Class D at this location were obtained from the SEA/OSHPD web site https://seismicmaps.org/, as shown in Appendix A, and Supplement No.1 to ASCE 7-16, and the code spectrum for Site Class D and a spectrum equal to 80 percent of the code values, the minimum allowed by the current code, are also shown on these figures.

The analyses of the unimproved free-field profiles suggest that the more recent alluvium in EB-1 and EB-2 will come close to liquefying or will liquefy in a major earthquake, but that the older alluvium underlying that layer will not. The estimated seismic settlement of the ground surface is about 1 inch for the EB-1 profile and 3 inches for the EB-2 profile. Note that these results are for the "mean + one standard deviation" earthquake generated by rupture of the San Andreas fault which, very approximately, might occur once in a thousand years. Smaller earthquakes, which might occur more frequently, will have relatively smaller effects.

These free-field analyses were then repeated assuming that the upper 25 feet of the profile is subjected to ground improvement which would both compact the looser sand layers and further stiffen it by the introduction of gravel or cement grout elements. No attempt was made to account for dissipation of excess pore pressures during the earthquake should "stone columns" be installed, but these would further mitigate the development of excess pore pressures and liquefaction and settlement. The maximum computed excess pore pressures for Profile EB-1 dropped from just less than 1.0 to less than 0.1 and the maximum computed excess pore pressures for profile EB-2 dropped from 1.0 to about 0.3. The assumed ground improvement reduces the estimated seismic settlements to about ½ inch for both profiles.

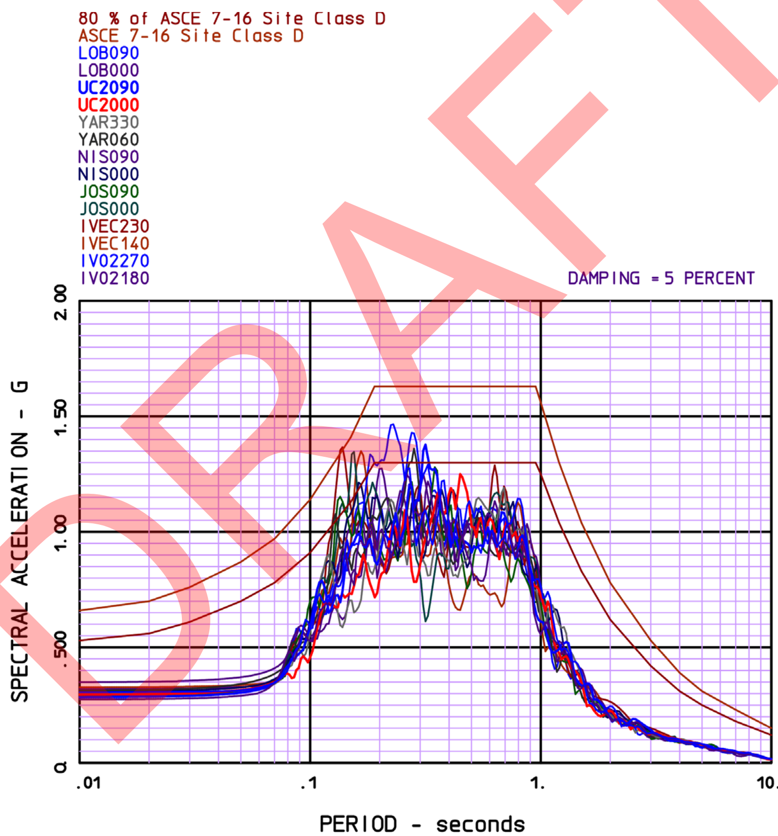


Figure 8 – Free-field Ground Surface Response Spectra for EB-1 / CPT-1

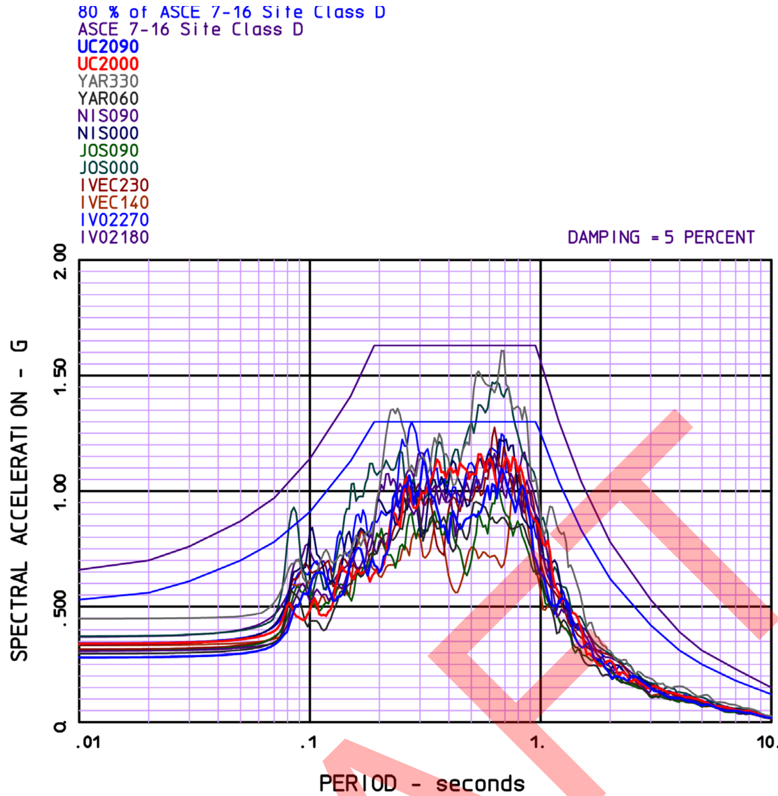


Figure 9 – Free-field Response Spectra after Ground Improvement for EB1 /CPT-1

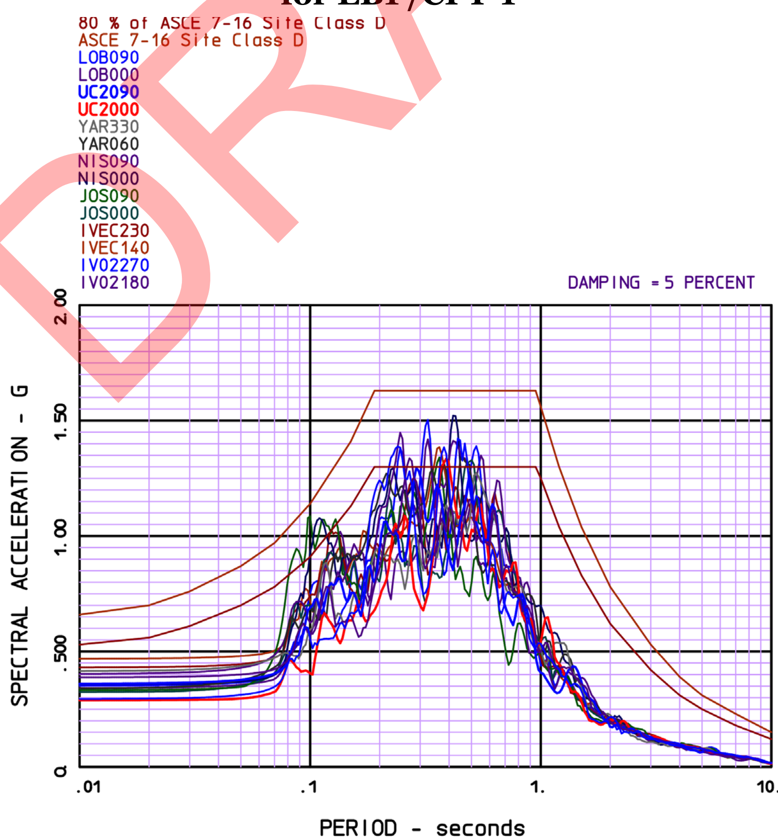


Figure 10 – Free-field Ground Surface Response Spectra for EB-2 / CPT-3

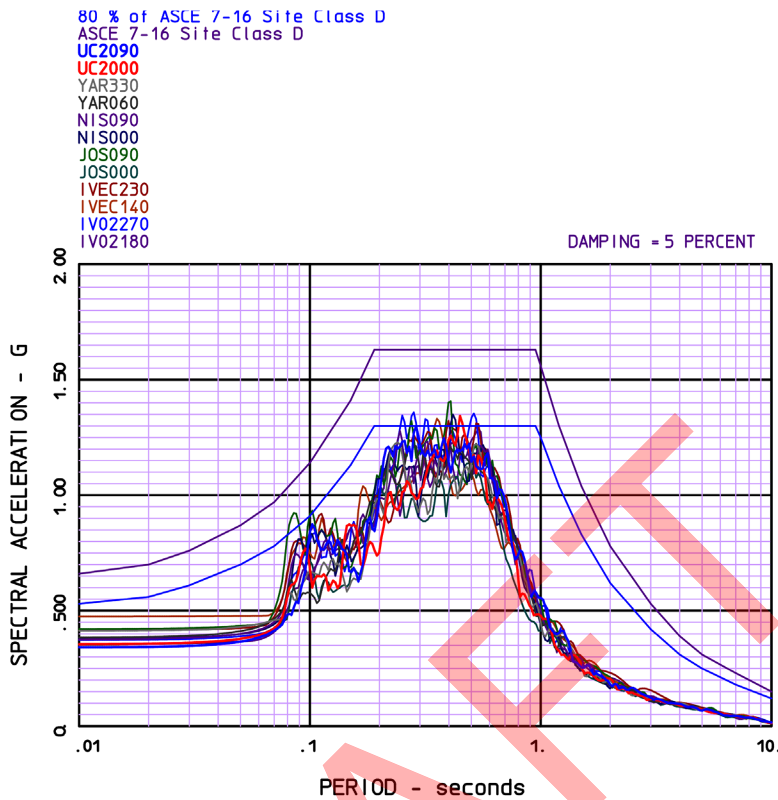
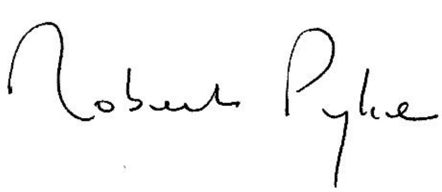


Figure 11 – Free-field Response Spectra after Ground Improvement for EB2 /CPT-3

The spectral accelerations shown in Figures 8-11 are still in "median ground motion space" and should be adjusted to "maximum direction space", but the 1D analyses are likely conservative because there will be greater damping in the natural deposits which are not horizontally bedded. Therefore, these analyses suggest that the proposed building could be safely designed for 80% of the code Site Class D spectrum, as shown in Table 2. The values of S_{MS} and S_{M1} are 1.30 and 1.25 g. S_{DS} and S_{D1} by code are two-thirds of these value or 0.87 and 0.83 g.

I would be happy to address any questions that you or the structural engineer might have.

Sincerely,



Robert Pyke Ph.D, G.E.

Table 2 – Recommended MCE Response Spectrum

PERIOD	Sa
seconds	g
0.01	0.53
0.02	0.56
0.03	0.61
0.05	0.70
0.07	0.78
0.1	0.91
0.15	1.13
0.19	1.30
0.95	1.30
1.0	1.25
1.2	1.04
1.5	0.83
2.0	0.62
3.0	0.42
4.0	0.31
5.0	0.25
7.0	0.18
10.0	0.12

Attachments:

Appendix A – Outputs from SEA/OSHPD and USGS web sites

Appendix B – Normalization of SPT Blowcounts

Appendix B – Input and output from TESS2 analyses

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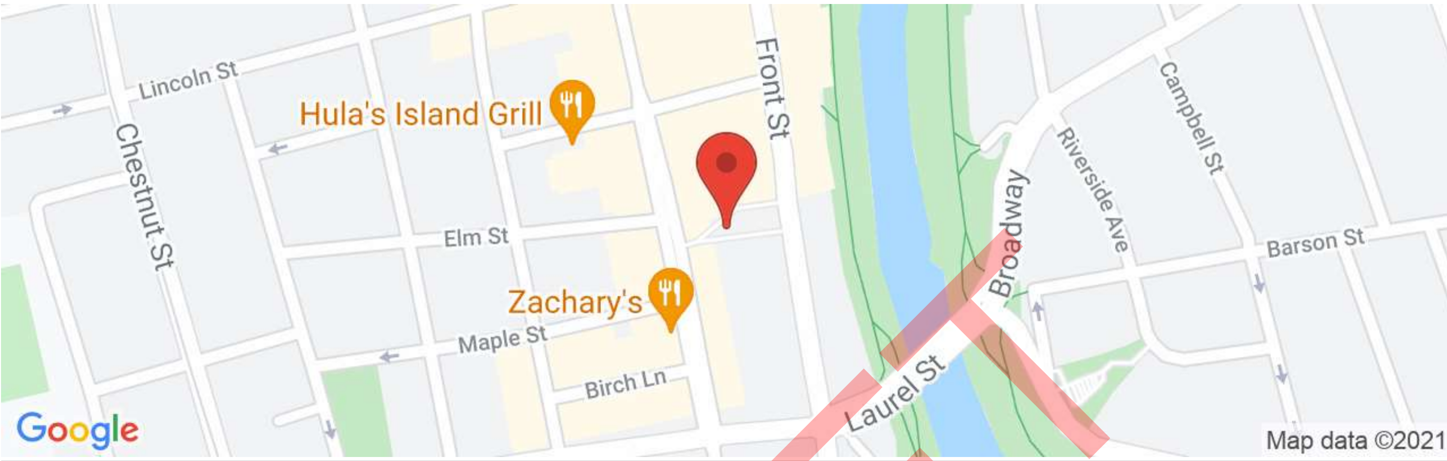
Appendix A

Output from SEA/OSHPD and USGS Hazard Tools

920 Pacific Avenue

Latitude, Longitude: 36.9708, -122.0247



Date	5/20/2021, 7:43:07 AM
Design Code Reference Document	ASCE7-16
Risk Category	II
Site Class	D - Stiff Soil

Type	Value	Description
S_S	1.639	MCE_R ground motion. (for 0.2 second period)
S_1	0.626	MCE_R ground motion. (for 1.0s period)
S_{MS}	1.639	Site-modified spectral acceleration value
S_{M1}	null -See Section 11.4.8	Site-modified spectral acceleration value
S_{DS}	1.093	Numeric seismic design value at 0.2 second SA
S_{D1}	null -See Section 11.4.8	Numeric seismic design value at 1.0 second SA

Type	Value	Description
SDC	null -See Section 11.4.8	Seismic design category
F_a	1	Site amplification factor at 0.2 second
F_v	null -See Section 11.4.8	Site amplification factor at 1.0 second
PGA	0.688	MCE_G peak ground acceleration
F_{PGA}	1.1	Site amplification factor at PGA
PGA_M	0.757	Site modified peak ground acceleration
T_L	12	Long-period transition period in seconds
SsRT	1.639	Probabilistic risk-targeted ground motion. (0.2 second)
SsUH	1.759	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration
SsD	3.025	Factored deterministic acceleration value. (0.2 second)
S1RT	0.626	Probabilistic risk-targeted ground motion. (1.0 second)
S1UH	0.687	Factored uniform-hazard (2% probability of exceedance in 50 years) spectral acceleration.
S1D	1.028	Factored deterministic acceleration value. (1.0 second)
PGAd	1.228	Factored deterministic acceleration value. (Peak Ground Acceleration)
C_{RS}	0.932	Mapped value of the risk coefficient at short periods
C_{R1}	0.912	Mapped value of the risk coefficient at a period of 1 s

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U.S. Geological Survey - Earthquake Hazards Program

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

^ Input

Edition

Dynamic: Conterminous U.S. 2014 (u...

Latitude

Decimal degrees

36.9708

Longitude

Decimal degrees, negative values for western longitudes

-122.0247

Site Class

760 m/s (B/C boundary)

Spectral Period

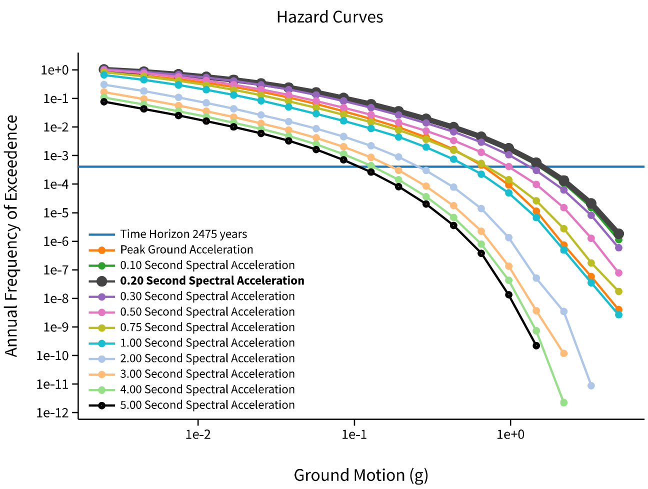
0.20 Second Spectral Acceleration

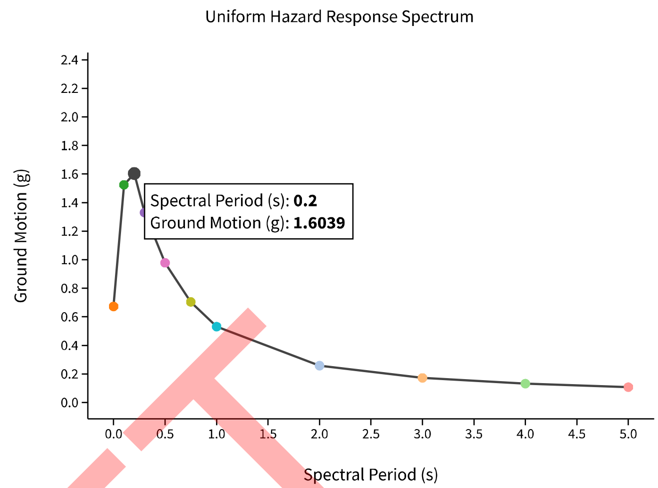
Time Horizon

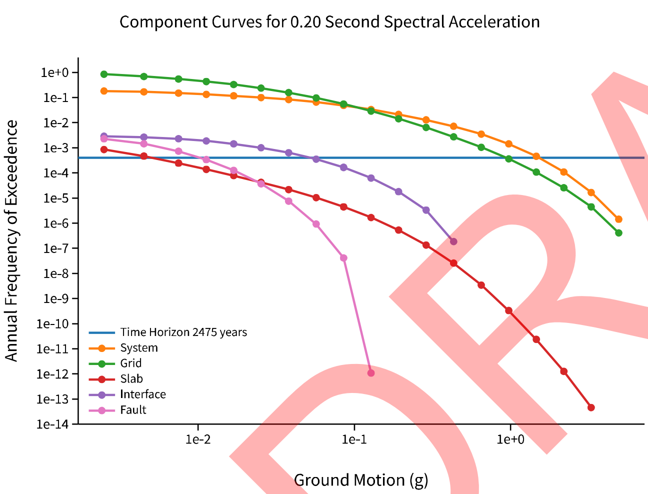
Return period in years

2475

Hazard Curve





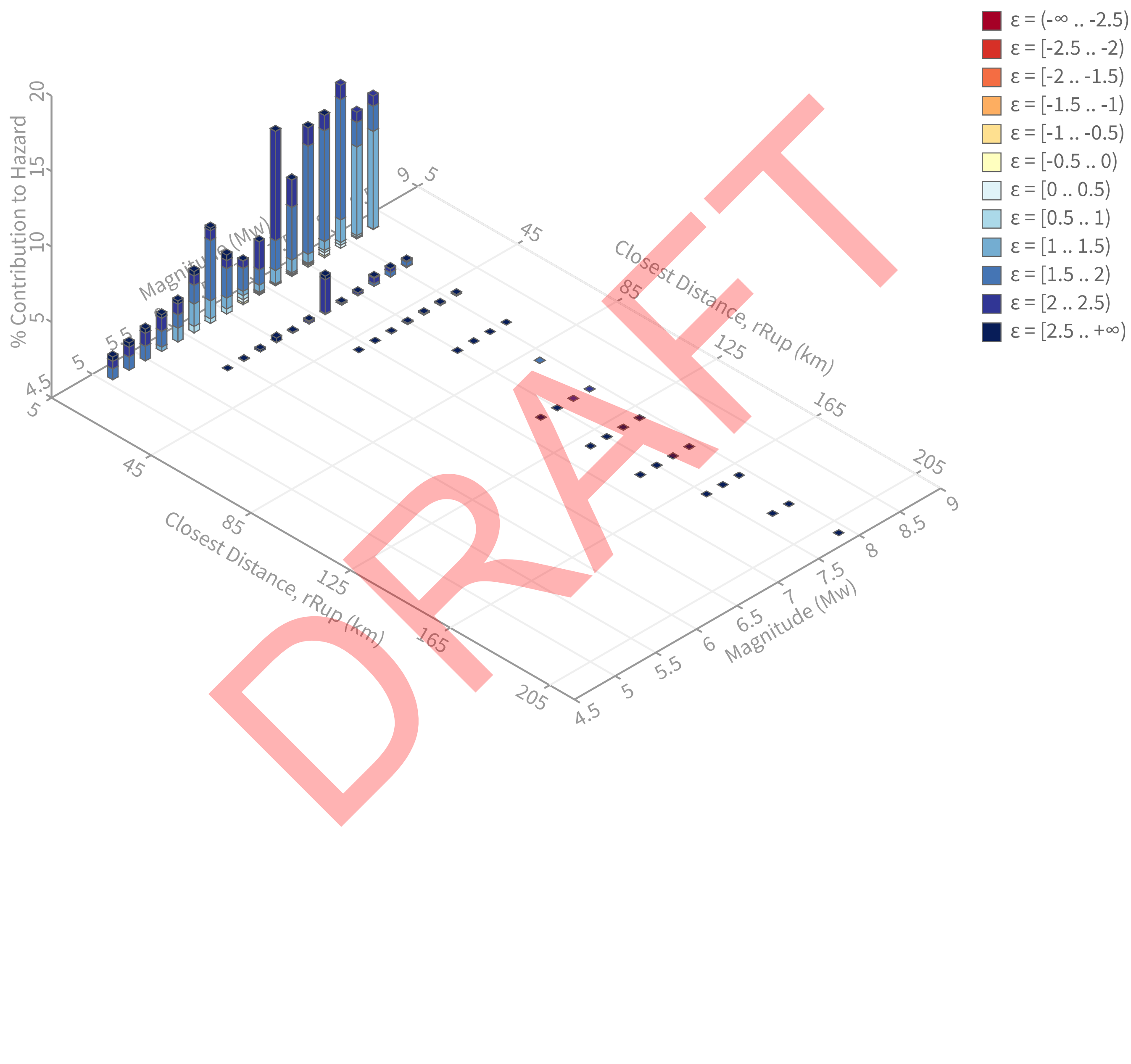


View Raw Data

^ Deaggregation

Component

Total



Summary statistics for, Deaggregation: Total

Deaggregation targets

Return period: 2475 yrs
Exceedance rate: 0.0004040404 yr^{-1}
0.2 s SA ground motion: 1.6038508 g

