RECOMMENDATION FOR BOARD ACTION: After consideration of this memo and the attachments thereto, Community Development Department staff recommends that the Board take the following actions:

1. Direct staff to require the submittal of a foundation and soils investigation prepared by a California licensed engineer in lieu of a geotechnical report as part of a building permit pursuant to the Board’s interpretation of Chapter 18 of the California Building Code. (Geotechnical reports or slope stability reports may still be required depending upon the individual circumstance applicable to the site specific project location.)
2. Direct staff to work with local engineers to develop thresholds for exceptions to the requirement of a foundation and soils investigation.
3. Direct staff, in consultation with local engineers, to draft an implementing ordinance and discuss whether or not to continue to grant soils report waivers on subdivisions.
4. Request the Board’s representative on the Regional Council of Rural Counties to discuss with RCRC and to determine if a model ordinance could be prepared by RCRC for consideration by rural counties.

DISCUSSION/SUMMARY: The recent adoption by the State of California of the 2007 Building Code has added a few wrinkles. One of the more onerous provisions requires soils investigations prior to and as part of the issuance of a building permit. Various building departments around the state are addressing this issue by requiring the preparation of geotechnical reports for construction projects. These geotechnical reports are quite extensive and can be very expensive. One of our local problems is that there are no geotechnical professionals within the County with such services being obtained from Eureka or other more distant locations. The cost of such geotechnical
reports here can run in the $5,000 and up range in costs. Interestingly, most of the urban areas of California have had extensive studies conducted by state agencies which will assist those local governments in processing building permits in compliance with these standards.

There are two chapters which apply; Chapter 18 and Chapter 18A. For ease of discussion, this memo will discuss Chapter 18A first.

**Chapter 18A**

This chapter specifically requires “foundation and soils investigation” to be submitted to the building official for each building permit. The chapter also requires that “the classification and investigation of the soil shall be made under the responsible charge of a California-registered geotechnical engineer.” However, Chapter 18A also provides in section 1801A.1.1 *Application*, that the scope of application of Chapter 18A is to applications regulated by the State Architect and to facilities such as hospitals, nursing facilities, intermediate care facilities and correctional treatment facilities. Therefore, this chapter does not apply to most of the construction activity in Del Norte County. Given that most of the structures to which this provision applies are critical facilities, geotechnical studies are probably justified.

**Chapter 18**

This chapter is the chapter which applies to most of our construction. In section 1802.1, the code specifically requires that foundation and soil investigations shall be made by a registered design professional. The term registered design professional is not defined within this chapter however the subsections to this section provide guidance by stating that soils reports are to be prepared by a registered civil engineer. Further, in section 1802.1.1.2, which addresses expansive soils, the code states that “(t)he soil investigation shall be prepared by a civil engineer who is registered in this state.” Therefore, a registered civil engineer is an acceptable professional to prepare the foundation and soils investigations pursuant to this section.

Section 1802.2 *Where Required*, requires that the owner or applicant shall submit a foundation and soils report investigation to the building official where required by Section 1802.2.1 through 1802.2.7. An exception is available “....where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary...” This exception would be difficult to utilize until a data base was developed or in the case of more urbanized areas, the state has already developed a data base. Immediately following this exception is another statement that provides that geotechnical reports are not required for one-story, wood frame, and light steel buildings and 4000 square feet or less in area and not located in a California Geological Survey mapped Earthquake Fault Zone or Seismic Hazard Zone. This exception only applies to type V construction which is wood frame typical construction including but not limited to residences, barns, and some commercial buildings.
Del Norte County is not mapped by the Geological Survey as part of the Alquist-Priolo Earthquake Fault Zones which are the maps that jurisdictions utilize on a daily basis. A review of the Geological Survey web-site did not turn up any specifically titled maps as referenced in the above section.

Section 1802.2.7 Seismic Design Category D, E, or F, applies to Del Norte County as, as part of the adoption of the California Building Code, a nationwide mapping of seismic risk has been included. That mapping is on two 8 ½ by 11 sheets of paper resulting in Del Norte County being so small on the map that a magnifying glass is required. This section requires that the soils investigation address two additional issues. First are lateral pressures on basement and retaining walls due to earthquake motions. This first additional requirement would have limited application in Del Norte regarding basements, but would apply to retaining walls, especially on hillside development. The second additional requirement is quite lengthy but, in summary, requires the civil engineer to assess liquefaction potential and propose any appropriate mitigation measures related to differential settlement, lateral movement, or reduction in foundation soil-bearing capacity.