Recovered targets

Return period: 2927.1246 yrs
Exceedance rate: 0.00034163219 yr^{-1}

Totals

Binned: 100 %
Residual: 0 %
Trace: 0.05 %

Mean (over all sources)

m: 7.19
r: 15.34 km
ε_0: 1.75 σ

Mode (largest m-r bin)

m: 7.88
r: 17.49 km
ε_0: 1.62 σ
Contribution: 10.78 %

Mode (largest m-r-ε_0 bin)

m: 7.87
r: 18.06 km
ε_0: 1.64 σ
Contribution: 7.97 %

Discretization

r: min = 0.0, max = 1000.0, Δ = 20.0 km
m: min = 4.4, max = 9.4, Δ = 0.2
ε: min = -3.0, max = 3.0, Δ = 0.5 σ

Epsilon keys

ε0: [-∞ .. -2.5)
ε1: [-2.5 .. -2.0)
ε2: [-2.0 .. -1.5)
ε3: [-1.5 .. -1.0)
ε4: [-1.0 .. -0.5)
ε5: [-0.5 .. 0.0)
ε6: [0.0 .. 0.5)
ε7: [0.5 .. 1.0)
ε8: [1.0 .. 1.5)
ε9: [1.5 .. 2.0)
ε10: [2.0 .. 2.5)
ε11: [2.5 .. +∞]

Deaggregation Contributors

Source Set ↳ Source	Type	r	m	ε_0	lon	lat	az	%
UC33brAvg_FM31	System							41.86
San Andreas (Santa Cruz Mts) [1]		18.08	7.76	1.73	121.893°W	37.099°N	39.49	20.68
San Gregorio (North) [21]		16.91	7.55	1.82	122.202°W	36.915°N	248.37	5.18
Monterey Bay-Tularcitos [12]		10.28	6.73	1.67	122.115°W	36.915°N	232.31	3.98
Zayante-Vergeles [3]		6.82	7.47	0.23	121.948°W	37.054°N	36.55	1.79
San Andreas (Santa Cruz Mts) [2]		18.11	7.12	2.06	121.884°W	37.093°N	42.57	1.76
San Andreas (Santa Cruz Mts) [0]		19.26	7.68	1.87	121.943°W	37.134°N	21.79	1.73
Reliz [2]		9.25	7.14	1.40	122.090°W	36.907°N	219.44	1.70
San Andreas (Santa Cruz Mts) [3]		20.26	7.15	2.15	121.820°W	37.057°N	62.08	1.17
UC33brAvg_FM32	System							38.67
San Andreas (Santa Cruz Mts) [1]		18.08	7.75	1.73	121.893°W	37.099°N	39.49	21.60
San Gregorio (North) [21]		16.91	7.57	1.81	122.202°W	36.915°N	248.37	5.07
Monterey Bay-Tularcitos [12]		10.28	6.61	1.73	122.115°W	36.915°N	232.31	2.47
San Andreas (Santa Cruz Mts) [2]		18.11	7.14	2.06	121.884°W	37.093°N	42.57	1.81
San Andreas (Santa Cruz Mts) [0]		19.26	7.68	1.86	121.943°W	37.134°N	21.79	1.59
Reliz [2]		9.25	7.13	1.41	122.090°W	36.907°N	219.44	1.48
San Andreas (Santa Cruz Mts) [3]		20.26	7.15	2.17	121.820°W	37.057°N	62.08	1.12
UC33brAvg_FM31 (opt)	Grid							11.37
PointSourceFinite: -122.025, 37.002		6.18	5.80	1.44	122.025°W	37.002°N	0.00	2.26
PointSourceFinite: -122.025, 37.002		6.18	5.80	1.44	122.025°W	37.002°N	0.00	2.26
UC33brAvg_FM32 (opt)	Grid							8.09
PointSourceFinite: -122.025, 37.002		6.18	5.68	1.56	122.025°W	37.002°N	0.00	1.64
PointSourceFinite: -122.025, 37.002		6.18	5.68	1.56	122.025°W	37.002°N	0.00	1.64

Appendix B

Corrected N_{160cs} Values

N_{160cs} values are N_{160} values using standard overburden and energy corrections multiplied by average fines corrections from Robertson and Wride (1998) (developed for CPTs) using data from the companion CPTs.

Boring	Sample Depth (ft)	N_{meas} (blows/ft)	C_N	C_{ER}	C_B	C_R	C_S	$(N_1)_{60}$ (blows/ft)	Average I_c from paired CPT	Robertson & Wride K_c (1998)	$N_{1(60)cs}$ (blows/ft)
EB-1	7	12	1.70	0.9	1.00	0.75	0.67	8.7	2.53	2.92	26
EB-1	9	22	1.43	0.9	1.00	0.75	0.67	13.5	2.50	2.77	37
EB-1	11	26	1.29	0.9	1.00	0.75	0.67	14.4	2.05	1.37	20
EB-1	13	26	1.19	0.9	1.00	0.75	0.67	13.3	2.35	2.12	28
EB-1	15	30	1.08	0.9	1.00	0.75	1.26	26.3	2.48	2.67	70
EB-1	17.5	21	1.02	0.9	1.00	0.75	1.16	16.0	2.17	1.60	25
EB-1	19	24	0.99	0.9	1.00	0.75	1.18	17.8	1.48	1.00	18
EB-1	21	60	0.95	0.9	1.00	0.75	0.67	24.4	1.53	1.00	24
EB-1	23	50	0.93	0.9	1.00	0.75	1.30	38.9	1.53	1.00	39
EB-1	25	31	0.88	0.9	1.00	0.75	1.21	21.0	1.47	1.00	21
EB-2	7	18	1.64	0.9	1.00	0.75	0.67	12.6	3.75	-	-
EB-2	9	36	1.36	0.9	1.00	0.75	0.67	21.0	3.3	-	-
EB-2	11	48	1.15	0.9	1.00	0.75	1.30	45.8	2.49	2.72	124
EB-2	13	30	1.14	0.9	1.00	0.75	1.28	28.0	2.23	1.74	49
EB-2	15	24	1.09	0.9	1.00	0.75	1.20	20.2	1.3	1.00	20
EB-2	17	58	1.03	0.9	1.00	0.75	0.67	25.7	1.64	1.00	26
EB-2	19	20	0.98	0.9	1.00	0.75	1.14	14.4	1.38	1.00	14
EB-2	21	32	0.95	0.9	1.00	0.75	1.24	24.1	1.61	1.00	24
EB-2	23	45	0.90	0.9	1.00	0.75	0.67	17.4	1.58	1.00	17
EB-2	25	35	0.88	0.9	1.00	0.75	1.25	24.7	1.67	1.02	25
EB-2	27	50	0.89	0.9	1.00	0.75	1.30	36.8	1.61	1.00	37

Appendix C
Example Outputs
Nonlinear Site Response Analyses

The following pages show the printed output from TESS2 for four runs showing the assumed input parameters and summaries of the results:

eb1 – free-field analysis for EB-1 / CPT-1
eb1i – free-field analysis for improved condition
eb2 – free-field analysis for EB-2 / CPT-3
eb2i – free-field analysis for improved condition

Each printed output is preceded by a summary of the results.

Definitions of key column headings are as follows:

In the INPUT data:

SIGV - vertical effective stress
VS - shear wave velocity
GMAX - shear modulus at low strains
TAUMAX - asymptote of stress-strain curve under rapid, cyclic loading
GAMREF – reference strain - ratio of TAUMAX to shear modulus at low strains

In the OUTPUT:

TAUMAX – is now the peak shear stress during the loading
GAMMAX – is the peak cyclic shear strain
DELTA, DETAG and DETAU – are degradation indices generally used for clayey soils. Unity indicates no degradation.
UMAX – maximum excess pore pressure ratio at any time. Unity indicates initial liquefaction.
UFINAL – excess pore pressure ratio at the end of the specified input motion

EB1 Profile EB1 Free Field

****
MAXIMUM RESPONSE VALUES AT GROUND SURFACE
****

INPUT FILE	INPUT MOTION	INPUT AMAX	SLOPE	COMP	KDIS	AMAX	VMAX	DMAXR	DFINALR	RUMAX	SETTLEMENT
eb1	IV02180.txt	0.36	0.00	1	1	0.32	1.66	0.20	0.06	0.86	0.09
eb1	iv02270.txt	0.37	0.00	2	1	0.29	1.54	0.24	0.24	0.86	0.09
eb1	IVEC4140.txt	0.43	0.00	1	1	0.33	1.35	0.29	-0.10	0.58	0.07
eb1	IVEC4230.txt	0.40	0.00	2	1	0.30	1.86	0.22	0.00	0.58	0.07
eb1	JOS000.txt	0.35	0.00	1	1	0.29	1.94	0.19	-0.12	0.86	0.10
eb1	JOS090.txt	0.39	0.00	2	1	0.29	1.57	0.45	-0.40	0.86	0.10
eb1	NIS000.txt	0.39	0.00	1	1	0.31	1.67	0.19	0.09	0.81	0.08
eb1	NIS090.txt	0.36	0.00	2	1	0.35	1.78	0.29	0.13	0.81	0.08
eb1	YAR060.txt	0.43	0.00	1	1	0.31	1.35	0.14	0.13	0.76	0.07
eb1	YAR330.txt	0.43	0.00	2	1	0.30	1.37	0.31	0.21	0.76	0.07
eb1	UC2000.txt	0.42	0.00	1	1	0.30	1.40	0.19	0.05	0.85	0.09
eb1	UC2090.txt	0.34	0.00	2	1	0.28	1.60	0.26	-0.02	0.85	0.09
eb1	LOB000.txt	0.36	0.00	1	1	0.27	1.63	0.20	-0.05	0.85	0.09
eb1	LOB090.txt	0.38	0.00	2	1	0.31	1.36	0.21	-0.07	0.85	0.09

RUMAX IS MAX RU IN ANY LAYER; SETTLEMENT IS SETTLEMENT OF GROUND SURFACE IN FEET
DFINALR IS GROUND SURFACE FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN GSFRD IF SLOPE IS GREATER THAN ZERO

```
**************************************************
**************************************************

 TESS2 - Version 3.00D
 Copyright 2020 Robert Pyke
 Built by rmp on 08/29/2020
 Using Simply Fortran v. 2.4

**************************************************
**************************************************

INPUT/OUTPUT FILE NAME: eb1


****************************************
920 Pacific Santa Cruz       EB-1
****************************************
Free-field 150-foot profile
****************************************


REDISTRIBUTION AND DISSIPATION OF PORE PRESSURES
IS INCLUDED!


CALCULATION OF SETTLEMENTS IS TURNED ON


UNITS ARE KIPS, FEET AND SECONDS


**********
INPUT DATA
**********

MATERIAL PROPERTY PARAMETERS

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  1          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  2          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  3          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  4          0.02      1.00      0.00       0.00       0.00
```

PARAMETERS FOR SIMPLE DEGRADATION

MTYPE	SS	RS	E	SG	RG	ST	RT
2	0.12	0.65	1.50	0.12	0.65	0.12	0.65

PARAMETERS FOR PORE PRESSURE GENERATION CURVES

LAYER NO.	MTYPE	TAUAV/SIGV	NL	E	F	G
3	3	0.400	10	2.00	0.10	2.00
4	3	0.400	10	2.00	0.10	2.00
5	3	0.400	10	2.00	0.10	2.00
6	4	0.600	10	2.00	0.10	2.00
7	4	0.600	10	2.00	0.10	2.00
8	4	0.600	10	2.00	0.10	2.00
9	4	0.800	10	2.00	0.10	2.00

VALUES FOR CONSOLIDATION PROPERTIES

LAYER NO.	MV	K
2	0.839E-03	0.328E-05
3	0.663E-03	0.328E-04
4	0.253E-03	0.328E-04
5	0.253E-03	0.328E-04
6	0.537E-03	0.328E-04
7	0.537E-03	0.328E-05
8	0.318E-03	0.328E-05
9	0.210E-03	0.328E-05
10	0.166E-03	0.328E-08
11	0.210E-03	0.328E-08
12	0.239E-03	0.328E-08
13	0.149E-03	0.328E-08
14	0.134E-03	0.328E-08
15	0.111E-03	0.328E-08
16	0.932E-04	0.328E-08
17	0.685E-04	0.328E-08
18	0.932E-04	0.328E-08
19	0.596E-04	0.328E-08

PARAMETERS FOR SETTLEMENT CALCULATIONS

LAYER NO.	ARD	FACTOR
3	60	0.33
4	70	0.50
5	70	0.50
6	70	0.33
7	70	0.33

8	75	0.33
9	80	0.33

PARAMETERS FOR HARDENING OF SHEAR MODULUS

MAT.TYPE	KHARD	FHARD	FHARDS
3	1	1.00	0.50
4	1	1.00	0.50

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
LAYER DATA
****

DEPTH TO WATER TABLE = 6.00
TRAVEL TIMES ARE RELATIVE TO A TIMESTEP OF 0.0050 SECONDS

LAYER NO.	MTYPE	THICK	UNIT WT	OCR	KO	SIGV	VS	GMAX	TAUMAX	GAMREF	TTR
1	1	7.00	0.125			0.44	600.00	1397.52	1.677	0.120	0.429
2	1	4.00	0.120			0.93	400.00	596.27	0.894	0.150	0.500
3	3	6.00	0.120	1.00	0.50	1.22	450.00	754.66	0.906	0.120	0.375
4	3	5.00	0.130	1.00	0.50	1.56	700.00	1978.26	2.374	0.120	0.700
5	3	5.00	0.130	1.00	0.50	1.90	700.00	1978.26	2.374	0.120	0.700
6	4	5.00	0.120	1.00	0.80	2.21	500.00	931.68	1.398	0.150	0.500
7	4	5.00	0.120	1.00	0.80	2.50	500.00	931.68	1.398	0.150	0.500
8	4	8.00	0.120	1.00	0.80	2.87	650.00	1574.53	2.362	0.150	0.406
9	4	5.00	0.120	1.00	0.80	3.25	800.00	2385.09	3.578	0.150	0.800
10	1	10.00	0.120			3.68	900.00	3018.63	3.622	0.120	0.450
11	1	10.00	0.120			4.25	800.00	2385.09	2.862	0.120	0.400
12	1	10.00	0.120			4.83	750.00	2096.27	4.193	0.200	0.375
13	1	10.00	0.120			5.41	950.00	3363.35	6.727	0.200	0.475
14	1	10.00	0.120			5.98	1000.00	3726.71	7.453	0.200	0.500
15	1	10.00	0.120			6.56	1100.00	4509.32	9.019	0.200	0.550
16	1	10.00	0.120			7.13	1200.00	5366.46	10.733	0.200	0.600
17	1	10.00	0.120			7.71	1400.00	7304.35	14.609	0.200	0.700
18	1	10.00	0.120			8.29	1200.00	5366.46	10.733	0.200	0.600
19	1	10.00	0.120			8.86	1500.00	8385.09	16.770	0.200	0.750

SHEAR WAVE VELOCITY IN BASE = 2500.
UNIT WEIGHT OF BASE = 0.130

BASE IS IMPERMEABLE

```
*************************************************************
  OUTPUT FOR IV02180
  WITH A PEAK ACCELERATION OF  0.36 G
  AND SLOPE = 0.00
*************************************************************

********************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
********************************************************
```

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.320	1.657	0.205	25.776	0.057	0.140	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.302	1.637	0.205	25.771	0.058	0.342	0.103	1.000	1.000	1.000	0.197	0.197	0.000	9.00
3	11.00	0.269	1.556	0.203	25.771	0.058	0.504	0.555	1.000	1.000	1.000	0.858	0.788	0.042	14.00
4	17.00	0.309	1.405	0.153	12.063	0.040	0.661	0.068	1.000	1.000	1.000	0.666	0.574	0.005	19.50
5	22.00	0.312	1.397	0.149	12.063	0.038	0.776	0.078	1.000	1.000	1.000	0.463	0.402	0.005	24.50
6	27.00	0.311	1.375	0.143	12.058	0.035	0.909	0.301	1.000	1.000	1.000	0.272	0.272	0.013	29.50
7	32.00	0.336	1.311	0.154	12.053	0.059	1.028	0.433	1.000	1.000	1.000	0.085	0.085	0.014	34.50
8	37.00	0.346	1.249	0.160	12.033	0.069	1.169	0.145	1.000	1.000	1.000	0.046	0.046	0.010	41.00
9	45.00	0.289	1.172	0.144	12.023	0.062	1.314	0.071	1.000	1.000	1.000	0.011	0.011	0.005	47.50
10	50.00	0.288	1.142	0.141	12.023	0.063	1.496	0.100	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.254	1.085	0.129	12.013	0.060	1.677	0.216	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.387	1.006	0.079	11.978	0.029	1.798	0.185	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.345	0.944	0.051	11.958	0.017	1.976	0.091	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.322	0.958	0.040	11.948	0.012	2.199	0.081	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.323	0.967	0.030	11.938	0.009	2.514	0.068	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.286	0.969	0.023	11.928	0.007	2.661	0.059	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.310	0.969	0.014	11.923	0.004	2.833	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.288	0.967	0.010	5.403	0.002	3.018	0.069	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.280	0.961	0.004	2.218	0.000	3.074	0.039	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.257	0.950	0.495						GROUND SURFACE SETTLEMENT				0.094	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

```
*************************************************************
  OUTPUT FOR IV02270
  WITH A PEAK ACCELERATION OF  0.37 G
  AND SLOPE = 0.00
*************************************************************

********************************************************
```

MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.290	1.542	0.244	36.756	0.236	0.127	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.278	1.517	0.244	36.756	0.236	0.306	0.091	1.000	1.000	1.000	0.197	0.197	0.000	9.00
3	11.00	0.290	1.443	0.244	36.756	0.236	0.456	1.167	1.000	1.000	1.000	0.858	0.788	0.042	14.00
4	17.00	0.319	1.429	0.191	5.753	0.119	0.643	0.077	1.000	1.000	1.000	0.666	0.574	0.005	19.50
5	22.00	0.346	1.408	0.188	5.753	0.115	0.808	0.090	1.000	1.000	1.000	0.463	0.402	0.005	24.50
6	27.00	0.319	1.381	0.185	5.753	0.110	0.932	0.427	1.000	1.000	1.000	0.272	0.272	0.013	29.50
7	32.00	0.314	1.337	0.156	5.738	0.084	1.070	0.597	1.000	1.000	1.000	0.085	0.085	0.014	34.50
8	37.00	0.346	1.342	0.114	5.693	0.066	1.208	0.180	1.000	1.000	1.000	0.046	0.046	0.010	41.00
9	45.00	0.312	1.337	0.093	5.683	0.060	1.366	0.090	1.000	1.000	1.000	0.011	0.011	0.005	47.50
10	50.00	0.285	1.330	0.091	5.678	0.053	1.518	0.105	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.254	1.296	0.077	5.673	0.054	1.717	0.219	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.301	1.215	0.056	11.703	0.035	1.854	0.188	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.337	1.165	0.042	11.688	0.018	1.994	0.095	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.299	1.165	0.034	11.683	0.014	2.122	0.090	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.283	1.157	0.025	11.673	0.008	2.224	0.075	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.278	1.142	0.019	11.668	0.006	2.304	0.061	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.319	1.118	0.014	11.658	0.004	2.375	0.041	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.262	1.101	0.011	11.658	0.004	2.473	0.067	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.283	1.082	0.004	12.233	0.000	2.550	0.038	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.258	1.074	0.757						GROUND SURFACE SETTLEMENT				0.094	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 1
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 2
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 3
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 4

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 5
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 6
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 7

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 2

IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
OUTPUT FOR IVEC4140
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.328	1.347	0.286	5.678	-0.098	0.144	0.011	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.322	1.326	0.285	5.678	-0.098	0.350	0.115	1.000	1.000	1.000	0.133	0.133	0.000	9.00
3	11.00	0.327	1.257	0.280	5.678	-0.099	0.532	0.270	1.000	1.000	1.000	0.577	0.525	0.018	14.00
4	17.00	0.300	1.176	0.262	5.678	-0.092	0.737	0.060	1.000	1.000	1.000	0.543	0.394	0.005	19.50
5	22.00	0.298	1.169	0.258	5.678	-0.092	0.931	0.080	1.000	1.000	1.000	0.412	0.289	0.005	24.50
6	27.00	0.294	1.153	0.253	5.678	-0.092	1.113	0.468	1.000	1.000	1.000	0.208	0.208	0.012	29.50
7	32.00	0.326	1.146	0.220	5.663	-0.082	1.248	0.856	1.000	1.000	1.000	0.077	0.077	0.013	34.50
8	37.00	0.307	1.190	0.170	5.598	-0.049	1.424	0.172	1.000	1.000	1.000	0.046	0.045	0.009	41.00
9	45.00	0.343	1.224	0.154	5.588	-0.039	1.608	0.095	1.000	1.000	1.000	0.011	0.011	0.004	47.50
10	50.00	0.305	1.208	0.149	5.588	-0.038	1.821	0.118	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.275	1.177	0.134	5.583	-0.033	2.062	0.304	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.344	1.144	0.096	5.548	-0.016	2.190	0.229	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.327	1.136	0.068	5.523	-0.010	2.395	0.114	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.325	1.109	0.055	5.508	-0.007	2.602	0.111	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.335	1.054	0.041	5.493	-0.005	2.786	0.090	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.302	1.008	0.031	5.483	-0.003	2.949	0.077	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.291	0.959	0.023	5.478	-0.001	3.112	0.054	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.289	0.910	0.017	5.478	-0.002	3.300	0.092	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.334	0.869	0.006	5.478	-0.001	3.405	0.052	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.322	0.854	0.524						GROUND SURFACE SETTLEMENT				0.066	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR IVEC4230
WITH A PEAK ACCELERATION OF 0.40 G
AND SLOPE = 0.00
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*******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.303	1.855	0.217	5.673	0.000	0.133	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.303	1.813	0.217	5.678	0.001	0.324	0.103	1.000	1.000	1.000	0.133	0.133	0.000	9.00
3	11.00	0.296	1.708	0.212	5.703	-0.002	0.481	0.370	1.000	1.000	1.000	0.577	0.525	0.018	14.00
4	17.00	0.336	1.630	0.200	5.743	-0.013	0.668	0.070	1.000	1.000	1.000	0.543	0.394	0.005	19.50
5	22.00	0.369	1.600	0.199	5.743	-0.014	0.833	0.082	1.000	1.000	1.000	0.412	0.289	0.005	24.50
6	27.00	0.320	1.561	0.196	5.743	-0.016	0.969	0.386	1.000	1.000	1.000	0.208	0.208	0.012	29.50
7	32.00	0.345	1.544	0.171	5.738	-0.027	1.099	0.616	1.000	1.000	1.000	0.077	0.077	0.013	34.50
8	37.00	0.376	1.552	0.129	5.733	-0.033	1.227	0.166	1.000	1.000	1.000	0.046	0.045	0.009	41.00
9	45.00	0.350	1.569	0.115	5.728	-0.027	1.314	0.085	1.000	1.000	1.000	0.011	0.011	0.004	47.50
10	50.00	0.364	1.538	0.110	5.728	-0.028	1.434	0.096	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.312	1.472	0.098	5.723	-0.023	1.581	0.200	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.300	1.442	0.072	5.718	-0.025	1.862	0.189	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.329	1.431	0.051	10.108	-0.020	2.082	0.096	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.294	1.409	0.041	10.103	-0.014	2.324	0.101	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.288	1.400	0.031	10.098	-0.011	2.501	0.081	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.284	1.403	0.023	10.093	-0.005	2.672	0.064	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.308	1.408	0.016	10.088	-0.003	2.790	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.336	1.403	0.013	10.083	-0.003	2.990	0.068	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.357	1.399	0.006	10.078	-0.001	2.999	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.267	1.402	0.854						GROUND SURFACE SETTLEMENT				0.066	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 8
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 9
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 10
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 11

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 12
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 13
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 14

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  NEXT INPUT MOTION
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**********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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***********************************************************
  OUTPUT FOR JOS000
  WITH A PEAK ACCELERATION OF  0.35 G
  AND SLOPE = 0.00
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  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.294	1.941	0.186	27.556	-0.117	0.129	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.294	1.928	0.186	27.556	-0.117	0.322	0.082	1.000	1.000	1.000	0.178	0.178	0.000	9.00
3	11.00	0.292	1.869	0.178	27.556	-0.109	0.479	0.744	1.000	1.000	1.000	0.862	0.823	0.043	14.00
4	17.00	0.344	1.739	0.130	10.458	-0.021	0.661	0.062	1.000	1.000	1.000	0.666	0.605	0.005	19.50
5	22.00	0.320	1.714	0.131	10.458	-0.013	0.786	0.063	1.000	1.000	1.000	0.457	0.414	0.005	24.50
6	27.00	0.352	1.692	0.130	10.463	-0.006	0.923	0.267	1.000	1.000	1.000	0.257	0.257	0.014	29.50
7	32.00	0.392	1.648	0.129	10.468	0.015	1.001	0.280	1.000	1.000	1.000	0.064	0.064	0.014	34.50
8	37.00	0.360	1.596	0.099	10.468	0.003	1.073	0.113	1.000	1.000	1.000	0.032	0.032	0.010	41.00
9	45.00	0.300	1.533	0.094	10.473	0.010	1.159	0.068	1.000	1.000	1.000	0.006	0.006	0.005	47.50
10	50.00	0.308	1.500	0.091	10.468	0.013	1.279	0.074	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.258	1.438	0.082	10.463	0.013	1.539	0.164	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.262	1.348	0.057	10.453	0.008	1.659	0.148	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.276	1.264	0.048	10.928	-0.012	1.706	0.078	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.335	1.259	0.040	10.928	-0.011	1.857	0.076	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.281	1.236	0.036	26.106	-0.014	2.077	0.065	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.287	1.202	0.030	26.101	-0.014	2.277	0.056	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.275	1.177	0.021	26.091	-0.008	2.468	0.041	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.267	1.137	0.015	26.091	-0.006	2.539	0.061	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.309	1.087	0.004	10.918	-0.000	2.642	0.035	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.236	1.080	0.579						GROUND SURFACE SETTLEMENT				0.096	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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***********************************************************
  OUTPUT FOR JOS090
  WITH A PEAK ACCELERATION OF  0.39 G
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AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.289	1.571	0.453	28.556	-0.396	0.127	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.287	1.547	0.453	28.556	-0.396	0.316	0.096	1.000	1.000	1.000	0.178	0.178	0.000	9.00
3	11.00	0.278	1.483	0.449	28.556	-0.394	0.478	1.281	1.000	1.000	1.000	0.862	0.823	0.043	14.00
4	17.00	0.284	1.513	0.351	33.986	-0.313	0.660	0.065	1.000	1.000	1.000	0.666	0.605	0.005	19.50
5	22.00	0.280	1.465	0.348	33.986	-0.311	0.836	0.089	1.000	1.000	1.000	0.457	0.414	0.005	24.50
6	27.00	0.288	1.436	0.342	33.981	-0.306	0.998	0.387	1.000	1.000	1.000	0.257	0.257	0.014	29.50
7	32.00	0.370	1.371	0.301	33.976	-0.266	1.123	0.604	1.000	1.000	1.000	0.064	0.064	0.014	34.50
8	37.00	0.355	1.355	0.231	33.951	-0.196	1.313	0.186	1.000	1.000	1.000	0.032	0.032	0.010	41.00
9	45.00	0.297	1.319	0.206	33.931	-0.173	1.504	0.097	1.000	1.000	1.000	0.006	0.006	0.005	47.50
10	50.00	0.285	1.293	0.198	33.931	-0.166	1.730	0.117	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.264	1.231	0.176	33.921	-0.146	1.972	0.279	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.319	1.158	0.115	33.906	-0.088	2.033	0.201	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.326	1.139	0.065	26.911	-0.044	2.158	0.100	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.297	1.121	0.051	26.906	-0.033	2.310	0.092	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.293	1.121	0.039	26.906	-0.022	2.422	0.073	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.288	1.143	0.027	9.863	-0.013	2.525	0.064	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.283	1.157	0.020	9.853	-0.010	2.642	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.275	1.162	0.014	9.853	-0.007	2.763	0.067	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.280	1.158	0.005	9.853	-0.001	2.844	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.282	1.158	0.551						GROUND SURFACE SETTLEMENT				0.096	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 15
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 16
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 17
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 18

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 19
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 20
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 21

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NEXT INPUT MOTION
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**********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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***********************************************************
  OUTPUT FOR NIS000
  WITH A PEAK ACCELERATION OF  0.39 G
  AND SLOPE = 0.00
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******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.310	1.668	0.188	8.903	0.093	0.136	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.306	1.657	0.188	8.903	0.093	0.329	0.103	1.000	1.000	1.000	0.176	0.176	0.000	9.00
3	11.00	0.291	1.620	0.187	8.903	0.092	0.485	0.483	1.000	1.000	1.000	0.806	0.723	0.028	14.00
4	17.00	0.289	1.394	0.172	8.908	0.041	0.667	0.086	1.000	1.000	1.000	0.764	0.534	0.005	19.50
5	22.00	0.328	1.363	0.172	8.903	0.039	0.783	0.083	1.000	1.000	1.000	0.554	0.380	0.005	24.50
6	27.00	0.382	1.327	0.170	8.908	0.037	0.923	0.351	1.000	1.000	1.000	0.262	0.262	0.013	29.50
7	32.00	0.370	1.233	0.151	8.908	0.030	1.012	0.418	1.000	1.000	1.000	0.072	0.072	0.015	34.50
8	37.00	0.364	1.168	0.117	8.908	0.021	1.139	0.152	1.000	1.000	1.000	0.035	0.035	0.010	41.00
9	45.00	0.364	1.135	0.103	8.908	0.015	1.290	0.087	1.000	1.000	1.000	0.007	0.007	0.004	47.50
10	50.00	0.283	1.122	0.099	8.908	0.013	1.466	0.099	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.258	1.060	0.091	8.903	0.012	1.625	0.224	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.293	0.980	0.065	8.888	0.004	1.754	0.198	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.325	0.959	0.054	12.053	-0.003	1.924	0.092	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.296	0.938	0.050	12.048	-0.009	2.053	0.090	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.286	0.913	0.040	12.043	-0.008	2.164	0.073	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.270	0.877	0.032	12.038	-0.006	2.315	0.060	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.273	0.842	0.023	12.038	-0.004	2.499	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.277	0.829	0.018	12.038	-0.004	2.654	0.069	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.314	0.785	0.006	12.038	-0.002	2.794	0.040	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.247	0.752	0.523						GROUND SURFACE SETTLEMENT				0.081	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR NIS090
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.349	1.783	0.288	14.738	0.129	0.153	0.012	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.341	1.773	0.287	14.738	0.129	0.363	0.126	1.000	1.000	1.000	0.176	0.176	0.000	9.00
3	11.00	0.297	1.735	0.281	14.733	0.125	0.521	0.407	1.000	1.000	1.000	0.806	0.723	0.028	14.00
4	17.00	0.333	1.550	0.212	14.698	0.089	0.640	0.082	1.000	1.000	1.000	0.764	0.534	0.005	19.50
5	22.00	0.336	1.495	0.201	14.703	0.083	0.765	0.091	1.000	1.000	1.000	0.554	0.380	0.005	24.50
6	27.00	0.296	1.475	0.193	14.703	0.078	0.883	0.308	1.000	1.000	1.000	0.262	0.262	0.013	29.50
7	32.00	0.388	1.399	0.155	14.708	0.052	1.021	0.454	1.000	1.000	1.000	0.072	0.072	0.015	34.50
8	37.00	0.357	1.313	0.117	14.713	0.028	1.178	0.146	1.000	1.000	1.000	0.035	0.035	0.010	41.00
9	45.00	0.357	1.259	0.102	14.713	0.024	1.326	0.077	1.000	1.000	1.000	0.007	0.007	0.004	47.50
10	50.00	0.347	1.249	0.098	14.718	0.022	1.483	0.092	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.294	1.214	0.086	14.718	0.019	1.641	0.169	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.260	1.186	0.057	14.708	0.004	1.716	0.156	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.310	1.138	0.044	14.698	0.007	1.791	0.073	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.320	1.116	0.032	14.693	0.002	1.965	0.073	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.317	1.087	0.024	5.088	0.002	2.087	0.063	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.282	1.070	0.018	14.693	0.001	2.187	0.054	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.267	1.046	0.013	5.078	-0.001	2.260	0.038	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.257	1.030	0.009	5.078	-0.001	2.372	0.059	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.315	0.999	0.004	8.318	-0.001	2.471	0.034	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.237	0.991	0.614						GROUND SURFACE SETTLEMENT				0.081	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 22
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 23
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 24
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 25

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 26
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 27
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 28

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

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OUTPUT FOR YAR060
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.313	1.347	0.142	30.020	0.131	0.137	0.011	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.309	1.342	0.142	30.020	0.131	0.339	0.102	1.000	1.000	1.000	0.148	0.148	0.000	9.00
3	11.00	0.280	1.314	0.138	30.015	0.128	0.490	0.465	1.000	1.000	1.000	0.759	0.688	0.023	14.00
4	17.00	0.275	1.255	0.112	16.033	0.059	0.658	0.062	1.000	1.000	1.000	0.689	0.505	0.005	19.50
5	22.00	0.309	1.247	0.111	16.033	0.057	0.830	0.079	1.000	1.000	1.000	0.505	0.353	0.005	24.50
6	27.00	0.284	1.254	0.109	16.028	0.055	0.983	0.278	1.000	1.000	1.000	0.236	0.236	0.012	29.50
7	32.00	0.333	1.276	0.099	16.018	0.039	1.100	0.359	1.000	1.000	1.000	0.073	0.073	0.014	34.50
8	37.00	0.336	1.305	0.091	16.473	0.019	1.244	0.203	1.000	1.000	1.000	0.043	0.042	0.009	41.00
9	45.00	0.301	1.308	0.080	16.458	0.018	1.357	0.098	1.000	1.000	1.000	0.008	0.008	0.004	47.50
10	50.00	0.286	1.309	0.075	16.453	0.018	1.505	0.108	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.297	1.291	0.068	16.438	0.017	1.673	0.221	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.331	1.246	0.055	16.413	0.012	1.731	0.177	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.345	1.208	0.036	16.393	0.015	1.906	0.090	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.331	1.174	0.028	16.378	0.013	2.098	0.081	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.316	1.145	0.021	16.368	0.010	2.236	0.068	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.368	1.115	0.016	13.903	0.007	2.347	0.061	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.307	1.100	0.012	13.898	0.006	2.451	0.042	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.300	1.095	0.008	13.893	0.003	2.562	0.064	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.302	1.092	0.003	16.403	0.001	2.739	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.302	1.082	0.540						GROUND SURFACE SETTLEMENT				0.073	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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**********************************************************
  OUTPUT FOR YAR330
  WITH A PEAK ACCELERATION OF  0.43 G
  AND SLOPE = 0.00
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*****************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.304	1.371	0.312	17.863	0.215	0.133	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.303	1.349	0.311	17.863	0.215	0.334	0.098	1.000	1.000	1.000	0.148	0.148	0.000	9.00
3	11.00	0.291	1.307	0.302	17.863	0.208	0.505	0.464	1.000	1.000	1.000	0.759	0.688	0.023	14.00
4	17.00	0.309	1.278	0.263	17.853	0.199	0.679	0.077	1.000	1.000	1.000	0.689	0.505	0.005	19.50
5	22.00	0.332	1.267	0.255	17.853	0.195	0.841	0.089	1.000	1.000	1.000	0.505	0.353	0.005	24.50
6	27.00	0.395	1.249	0.248	17.853	0.191	1.002	0.505	1.000	1.000	1.000	0.236	0.236	0.012	29.50
7	32.00	0.402	1.206	0.198	17.848	0.149	1.111	0.623	1.000	1.000	1.000	0.073	0.073	0.014	34.50
8	37.00	0.414	1.145	0.127	17.843	0.083	1.205	0.173	1.000	1.000	1.000	0.043	0.042	0.009	41.00
9	45.00	0.311	1.078	0.110	17.843	0.070	1.351	0.088	1.000	1.000	1.000	0.008	0.008	0.004	47.50
10	50.00	0.307	1.052	0.104	17.843	0.066	1.536	0.098	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.286	0.997	0.093	17.843	0.060	1.707	0.211	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.480	0.957	0.061	17.843	0.033	1.861	0.138	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.459	0.925	0.046	17.833	0.026	1.962	0.079	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.357	0.918	0.038	17.828	0.021	2.133	0.079	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.363	0.905	0.033	17.823	0.020	2.293	0.069	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.371	0.891	0.026	17.813	0.017	2.488	0.060	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.359	0.874	0.019	17.808	0.012	2.685	0.042	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.352	0.866	0.014	17.808	0.009	2.909	0.073	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.336	0.849	0.005	17.808	0.003	3.021	0.046	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.315	0.861	0.565						GROUND SURFACE SETTLEMENT				0.073	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 29
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 30
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 31
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 32

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 33
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 34
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 35

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*********************
  NEXT INPUT MOTION
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**********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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***********************************************************
  OUTPUT FOR UC2000
  WITH A PEAK ACCELERATION OF  0.42 G
  AND SLOPE = 0.00
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  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.295	1.397	0.191	9.413	0.049	0.129	0.011	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.288	1.384	0.190	9.413	0.049	0.319	0.086	1.000	1.000	1.000	0.182	0.182	0.000	9.00
3	11.00	0.277	1.335	0.185	9.413	0.048	0.478	0.810	1.000	1.000	1.000	0.846	0.748	0.033	14.00
4	17.00	0.287	1.264	0.164	9.408	0.049	0.646	0.072	1.000	1.000	1.000	0.743	0.547	0.005	19.50
5	22.00	0.301	1.239	0.160	9.408	0.048	0.804	0.075	1.000	1.000	1.000	0.524	0.386	0.005	24.50
6	27.00	0.334	1.232	0.154	9.408	0.044	0.948	0.327	1.000	1.000	1.000	0.263	0.263	0.013	29.50
7	32.00	0.314	1.231	0.131	9.408	0.046	1.049	0.354	1.000	1.000	1.000	0.074	0.074	0.015	34.50
8	37.00	0.315	1.237	0.104	9.408	0.036	1.245	0.132	1.000	1.000	1.000	0.040	0.039	0.010	41.00
9	45.00	0.358	1.210	0.088	9.413	0.033	1.421	0.072	1.000	1.000	1.000	0.009	0.009	0.005	47.50
10	50.00	0.336	1.190	0.083	9.408	0.032	1.647	0.081	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.253	1.177	0.072	10.263	0.028	1.927	0.151	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.280	1.138	0.058	10.258	0.020	2.097	0.162	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.355	1.093	0.045	10.238	0.012	2.193	0.080	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.347	1.069	0.040	10.233	0.012	2.467	0.083	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.337	1.040	0.033	10.228	0.011	2.715	0.072	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.313	1.008	0.026	10.223	0.008	2.949	0.062	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.311	0.979	0.019	10.223	0.007	3.149	0.049	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.286	0.981	0.014	10.218	0.004	3.326	0.074	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.329	0.980	0.005	10.223	0.001	3.489	0.046	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.312	0.976	0.747						GROUND SURFACE SETTLEMENT				0.086	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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***********************************************************
  OUTPUT FOR UC2090
  WITH A PEAK ACCELERATION OF  0.34 G
  AND SLOPE = 0.00
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******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.284	1.600	0.263	11.628	-0.021	0.124	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.283	1.597	0.262	11.628	-0.021	0.306	0.098	1.000	1.000	1.000	0.182	0.182	0.000	9.00
3	11.00	0.264	1.551	0.257	11.628	-0.019	0.452	0.708	1.000	1.000	1.000	0.846	0.748	0.033	14.00
4	17.00	0.318	1.447	0.197	7.653	-0.001	0.595	0.088	1.000	1.000	1.000	0.743	0.547	0.005	19.50
5	22.00	0.359	1.421	0.193	7.653	0.001	0.757	0.098	1.000	1.000	1.000	0.524	0.386	0.005	24.50
6	27.00	0.294	1.399	0.185	7.648	0.003	0.917	0.354	1.000	1.000	1.000	0.263	0.263	0.013	29.50
7	32.00	0.340	1.339	0.153	11.598	0.009	1.003	0.502	1.000	1.000	1.000	0.074	0.074	0.015	34.50
8	37.00	0.326	1.281	0.114	11.583	0.015	1.152	0.145	1.000	1.000	1.000	0.040	0.039	0.010	41.00
9	45.00	0.353	1.222	0.096	11.573	0.019	1.367	0.077	1.000	1.000	1.000	0.009	0.009	0.005	47.50
10	50.00	0.284	1.196	0.091	11.573	0.019	1.526	0.082	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.275	1.134	0.081	11.563	0.018	1.732	0.162	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.301	1.092	0.066	11.543	0.012	1.744	0.140	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.285	1.039	0.048	11.523	0.006	1.789	0.074	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.264	0.985	0.040	11.508	0.002	2.023	0.070	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.263	0.938	0.032	11.498	0.002	2.197	0.062	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.282	0.921	0.026	11.483	-0.002	2.308	0.053	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.278	0.891	0.019	11.478	-0.001	2.435	0.040	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.246	0.869	0.013	11.478	-0.001	2.511	0.061	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.265	0.859	0.005	11.478	-0.000	2.584	0.037	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.236	0.845	0.597						GROUND SURFACE SETTLEMENT				0.086	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 36
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 37
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 38
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 39

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 40
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 41

HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 42

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 2
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
OUTPUT FOR LOB000
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.275	1.626	0.200	10.768	-0.054	0.120	0.009	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.276	1.609	0.200	10.768	-0.054	0.297	0.092	1.000	1.000	1.000	0.190	0.190	0.000	9.00
3	11.00	0.279	1.564	0.194	10.763	-0.052	0.450	0.592	1.000	1.000	1.000	0.851	0.779	0.035	14.00
4	17.00	0.272	1.399	0.173	6.048	-0.009	0.610	0.082	1.000	1.000	1.000	0.801	0.581	0.006	19.50
5	22.00	0.305	1.364	0.172	6.043	-0.005	0.768	0.096	1.000	1.000	1.000	0.577	0.416	0.006	24.50
6	27.00	0.300	1.329	0.168	6.038	-0.004	0.916	0.350	1.000	1.000	1.000	0.286	0.286	0.013	29.50
7	32.00	0.302	1.257	0.140	6.028	0.012	1.026	0.502	1.000	1.000	1.000	0.081	0.081	0.015	34.50
8	37.00	0.278	1.224	0.110	6.023	0.025	1.151	0.146	1.000	1.000	1.000	0.041	0.040	0.010	41.00
9	45.00	0.313	1.191	0.097	6.018	0.027	1.290	0.080	1.000	1.000	1.000	0.008	0.008	0.005	47.50
10	50.00	0.301	1.189	0.092	6.018	0.027	1.449	0.089	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.287	1.130	0.085	6.013	0.020	1.625	0.188	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.273	1.080	0.065	6.008	0.023	1.718	0.156	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.263	1.040	0.045	6.008	0.018	1.838	0.077	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.259	1.015	0.038	6.003	0.012	2.022	0.072	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.280	0.982	0.029	10.653	0.011	2.124	0.058	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.251	0.944	0.025	10.648	0.006	2.292	0.054	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.264	0.898	0.019	10.633	0.006	2.406	0.038	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.264	0.877	0.014	10.633	0.003	2.554	0.064	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.250	0.844	0.005	10.633	0.002	2.641	0.038	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.255	0.840	0.575						GROUND SURFACE SETTLEMENT				0.088	

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DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT


************************************************************
  OUTPUT FOR LOB090
  WITH A PEAK ACCELERATION OF  0.38 G
  AND SLOPE = 0.00
************************************************************