An exception is provided that may or may not apply to portions of Del Norte County as it deals with peak ground acceleration, of which this office has limited information. The Building Official for the City of Vacaville has taken the position that the intent of Section 1802.2.7 is not to require a soils report for every single small development such as room additions and sheds. Instead, he believes the intent is to grant local officials the discretion when they know about local characteristics such as previous construction in the same areas and any foundation problems that have occurred.

Sections 1802.3 through 1802.6 deal with soils classifications and boring when required.

The next section, 1802.7 Engineering geologic reports, immediately contradicts the previous sections. This section states that “Geologic and earthquake engineering reports shall be required for all proposed construction.” An exception is included similar to and more expansive that the exception in Section 1802.2. In the next section the code states that the reports "...shall be prepared by a California-certified engineering geologist in consultation with a California-registered geotechnical engineer." The requirements for this report are extensive and therefore expensive. Interestingly, there is a provision that all such prepared reports are to be submitted to the state. This might explain the extensive reporting requirements. An extensive data base will be developed by the state at the expense of a building applicant; therefore increasing the cost of construction, specifically housing.

This office has required geotechnical reports or slope stability reports for hillside development. In particular, Requa Hill has a lot of instability and geotechnical reports are appropriate. There have been soils reports prepared as part of a subdivision;
however, some soils reports have been previously waived by the County out on the flat coastal plain. The County may want to consider not waiving soils reports on subdivisions as a result of the information above. CDD staff is recommending the actions listed above as an interim measure in order to allow the processing of building permits. This issue has a lot of jurisdictions in the same state of confusion as Del Norte.

Attachments:
- Chapter 18A Soils and Foundations (pages 157-158)
- Chapter 18 Soils and Foundations (pages 125-128)
- Figure D-1 Seismic Design Categories

ALTERNATIVES: Geotechnical reports could be required for all construction permits. This would be expensive and would significantly delay the processing of permits as there are no registered geologists located in Del Norte County.

ADMINISTRATIVE SIGN-OFF:
Auditor: No.
County Counsel: No.
County Administrative Officer: No.
Personnel: No.
Other Department: None.

EWP/wm

cc: Stan Morris, Building Official
    Dan Minges, Building Inspector
    Ward Stover, Consulting Engineer
    Lee Tromble, Consulting Engineer
    Erik Weber, Consulting Engineer
    Jeff Anderson, Consulting Engineer

Acct. # 101-261-20221
CHAPTER 18A
SOILS AND FOUNDATIONS

SECTION 1801A
GENERAL

1801A.1 Scope. The provisions of this chapter shall apply to building and foundation systems in those areas not subject to scour or water pressure by wind and wave action. Buildings and foundations subject to such scour or water pressure loads shall be designed in accordance with Chapter 16A.

Refer to Appendix J, Grading, for requirements governing grading, excavation and earthwork construction, including fills and embankments.

1801A.1.1 Application. The scope of application of Chapter 18A is as follows:

1. Applications listed in Section 109.2 regulated by the Division of the State Architect—Structural Safety (DSA-SS). These applications include public elementary and secondary schools, community colleges and state-owned or state-leased essential services buildings.

2. Applications listed in Sections 110.1, and 110.4 regulated by the Office of Statewide Health Planning and Development (OSHPD). These applications include hospitals, skilled nursing facilities, intermediate care facilities and correctional treatment centers.

Exception: [OSHPD 2] Single-story Type V skilled nursing or intermediate care facilities utilizing wood-frame or light-steel-frame construction as defined in Health and Safety Code Section 129725, which shall comply with Chapter 18 and any applicable amendments therein.

1801A.1.2 Amendments in this chapter. DSA-SS and OSHPD adopt this chapter and all amendments.

Exception: Amendments adopted by only one agency appear in this chapter preceded with the appropriate acronym of the adopting agency, as follows:

1. Division of the State Architect—Structural Safety:
   [DSA-SS] For applications listed in Section 109.2.

2. Office of Statewide Health Planning and Development:
   [OSHPD 1] For applications listed in Section 110.1.
   [OSHPD 4] For applications listed in Section 110.4.

1801A.2 Design. Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the allowable stress design load combinations specified in Section 1605A.3. The quality and design of materials used structurally in excavations, footings and foundations shall conform to the requirements specified in Chapters 16A, 19A, 21A, 22A and 23 of this code. Excavations and fills shall also comply with Chapter 33.

1801A.2.1 Foundation design for seismic overturning. Where the foundation is proportioned using the load combinations of Section 1605A.2, and the computation of the seismic overturning moment is by the equivalent lateral-force method or the modal analysis method, the proportioning shall be in accordance with Section 12.13.4 of ASCE 7.

SECTION 1802A
FOUNDATION AND SOILS INVESTIGATIONS

1802A.1 General. Foundation and soils investigations shall be conducted in conformance with Sections 1802A.2 through 1802A.7. The classification and investigation of the soil shall be made under the responsible charge of a California-registered geotechnical engineer. All recommendations contained in geotechnical and engineering geology reports shall be subject to the approval of the enforcement agency, in consultation with the California Geological Survey (CGS). All reports shall be prepared and signed by a registered geotechnical engineer and an engineering geologist where applicable.

1802A.2 Where required. The owner or applicant shall submit a foundation and soils investigation to the building official where required in Sections 1802A.2.1 through 1802A.2.8.

Exception: Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or V construction and 4,000 square feet (371 m²) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table 1804A.2.

1802A.2.1 Questionable soil. Where the classification, strength or compressibility of the soil are in doubt or where a load-bearing value superior to that specified in this code is claimed, the building official shall require that the necessary investigation be made. Such investigation shall comply with the provisions of Sections 1802A.4 through 1802A.7.

1802A.2.2 Expansive soils. In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist.

1802A.2.3 Ground-water table. A subsurface soil investigation shall be performed to determine whether the existing ground-water table is above or within 5 feet (1524 mm) below the elevation of the lowest floor level where such floor is located below the finished ground level adjacent to the foundation.

1802A.2.4 Pile and pier foundations. Pile and pier foundations shall be designed and installed on the basis of a foundation investigation and report as specified in Sections 1802A.4 through 1802A.7 and Section 1808A.2.2.
1802A.2.5 Rock strata. Where subsurface explorations at the project site indicate variations or doubtful characteristics in the structure of the rock upon which foundations are to be constructed, a sufficient number of borings shall be made to a depth of not less than 10 feet (3048 mm) below the level of the foundations to provide assurance of the soundness of the foundation bed and its load-bearing capacity.

1802A.2.6 Seismic Design Category C. Where a structure is determined to be in Seismic Design Category C, an investigation shall be conducted and shall include an evaluation of the following potential hazards resulting from earthquake motions: slope instability, liquefaction and surface rupture due to faulting or lateral spreading.

1802A.2.7 Seismic Design Category D, E or F. Where the structure is determined to be in Seismic Design Category D, E or F, in accordance with Section 1613A, the soils investigation requirements for Seismic Design Category C, given in Section 1802A.2.6, shall be met, in addition to the following. The investigation shall include:

1. A determination of lateral pressures on basement and retaining walls due to earthquake motions.
2. An assessment of potential consequences of any liquefaction and soil strength loss, including estimation of differential settlement, lateral movement or reduction in foundation soil-bearing capacity, and shall address mitigation measures. Such measures shall be given consideration in the design of the structure and can include but are not limited to ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements or any combination of these measures. The potential for liquefaction and soil strength loss shall be evaluated for site peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions. Peak ground acceleration shall be determined from a site-specific study taking into account soil amplification effects, as specified in Chapter 21 of ASCE 7.

Exception: A site-specific study need not be performed, provided that peak ground acceleration equal to $S_{Dy}/2.5$ is used, where $S_{Dy}$ is determined in accordance with Section 1613A.

1802A.2.8 High sulfate soils. In areas subject to high sulfate soils, an evaluation of the impact on the durability of concrete foundations shall be considered.

1802A.3 Soil classification. Where required, soils shall be classified in accordance with Section 1802A.3.1 or 1802A.3.2.

1802A.3.1 General. For the purposes of this chapter, the definition and classification of soil materials for use in Table 1804A.4 shall be in accordance with ASTM D 2487.

1802A.3.2 Expansive soils. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D 4318.
2. More than 10 percent of the soil particles pass a No. 200 sieve (75 μm), determined in accordance with ASTM D 422.
3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.
4. Expansion index greater than 20, determined in accordance with ASTM D 4829.

1802A.4 Investigation. Soil classification shall be based on observation and any necessary tests of the materials disclosed by borings, test pits or other subsurface exploration made in appropriate locations. Additional studies shall be made as necessary to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness.

1802A.4.1 Exploratory boring. The scope of the soil investigation including the number and types of borings or soundings, the equipment used to drill and sample, the in-situ testing equipment and the laboratory testing program shall be determined by a registered design professional. There shall not be less than one boring or exploration shaft for each 5,000 square feet (465 m²) of building area at the foundation level with a minimum of two provided for any one building. A boring may be considered to reflect subsurface conditions relevant to more than one building, subject to the approval of the enforcement agency.

Borings shall be of sufficient size to permit visual examination of the soil in place or, in lieu thereof, cores shall be taken.