*******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
*******************************************************
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.306	1.358	0.209	8.553	-0.067	0.134	0.010	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.307	1.357	0.209	8.553	-0.067	0.323	0.094	1.000	1.000	1.000	0.190	0.190	0.000	9.00
3	11.00	0.309	1.347	0.207	8.553	-0.067	0.478	1.150	1.000	1.000	1.000	0.851	0.779	0.035	14.00
4	17.00	0.330	1.308	0.191	8.543	-0.050	0.641	0.109	1.000	1.000	1.000	0.801	0.581	0.006	19.50
5	22.00	0.284	1.304	0.186	8.543	-0.047	0.794	0.084	1.000	1.000	1.000	0.577	0.416	0.006	24.50
6	27.00	0.288	1.293	0.182	8.543	-0.047	0.939	0.317	1.000	1.000	1.000	0.286	0.286	0.013	29.50
7	32.00	0.314	1.241	0.148	8.528	-0.044	1.040	0.380	1.000	1.000	1.000	0.081	0.081	0.015	34.50
8	37.00	0.309	1.246	0.117	8.493	-0.030	1.142	0.135	1.000	1.000	1.000	0.041	0.040	0.010	41.00
9	45.00	0.289	1.257	0.107	8.483	-0.035	1.277	0.075	1.000	1.000	1.000	0.008	0.008	0.005	47.50
10	50.00	0.287	1.241	0.103	8.483	-0.034	1.433	0.081	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.256	1.210	0.090	8.478	-0.032	1.606	0.180	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.317	1.180	0.064	9.393	-0.016	1.751	0.142	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.300	1.138	0.047	9.383	-0.005	1.988	0.079	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.287	1.114	0.037	9.378	-0.001	2.206	0.076	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.290	1.078	0.030	9.378	0.002	2.428	0.062	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.279	1.041	0.022	9.368	0.002	2.615	0.056	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.262	1.005	0.016	9.368	0.003	2.821	0.043	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.260	0.976	0.012	9.363	0.001	3.018	0.066	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.272	0.938	0.005	9.358	0.000	3.127	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.284	0.931	0.742						GROUND SURFACE SETTLEMENT				0.088	


```
DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT
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HISTORY OF ACCELERATION AT TOP OF LAYER  1 IS SAVED IN OUTPUT FILE NUMBER 43
HISTORY OF SHEAR STRESS IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 44
HISTORY OF SHEAR STRAIN IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 45
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 46

FOR SECOND COMPONENT
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HISTORY OF ACCELERATION AT TOP OF LAYER  1 IS SAVED IN OUTPUT FILE NUMBER 47
HISTORY OF SHEAR STRESS IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 48
HISTORY OF SHEAR STRAIN IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 49


**************************************
NORMAL TERMINATION FOR THIS INPUT FILE
**************************************
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EB1i Profile EB1 with ground improvement to about 25 feet

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*********************************************
  MAXIMUM RESPONSE VALUES AT GROUND SURFACE
*********************************************
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INPUT FILE	INPUT MOTION	INPUT AMAX	SLOPE	COMP	KDIS	AMAX	VMAX	DMAXR	DFINALR	RUMAX	SETTLEMENT
eb1i	IV02180.txt	0.36	0.00	1	1	0.37	1.47	0.15	0.00	0.07	0.05
eb1i	iv02270.txt	0.37	0.00	2	1	0.34	1.48	0.21	0.06	0.07	0.05
eb1i	IVEC4140.txt	0.43	0.00	1	1	0.33	1.20	0.27	-0.10	0.06	0.04
eb1i	IVEC4230.txt	0.40	0.00	2	1	0.32	1.76	0.19	-0.02	0.06	0.04
eb1i	JOS000.txt	0.35	0.00	1	1	0.37	1.80	0.12	-0.04	0.07	0.05
eb1i	JOS090.txt	0.39	0.00	2	1	0.31	1.50	0.28	-0.23	0.07	0.05
eb1i	NIS000.txt	0.39	0.00	1	1	0.34	1.47	0.17	0.09	0.06	0.05
eb1i	NIS090.txt	0.36	0.00	2	1	0.31	1.64	0.24	0.12	0.06	0.05
eb1i	YAR060.txt	0.43	0.00	1	1	0.30	1.28	0.12	0.07	0.08	0.05
eb1i	YAR330.txt	0.43	0.00	2	1	0.45	1.24	0.24	0.17	0.08	0.05
eb1i	UC2000.txt	0.42	0.00	1	1	0.34	1.29	0.16	-0.00	0.07	0.05
eb1i	UC2090.txt	0.34	0.00	2	1	0.28	1.49	0.19	-0.00	0.07	0.05
eb1i	LOB000.txt	0.36	0.00	1	1	0.44	1.46	0.16	-0.01	0.07	0.05
eb1i	LOB090.txt	0.38	0.00	2	1	0.37	1.31	0.19	-0.07	0.07	0.05

RUMAX IS MAX RU IN ANY LAYER; SETTLEMENT IS SETTLEMENT OF GROUND SURFACE IN FEET
DFINALR IS GROUND SURFACE FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN GSFRD IF SLOPE IS GREATER THAN ZERO

```
**************************************************
**************************************************

 TESS2 - Version 3.00D
 Copyright 2020 Robert Pyke
 Built by rmp on 08/29/2020
 Using Simply Fortran v. 2.4

**************************************************
**************************************************

INPUT/OUTPUT FILE NAME: eb1i


****************************************
920 Pacific Santa Cruz       EB-1
****************************************
Improved 150-foot profile
****************************************


REDISTRIBUTION AND DISSIPATION OF PORE PRESSURES
IS INCLUDED!


CALCULATION OF SETTLEMENTS IS TURNED ON


UNITS ARE KIPS, FEET AND SECONDS


**********
INPUT DATA
**********

MATERIAL PROPERTY PARAMETERS

 MTYPE        VT     ALPHA      GMRP       TSTR       FSTR
  1         0.02      1.00      0.00       0.00       0.00

 MTYPE        VT     ALPHA      GMRP       TSTR       FSTR
  2         0.02      1.00      0.00       0.00       0.00

 MTYPE        VT     ALPHA      GMRP       TSTR       FSTR
  3         0.02      1.00      0.00       0.00       0.00

 MTYPE        VT     ALPHA      GMRP       TSTR       FSTR
  4         0.02      1.00      0.00       0.00       0.00
```

PARAMETERS FOR SIMPLE DEGRADATION

MTYPE	SS	RS	E	SG	RG	ST	RT
2	0.12	0.65	1.50	0.12	0.65	0.12	0.65

PARAMETERS FOR PORE PRESSURE GENERATION CURVES

LAYER NO.	MTYPE	TAUAV/SIGV	NL	E	F	G
3	3	0.600	10	2.00	0.10	2.00
4	3	0.600	10	2.00	0.10	2.00
5	3	0.600	10	2.00	0.10	2.00
6	4	0.600	10	2.00	0.10	2.00
7	4	0.600	10	2.00	0.10	2.00
8	4	0.600	10	2.00	0.10	2.00
9	4	0.800	10	2.00	0.10	2.00

VALUES FOR CONSOLIDATION PROPERTIES

LAYER NO.	MV	K
2	0.210E-03	0.328E-05
3	0.210E-03	0.328E-04
4	0.194E-03	0.328E-04
5	0.220E-03	0.328E-04
6	0.537E-03	0.328E-04
7	0.537E-03	0.328E-05
8	0.318E-03	0.328E-05
9	0.210E-03	0.328E-05
10	0.166E-03	0.328E-08
11	0.210E-03	0.328E-08
12	0.239E-03	0.328E-08
13	0.149E-03	0.328E-08
14	0.134E-03	0.328E-08
15	0.111E-03	0.328E-08
16	0.932E-04	0.328E-08
17	0.685E-04	0.328E-08
18	0.932E-04	0.328E-08
19	0.596E-04	0.328E-08

PARAMETERS FOR SETTLEMENT CALCULATIONS

LAYER NO.	ARD	FACTOR
3	60	0.33
4	70	0.50
5	70	0.50
6	70	0.33
7	70	0.33

8	75	0.33
9	80	0.33

PARAMETERS FOR HARDENING OF SHEAR MODULUS

MAT.TYPE	KHARD	FHARD	FHARDS
3	1	1.00	0.50
4	1	1.00	0.50

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
LAYER DATA
****

DEPTH TO WATER TABLE = 6.00
TRAVEL TIMES ARE RELATIVE TO A TIMESTEP OF 0.0025 SECONDS

LAYER NO.	MTYPE	THICK	UNIT WT	OCR	KO	SIGV	VS	GMAX	TAUMAX	GAMREF	TTR
1	1	7.00	0.125			0.44	800.00	2484.47	2.981	0.120	0.286
2	1	4.00	0.120			0.93	800.00	2385.09	3.578	0.150	0.500
3	3	6.00	0.120	1.00	0.80	1.22	800.00	2385.09	2.862	0.120	0.333
4	3	5.00	0.130	1.00	0.80	1.56	800.00	2583.85	3.101	0.120	0.400
5	3	5.00	0.130	1.00	0.80	1.90	750.00	2270.96	2.725	0.120	0.375
6	4	5.00	0.120	1.00	0.80	2.21	500.00	931.68	1.398	0.150	0.250
7	4	5.00	0.120	1.00	0.80	2.50	500.00	931.68	1.398	0.150	0.250
8	4	8.00	0.120	1.00	0.80	2.87	650.00	1574.53	2.362	0.150	0.203
9	4	5.00	0.120	1.00	0.80	3.25	800.00	2385.09	3.578	0.150	0.400
10	1	10.00	0.120			3.68	900.00	3018.63	3.622	0.120	0.225
11	1	10.00	0.120			4.25	800.00	2385.09	2.862	0.120	0.200
12	1	10.00	0.120			4.83	750.00	2096.27	4.193	0.200	0.187
13	1	10.00	0.120			5.41	950.00	3363.35	6.727	0.200	0.237
14	1	10.00	0.120			5.98	1000.00	3726.71	7.453	0.200	0.250
15	1	10.00	0.120			6.56	1100.00	4509.32	9.019	0.200	0.275
16	1	10.00	0.120			7.13	1200.00	5366.46	10.733	0.200	0.300
17	1	10.00	0.120			7.71	1400.00	7304.35	14.609	0.200	0.350
18	1	10.00	0.120			8.29	1200.00	5366.46	10.733	0.200	0.300
19	1	10.00	0.120			8.86	1500.00	8385.09	16.770	0.200	0.375

SHEAR WAVE VELOCITY IN BASE = 2500.
UNIT WEIGHT OF BASE = 0.130

BASE IS IMPERMEABLE

****
OUTPUT FOR IV02180
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.368	1.470	0.148	12.058	0.003	0.161	0.007	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.288	1.460	0.147	12.058	0.003	0.325	0.014	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.301	1.450	0.147	12.056	0.003	0.460	0.022	1.000	1.000	1.000	0.066	0.066	0.001	14.00
4	17.00	0.315	1.435	0.146	12.056	0.003	0.639	0.033	1.000	1.000	1.000	0.065	0.065	0.003	19.50
5	22.00	0.347	1.412	0.146	12.056	0.004	0.782	0.047	1.000	1.000	1.000	0.067	0.065	0.005	24.50
6	27.00	0.471	1.383	0.146	12.056	0.005	0.936	0.261	1.000	1.000	1.000	0.069	0.064	0.013	29.50
7	32.00	0.341	1.254	0.150	12.048	0.018	1.050	0.508	1.000	1.000	1.000	0.063	0.063	0.015	34.50
8	37.00	0.347	1.161	0.139	12.033	0.028	1.200	0.184	1.000	1.000	1.000	0.053	0.053	0.010	41.00
9	45.00	0.440	1.122	0.117	12.026	0.018	1.347	0.075	1.000	1.000	1.000	0.011	0.011	0.005	47.50
10	50.00	0.420	1.100	0.112	12.023	0.015	1.519	0.100	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.298	1.042	0.100	12.013	0.013	1.689	0.210	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.302	0.994	0.072	11.988	0.008	1.813	0.179	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.305	0.998	0.053	11.968	0.009	1.908	0.089	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.300	0.990	0.042	11.958	0.007	2.085	0.083	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.289	0.970	0.030	11.948	0.004	2.324	0.066	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.291	0.949	0.022	11.941	0.005	2.523	0.057	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.275	0.930	0.014	2.231	0.001	2.695	0.043	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.246	0.918	0.011	11.928	0.002	2.869	0.061	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.286	0.915	0.005	15.680	0.001	2.971	0.041	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.268	0.929	0.495						GROUND SURFACE SETTLEMENT				0.053	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR IV02270
WITH A PEAK ACCELERATION OF 0.37 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.342	1.478	0.214	5.749	0.062	0.150	0.007	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.283	1.460	0.214	5.749	0.062	0.305	0.013	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.309	1.457	0.214	5.749	0.063	0.460	0.020	1.000	1.000	1.000	0.066	0.066	0.001	14.00
4	17.00	0.359	1.448	0.212	5.746	0.062	0.654	0.031	1.000	1.000	1.000	0.065	0.065	0.003	19.50
5	22.00	0.444	1.430	0.211	5.746	0.061	0.814	0.053	1.000	1.000	1.000	0.067	0.065	0.005	24.50
6	27.00	0.332	1.408	0.209	5.746	0.061	0.941	0.372	1.000	1.000	1.000	0.069	0.064	0.013	29.50
7	32.00	0.298	1.300	0.180	5.724	0.049	1.074	0.614	1.000	1.000	1.000	0.063	0.063	0.015	34.50
8	37.00	0.431	1.313	0.130	5.699	0.037	1.237	0.197	1.000	1.000	1.000	0.053	0.053	0.010	41.00
9	45.00	0.391	1.295	0.103	5.694	0.054	1.394	0.097	1.000	1.000	1.000	0.011	0.011	0.005	47.50
10	50.00	0.360	1.299	0.097	5.694	0.052	1.580	0.114	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.265	1.287	0.083	5.691	0.044	1.812	0.241	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.312	1.212	0.059	11.713	0.019	2.012	0.210	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.299	1.146	0.047	11.698	0.015	2.159	0.105	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.279	1.154	0.038	11.691	0.011	2.277	0.097	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.301	1.153	0.028	11.681	0.009	2.374	0.078	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.317	1.146	0.024	25.410	0.013	2.451	0.061	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.308	1.132	0.016	25.407	0.009	2.532	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.261	1.114	0.011	11.666	0.006	2.583	0.069	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.292	1.090	0.004	2.374	0.001	2.651	0.040	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.244	1.075	0.757						GROUND SURFACE SETTLEMENT				0.053	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 1
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 2
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 3
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 4

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 5
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 6
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 7

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4

IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR IVEC4140
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.332	1.200	0.271	5.684	-0.095	0.145	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.336	1.193	0.271	5.684	-0.095	0.357	0.016	1.000	1.000	1.000	0.028	0.028	0.000	9.00
3	11.00	0.350	1.192	0.270	5.684	-0.095	0.530	0.029	1.000	1.000	1.000	0.059	0.059	0.001	14.00
4	17.00	0.402	1.188	0.269	5.684	-0.095	0.764	0.034	1.000	1.000	1.000	0.057	0.057	0.002	19.50
5	22.00	0.439	1.184	0.267	5.684	-0.096	0.956	0.060	1.000	1.000	1.000	0.060	0.056	0.004	24.50
6	27.00	0.341	1.184	0.264	5.684	-0.098	1.107	0.503	1.000	1.000	1.000	0.063	0.055	0.011	29.50
7	32.00	0.330	1.123	0.229	5.669	-0.087	1.238	0.930	1.000	1.000	1.000	0.055	0.055	0.013	34.50
8	37.00	0.425	1.200	0.175	5.601	-0.047	1.398	0.210	1.000	1.000	1.000	0.044	0.044	0.009	41.00
9	45.00	0.336	1.234	0.150	5.594	-0.035	1.602	0.117	1.000	1.000	1.000	0.011	0.011	0.004	47.50
10	50.00	0.425	1.210	0.143	5.591	-0.036	1.803	0.114	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.269	1.157	0.128	5.586	-0.036	2.054	0.301	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.351	1.116	0.091	5.551	-0.016	2.152	0.211	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.382	1.128	0.066	5.524	-0.009	2.312	0.106	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.353	1.111	0.055	5.504	-0.005	2.457	0.106	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.357	1.054	0.043	5.494	-0.002	2.708	0.086	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.333	1.002	0.033	5.484	-0.001	2.972	0.078	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.319	0.958	0.023	5.479	-0.000	3.196	0.056	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.293	0.908	0.017	5.476	-0.000	3.423	0.091	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.284	0.875	0.006	5.476	0.000	3.521	0.055	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.305	0.852	0.525						GROUND SURFACE SETTLEMENT				0.044	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR IVEC4230
WITH A PEAK ACCELERATION OF 0.40 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.315	1.756	0.193	5.749	-0.017	0.138	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.304	1.735	0.193	5.749	-0.017	0.308	0.014	1.000	1.000	1.000	0.028	0.028	0.000	9.00
3	11.00	0.320	1.714	0.192	5.749	-0.017	0.477	0.024	1.000	1.000	1.000	0.059	0.059	0.001	14.00
4	17.00	0.343	1.674	0.191	5.716	-0.017	0.669	0.029	1.000	1.000	1.000	0.057	0.057	0.002	19.50
5	22.00	0.381	1.660	0.191	5.739	-0.016	0.829	0.046	1.000	1.000	1.000	0.060	0.056	0.004	24.50
6	27.00	0.410	1.643	0.190	5.729	-0.014	0.952	0.364	1.000	1.000	1.000	0.063	0.055	0.011	29.50
7	32.00	0.326	1.524	0.172	5.729	-0.026	1.074	0.646	1.000	1.000	1.000	0.055	0.055	0.013	34.50
8	37.00	0.375	1.518	0.122	5.724	-0.032	1.204	0.180	1.000	1.000	1.000	0.044	0.044	0.009	41.00
9	45.00	0.456	1.516	0.109	5.724	-0.025	1.330	0.075	1.000	1.000	1.000	0.011	0.011	0.004	47.50
10	50.00	0.362	1.496	0.107	5.724	-0.018	1.447	0.088	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.350	1.467	0.095	5.721	-0.018	1.618	0.193	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.316	1.454	0.070	5.716	-0.013	1.852	0.183	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.345	1.406	0.049	5.716	-0.014	2.094	0.093	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.339	1.385	0.040	5.716	-0.008	2.298	0.096	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.303	1.391	0.030	5.714	-0.001	2.461	0.080	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.371	1.400	0.023	5.716	0.000	2.747	0.064	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.313	1.409	0.016	5.724	-0.002	2.809	0.045	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.265	1.407	0.011	5.716	-0.003	2.900	0.078	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.278	1.399	0.005	10.079	-0.001	3.080	0.046	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.271	1.396	0.854						GROUND SURFACE SETTLEMENT				0.044	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 8
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 9
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 10
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 11

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 12
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 13
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 14

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NEXT INPUT MOTION
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**********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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***********************************************************
  OUTPUT FOR JOS000
  WITH A PEAK ACCELERATION OF  0.35 G
  AND SLOPE = 0.00
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  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.371	1.802	0.120	19.176	-0.035	0.162	0.007	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.290	1.797	0.120	19.176	-0.035	0.321	0.014	1.000	1.000	1.000	0.025	0.025	0.000	9.00
3	11.00	0.309	1.788	0.119	19.176	-0.035	0.473	0.019	1.000	1.000	1.000	0.061	0.061	0.002	14.00
4	17.00	0.381	1.774	0.117	19.176	-0.033	0.641	0.025	1.000	1.000	1.000	0.062	0.062	0.003	19.50
5	22.00	0.447	1.754	0.115	19.176	-0.031	0.788	0.043	1.000	1.000	1.000	0.065	0.063	0.005	24.50
6	27.00	0.405	1.727	0.113	19.176	-0.030	0.910	0.260	1.000	1.000	1.000	0.067	0.063	0.014	29.50
7	32.00	0.332	1.625	0.106	10.466	0.003	1.012	0.307	1.000	1.000	1.000	0.055	0.055	0.015	34.50
8	37.00	0.373	1.554	0.107	10.471	0.023	1.108	0.123	1.000	1.000	1.000	0.040	0.040	0.010	41.00
9	45.00	0.377	1.524	0.093	10.471	0.023	1.184	0.070	1.000	1.000	1.000	0.007	0.007	0.005	47.50
10	50.00	0.326	1.515	0.090	10.471	0.024	1.324	0.075	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.280	1.470	0.076	10.471	0.018	1.465	0.144	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.296	1.382	0.057	10.928	0.007	1.647	0.137	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.296	1.274	0.050	10.926	-0.005	1.775	0.074	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.303	1.227	0.044	10.926	-0.008	1.932	0.075	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.261	1.197	0.034	10.921	-0.007	2.089	0.061	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.252	1.169	0.026	10.918	-0.008	2.229	0.055	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.236	1.141	0.019	26.100	-0.005	2.370	0.038	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.273	1.125	0.014	26.097	-0.003	2.452	0.057	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.224	1.110	0.006	26.092	-0.003	2.562	0.037	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.236	1.080	0.578						GROUND SURFACE SETTLEMENT				0.054	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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***********************************************************
  OUTPUT FOR JOS090
  WITH A PEAK ACCELERATION OF  0.39 G
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AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.308	1.499	0.279	10.041	-0.231	0.135	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.305	1.485	0.279	10.041	-0.231	0.332	0.015	1.000	1.000	1.000	0.025	0.025	0.000	9.00
3	11.00	0.322	1.473	0.279	10.041	-0.231	0.494	0.024	1.000	1.000	1.000	0.061	0.061	0.002	14.00
4	17.00	0.347	1.449	0.278	28.505	-0.230	0.684	0.030	1.000	1.000	1.000	0.062	0.062	0.003	19.50
5	22.00	0.327	1.429	0.275	28.505	-0.228	0.861	0.053	1.000	1.000	1.000	0.065	0.063	0.005	24.50
6	27.00	0.366	1.392	0.271	28.505	-0.224	1.019	0.352	1.000	1.000	1.000	0.067	0.063	0.014	29.50
7	32.00	0.342	1.292	0.234	33.987	-0.194	1.133	0.535	1.000	1.000	1.000	0.055	0.055	0.015	34.50
8	37.00	0.397	1.242	0.187	33.975	-0.147	1.324	0.175	1.000	1.000	1.000	0.040	0.040	0.010	41.00
9	45.00	0.374	1.238	0.164	26.995	-0.127	1.519	0.106	1.000	1.000	1.000	0.007	0.007	0.005	47.50
10	50.00	0.356	1.227	0.162	34.012	-0.128	1.756	0.117	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.314	1.210	0.141	34.022	-0.110	2.012	0.285	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.318	1.183	0.085	34.022	-0.059	2.112	0.219	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.309	1.182	0.060	26.925	-0.037	2.230	0.105	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.308	1.146	0.045	9.896	-0.023	2.407	0.098	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.293	1.130	0.034	26.910	-0.018	2.489	0.082	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.284	1.139	0.024	9.869	-0.012	2.614	0.062	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.280	1.141	0.018	26.907	-0.009	2.664	0.043	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.302	1.141	0.013	26.900	-0.006	2.798	0.069	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.283	1.136	0.005	9.874	-0.002	2.873	0.044	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.287	1.135	0.553						GROUND SURFACE SETTLEMENT				0.054	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 15
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 16
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 17
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 18

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 19
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 20
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 21

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NEXT INPUT MOTION
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***********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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************************************************************
  OUTPUT FOR NIS000
  WITH A PEAK ACCELERATION OF  0.39 G
  AND SLOPE = 0.00
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*******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.336	1.467	0.167	7.511	0.086	0.147	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.319	1.466	0.167	7.511	0.086	0.300	0.014	1.000	1.000	1.000	0.023	0.023	0.000	9.00
3	11.00	0.358	1.464	0.167	7.514	0.086	0.451	0.021	1.000	1.000	1.000	0.051	0.051	0.001	14.00
4	17.00	0.402	1.449	0.166	7.511	0.085	0.627	0.028	1.000	1.000	1.000	0.050	0.050	0.002	19.50
5	22.00	0.372	1.440	0.165	7.514	0.086	0.789	0.051	1.000	1.000	1.000	0.055	0.050	0.004	24.50
6	27.00	0.366	1.430	0.164	8.906	0.086	0.923	0.355	1.000	1.000	1.000	0.056	0.049	0.013	29.50
7	32.00	0.326	1.322	0.142	8.906	0.057	1.014	0.429	1.000	1.000	1.000	0.047	0.047	0.014	34.50
8	37.00	0.362	1.211	0.111	10.973	0.027	1.127	0.140	1.000	1.000	1.000	0.033	0.033	0.010	41.00
9	45.00	0.397	1.144	0.105	10.971	0.018	1.238	0.081	1.000	1.000	1.000	0.006	0.006	0.004	47.50
10	50.00	0.342	1.120	0.097	10.971	0.020	1.367	0.095	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.307	1.047	0.085	10.971	0.017	1.564	0.212	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.294	0.973	0.068	10.548	0.022	1.744	0.186	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.336	0.913	0.048	10.953	0.005	1.960	0.095	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.308	0.882	0.039	10.951	-0.001	2.044	0.086	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.334	0.880	0.032	10.946	-0.003	2.156	0.070	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.281	0.851	0.026	10.941	-0.004	2.234	0.060	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.283	0.832	0.018	10.938	-0.002	2.399	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.290	0.817	0.013	10.938	-0.002	2.525	0.072	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.255	0.806	0.005	10.933	-0.000	2.663	0.041	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.240	0.787	0.522						GROUND SURFACE SETTLEMENT				0.049	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR NIS090
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.307	1.638	0.236	14.693	0.120	0.134	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.343	1.635	0.236	14.693	0.120	0.302	0.013	1.000	1.000	1.000	0.023	0.023	0.000	9.00
3	11.00	0.298	1.633	0.235	14.693	0.120	0.448	0.022	1.000	1.000	1.000	0.051	0.051	0.001	14.00
4	17.00	0.365	1.626	0.234	14.693	0.119	0.603	0.027	1.000	1.000	1.000	0.050	0.050	0.002	19.50
5	22.00	0.398	1.616	0.232	14.695	0.119	0.749	0.048	1.000	1.000	1.000	0.055	0.050	0.004	24.50
6	27.00	0.314	1.596	0.226	14.695	0.114	0.881	0.336	1.000	1.000	1.000	0.056	0.049	0.013	29.50
7	32.00	0.358	1.489	0.185	14.698	0.084	0.972	0.374	1.000	1.000	1.000	0.047	0.047	0.014	34.50
8	37.00	0.355	1.356	0.118	14.708	0.032	1.144	0.138	1.000	1.000	1.000	0.033	0.033	0.010	41.00
9	45.00	0.456	1.251	0.099	14.703	0.023	1.293	0.065	1.000	1.000	1.000	0.006	0.006	0.004	47.50
10	50.00	0.457	1.219	0.091	14.700	0.019	1.462	0.088	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.338	1.182	0.079	14.698	0.014	1.635	0.170	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.277	1.128	0.061	14.695	0.010	1.731	0.151	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.296	1.096	0.048	14.685	0.009	1.845	0.083	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.292	1.092	0.038	14.680	0.007	1.969	0.067	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.293	1.083	0.025	14.683	0.002	2.072	0.064	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.280	1.078	0.019	14.680	0.001	2.180	0.054	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.254	1.070	0.014	14.678	0.002	2.309	0.035	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.248	1.056	0.010	14.680	0.002	2.456	0.058	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.259	1.022	0.005	14.685	0.001	2.607	0.036	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.236	1.013	0.615						GROUND SURFACE SETTLEMENT				0.049	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 22
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 23
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 24
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 25

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 26
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 27
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 28

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

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OUTPUT FOR YAR060
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.296	1.277	0.117	16.490	0.065	0.129	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.275	1.275	0.117	16.490	0.065	0.308	0.015	1.000	1.000	1.000	0.031	0.031	0.000	9.00
3	11.00	0.287	1.272	0.116	16.490	0.065	0.468	0.021	1.000	1.000	1.000	0.071	0.071	0.001	14.00
4	17.00	0.336	1.264	0.116	16.490	0.064	0.649	0.027	1.000	1.000	1.000	0.068	0.068	0.002	19.50
5	22.00	0.312	1.256	0.113	16.490	0.065	0.819	0.044	1.000	1.000	1.000	0.078	0.068	0.004	24.50
6	27.00	0.311	1.249	0.111	16.488	0.063	0.980	0.249	1.000	1.000	1.000	0.076	0.066	0.013	29.50
7	32.00	0.311	1.245	0.106	16.483	0.043	1.098	0.348	1.000	1.000	1.000	0.057	0.057	0.014	34.50
8	37.00	0.328	1.288	0.101	16.468	0.025	1.230	0.122	1.000	1.000	1.000	0.043	0.043	0.010	41.00
9	45.00	0.412	1.303	0.086	16.463	0.020	1.375	0.069	1.000	1.000	1.000	0.009	0.009	0.004	47.50
10	50.00	0.363	1.301	0.084	16.460	0.016	1.547	0.109	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.283	1.289	0.075	16.450	0.016	1.704	0.218	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.316	1.250	0.062	16.418	0.007	1.723	0.163	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.329	1.212	0.042	16.383	0.008	1.833	0.083	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.334	1.181	0.034	16.370	0.007	1.986	0.084	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.354	1.150	0.026	16.360	0.006	2.184	0.067	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.359	1.120	0.021	16.355	0.004	2.391	0.058	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.347	1.095	0.015	16.348	0.002	2.563	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.305	1.084	0.011	16.345	0.002	2.654	0.066	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.301	1.078	0.005	16.383	0.001	2.792	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.292	1.075	0.540						GROUND SURFACE SETTLEMENT				0.049	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR YAR330
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.447	1.241	0.238	17.850	0.169	0.196	0.008	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.362	1.232	0.238	17.850	0.169	0.394	0.018	1.000	1.000	1.000	0.031	0.031	0.000	9.00
3	11.00	0.362	1.219	0.238	17.850	0.169	0.542	0.026	1.000	1.000	1.000	0.071	0.071	0.001	14.00
4	17.00	0.422	1.210	0.237	17.850	0.168	0.760	0.038	1.000	1.000	1.000	0.068	0.068	0.002	19.50
5	22.00	0.539	1.203	0.236	17.850	0.168	0.929	0.057	1.000	1.000	1.000	0.078	0.068	0.004	24.50
6	27.00	0.459	1.192	0.233	17.850	0.166	1.031	0.443	1.000	1.000	1.000	0.076	0.066	0.013	29.50
7	32.00	0.322	1.152	0.194	17.850	0.137	1.129	0.568	1.000	1.000	1.000	0.057	0.057	0.014	34.50
8	37.00	0.418	1.116	0.140	17.845	0.094	1.218	0.175	1.000	1.000	1.000	0.043	0.043	0.010	41.00
9	45.00	0.361	1.083	0.117	17.843	0.076	1.379	0.090	1.000	1.000	1.000	0.009	0.009	0.004	47.50
10	50.00	0.342	1.067	0.106	17.840	0.067	1.510	0.090	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.318	1.021	0.090	17.840	0.057	1.670	0.185	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.424	0.934	0.063	14.208	0.032	1.904	0.178	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.368	0.906	0.045	14.170	0.021	2.066	0.076	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.326	0.892	0.037	14.165	0.018	2.222	0.077	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.367	0.881	0.029	9.956	0.012	2.369	0.065	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.370	0.869	0.024	9.951	0.010	2.508	0.058	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.368	0.858	0.018	9.946	0.009	2.631	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.362	0.851	0.013	9.944	0.007	2.842	0.072	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.325	0.854	0.005	17.823	0.003	3.004	0.042	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.316	0.860	0.565						GROUND SURFACE SETTLEMENT				0.049	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 29
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 30
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 31
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 32

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 33
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 34
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 35

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*********************
  NEXT INPUT MOTION
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**********************************************************
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF  4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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***********************************************************
  OUTPUT FOR UC2000
  WITH A PEAK ACCELERATION OF  0.42 G
  AND SLOPE = 0.00
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******************************************************
  MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.339	1.290	0.155	9.406	-0.003	0.148	0.006	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.283	1.288	0.155	9.406	-0.003	0.315	0.014	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.298	1.283	0.155	9.406	-0.003	0.470	0.018	1.000	1.000	1.000	0.065	0.065	0.001	14.00
4	17.00	0.379	1.273	0.154	9.406	-0.003	0.653	0.026	1.000	1.000	1.000	0.064	0.064	0.003	19.50
5	22.00	0.340	1.259	0.152	9.406	-0.003	0.809	0.046	1.000	1.000	1.000	0.069	0.064	0.005	24.50
6	27.00	0.294	1.238	0.149	9.406	-0.003	0.958	0.257	1.000	1.000	1.000	0.072	0.063	0.014	29.50
7	32.00	0.289	1.190	0.147	15.248	-0.011	1.074	0.486	1.000	1.000	1.000	0.063	0.063	0.016	34.50
8	37.00	0.278	1.150	0.105	15.225	0.013	1.230	0.157	1.000	1.000	1.000	0.046	0.046	0.010	41.00
9	45.00	0.319	1.139	0.083	9.411	0.024	1.393	0.075	1.000	1.000	1.000	0.010	0.010	0.005	47.50
10	50.00	0.318	1.138	0.081	15.215	0.020	1.648	0.093	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.278	1.137	0.073	15.210	0.018	1.926	0.150	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.290	1.140	0.055	10.259	0.020	2.104	0.146	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.325	1.137	0.041	10.249	0.013	2.319	0.085	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.317	1.127	0.034	15.185	0.008	2.453	0.082	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.320	1.090	0.027	10.234	0.010	2.651	0.071	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.325	1.048	0.022	10.226	0.008	2.851	0.056	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.327	1.001	0.018	10.224	0.007	3.076	0.045	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.296	0.957	0.014	10.221	0.006	3.255	0.073	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.330	0.945	0.004	10.224	0.001	3.446	0.045	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.309	0.954	0.748						GROUND SURFACE SETTLEMENT				0.053	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR UC2090
WITH A PEAK ACCELERATION OF 0.34 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.279	1.486	0.188	7.649	-0.000	0.122	0.005	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.279	1.482	0.188	7.651	-0.000	0.290	0.014	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.292	1.475	0.187	7.651	-0.001	0.442	0.023	1.000	1.000	1.000	0.065	0.065	0.001	14.00
4	17.00	0.306	1.461	0.186	7.649	-0.001	0.626	0.031	1.000	1.000	1.000	0.064	0.064	0.003	19.50
5	22.00	0.486	1.447	0.183	7.651	-0.002	0.762	0.050	1.000	1.000	1.000	0.069	0.064	0.005	24.50
6	27.00	0.324	1.426	0.182	7.649	-0.006	0.875	0.380	1.000	1.000	1.000	0.072	0.063	0.014	29.50
7	32.00	0.320	1.388	0.169	7.639	-0.008	0.985	0.501	1.000	1.000	1.000	0.063	0.063	0.016	34.50
8	37.00	0.319	1.337	0.117	11.598	0.003	1.184	0.186	1.000	1.000	1.000	0.046	0.046	0.010	41.00
9	45.00	0.379	1.280	0.094	11.591	0.015	1.329	0.072	1.000	1.000	1.000	0.010	0.010	0.005	47.50
10	50.00	0.337	1.255	0.091	11.591	0.015	1.504	0.086	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.299	1.208	0.080	11.586	0.015	1.656	0.150	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.276	1.156	0.064	11.571	0.011	1.746	0.146	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.281	1.089	0.043	11.583	0.012	1.809	0.070	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.271	1.030	0.033	4.719	0.010	2.015	0.070	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.270	0.964	0.028	10.399	0.005	2.177	0.061	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.288	0.915	0.022	10.399	0.003	2.348	0.053	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.283	0.879	0.016	10.396	0.002	2.429	0.039	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.264	0.854	0.012	10.389	-0.001	2.539	0.061	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.242	0.844	0.004	13.021	-0.000	2.626	0.037	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.218	0.828	0.598						GROUND SURFACE SETTLEMENT				0.053	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 36
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 37
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 38
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 39

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 40
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 41

HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 42

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
OUTPUT FOR LOB000
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.443	1.459	0.160	10.741	-0.009	0.194	0.008	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.396	1.453	0.159	10.743	-0.009	0.345	0.016	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.372	1.444	0.159	10.743	-0.009	0.495	0.025	1.000	1.000	1.000	0.064	0.064	0.001	14.00
4	17.00	0.439	1.426	0.157	10.743	-0.009	0.672	0.029	1.000	1.000	1.000	0.062	0.062	0.003	19.50
5	22.00	0.541	1.408	0.155	10.743	-0.009	0.839	0.051	1.000	1.000	1.000	0.068	0.061	0.005	24.50
6	27.00	0.368	1.392	0.152	10.743	-0.008	0.960	0.370	1.000	1.000	1.000	0.069	0.060	0.013	29.50
7	32.00	0.316	1.273	0.136	10.738	-0.011	1.037	0.533	1.000	1.000	1.000	0.057	0.057	0.015	34.50
8	37.00	0.362	1.172	0.097	10.716	0.003	1.168	0.144	1.000	1.000	1.000	0.038	0.038	0.010	41.00
9	45.00	0.356	1.139	0.087	10.711	-0.000	1.280	0.080	1.000	1.000	1.000	0.007	0.007	0.005	47.50
10	50.00	0.311	1.123	0.084	6.014	0.001	1.429	0.089	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.310	1.087	0.077	6.011	0.002	1.599	0.182	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.277	1.040	0.062	6.011	0.006	1.763	0.157	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.251	0.989	0.045	6.011	0.013	1.935	0.086	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.256	0.983	0.035	6.009	0.014	2.094	0.085	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.288	0.943	0.026	6.004	0.012	2.188	0.060	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.262	0.938	0.020	6.001	0.008	2.302	0.051	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.257	0.919	0.015	5.994	0.005	2.395	0.038	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.265	0.895	0.011	5.991	0.004	2.434	0.055	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.251	0.860	0.004	6.019	0.001	2.474	0.034	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.263	0.849	0.575						GROUND SURFACE SETTLEMENT				0.052	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR LOB090
WITH A PEAK ACCELERATION OF 0.38 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.369	1.305	0.186	8.549	-0.065	0.161	0.007	1.000	1.000	1.000	0.000	0.000	0.000	3.50
2	7.00	0.293	1.301	0.185	8.549	-0.065	0.304	0.014	1.000	1.000	1.000	0.029	0.029	0.000	9.00
3	11.00	0.293	1.298	0.185	8.549	-0.066	0.456	0.021	1.000	1.000	1.000	0.064	0.064	0.001	14.00
4	17.00	0.409	1.295	0.184	8.549	-0.065	0.630	0.029	1.000	1.000	1.000	0.062	0.062	0.003	19.50
5	22.00	0.366	1.294	0.184	8.549	-0.067	0.799	0.051	1.000	1.000	1.000	0.068	0.061	0.005	24.50
6	27.00	0.307	1.284	0.181	8.549	-0.067	0.945	0.355	1.000	1.000	1.000	0.069	0.060	0.013	29.50
7	32.00	0.294	1.252	0.143	8.536	-0.051	1.036	0.476	1.000	1.000	1.000	0.057	0.057	0.015	34.50
8	37.00	0.342	1.193	0.111	8.489	-0.026	1.106	0.158	1.000	1.000	1.000	0.038	0.038	0.010	41.00
9	45.00	0.331	1.178	0.089	8.484	-0.024	1.210	0.082	1.000	1.000	1.000	0.007	0.007	0.005	47.50
10	50.00	0.315	1.179	0.085	14.780	-0.024	1.332	0.082	1.000	1.000	1.000	0.000	0.000	0.000	55.00
11	60.00	0.267	1.163	0.077	14.773	-0.021	1.514	0.160	1.000	1.000	1.000	0.000	0.000	0.000	65.00
12	70.00	0.295	1.164	0.064	14.755	-0.017	1.679	0.158	1.000	1.000	1.000	0.000	0.000	0.000	75.00
13	80.00	0.334	1.162	0.044	14.745	-0.008	1.819	0.084	1.000	1.000	1.000	0.000	0.000	0.000	85.00
14	90.00	0.354	1.152	0.036	9.376	-0.005	1.951	0.080	1.000	1.000	1.000	0.000	0.000	0.000	95.00
15	100.00	0.371	1.118	0.029	9.374	-0.003	2.143	0.067	1.000	1.000	1.000	0.000	0.000	0.000	105.00
16	110.00	0.318	1.075	0.023	9.371	-0.002	2.407	0.052	1.000	1.000	1.000	0.000	0.000	0.000	115.00
17	120.00	0.284	1.030	0.017	9.369	0.001	2.679	0.042	1.000	1.000	1.000	0.000	0.000	0.000	125.00
18	130.00	0.260	0.991	0.014	9.366	-0.002	2.931	0.064	1.000	1.000	1.000	0.000	0.000	0.000	135.00
19	140.00	0.260	0.944	0.004	9.376	0.001	3.096	0.041	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.253	0.948	0.744						GROUND SURFACE SETTLEMENT				0.052	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 43
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 44
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 45
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 46

FOR SECOND COMPONENT

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HISTORY OF ACCELERATION AT TOP OF LAYER  1 IS SAVED IN OUTPUT FILE NUMBER 47
HISTORY OF SHEAR STRESS IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 48
HISTORY OF SHEAR STRAIN IN LAYER  7 IS SAVED IN OUTPUT FILE NUMBER 49


**************************************
NORMAL TERMINATION FOR THIS INPUT FILE
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EB2 Profile EB-2 Free Field

`*********************************************`

MAXIMUM RESPONSE VALUES AT GROUND SURFACE

`*********************************************`

INPUT FILE	INPUT MOTION	INPUT AMAX	SLOPE	COMP	KDIS	AMAX	VMAX	DMAXR	DFINALR	RUMAX	SETTLEMENT
eb2	IV02180.txt	0.36	0.00	1	1	0.34	1.36	0.18	-0.04	1.00	0.21
eb2	iv02270.txt	0.37	0.00	2	1	0.35	1.50	0.37	0.29	1.00	0.21
eb2	IVEC4140.txt	0.43	0.00	1	1	0.47	1.67	0.15	0.07	0.96	0.07
eb2	IVEC4230.txt	0.40	0.00	2	1	0.43	1.90	0.21	0.14	0.96	0.07
eb2	JOS000.txt	0.35	0.00	1	1	0.32	1.62	0.30	-0.16	1.00	0.20
eb2	JOS090.txt	0.39	0.00	2	1	0.33	1.43	0.25	-0.01	1.00	0.20
eb2	NIS000.txt	0.39	0.00	1	1	0.36	1.24	0.22	-0.10	1.00	0.30
eb2	NIS090.txt	0.36	0.00	2	1	0.40	1.22	0.28	0.09	1.00	0.30
eb2	YAR060.txt	0.43	0.00	1	1	0.34	1.25	0.19	0.14	1.00	0.21
eb2	YAR330.txt	0.43	0.00	2	1	0.41	1.29	0.31	0.21	1.00	0.21
eb2	UC2000.txt	0.42	0.00	1	1	0.29	1.15	0.19	0.04	1.00	0.21
eb2	UC2090.txt	0.34	0.00	2	1	0.36	1.47	0.54	-0.48	1.00	0.21
eb2	LOB000.txt	0.36	0.00	1	1	0.39	1.41	0.16	-0.04	1.00	0.21
eb2	LOB090.txt	0.38	0.00	2	1	0.29	1.18	0.27	0.01	1.00	0.21

RUMAX IS MAX RU IN ANY LAYER; SETTLEMENT IS SETTLEMENT OF GROUND SURFACE IN FEET

DFINALR IS GROUND SURFACE FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN GSFRD IF SLOPE IS GREATER THAN ZERO

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**************************************************
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 TESS2 - Version 3.00D
 Copyright 2020 Robert Pyke
 Built by rmp on 08/29/2020
 Using Simply Fortran v. 2.4

**************************************************
**************************************************

INPUT/OUTPUT FILE NAME: eb2


****************************************
920 Pacific Santa Cruz       EB-2
****************************************
Free-field 150-foot profile
****************************************


REDISTRIBUTION AND DISSIPATION OF PORE PRESSURES
IS INCLUDED!


CALCULATION OF SETTLEMENTS IS TURNED ON


UNITS ARE KIPS, FEET AND SECONDS


**********
INPUT DATA
**********

MATERIAL PROPERTY PARAMETERS

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  1          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  2          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  3          0.02      1.00      0.00       0.00       0.00

 MTYPE         VT     ALPHA      GMRP       TSTR       FSTR
  4          0.02      1.00      0.00       0.00       0.00
```

PARAMETERS FOR SIMPLE DEGRADATION

MTYPE	SS	RS	E	SG	RG	ST	RT
2	0.12	0.65	1.50	0.12	0.65	0.12	0.65

PARAMETERS FOR PORE PRESSURE GENERATION CURVES

LAYER NO.	MTYPE	TAUAV/SIGV	NL	E	F	G
3	3	0.400	10	2.00	0.10	2.00
4	3	0.400	10	2.00	0.10	2.00
5	3	0.400	10	2.00	0.10	2.00
6	4	0.600	10	2.00	0.10	2.00
7	4	0.600	10	2.00	0.10	2.00
8	4	0.600	10	2.00	0.10	2.00

VALUES FOR CONSOLIDATION PROPERTIES

LAYER NO.	MV	K
2	0.201E-03	0.328E-05
3	0.373E-03	0.328E-04
4	0.293E-03	0.328E-04
5	0.293E-03	0.328E-04
6	0.318E-03	0.328E-04
7	0.274E-03	0.328E-05
8	0.239E-03	0.328E-05
9	0.685E-04	0.328E-08
10	0.685E-04	0.328E-08
11	0.736E-04	0.328E-08
12	0.638E-04	0.328E-08
13	0.596E-04	0.328E-08
14	0.685E-04	0.328E-08
15	0.685E-04	0.328E-08
16	0.685E-04	0.328E-08
17	0.932E-04	0.328E-08
18	0.596E-04	0.328E-08