Borings shall be of sufficient depth and size to adequately characterize subsurface conditions.

1802A.4.5 Soil boring and sampling. The soil boring and sampling procedure and apparatus shall be in accordance with generally accepted engineering practice. The registered design professional shall have a fully qualified representative on the site during all boring and sampling operations.

1802A.6 Site data.

1802A.6.1 Engineering geologic reports.

1802A.6.1.1 Geologic and earthquake engineering reports shall be required for all proposed construction.

Exceptions:

1. Reports are not required for one-story, wood-frame and light-steel-frame buildings of Type II or V construction and 4,000 square feet (371 m²) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from the California Geological Survey (CGS); nonstructural, associated structural or nonrequired structural alterations and incidental structural additions or alterations, and structural repairs for other than earthquake damage.

2. A previous report for a specific site may be re-submitted, provided that a reevaluation is made
CHAPTER 18
SOILS AND FOUNDATIONS

SECTION 1801
GENERAL

1801.1 Scope. The provisions of this chapter shall apply to building and foundation systems in those areas not subject to scour or water pressure by wind and wave action. Buildings and foundations subject to such scour or water pressure loads shall be designed in accordance with Chapter 16.

1801.2 Design. Allowable bearing pressures, allowable stresses and design formulas provided in this chapter shall be used with the allowable stress design load combinations specified in Section 1605.3. The quality and design of materials used structurally in excavations, footings and foundations shall conform to the requirements specified in Chapters 16, 19, 21, 22 and 23 of this code. Excavations and fills shall also comply with Chapter 33.

1802 FOUNDATION AND SOILS INVESTIGATIONS

1802.1 General. Foundation and soils investigations shall be conducted in conformance with Sections 1802.2 through 1802.8. Where required by the building official, the classification and investigation of the soil shall be made by a registered design professional.

1802.1.1 General and where required for applications listed in Section 108.2.1.1 regulated by the Department of Housing and Community Development. [HCD 1] Foundation and soils investigations shall be conducted in conference with Health and Safety Code Sections 17953 through 17955 as summarized below.

1802.1.1.1 Preliminary soil report. Each city, county, or city and county shall enact an ordinance which requires a preliminary soil report, prepared by a civil engineer who is registered by the state. The report shall be based upon adequate test borings or excavations, of every subdivision, where a tentative and final map is required pursuant to Section 66426 of the Government Code.

The preliminary soil report may be waived if the building department of the city, county or city and county, or other enforcement agency charged with the administration and enforcement of the provisions of this part, shall determine that, due to the knowledge such department has as to the soil qualities of the soil of the subdivision or lot, no preliminary analysis is necessary.

1802.1.2 Soil investigation by lot, necessity, preparation, and recommendations. If the preliminary soil report indicates the presence of critically expansive soils or other soil problems which, if not corrected, would lead to structural defects, such ordinance shall require a soil investigation of each lot in the subdivision.

The soil investigation shall be prepared by a civil engineer who is registered in this state. It shall recommend corrective action which is likely to prevent structural damage to each dwelling proposed to be constructed on the expansive soil.

1802.1.3 Approval, building permit conditions, appeal. The building department of each city, county or city and county, or other enforcement agency charged with the administration and enforcement of the provisions of this part, shall approve the soil investigation if it determines that the recommended action is likely to prevent structural damage to each dwelling to be constructed. As a condition to the building permit, the ordinance shall require that the approved recommended action be incorporated in the construction of each dwelling. Appeal from such determination shall be to the local appeals board.

1802.2 Where required. The owner or applicant shall submit a foundation and soils investigation to the building official where required in Sections 1802.2.1 through 1802.2.7.

Exception: The building official need not require a foundation or soils investigation where satisfactory data from adjacent areas is available that demonstrates an investigation is not necessary for any of the conditions in Sections 1802.2.1 through 1802.2.6.

[OSHPD 2] Geotechnical reports are not required for one-story, wood-frame and light-steel-frame buildings of Type V construction and 4,000 square feet (371 m²) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from California Geological Survey (CGS). Allowable foundation and lateral soil pressure values may be determined from Table 1804.2.

1802.2.1 Questionable soil. Where the classification, strength or compressibility of the soil are in doubt or where a load-bearing value superior to that specified in this code is claimed, the building official shall require that the necessary investigation be made. Such investigation shall comply with the provisions of Sections 1802.4 through 1802.6.

1802.2.2 Expansive soils. In areas likely to have expansive soil, the building official shall require soil tests to determine where such soils do exist.
1802.2.3 Ground-water table. A subsurface soil investigation shall be performed to determine whether the existing ground-water table is above or within 5 feet (1524 mm) below the elevation of the lowest floor level where such floor is located below the finished ground level adjacent to the foundation.