PARAMETERS FOR SETTLEMENT CALCULATIONS

LAYER NO.	ARD	FACTOR
3	60	0.33
4	70	0.50
5	70	0.50
6	70	0.33
7	70	0.33
8	75	0.33

PARAMETERS FOR HARDENING OF SHEAR MODULUS

MAT.TYPE	KHARD	FHARD	FHARDS
3	1	1.00	0.50
4	1	1.00	0.50

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
LAYER DATA
****

DEPTH TO WATER TABLE = 6.00
TRAVEL TIMES ARE RELATIVE TO A TIMESTEP OF 0.0025 SECONDS

LAYER NO.	MTYPE	THICK	UNIT WT	OCR	KO	SIGV	VS	GMAX	TAUMAX	GAMREF	TTR
1	1	8.00	0.125			0.50	600.00	1397.52	1.677	0.120	0.187
2	1	4.00	0.125			1.00	800.00	2484.47	3.727	0.150	0.500
3	3	6.00	0.120	1.00	0.50	1.30	600.00	1341.61	1.610	0.120	0.250
4	3	5.00	0.130	1.00	0.50	1.64	650.00	1705.75	2.047	0.120	0.325
5	3	5.00	0.130	1.00	0.50	1.98	650.00	1705.75	2.047	0.120	0.325
6	4	5.00	0.120	1.00	0.80	2.29	650.00	1574.53	2.362	0.150	0.325
7	4	7.00	0.120	1.00	0.80	2.64	700.00	1826.09	2.739	0.150	0.250
8	4	8.00	0.120	1.00	0.80	3.07	750.00	2096.27	3.144	0.150	0.234
9	1	12.00	0.120			3.64	1400.00	7304.35	8.765	0.120	0.292
10	1	10.00	0.120			4.28	1400.00	7304.35	8.765	0.120	0.350
11	1	10.00	0.120			4.85	1350.00	6791.93	13.584	0.200	0.338
12	1	10.00	0.120			5.43	1450.00	7835.40	15.671	0.200	0.362
13	1	10.00	0.120			6.01	1500.00	8385.09	16.770	0.200	0.375
14	1	10.00	0.120			6.58	1400.00	7304.35	14.609	0.200	0.350
15	1	10.00	0.120			7.16	1400.00	7304.35	14.609	0.200	0.350
16	1	10.00	0.120			7.73	1400.00	7304.35	14.609	0.200	0.350
17	1	10.00	0.120			8.31	1200.00	5366.46	10.733	0.200	0.300
18	1	10.00	0.120			8.89	1500.00	8385.09	16.770	0.200	0.375

SHEAR WAVE VELOCITY IN BASE = 2500.
UNIT WEIGHT OF BASE = 0.130
BASE IS IMPERMEABLE

****

OUTPUT FOR IV02180
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00

****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.341	1.362	0.182	5.399	-0.036	0.171	0.014	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.348	1.331	0.181	5.399	-0.035	0.426	0.019	1.000	1.000	1.000	0.524	0.524	0.000	10.00
3	12.00	0.340	1.321	0.180	5.399	-0.035	0.630	1.009	1.000	1.000	1.000	1.000	0.931	0.162	15.00
4	18.00	0.381	1.195	0.147	5.406	-0.064	0.857	0.889	1.000	1.000	1.000	0.977	0.751	0.017	20.50
5	23.00	0.401	1.203	0.090	2.271	-0.039	1.064	0.236	1.000	1.000	1.000	0.734	0.595	0.011	25.50
6	28.00	0.395	1.184	0.086	2.266	-0.017	1.245	0.156	1.000	1.000	1.000	0.471	0.471	0.006	30.50
7	33.00	0.344	1.151	0.079	2.261	-0.014	1.425	0.153	1.000	1.000	1.000	0.172	0.172	0.007	36.50
8	40.00	0.311	1.094	0.070	2.254	-0.008	1.606	0.141	1.000	1.000	1.000	0.106	0.106	0.008	44.00
9	48.00	0.299	1.017	0.059	2.249	-0.008	1.848	0.035	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.264	0.998	0.055	2.246	-0.007	2.156	0.041	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.267	0.978	0.052	2.244	-0.007	2.410	0.043	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.259	0.955	0.048	2.244	-0.007	2.654	0.043	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.250	0.938	0.044	2.241	-0.005	2.873	0.043	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.260	0.932	0.040	2.239	-0.004	3.074	0.057	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.296	0.931	0.034	2.239	-0.005	3.244	0.062	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.253	0.937	0.026	2.234	-0.003	3.400	0.066	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.299	0.942	0.020	2.234	-0.001	3.521	0.110	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.328	0.945	0.007	11.921	0.001	3.563	0.058	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.283	0.941	0.491						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR IV02270
WITH A PEAK ACCELERATION OF 0.37 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.352	1.500	0.373	20.659	0.295	0.176	0.014	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.358	1.495	0.373	20.659	0.294	0.433	0.020	1.000	1.000	1.000	0.524	0.524	0.000	10.00
3	12.00	0.386	1.489	0.373	20.656	0.294	0.622	2.600	1.000	1.000	1.000	1.000	0.931	0.162	15.00
4	18.00	0.387	1.550	0.153	7.346	-0.045	0.836	0.936	1.000	1.000	1.000	0.977	0.751	0.017	20.50
5	23.00	0.384	1.545	0.116	4.851	0.009	1.030	0.263	1.000	1.000	1.000	0.734	0.595	0.011	25.50
6	28.00	0.357	1.517	0.100	4.844	0.006	1.210	0.150	1.000	1.000	1.000	0.471	0.471	0.006	30.50
7	33.00	0.350	1.477	0.089	4.841	-0.001	1.372	0.144	1.000	1.000	1.000	0.172	0.172	0.007	36.50
8	40.00	0.341	1.418	0.077	2.194	-0.000	1.588	0.137	1.000	1.000	1.000	0.106	0.106	0.008	44.00
9	48.00	0.320	1.337	0.063	2.189	-0.001	1.858	0.035	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.338	1.300	0.058	2.189	-0.002	2.185	0.043	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.383	1.262	0.053	2.189	-0.001	2.321	0.042	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.337	1.226	0.048	2.186	-0.000	2.604	0.042	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.371	1.194	0.043	2.189	-0.000	2.701	0.041	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.369	1.166	0.039	2.186	-0.001	2.882	0.055	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.335	1.125	0.033	24.937	0.000	3.122	0.062	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.359	1.094	0.026	24.937	0.000	3.270	0.066	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.307	1.070	0.019	2.189	0.000	3.427	0.111	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.300	1.049	0.006	2.191	0.002	3.574	0.059	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.317	1.049	0.756						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 1
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 2
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 3
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 4

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 5
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 6
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 7

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****

OUTPUT FOR IVEC4140
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.469	1.672	0.150	5.571	0.068	0.234	0.020	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.469	1.668	0.149	5.571	0.068	0.584	0.028	1.000	1.000	1.000	0.480	0.480	0.000	10.00
3	12.00	0.472	1.665	0.148	5.571	0.068	0.861	0.393	1.000	1.000	1.000	0.959	0.859	0.031	15.00
4	18.00	0.501	1.559	0.138	5.569	0.034	1.155	0.273	1.000	1.000	1.000	0.900	0.697	0.012	20.50
5	23.00	0.405	1.457	0.129	5.564	0.013	1.416	0.273	1.000	1.000	1.000	0.678	0.555	0.009	25.50
6	28.00	0.362	1.315	0.114	5.556	0.005	1.623	0.253	1.000	1.000	1.000	0.445	0.445	0.006	30.50
7	33.00	0.333	1.182	0.098	5.549	0.007	1.841	0.222	1.000	1.000	1.000	0.209	0.209	0.007	36.50
8	40.00	0.319	1.038	0.084	5.534	0.005	2.061	0.201	1.000	1.000	1.000	0.154	0.154	0.008	44.00
9	48.00	0.350	0.959	0.069	5.511	0.004	2.367	0.043	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.321	0.969	0.065	5.509	0.003	2.688	0.051	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.313	0.982	0.060	5.504	0.002	2.923	0.053	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.326	0.987	0.055	5.499	0.001	3.259	0.053	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.332	0.988	0.050	5.496	0.000	3.484	0.051	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.322	0.998	0.045	5.494	-0.000	3.741	0.071	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.396	1.004	0.038	5.489	-0.002	3.973	0.074	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.357	1.010	0.030	5.484	-0.001	4.111	0.082	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.409	1.027	0.022	5.481	-0.000	4.294	0.136	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.330	1.029	0.008	5.494	0.001	4.345	0.074	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.312	1.020	0.527						GROUND SURFACE SETTLEMENT				0.073	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR IVEC4230
WITH A PEAK ACCELERATION OF 0.40 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP						GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.430	1.901	0.212	23.624	0.141	0.215	0.018	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.438	1.856	0.211	23.624	0.141	0.529	0.028	1.000	1.000	1.000	0.480	0.480	0.000	10.00
3	12.00	0.444	1.833	0.210	23.624	0.141	0.767	1.118	1.000	1.000	1.000	0.959	0.859	0.031	15.00
4	18.00	0.392	1.719	0.145	5.511	0.073	1.008	0.336	1.000	1.000	1.000	0.900	0.697	0.012	20.50
5	23.00	0.367	1.652	0.135	5.509	0.065	1.215	0.204	1.000	1.000	1.000	0.678	0.555	0.009	25.50
6	28.00	0.309	1.624	0.121	5.504	0.062	1.396	0.223	1.000	1.000	1.000	0.445	0.445	0.006	30.50
7	33.00	0.305	1.588	0.109	12.208	0.056	1.596	0.206	1.000	1.000	1.000	0.209	0.209	0.007	36.50
8	40.00	0.296	1.552	0.087	12.201	0.038	1.825	0.200	1.000	1.000	1.000	0.154	0.154	0.008	44.00
9	48.00	0.322	1.527	0.064	12.186	0.019	2.106	0.040	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.333	1.515	0.061	12.183	0.019	2.383	0.047	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.291	1.485	0.056	12.178	0.017	2.568	0.051	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.321	1.450	0.050	12.176	0.014	2.696	0.044	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.282	1.410	0.045	12.176	0.013	2.812	0.041	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.323	1.376	0.041	12.173	0.012	2.954	0.057	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.392	1.339	0.036	12.173	0.012	3.113	0.058	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.320	1.315	0.030	12.173	0.010	3.257	0.064	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.278	1.295	0.022	12.176	0.006	3.351	0.099	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.318	1.303	0.006	12.178	0.001	3.401	0.055	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.311	1.311	0.869						GROUND SURFACE SETTLEMENT				0.073	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 8
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 9
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 10
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 11

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 12
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 13
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 14

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****

OUTPUT FOR JOS000
WITH A PEAK ACCELERATION OF 0.35 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.324	1.617	0.304	27.560	-0.160	0.162	0.013	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.327	1.596	0.304	27.560	-0.160	0.405	0.018	1.000	1.000	1.000	0.521	0.521	0.000	10.00
3	12.00	0.327	1.589	0.303	27.560	-0.159	0.590	1.081	1.000	1.000	1.000	1.000	0.969	0.162	15.00
4	18.00	0.407	1.533	0.107	27.202	-0.065	0.779	0.204	1.000	1.000	1.000	0.893	0.785	0.012	20.50
5	23.00	0.416	1.517	0.081	26.152	-0.041	0.937	0.171	1.000	1.000	1.000	0.675	0.608	0.008	25.50
6	28.00	0.424	1.486	0.064	26.142	-0.023	1.067	0.131	1.000	1.000	1.000	0.460	0.460	0.006	30.50
7	33.00	0.307	1.463	0.058	26.137	-0.018	1.190	0.099	1.000	1.000	1.000	0.127	0.127	0.007	36.50
8	40.00	0.301	1.405	0.054	26.132	-0.016	1.302	0.089	1.000	1.000	1.000	0.066	0.066	0.008	44.00
9	48.00	0.290	1.342	0.046	26.125	-0.010	1.432	0.025	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.297	1.310	0.044	26.125	-0.010	1.667	0.028	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.279	1.295	0.040	26.122	-0.010	1.936	0.034	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.353	1.281	0.035	26.122	-0.008	2.211	0.032	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.385	1.265	0.031	26.120	-0.006	2.466	0.036	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.290	1.258	0.026	26.117	-0.004	2.651	0.045	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.233	1.239	0.021	26.115	-0.004	2.771	0.048	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.277	1.220	0.016	10.281	-0.003	2.868	0.051	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.244	1.188	0.013	10.281	-0.002	2.892	0.077	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.288	1.161	0.004	7.454	-0.001	2.886	0.043	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.299	1.138	0.578						GROUND SURFACE SETTLEMENT				0.203	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR JOS090
WITH A PEAK ACCELERATION OF 0.39 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO. DEPTH AMAX VMAX DMAXR TIME DFINALR TAUMAX CYCLIC FINAL FINAL FINAL UMAX UFINAL SETTLE DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.332	1.432	0.250	32.006	-0.006	0.166	0.013	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.335	1.420	0.250	32.006	-0.006	0.407	0.020	1.000	1.000	1.000	0.521	0.521	0.000	10.00
3	12.00	0.334	1.414	0.250	32.006	-0.006	0.580	1.914	1.000	1.000	1.000	1.000	0.969	0.162	15.00
4	18.00	0.425	1.438	0.118	9.946	-0.021	0.769	0.271	1.000	1.000	1.000	0.893	0.785	0.012	20.50
5	23.00	0.419	1.364	0.109	9.936	-0.024	0.940	0.221	1.000	1.000	1.000	0.675	0.608	0.008	25.50
6	28.00	0.415	1.342	0.095	9.926	-0.019	1.069	0.140	1.000	1.000	1.000	0.460	0.460	0.006	30.50
7	33.00	0.392	1.323	0.088	9.919	-0.018	1.304	0.132	1.000	1.000	1.000	0.127	0.127	0.007	36.50
8	40.00	0.362	1.294	0.079	9.909	-0.021	1.551	0.142	1.000	1.000	1.000	0.066	0.066	0.008	44.00
9	48.00	0.371	1.251	0.063	9.894	-0.011	1.820	0.032	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.350	1.231	0.059	9.889	-0.010	2.218	0.043	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.316	1.210	0.055	9.884	-0.008	2.539	0.048	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.305	1.191	0.050	9.881	-0.008	2.805	0.045	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.304	1.175	0.045	9.876	-0.007	3.036	0.046	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.304	1.171	0.041	9.874	-0.006	3.241	0.059	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.304	1.161	0.036	9.866	-0.007	3.433	0.063	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.306	1.152	0.029	9.874	-0.006	3.605	0.067	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.350	1.135	0.021	9.866	-0.002	3.766	0.113	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.288	1.119	0.007	9.901	-0.002	3.852	0.062	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.277	1.097	0.543									GROUND SURFACE SETTLEMENT	0.203	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 15
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 16
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 17
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 18

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 19
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 20
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 21

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR NIS000
WITH A PEAK ACCELERATION OF 0.39 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.357	1.239	0.222	11.001	-0.099	0.179	0.014	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.371	1.235	0.221	11.001	-0.099	0.439	0.021	1.000	1.000	1.000	0.499	0.499	0.000	10.00
3	12.00	0.373	1.234	0.220	11.001	-0.099	0.631	1.088	1.000	1.000	1.000	1.000	0.898	0.162	15.00
4	18.00	0.343	1.309	0.155	10.996	-0.090	0.823	1.030	1.000	1.000	1.000	1.000	0.714	0.105	20.50
5	23.00	0.389	1.278	0.082	9.119	-0.018	0.989	0.229	1.000	1.000	1.000	0.718	0.551	0.009	25.50
6	28.00	0.355	1.268	0.072	9.111	-0.012	1.089	0.130	1.000	1.000	1.000	0.425	0.425	0.005	30.50
7	33.00	0.339	1.239	0.065	9.109	-0.006	1.276	0.119	1.000	1.000	1.000	0.119	0.119	0.007	36.50
8	40.00	0.337	1.183	0.059	9.099	-0.002	1.506	0.123	1.000	1.000	1.000	0.053	0.053	0.008	44.00
9	48.00	0.336	1.112	0.051	9.084	0.005	1.769	0.031	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.311	1.067	0.047	9.081	0.005	2.048	0.039	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.274	1.036	0.042	9.076	0.007	2.256	0.042	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.272	1.020	0.038	9.071	0.007	2.441	0.038	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.276	1.003	0.034	9.069	0.006	2.628	0.040	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.257	0.980	0.031	9.066	0.006	2.807	0.052	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.248	0.946	0.026	9.061	0.004	2.971	0.056	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.266	0.907	0.021	9.059	0.003	3.151	0.059	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.320	0.862	0.014	9.056	0.002	3.249	0.098	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.330	0.791	0.006	12.086	-0.001	3.243	0.052	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.350	0.753	0.520						GROUND SURFACE SETTLEMENT				0.296	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR NIS090
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO. DEPTH AMAX VMAX DMAXR TIME DFINALR TAUMAX CYCLIC FINAL FINAL FINAL UMAX UFINAL SETTLE DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.403	1.216	0.282	14.950	0.091	0.201	0.016	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.388	1.186	0.281	14.950	0.091	0.470	0.021	1.000	1.000	1.000	0.499	0.499	0.000	10.00
3	12.00	0.400	1.170	0.281	14.950	0.091	0.682	2.027	1.000	1.000	1.000	1.000	0.898	0.162	15.00
4	18.00	0.347	1.410	0.110	10.653	-0.010	0.898	1.084	1.000	1.000	1.000	1.000	0.714	0.105	20.50
5	23.00	0.357	1.464	0.096	12.183	0.067	1.083	0.183	1.000	1.000	1.000	0.718	0.551	0.009	25.50
6	28.00	0.319	1.448	0.088	11.443	0.062	1.177	0.149	1.000	1.000	1.000	0.425	0.425	0.005	30.50
7	33.00	0.340	1.423	0.085	11.441	0.059	1.242	0.109	1.000	1.000	1.000	0.119	0.119	0.007	36.50
8	40.00	0.340	1.378	0.079	11.433	0.055	1.313	0.103	1.000	1.000	1.000	0.053	0.053	0.008	44.00
9	48.00	0.335	1.329	0.064	11.431	0.042	1.546	0.026	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.297	1.308	0.061	11.428	0.040	1.778	0.032	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.274	1.283	0.056	11.428	0.037	1.994	0.033	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.283	1.259	0.051	11.428	0.034	2.212	0.033	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.319	1.235	0.048	12.171	0.032	2.346	0.034	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.276	1.209	0.045	12.168	0.031	2.513	0.042	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.389	1.173	0.041	12.168	0.029	2.636	0.042	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.317	1.133	0.033	14.508	0.024	2.723	0.044	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.263	1.094	0.025	14.513	0.020	2.801	0.067	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.280	1.041	0.007	12.163	0.004	2.868	0.040	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.249	1.016	0.614						GROUND SURFACE SETTLEMENT				0.296	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 22
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 23
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 24
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 25

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 26
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 27
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 28

****
NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR YAR060
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.339	1.249	0.191	19.966	0.141	0.169	0.014	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.312	1.230	0.191	19.968	0.141	0.390	0.018	1.000	1.000	1.000	0.482	0.482	0.000	10.00
3	12.00	0.308	1.225	0.190	19.968	0.141	0.561	1.109	1.000	1.000	1.000	1.000	0.916	0.162	15.00
4	18.00	0.299	1.177	0.083	12.111	0.038	0.710	0.437	1.000	1.000	1.000	0.959	0.738	0.018	20.50
5	23.00	0.390	1.155	0.074	12.101	0.024	0.848	0.178	1.000	1.000	1.000	0.716	0.572	0.011	25.50
6	28.00	0.363	1.175	0.058	12.093	0.029	0.974	0.120	1.000	1.000	1.000	0.440	0.440	0.005	30.50
7	33.00	0.347	1.191	0.051	12.088	0.030	1.135	0.110	1.000	1.000	1.000	0.151	0.151	0.007	36.50
8	40.00	0.341	1.208	0.046	16.405	0.024	1.314	0.102	1.000	1.000	1.000	0.091	0.091	0.008	44.00
9	48.00	0.357	1.225	0.040	16.398	0.017	1.550	0.025	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.332	1.222	0.038	16.398	0.016	1.841	0.030	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.313	1.215	0.034	16.400	0.016	2.075	0.034	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.311	1.200	0.032	16.408	0.015	2.284	0.032	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.318	1.179	0.028	16.408	0.014	2.467	0.034	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.308	1.159	0.025	16.410	0.012	2.628	0.046	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.387	1.140	0.021	16.408	0.011	2.823	0.048	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.375	1.121	0.016	16.405	0.009	2.916	0.049	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.293	1.104	0.011	16.400	0.006	2.987	0.076	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.305	1.086	0.004	16.418	0.001	3.093	0.045	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.306	1.074	0.540						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR YAR330
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.415	1.289	0.305	18.331	0.209	0.207	0.017	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.427	1.276	0.305	18.331	0.208	0.510	0.024	1.000	1.000	1.000	0.482	0.482	0.000	10.00
3	12.00	0.403	1.270	0.305	18.331	0.208	0.742	1.694	1.000	1.000	1.000	1.000	0.916	0.162	15.00
4	18.00	0.389	1.194	0.205	16.993	0.186	1.007	0.892	1.000	1.000	1.000	0.959	0.738	0.018	20.50
5	23.00	0.522	1.119	0.120	16.740	0.074	1.215	0.245	1.000	1.000	1.000	0.716	0.572	0.011	25.50
6	28.00	0.459	1.042	0.100	16.735	0.055	1.359	0.185	1.000	1.000	1.000	0.440	0.440	0.005	30.50
7	33.00	0.364	1.012	0.088	16.733	0.046	1.494	0.164	1.000	1.000	1.000	0.151	0.151	0.007	36.50
8	40.00	0.343	0.972	0.071	16.728	0.032	1.621	0.137	1.000	1.000	1.000	0.091	0.091	0.008	44.00
9	48.00	0.358	0.944	0.060	16.720	0.026	1.814	0.032	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.332	0.924	0.056	16.720	0.024	2.110	0.037	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.309	0.903	0.050	16.720	0.021	2.316	0.041	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.277	0.877	0.045	16.718	0.019	2.514	0.038	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.295	0.862	0.039	16.718	0.015	2.713	0.039	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.279	0.848	0.033	16.718	0.013	2.884	0.049	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.266	0.829	0.027	16.718	0.010	3.001	0.058	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.312	0.821	0.022	16.715	0.009	3.064	0.059	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.297	0.814	0.016	16.710	0.006	3.093	0.092	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.299	0.804	0.005	16.708	0.001	3.091	0.051	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.307	0.811	0.575						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 29
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 30
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 31
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 32

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 33
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 34
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 35

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR UC2000
WITH A PEAK ACCELERATION OF 0.42 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.288	1.153	0.195	13.588	0.036	0.144	0.012	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.291	1.140	0.194	13.588	0.036	0.356	0.017	1.000	1.000	1.000	0.502	0.502	0.000	10.00
3	12.00	0.305	1.132	0.194	13.588	0.036	0.512	1.309	1.000	1.000	1.000	1.000	0.898	0.162	15.00
4	18.00	0.342	1.294	0.107	9.334	0.068	0.683	0.667	1.000	1.000	1.000	0.975	0.712	0.017	20.50
5	23.00	0.414	1.207	0.076	10.271	0.014	0.835	0.151	1.000	1.000	1.000	0.690	0.549	0.008	25.50
6	28.00	0.387	1.199	0.064	10.269	0.003	0.995	0.113	1.000	1.000	1.000	0.424	0.424	0.005	30.50
7	33.00	0.363	1.173	0.057	10.266	-0.001	1.147	0.117	1.000	1.000	1.000	0.128	0.128	0.007	36.50
8	40.00	0.335	1.121	0.054	10.261	0.002	1.283	0.102	1.000	1.000	1.000	0.067	0.067	0.008	44.00
9	48.00	0.336	1.057	0.048	10.256	0.004	1.502	0.025	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.316	1.029	0.045	10.251	0.003	1.782	0.031	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.313	1.015	0.043	10.249	0.004	1.997	0.033	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.298	1.001	0.040	10.244	0.005	2.197	0.030	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.331	0.984	0.037	10.241	0.006	2.391	0.032	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.307	0.968	0.033	10.239	0.005	2.615	0.043	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.321	0.951	0.029	10.234	0.005	2.834	0.046	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.322	0.942	0.023	10.229	0.004	3.005	0.049	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.283	0.940	0.018	10.224	0.003	3.209	0.077	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.311	0.933	0.006	10.231	0.001	3.302	0.045	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.303	0.929	0.748						GROUND SURFACE SETTLEMENT				0.207	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR UC2090
WITH A PEAK ACCELERATION OF 0.34 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO. DEPTH AMAX VMAX DMAXR TIME DFINALR TAUMAX CYCLIC FINAL FINAL FINAL UMAX UFINAL SETTLE DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.360	1.473	0.536	40.546	-0.483	0.180	0.014	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.345	1.471	0.535	40.546	-0.483	0.433	0.020	1.000	1.000	1.000	0.502	0.502	0.000	10.00
3	12.00	0.353	1.469	0.535	40.546	-0.483	0.637	2.360	1.000	1.000	1.000	1.000	0.898	0.162	15.00
4	18.00	0.379	1.338	0.116	7.539	-0.006	0.821	0.486	1.000	1.000	1.000	0.975	0.712	0.017	20.50
5	23.00	0.365	1.306	0.108	7.529	-0.018	0.964	0.187	1.000	1.000	1.000	0.690	0.549	0.008	25.50
6	28.00	0.372	1.293	0.098	7.511	-0.018	1.059	0.139	1.000	1.000	1.000	0.424	0.424	0.005	30.50
7	33.00	0.333	1.276	0.089	11.493	-0.012	1.218	0.135	1.000	1.000	1.000	0.128	0.128	0.007	36.50
8	40.00	0.306	1.248	0.075	11.493	-0.004	1.384	0.129	1.000	1.000	1.000	0.067	0.067	0.008	44.00
9	48.00	0.266	1.196	0.061	11.496	0.000	1.574	0.029	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.295	1.174	0.058	11.498	0.001	1.783	0.033	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.309	1.150	0.052	11.501	0.002	1.930	0.037	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.312	1.125	0.048	11.496	0.002	2.081	0.032	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.320	1.102	0.044	11.503	0.003	2.318	0.035	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.309	1.077	0.038	11.498	0.003	2.509	0.045	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.278	1.040	0.032	11.506	0.003	2.684	0.049	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.282	0.998	0.026	11.491	0.002	2.859	0.052	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.274	0.952	0.017	11.488	0.003	3.028	0.084	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.276	0.880	0.006	11.511	0.001	3.137	0.047	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.250	0.871	0.597						GROUND SURFACE SETTLEMENT				0.207	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 36
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 37
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 38
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 39

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 40
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 41
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 42

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****

OUTPUT FOR LOB000
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.387	1.413	0.163	11.851	-0.041	0.194	0.016	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.399	1.412	0.163	11.851	-0.042	0.487	0.024	1.000	1.000	1.000	0.503	0.503	0.000	10.00
3	12.00	0.426	1.414	0.162	11.848	-0.042	0.715	1.146	1.000	1.000	1.000	1.000	0.900	0.162	15.00
4	18.00	0.392	1.318	0.116	4.139	0.009	0.938	0.761	1.000	1.000	1.000	0.975	0.718	0.021	20.50
5	23.00	0.374	1.293	0.109	4.134	0.006	1.133	0.197	1.000	1.000	1.000	0.689	0.555	0.008	25.50
6	28.00	0.386	1.267	0.096	4.129	0.003	1.291	0.169	1.000	1.000	1.000	0.426	0.426	0.006	30.50
7	33.00	0.367	1.236	0.087	4.124	0.004	1.463	0.169	1.000	1.000	1.000	0.126	0.126	0.007	36.50
8	40.00	0.300	1.183	0.071	4.116	0.009	1.649	0.156	1.000	1.000	1.000	0.065	0.065	0.008	44.00
9	48.00	0.346	1.116	0.056	4.104	0.014	1.837	0.034	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.329	1.077	0.052	4.101	0.014	2.045	0.040	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.285	1.044	0.049	4.096	0.013	2.204	0.040	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.304	1.010	0.044	4.096	0.011	2.362	0.038	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.312	0.987	0.040	4.094	0.011	2.517	0.038	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.294	0.962	0.037	4.089	0.009	2.685	0.048	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.282	0.927	0.031	4.086	0.007	2.870	0.054	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.332	0.893	0.025	4.086	0.004	2.997	0.058	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.288	0.855	0.018	4.086	0.002	3.061	0.093	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.303	0.828	0.006	10.648	0.001	3.067	0.050	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.256	0.806	0.581						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR LOB090
WITH A PEAK ACCELERATION OF 0.38 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP						GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.294	1.181	0.268	14.508	0.013	0.147	0.011	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.302	1.162	0.267	14.508	0.014	0.357	0.017	1.000	1.000	1.000	0.503	0.503	0.000	10.00
3	12.00	0.298	1.155	0.267	14.508	0.014	0.518	1.554	1.000	1.000	1.000	1.000	0.900	0.162	15.00
4	18.00	0.404	1.209	0.136	8.531	-0.067	0.688	0.847	1.000	1.000	1.000	0.975	0.718	0.021	20.50
5	23.00	0.394	1.254	0.074	8.414	-0.024	0.824	0.131	1.000	1.000	1.000	0.689	0.555	0.008	25.50
6	28.00	0.343	1.185	0.066	9.414	-0.018	0.917	0.107	1.000	1.000	1.000	0.426	0.426	0.006	30.50
7	33.00	0.315	1.158	0.062	9.409	-0.018	1.002	0.090	1.000	1.000	1.000	0.126	0.126	0.007	36.50
8	40.00	0.335	1.109	0.057	9.401	-0.016	1.145	0.080	1.000	1.000	1.000	0.065	0.065	0.008	44.00
9	48.00	0.319	1.056	0.048	9.394	-0.014	1.393	0.022	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.292	1.038	0.045	9.391	-0.013	1.639	0.028	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.267	1.022	0.042	9.391	-0.011	1.838	0.032	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.264	1.005	0.038	9.386	-0.011	2.011	0.031	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.301	0.985	0.034	9.386	-0.009	2.180	0.031	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.281	0.963	0.030	9.381	-0.006	2.384	0.040	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.286	0.929	0.026	9.379	-0.006	2.579	0.043	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.289	0.909	0.020	9.376	-0.003	2.762	0.046	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.278	0.903	0.015	9.374	-0.003	2.915	0.071	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.260	0.902	0.005	9.391	-0.001	2.957	0.039	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.282	0.919	0.743						GROUND SURFACE SETTLEMENT				0.211	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 43
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 44
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 45
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 46

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 47
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 48
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 49

****
NORMAL TERMINATION FOR THIS INPUT FILE
****

EB2i Profile EB-2 with ground improvement to about 25 feet

****
MAXIMUM RESPONSE VALUES AT GROUND SURFACE
****

INPUT FILE	INPUT MOTION	INPUT AMAX	SLOPE	COMP	KDIS	AMAX	VMAX	DMAXR	DFINALR	RUMAX	SETTLEMENT
eb2i	IV02180.txt	0.36	0.00	1	1	0.35	1.25	0.12	-0.08	0.35	0.05
eb2i	iv02270.txt	0.37	0.00	2	1	0.37	1.72	0.12	0.06	0.35	0.05
eb2i	IVEC4140.txt	0.43	0.00	1	1	0.47	1.54	0.14	0.01	0.27	0.04
eb2i	IVEC4230.txt	0.40	0.00	2	1	0.42	1.86	0.16	0.09	0.27	0.04
eb2i	JOS000.txt	0.35	0.00	1	1	0.35	1.54	0.12	-0.08	0.32	0.05
eb2i	JOS090.txt	0.39	0.00	2	1	0.42	1.53	0.14	0.01	0.32	0.05
eb2i	NIS000.txt	0.39	0.00	1	1	0.38	1.40	0.08	0.03	0.27	0.04
eb2i	NIS090.txt	0.36	0.00	2	1	0.37	1.59	0.15	0.10	0.27	0.04
eb2i	YAR060.txt	0.43	0.00	1	1	0.38	1.23	0.11	0.05	0.33	0.04
eb2i	YAR330.txt	0.43	0.00	2	1	0.41	1.21	0.17	0.10	0.33	0.04
eb2i	UC2000.txt	0.42	0.00	1	1	0.35	1.27	0.10	0.02	0.34	0.05
eb2i	UC2090.txt	0.34	0.00	2	1	0.34	1.44	0.10	0.04	0.34	0.05
eb2i	LOB000.txt	0.36	0.00	1	1	0.60	1.39	0.12	0.03	0.32	0.04
eb2i	LOB090.txt	0.38	0.00	2	1	0.37	1.25	0.08	-0.00	0.32	0.04

RUMAX IS MAX RU IN ANY LAYER; SETTLEMENT IS SETTLEMENT OF GROUND SURFACE IN FEET
DFINALR IS GROUND SURFACE FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN GSFRD IF SLOPE IS GREATER THAN ZERO

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**************************************************
**************************************************

 TESS2 - Version 3.00D
 Copyright 2020 Robert Pyke
 Built by rmp on 08/29/2020
 Using Simply Fortran v. 2.4

**************************************************
**************************************************

INPUT/OUTPUT FILE NAME: eb2i


****************************************
920 Pacific Santa Cruz       EB-2
****************************************
Improved 150-foot profile
****************************************


REDISTRIBUTION AND DISSIPATION OF PORE PRESSURES
IS INCLUDED!


CALCULATION OF SETTLEMENTS IS TURNED ON


UNITS ARE KIPS, FEET AND SECONDS


**********
INPUT DATA
**********

MATERIAL PROPERTY PARAMETERS

 MTYPE         VT     ALPHA      GMRP      TSTR      FSTR
  1          0.02      1.00      0.00      0.00      0.00

 MTYPE         VT     ALPHA      GMRP      TSTR      FSTR
  2          0.02      1.00      0.00      0.00      0.00

 MTYPE         VT     ALPHA      GMRP      TSTR      FSTR
  3          0.02      1.00      0.00      0.00      0.00

 MTYPE         VT     ALPHA      GMRP      TSTR      FSTR
  4          0.02      1.00      0.00      0.00      0.00
```

PARAMETERS FOR SIMPLE DEGRADATION

MTYPE	SS	RS	E	SG	RG	ST	RT
2	0.12	0.65	1.50	0.12	0.65	0.12	0.65

PARAMETERS FOR PORE PRESSURE GENERATION CURVES

LAYER NO.	MTYPE	TAUAV/SIGV	NL	E	F	G
3	3	0.600	10	2.00	0.10	2.00
4	3	0.600	10	2.00	0.10	2.00
5	3	0.600	10	2.00	0.10	2.00
6	4	0.600	10	2.00	0.10	2.00
7	4	0.600	10	2.00	0.10	2.00
8	4	0.600	10	2.00	0.10	2.00

VALUES FOR CONSOLIDATION PROPERTIES

LAYER NO.	MV	K
2	0.159E-03	0.328E-05
3	0.210E-03	0.328E-04
4	0.194E-03	0.328E-04
5	0.220E-03	0.328E-04
6	0.318E-03	0.328E-04
7	0.274E-03	0.328E-05
8	0.239E-03	0.328E-05
9	0.685E-04	0.328E-08
10	0.685E-04	0.328E-08
11	0.736E-04	0.328E-08
12	0.638E-04	0.328E-08
13	0.596E-04	0.328E-08
14	0.685E-04	0.328E-08
15	0.685E-04	0.328E-08
16	0.685E-04	0.328E-08
17	0.932E-04	0.328E-08
18	0.596E-04	0.328E-08

PARAMETERS FOR SETTLEMENT CALCULATIONS

LAYER NO.	ARD	FACTOR
3	60	0.33
4	70	0.50
5	70	0.50
6	70	0.33
7	70	0.33
8	75	0.33

PARAMETERS FOR HARDENING OF SHEAR MODULUS

MAT.TYPE	KHARD	FHARD	FHARDS
3	1	1.00	0.50
4	1	1.00	0.50

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****
LAYER DATA
****

DEPTH TO WATER TABLE = 6.00
TRAVEL TIMES ARE RELATIVE TO A TIMESTEP OF 0.0025 SECONDS

LAYER NO.	MTYPE	THICK	UNIT WT	OCR	KO	SIGV	VS	GMAX	TAUMAX	GAMREF	TTR
1	1	8.00	0.125			0.50	800.00	2484.47	2.981	0.120	0.250
2	1	4.00	0.125			1.00	900.00	3144.41	4.717	0.150	0.562
3	3	6.00	0.120	1.00	0.80	1.30	800.00	2385.09	2.862	0.120	0.333
4	3	5.00	0.130	1.00	0.80	1.64	800.00	2583.85	3.101	0.120	0.400
5	3	5.00	0.130	1.00	0.80	1.98	750.00	2270.96	2.725	0.120	0.375
6	4	5.00	0.120	1.00	0.80	2.29	650.00	1574.53	2.362	0.150	0.325
7	4	7.00	0.120	1.00	0.80	2.64	700.00	1826.09	2.739	0.150	0.250
8	4	8.00	0.120	1.00	0.80	3.07	750.00	2096.27	3.144	0.150	0.234
9	1	12.00	0.120			3.64	1400.00	7304.35	8.765	0.120	0.292
10	1	10.00	0.120			4.28	1400.00	7304.35	8.765	0.120	0.350
11	1	10.00	0.120			4.85	1350.00	6791.93	13.584	0.200	0.338
12	1	10.00	0.120			5.43	1450.00	7835.40	15.671	0.200	0.362
13	1	10.00	0.120			6.01	1500.00	8385.09	16.770	0.200	0.375
14	1	10.00	0.120			6.58	1400.00	7304.35	14.609	0.200	0.350
15	1	10.00	0.120			7.16	1400.00	7304.35	14.609	0.200	0.350
16	1	10.00	0.120			7.73	1400.00	7304.35	14.609	0.200	0.350
17	1	10.00	0.120			8.31	1200.00	5366.46	10.733	0.200	0.300
18	1	10.00	0.120			8.89	1500.00	8385.09	16.770	0.200	0.375

SHEAR WAVE VELOCITY IN BASE = 2500.
UNIT WEIGHT OF BASE = 0.130
BASE IS IMPERMEABLE

****

OUTPUT FOR IV02180
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.354	1.253	0.118	12.301	-0.078	0.177	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.362	1.224	0.118	12.301	-0.078	0.436	0.014	1.000	1.000	1.000	0.182	0.182	0.000	10.00
3	12.00	0.379	1.218	0.117	12.303	-0.078	0.647	0.034	1.000	1.000	1.000	0.352	0.352	0.004	15.00
4	18.00	0.476	1.193	0.114	12.301	-0.075	0.926	0.052	1.000	1.000	1.000	0.331	0.330	0.005	20.50
5	23.00	0.384	1.164	0.111	12.303	-0.073	1.043	0.085	1.000	1.000	1.000	0.326	0.310	0.006	25.50
6	28.00	0.355	1.125	0.101	12.306	-0.066	1.232	0.184	1.000	1.000	1.000	0.313	0.291	0.009	30.50
7	33.00	0.351	1.057	0.083	2.266	-0.046	1.427	0.179	1.000	1.000	1.000	0.291	0.286	0.012	36.50
8	40.00	0.329	1.000	0.071	2.259	-0.030	1.630	0.180	1.000	1.000	1.000	0.223	0.223	0.011	44.00
9	48.00	0.323	0.986	0.057	2.249	-0.018	1.856	0.034	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.304	0.988	0.053	2.246	-0.018	2.174	0.041	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.321	0.988	0.049	2.244	-0.017	2.375	0.043	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.284	0.986	0.045	2.244	-0.015	2.606	0.042	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.275	0.984	0.041	2.241	-0.012	2.845	0.043	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.277	0.979	0.037	2.239	-0.010	3.042	0.058	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.328	0.971	0.031	2.236	-0.007	3.219	0.063	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.327	0.956	0.023	2.234	-0.006	3.385	0.063	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.358	0.935	0.018	12.296	-0.006	3.495	0.105	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.433	0.903	0.006	2.221	-0.000	3.518	0.057	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.371	0.881	0.492						GROUND SURFACE SETTLEMENT				0.047	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR IV02270
WITH A PEAK ACCELERATION OF 0.37 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.373	1.725	0.121	4.844	0.063	0.186	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.377	1.709	0.121	4.844	0.063	0.455	0.016	1.000	1.000	1.000	0.182	0.182	0.000	10.00
3	12.00	0.390	1.699	0.120	4.844	0.063	0.657	0.043	1.000	1.000	1.000	0.352	0.352	0.004	15.00
4	18.00	0.435	1.668	0.119	4.844	0.062	0.859	0.064	1.000	1.000	1.000	0.331	0.330	0.005	20.50
5	23.00	0.444	1.635	0.118	4.841	0.058	1.058	0.108	1.000	1.000	1.000	0.326	0.310	0.006	25.50
6	28.00	0.446	1.573	0.116	4.841	0.055	1.241	0.278	1.000	1.000	1.000	0.313	0.291	0.009	30.50
7	33.00	0.404	1.448	0.104	4.836	0.045	1.429	0.270	1.000	1.000	1.000	0.291	0.286	0.012	36.50
8	40.00	0.367	1.310	0.085	4.826	0.028	1.614	0.205	1.000	1.000	1.000	0.223	0.223	0.011	44.00
9	48.00	0.297	1.185	0.067	4.824	0.008	1.872	0.036	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.309	1.174	0.061	4.824	0.008	2.152	0.042	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.332	1.173	0.056	4.824	0.007	2.410	0.045	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.366	1.170	0.051	4.824	0.007	2.660	0.044	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.356	1.168	0.046	4.821	0.007	2.897	0.045	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.360	1.150	0.042	4.824	0.006	3.138	0.058	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.300	1.134	0.036	4.821	0.006	3.375	0.065	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.258	1.097	0.029	4.821	0.006	3.607	0.071	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.243	1.069	0.020	4.821	0.004	3.810	0.116	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.314	1.043	0.006	2.189	0.002	3.949	0.062	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.324	1.044	0.756									GROUND SURFACE SETTLEMENT	0.047	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 1
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 2
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 3
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 4

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 5
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 6
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 7

****
NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****

OUTPUT FOR IVEC4140
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.474	1.543	0.142	5.564	0.009	0.237	0.010	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.478	1.537	0.141	5.564	0.009	0.582	0.021	1.000	1.000	1.000	0.145	0.145	0.000	10.00
3	12.00	0.453	1.531	0.140	5.564	0.009	0.834	0.042	1.000	1.000	1.000	0.272	0.272	0.002	15.00
4	18.00	0.448	1.510	0.137	5.564	0.008	1.124	0.056	1.000	1.000	1.000	0.252	0.252	0.004	20.50
5	23.00	0.452	1.484	0.134	5.564	0.007	1.407	0.105	1.000	1.000	1.000	0.264	0.237	0.005	25.50
6	28.00	0.442	1.420	0.128	5.561	0.005	1.667	0.268	1.000	1.000	1.000	0.262	0.224	0.008	30.50
7	33.00	0.364	1.275	0.110	5.554	0.001	1.896	0.253	1.000	1.000	1.000	0.246	0.239	0.010	36.50
8	40.00	0.319	1.101	0.087	5.541	0.009	2.129	0.233	1.000	1.000	1.000	0.209	0.209	0.009	44.00
9	48.00	0.357	0.974	0.069	5.514	0.003	2.416	0.045	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.339	0.956	0.064	5.509	0.004	2.687	0.051	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.334	0.931	0.059	5.504	0.003	2.902	0.050	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.312	0.919	0.054	5.501	0.002	3.174	0.050	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.331	0.943	0.049	5.499	0.002	3.453	0.052	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.338	0.981	0.044	5.496	0.001	3.708	0.068	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.324	1.009	0.037	5.489	-0.001	3.912	0.074	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.325	1.020	0.029	5.499	-0.001	4.093	0.079	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.304	1.055	0.021	5.489	-0.002	4.192	0.121	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.341	1.051	0.008	5.511	-0.001	4.230	0.071	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.312	1.047	0.530						GROUND SURFACE SETTLEMENT				0.038	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR IVEC4230
WITH A PEAK ACCELERATION OF 0.40 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.417	1.859	0.162	12.236	0.089	0.208	0.009	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.433	1.834	0.162	12.236	0.089	0.502	0.018	1.000	1.000	1.000	0.145	0.145	0.000	10.00
3	12.00	0.460	1.818	0.161	12.236	0.089	0.732	0.039	1.000	1.000	1.000	0.272	0.272	0.002	15.00
4	18.00	0.465	1.767	0.158	12.236	0.088	1.007	0.057	1.000	1.000	1.000	0.252	0.252	0.004	20.50
5	23.00	0.432	1.708	0.153	12.233	0.086	1.235	0.101	1.000	1.000	1.000	0.264	0.237	0.005	25.50
6	28.00	0.431	1.642	0.145	12.231	0.081	1.444	0.239	1.000	1.000	1.000	0.262	0.224	0.008	30.50
7	33.00	0.358	1.582	0.121	12.223	0.062	1.642	0.215	1.000	1.000	1.000	0.246	0.239	0.010	36.50
8	40.00	0.322	1.560	0.091	12.211	0.043	1.857	0.210	1.000	1.000	1.000	0.209	0.209	0.009	44.00
9	48.00	0.317	1.536	0.068	5.479	0.019	2.138	0.042	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.277	1.516	0.063	5.474	0.018	2.437	0.051	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.286	1.485	0.057	5.469	0.016	2.634	0.052	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.300	1.444	0.051	5.464	0.014	2.782	0.047	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.316	1.408	0.046	5.459	0.013	2.925	0.047	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.326	1.371	0.041	5.454	0.012	3.061	0.057	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.374	1.337	0.035	5.449	0.012	3.188	0.060	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.335	1.308	0.027	8.191	0.009	3.400	0.061	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.328	1.283	0.020	8.191	0.006	3.328	0.099	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.378	1.291	0.006	5.441	-0.001	3.338	0.052	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.322	1.307	0.870									GROUND SURFACE SETTLEMENT	0.038	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 8
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 9
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 10
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 11

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 12
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 13
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 14

****
NEXT INPUT MOTION
****

****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

****

OUTPUT FOR JOS000
WITH A PEAK ACCELERATION OF 0.35 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.352	1.541	0.120	27.232	-0.085	0.176	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.354	1.531	0.119	27.232	-0.085	0.438	0.016	1.000	1.000	1.000	0.155	0.155	0.000	10.00
3	12.00	0.359	1.521	0.118	27.232	-0.084	0.645	0.038	1.000	1.000	1.000	0.322	0.322	0.004	15.00
4	18.00	0.361	1.491	0.113	27.230	-0.080	0.870	0.055	1.000	1.000	1.000	0.311	0.311	0.005	20.50
5	23.00	0.416	1.465	0.110	27.227	-0.079	1.072	0.092	1.000	1.000	1.000	0.312	0.299	0.006	25.50
6	28.00	0.304	1.422	0.104	27.225	-0.075	1.239	0.229	1.000	1.000	1.000	0.301	0.283	0.009	30.50
7	33.00	0.290	1.357	0.086	26.157	-0.057	1.375	0.191	1.000	1.000	1.000	0.260	0.258	0.011	36.50
8	40.00	0.320	1.376	0.057	26.145	-0.029	1.516	0.152	1.000	1.000	1.000	0.186	0.186	0.010	44.00
9	48.00	0.298	1.396	0.047	26.135	-0.018	1.704	0.030	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.286	1.395	0.044	26.132	-0.016	1.976	0.036	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.303	1.383	0.042	26.130	-0.016	2.194	0.040	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.283	1.359	0.038	26.127	-0.013	2.384	0.038	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.273	1.331	0.034	26.125	-0.013	2.523	0.036	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.285	1.297	0.030	26.122	-0.011	2.648	0.045	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.308	1.253	0.026	26.120	-0.011	2.728	0.049	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.287	1.214	0.019	26.117	-0.008	2.735	0.047	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.270	1.175	0.014	26.115	-0.006	2.694	0.072	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.273	1.155	0.005	26.490	0.002	2.812	0.039	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.291	1.131	0.576						GROUND SURFACE SETTLEMENT				0.045	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR JOS090
WITH A PEAK ACCELERATION OF 0.39 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.421	1.531	0.140	9.944	0.005	0.210	0.009	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.416	1.521	0.140	9.944	0.005	0.508	0.018	1.000	1.000	1.000	0.155	0.155	0.000	10.00
3	12.00	0.431	1.513	0.139	9.944	0.005	0.726	0.040	1.000	1.000	1.000	0.322	0.322	0.004	15.00
4	18.00	0.375	1.492	0.136	9.944	0.004	0.979	0.054	1.000	1.000	1.000	0.311	0.311	0.005	20.50
5	23.00	0.359	1.476	0.133	9.941	0.003	1.203	0.108	1.000	1.000	1.000	0.312	0.299	0.006	25.50
6	28.00	0.399	1.442	0.127	9.939	0.003	1.387	0.253	1.000	1.000	1.000	0.301	0.283	0.009	30.50
7	33.00	0.398	1.390	0.115	9.929	0.001	1.570	0.220	1.000	1.000	1.000	0.260	0.258	0.011	36.50
8	40.00	0.386	1.332	0.101	9.916	-0.007	1.814	0.197	1.000	1.000	1.000	0.186	0.186	0.010	44.00
9	48.00	0.383	1.279	0.081	9.901	-0.007	2.140	0.042	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.361	1.246	0.076	9.899	-0.007	2.573	0.053	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.330	1.217	0.071	9.896	-0.007	2.919	0.057	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.305	1.186	0.065	9.894	-0.007	3.221	0.053	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.445	1.169	0.058	9.891	-0.006	3.562	0.056	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.383	1.155	0.053	9.891	-0.006	3.714	0.074	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.338	1.136	0.043	9.889	-0.003	3.866	0.075	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.362	1.110	0.034	9.894	-0.003	4.209	0.083	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.316	1.085	0.025	9.906	-0.004	4.270	0.135	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.349	1.059	0.008	9.904	-0.001	4.187	0.072	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.273	1.055	0.544						GROUND SURFACE SETTLEMENT				0.045	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 15
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 16
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 17
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 18

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 19
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 20
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 21

****
NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR NIS000
WITH A PEAK ACCELERATION OF 0.39 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.379	1.399	0.081	9.121	0.028	0.190	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.386	1.390	0.080	9.121	0.028	0.465	0.018	1.000	1.000	1.000	0.142	0.142	0.000	10.00
3	12.00	0.396	1.384	0.080	9.121	0.028	0.670	0.033	1.000	1.000	1.000	0.272	0.272	0.003	15.00
4	18.00	0.376	1.361	0.078	9.121	0.027	0.910	0.048	1.000	1.000	1.000	0.254	0.254	0.004	20.50
5	23.00	0.381	1.333	0.076	9.121	0.027	1.127	0.087	1.000	1.000	1.000	0.266	0.237	0.005	25.50
6	28.00	0.379	1.284	0.073	9.119	0.026	1.331	0.198	1.000	1.000	1.000	0.259	0.223	0.008	30.50
7	33.00	0.322	1.181	0.068	9.111	0.019	1.524	0.190	1.000	1.000	1.000	0.228	0.222	0.010	36.50
8	40.00	0.287	1.079	0.055	9.104	0.013	1.717	0.164	1.000	1.000	1.000	0.162	0.162	0.010	44.00
9	48.00	0.335	1.001	0.045	9.091	0.005	1.939	0.034	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.284	0.978	0.041	9.086	0.005	2.195	0.043	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.312	0.958	0.039	10.843	0.004	2.440	0.045	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.323	0.937	0.035	10.843	0.003	2.549	0.041	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.321	0.922	0.032	10.846	0.003	2.712	0.041	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.330	0.911	0.028	10.848	0.004	2.829	0.052	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.296	0.880	0.025	10.843	0.002	2.921	0.055	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.304	0.842	0.020	10.846	0.003	2.978	0.056	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.349	0.809	0.015	10.848	0.003	2.997	0.083	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.295	0.779	0.005	10.863	0.000	3.032	0.048	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.316	0.762	0.524						GROUND SURFACE SETTLEMENT				0.040	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR NIS090
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP						GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.375	1.591	0.146	14.560	0.104	0.187	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.389	1.586	0.146	14.560	0.104	0.460	0.016	1.000	1.000	1.000	0.142	0.142	0.000	10.00
3	12.00	0.422	1.581	0.145	14.560	0.103	0.672	0.034	1.000	1.000	1.000	0.272	0.272	0.003	15.00
4	18.00	0.373	1.565	0.142	14.558	0.101	0.889	0.053	1.000	1.000	1.000	0.254	0.254	0.004	20.50
5	23.00	0.422	1.552	0.139	14.558	0.098	1.078	0.091	1.000	1.000	1.000	0.266	0.237	0.005	25.50
6	28.00	0.477	1.519	0.133	14.555	0.093	1.253	0.221	1.000	1.000	1.000	0.259	0.223	0.008	30.50
7	33.00	0.476	1.460	0.114	14.548	0.078	1.417	0.187	1.000	1.000	1.000	0.228	0.222	0.010	36.50
8	40.00	0.327	1.383	0.090	14.543	0.058	1.525	0.149	1.000	1.000	1.000	0.162	0.162	0.010	44.00
9	48.00	0.307	1.304	0.069	14.543	0.041	1.521	0.026	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.307	1.272	0.066	14.540	0.039	1.780	0.032	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.299	1.243	0.060	14.548	0.035	2.027	0.037	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.338	1.212	0.054	14.545	0.031	2.252	0.035	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.280	1.181	0.049	14.543	0.029	2.467	0.034	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.283	1.144	0.045	14.543	0.027	2.661	0.046	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.262	1.108	0.038	14.548	0.023	2.813	0.049	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.280	1.075	0.031	14.555	0.019	2.942	0.053	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.296	1.040	0.021	14.568	0.012	3.004	0.083	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.257	1.021	0.007	14.693	0.004	3.026	0.046	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.251	0.995	0.614						GROUND SURFACE SETTLEMENT				0.040	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 22
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 23
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 24
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 25

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 26
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 27
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 28

****
NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR YAR060
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.383	1.233	0.110	16.693	0.052	0.192	0.009	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.375	1.227	0.109	16.693	0.052	0.473	0.017	1.000	1.000	1.000	0.166	0.166	0.000	10.00
3	12.00	0.372	1.219	0.109	16.693	0.052	0.690	0.039	1.000	1.000	1.000	0.328	0.328	0.003	15.00
4	18.00	0.346	1.195	0.106	16.693	0.051	0.921	0.055	1.000	1.000	1.000	0.315	0.307	0.004	20.50
5	23.00	0.354	1.177	0.102	16.693	0.050	1.119	0.096	1.000	1.000	1.000	0.323	0.288	0.005	25.50
6	28.00	0.314	1.157	0.094	16.690	0.046	1.272	0.247	1.000	1.000	1.000	0.309	0.270	0.010	30.50
7	33.00	0.311	1.168	0.076	16.688	0.038	1.360	0.183	1.000	1.000	1.000	0.257	0.253	0.010	36.50
8	40.00	0.292	1.194	0.063	16.688	0.034	1.446	0.150	1.000	1.000	1.000	0.184	0.184	0.009	44.00
9	48.00	0.305	1.217	0.052	15.888	0.027	1.657	0.030	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.308	1.221	0.048	15.885	0.026	1.877	0.035	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.302	1.221	0.044	15.883	0.024	2.046	0.037	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.292	1.211	0.040	15.880	0.021	2.226	0.036	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.287	1.196	0.035	15.878	0.020	2.370	0.034	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.266	1.181	0.031	15.875	0.018	2.466	0.045	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.265	1.160	0.027	15.873	0.016	2.591	0.046	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.312	1.136	0.022	15.873	0.014	2.724	0.048	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.288	1.112	0.016	15.873	0.011	2.679	0.075	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.320	1.087	0.005	16.663	0.003	2.737	0.040	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.312	1.076	0.539						GROUND SURFACE SETTLEMENT				0.042	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

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OUTPUT FOR YAR330
WITH A PEAK ACCELERATION OF 0.43 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP						GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.413	1.212	0.165	16.770	0.104	0.207	0.009	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.427	1.208	0.164	16.770	0.104	0.512	0.019	1.000	1.000	1.000	0.166	0.166	0.000	10.00
3	12.00	0.468	1.203	0.164	16.770	0.103	0.751	0.043	1.000	1.000	1.000	0.328	0.328	0.003	15.00
4	18.00	0.496	1.189	0.159	16.770	0.101	1.026	0.059	1.000	1.000	1.000	0.315	0.307	0.004	20.50
5	23.00	0.410	1.171	0.154	16.768	0.099	1.238	0.108	1.000	1.000	1.000	0.323	0.288	0.005	25.50
6	28.00	0.437	1.145	0.143	16.763	0.092	1.432	0.262	1.000	1.000	1.000	0.309	0.270	0.010	30.50
7	33.00	0.341	1.106	0.107	14.153	0.058	1.604	0.201	1.000	1.000	1.000	0.257	0.253	0.010	36.50
8	40.00	0.340	1.054	0.086	14.150	0.049	1.727	0.166	1.000	1.000	1.000	0.184	0.184	0.009	44.00
9	48.00	0.347	0.990	0.058	14.150	0.020	1.956	0.035	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.339	0.963	0.053	14.143	0.017	2.126	0.040	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.329	0.942	0.049	14.130	0.016	2.334	0.044	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.288	0.918	0.044	14.128	0.015	2.509	0.039	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.268	0.894	0.039	14.125	0.012	2.728	0.038	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.300	0.869	0.034	14.125	0.010	2.932	0.051	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.298	0.837	0.027	14.123	0.006	3.108	0.053	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.281	0.809	0.021	14.128	0.006	3.233	0.057	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.273	0.780	0.015	14.128	0.005	3.313	0.103	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.308	0.805	0.005	14.118	-0.000	3.327	0.053	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.322	0.818	0.576						GROUND SURFACE SETTLEMENT				0.042	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 29
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 30
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 31
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 32

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 33
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 34
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 35

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NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
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OUTPUT FOR UC2000
WITH A PEAK ACCELERATION OF 0.42 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.354	1.268	0.099	10.271	0.021	0.177	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.348	1.264	0.098	10.271	0.021	0.436	0.015	1.000	1.000	1.000	0.175	0.175	0.000	10.00
3	12.00	0.350	1.258	0.098	10.271	0.021	0.639	0.034	1.000	1.000	1.000	0.336	0.336	0.003	15.00
4	18.00	0.421	1.239	0.099	10.271	0.022	0.859	0.048	1.000	1.000	1.000	0.314	0.314	0.005	20.50
5	23.00	0.401	1.216	0.098	10.271	0.022	1.048	0.089	1.000	1.000	1.000	0.326	0.295	0.006	25.50
6	28.00	0.486	1.177	0.092	10.269	0.019	1.203	0.189	1.000	1.000	1.000	0.318	0.277	0.010	30.50
7	33.00	0.367	1.137	0.082	10.269	0.029	1.378	0.155	1.000	1.000	1.000	0.282	0.274	0.012	36.50
8	40.00	0.362	1.099	0.067	10.266	0.019	1.599	0.138	1.000	1.000	1.000	0.206	0.206	0.011	44.00
9	48.00	0.386	1.018	0.051	10.261	0.014	1.710	0.033	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.348	1.001	0.048	10.259	0.014	2.060	0.035	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.304	0.993	0.043	10.254	0.013	2.360	0.040	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.274	0.987	0.038	10.251	0.012	2.591	0.035	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.283	0.983	0.034	10.249	0.011	2.788	0.035	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.318	0.973	0.028	10.249	0.009	2.930	0.046	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.279	0.960	0.024	10.244	0.008	3.029	0.047	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.256	0.954	0.017	10.241	0.007	3.078	0.053	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.290	0.943	0.013	10.241	0.003	3.117	0.082	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.281	0.925	0.005	10.239	0.002	3.130	0.044	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.300	0.911	0.749						GROUND SURFACE SETTLEMENT				0.046	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR UC2090
WITH A PEAK ACCELERATION OF 0.34 G
AND SLOPE = 0.00
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MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.341	1.445	0.104	11.866	0.036	0.171	0.007	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.360	1.439	0.104	11.866	0.036	0.425	0.015	1.000	1.000	1.000	0.175	0.175	0.000	10.00
3	12.00	0.365	1.437	0.103	11.866	0.036	0.625	0.036	1.000	1.000	1.000	0.336	0.336	0.003	15.00
4	18.00	0.483	1.429	0.102	11.866	0.037	0.833	0.050	1.000	1.000	1.000	0.314	0.314	0.005	20.50
5	23.00	0.385	1.420	0.102	11.863	0.039	1.013	0.101	1.000	1.000	1.000	0.326	0.295	0.006	25.50
6	28.00	0.365	1.399	0.094	11.861	0.035	1.180	0.259	1.000	1.000	1.000	0.318	0.277	0.010	30.50
7	33.00	0.345	1.344	0.079	11.853	0.030	1.337	0.228	1.000	1.000	1.000	0.282	0.274	0.012	36.50
8	40.00	0.375	1.254	0.059	11.833	0.020	1.456	0.184	1.000	1.000	1.000	0.206	0.206	0.011	44.00
9	48.00	0.364	1.159	0.051	7.474	0.006	1.635	0.029	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.321	1.117	0.046	7.469	0.007	1.814	0.034	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.298	1.072	0.043	11.533	0.005	1.990	0.035	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.341	1.018	0.039	7.466	0.005	2.126	0.034	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.326	1.021	0.035	7.466	0.004	2.256	0.033	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.298	1.021	0.031	7.466	0.005	2.410	0.043	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.330	1.009	0.025	11.521	0.005	2.535	0.044	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.294	0.994	0.019	7.476	0.005	2.666	0.050	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.244	0.979	0.014	7.469	0.005	2.767	0.077	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.286	0.938	0.005	11.553	0.002	2.849	0.046	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.259	0.905	0.599							GROUND SURFACE SETTLEMENT			0.046	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 36
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 37
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 38
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 39

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 40
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 41
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 42

****
NEXT INPUT MOTION
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****
THE TIMESTEP HAS BEEN REDUCED BY A FACTOR OF 4
IN ORDER TO MEET THE COURANT STABILITY CRITERION
ALTERNATELY YOU MAY INCREASE THE LAYER THICKNESS(ES)
****

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OUTPUT FOR LOB000
WITH A PEAK ACCELERATION OF 0.36 G
AND SLOPE = 0.00
****

****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
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LAYER NO.	DEPTH TO TOP	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC GAMMAX	FINAL DELTA	FINAL DETAG	FINAL DETAU	UMAX	UFINAL	SETTLE	DEPTH TO MIDLAYER
1	0.00	0.601	1.391	0.123	4.131	0.032	0.301	0.013	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.496	1.382	0.122	4.134	0.032	0.582	0.020	1.000	1.000	1.000	0.172	0.172	0.000	10.00
3	12.00	0.441	1.375	0.121	4.136	0.032	0.831	0.041	1.000	1.000	1.000	0.323	0.323	0.004	15.00
4	18.00	0.581	1.349	0.119	4.136	0.032	1.029	0.052	1.000	1.000	1.000	0.303	0.297	0.005	20.50
5	23.00	0.757	1.323	0.115	4.139	0.032	1.200	0.091	1.000	1.000	1.000	0.306	0.276	0.006	25.50
6	28.00	0.433	1.278	0.109	4.139	0.027	1.336	0.196	1.000	1.000	1.000	0.292	0.257	0.009	30.50
7	33.00	0.449	1.237	0.093	4.136	0.022	1.572	0.188	1.000	1.000	1.000	0.252	0.247	0.011	36.50
8	40.00	0.356	1.188	0.075	4.126	0.018	1.766	0.211	1.000	1.000	1.000	0.185	0.185	0.010	44.00
9	48.00	0.367	1.115	0.054	4.111	0.016	1.941	0.037	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.327	1.073	0.049	4.106	0.015	2.131	0.042	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.303	1.035	0.045	4.099	0.014	2.268	0.043	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.310	0.994	0.041	4.091	0.011	2.392	0.040	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.291	0.962	0.037	4.091	0.010	2.555	0.039	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.300	0.949	0.033	4.089	0.008	2.676	0.051	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.313	0.917	0.028	4.084	0.007	2.831	0.054	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.326	0.908	0.023	4.084	0.003	2.938	0.057	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.283	0.878	0.017	4.081	0.004	3.045	0.091	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.277	0.874	0.006	4.084	0.000	3.040	0.049	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.255	0.870	0.581						GROUND SURFACE SETTLEMENT				0.045	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

****
OUTPUT FOR LOB090
WITH A PEAK ACCELERATION OF 0.38 G
AND SLOPE = 0.00
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****
MAXIMUM RESPONSE VALUES AT TOP OF OR IN EACH LAYER
****

LAYER NO.	DEPTH	AMAX	VMAX	DMAXR	TIME	DFINALR	TAUMAX	CYCLIC	FINAL	FINAL	FINAL	UMAX	UFINAL	SETTLE	DEPTH TO

	TO TOP							GAMMAX	DELTA	DETAG	DETAU				MIDLAYER
1	0.00	0.373	1.250	0.082	10.154	-0.002	0.187	0.008	1.000	1.000	1.000	0.000	0.000	0.000	4.00
2	8.00	0.351	1.215	0.082	10.154	-0.002	0.440	0.016	1.000	1.000	1.000	0.172	0.172	0.000	10.00
3	12.00	0.351	1.209	0.081	10.154	-0.001	0.645	0.036	1.000	1.000	1.000	0.323	0.323	0.004	15.00
4	18.00	0.329	1.183	0.079	10.151	0.001	0.861	0.050	1.000	1.000	1.000	0.303	0.297	0.005	20.50
5	23.00	0.452	1.171	0.077	10.149	0.001	1.046	0.092	1.000	1.000	1.000	0.306	0.276	0.006	25.50
6	28.00	0.396	1.129	0.073	10.146	-0.000	1.187	0.206	1.000	1.000	1.000	0.292	0.257	0.009	30.50
7	33.00	0.340	1.075	0.059	14.278	0.010	1.285	0.176	1.000	1.000	1.000	0.252	0.247	0.011	36.50
8	40.00	0.365	1.043	0.054	14.275	0.016	1.392	0.136	1.000	1.000	1.000	0.185	0.185	0.010	44.00
9	48.00	0.289	1.032	0.041	8.399	0.005	1.506	0.027	1.000	1.000	1.000	0.000	0.000	0.000	54.00
10	60.00	0.265	1.030	0.037	8.389	0.005	1.747	0.031	1.000	1.000	1.000	0.000	0.000	0.000	65.00
11	70.00	0.280	1.026	0.033	8.391	0.004	1.944	0.035	1.000	1.000	1.000	0.000	0.000	0.000	75.00
12	80.00	0.300	1.016	0.029	8.389	0.005	2.138	0.031	1.000	1.000	1.000	0.000	0.000	0.000	85.00
13	90.00	0.281	1.007	0.027	8.736	0.005	2.315	0.031	1.000	1.000	1.000	0.000	0.000	0.000	95.00
14	100.00	0.341	0.995	0.023	8.736	0.003	2.460	0.041	1.000	1.000	1.000	0.000	0.000	0.000	105.00
15	110.00	0.280	0.994	0.021	8.386	-0.001	2.557	0.042	1.000	1.000	1.000	0.000	0.000	0.000	115.00
16	120.00	0.295	0.989	0.017	8.384	-0.000	2.619	0.045	1.000	1.000	1.000	0.000	0.000	0.000	125.00
17	130.00	0.290	0.982	0.012	8.386	0.001	2.628	0.076	1.000	1.000	1.000	0.000	0.000	0.000	135.00
18	140.00	0.331	0.972	0.004	14.643	-0.000	2.763	0.043	1.000	1.000	1.000	0.000	0.000	0.000	145.00
BASE	150.00	0.279	0.956	0.747						GROUND SURFACE SETTLEMENT				0.045	

DFINALR IS FINAL RELATIVE DISPLACEMENT WHEN SLOPE IS ZERO AND INCREASE IN FRD IF SLOPE IS GREATER IS GREATER THAN ZERO
DMAX FOR BASE IS ABSOLUTE DISPACEMENT, OTHERS ARE RELATIVE DISPLACEMENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 43
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 44
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 45
HISTORY OF SUSTAINED EXCESS PORE PRESSURE IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 46

FOR SECOND COMPONENT

HISTORY OF ACCELERATION AT TOP OF LAYER 1 IS SAVED IN OUTPUT FILE NUMBER 47
HISTORY OF SHEAR STRESS IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 48
HISTORY OF SHEAR STRAIN IN LAYER 7 IS SAVED IN OUTPUT FILE NUMBER 49

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NORMAL TERMINATION FOR THIS INPUT FILE
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