Exception: A subsurface soil investigation shall not be required where waterproofing is provided in accordance with Section 1807.

1802.2.4 Pile and pier foundations. Pile and pier foundations shall be designed and installed on the basis of a foundation investigation and report as specified in Sections 1802.4 through 1802.6 and Section 1808.2.2.

1802.2.5 Rock strata. Where subsurface explorations at the project site indicate variations or doubtful characteristics in the structure of the rock upon which foundations are to be constructed, a sufficient number of borings shall be made to a depth of not less than 10 feet (3048 mm) below the level of the foundations to provide assurance of the soundness of the foundation bed and its load-bearing capacity.

1802.2.6 Seismic Design Category C. Where a structure is determined to be in Seismic Design Category C in accordance with Section 1613, an investigation shall be conducted and shall include an evaluation of the following potential hazards resulting from earthquake motions: slope instability, liquefaction and surface rupture due to faulting or lateral spreading.

1802.2.7 Seismic Design Category D, E or F. Where the structure is determined to be in Seismic Design Category D, E or F, in accordance with Section 1613, the soils investigation requirements for Seismic Design Category C, given in Section 1802.2.6, shall be met, in addition to the following. The investigation shall include:

1. A determination of lateral pressures on basement and retaining walls due to earthquake motions.

2. An assessment of potential consequences of any liquefaction and soil strength loss, including estimation of differential settlement, lateral movement or reduction in foundation soil-bearing capacity, and shall address mitigation measures. Such measures shall be given consideration in the design of the structure and can include but are not limited to ground stabilization, selection of appropriate foundation type and depths, selection of appropriate structural systems to accommodate anticipated displacements or any combination of these measures. The potential for liquefaction and soil strength loss shall be evaluated for site peak ground acceleration magnitudes and source characteristics consistent with the design earthquake ground motions. Peak ground acceleration shall be determined from a site-specific study taking into account soil amplification effects, as specified in Chapter 21 of ASCE 7.

Exception: A site-specific study need not be performed, provided that peak ground acceleration equal to $S_{0.5}/2.5$ is used, where $S_{0.5}$ is determined in accordance with Section 21.2.1 of ASCE 7.

1802.3 Soil classification. Where required, soils shall be classified in accordance with Section 1802.3.1 or 1802.3.2.

1802.3.1 General. For the purposes of this chapter, the definition and classification of soil materials for use in Table 1804.2 shall be in accordance with ASTM D 2487.

1802.3.2 Expansive soils. Soils meeting all four of the following provisions shall be considered expansive, except that tests to show compliance with Items 1, 2 and 3 shall not be required if the test prescribed in Item 4 is conducted:

1. Plasticity index (PI) of 15 or greater, determined in accordance with ASTM D 4318.

2. More than 10 percent of the soil particles pass a No. 200 sieve (75 µm), determined in accordance with ASTM D 422.

3. More than 10 percent of the soil particles are less than 5 micrometers in size, determined in accordance with ASTM D 422.

4. Expansion index greater than 20, determined in accordance with ASTM D 4829.

1802.4 Investigation. Soil classification shall be based on observation and any necessary tests of the materials disclosed by borings, test pits or other subsurface exploration made in appropriate locations. Additional studies shall be made as necessary to evaluate slope stability, soil strength, position and adequacy of load-bearing soils, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness.

1802.4.1 Exploratory boring. The scope of the soil investigation including the number and types of borings or soundings, the equipment used to drill and sample, the in-situ testing equipment and the laboratory testing program shall be determined by a registered design professional.

1802.5 Soil boring and sampling. The soil boring and sampling procedure and apparatus shall be in accordance with generally accepted engineering practice. The registered design professional shall have a fully qualified representative on the site during all boring and sampling operations.

1802.6 Reports. The soil classification and design load-bearing capacity shall be shown on the construction document. Where required by the building official, a written report of the investigation shall be submitted that includes, but need not be limited to, the following information:

1. A plot showing the location of test borings and/or excavations.

2. A complete record of the soil samples.

3. A record of the soil profile.

4. Elevation of the water table, if encountered.

5. Recommendations for foundation type and design criteria, including but not limited to: bearing capacity of natural or compacted soil; provisions to mitigate the effects of expansive soils; mitigation of the effects of liquefaction, differential settlement and varying soil strength; and the effects of adjacent loads.

7. Pile and pier foundation information in accordance with Section 1808.2.2.
8. Special design and construction provisions for footings or foundations founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.
10. [OSHPD 2] The report shall consider the effects of seismic hazard per Sections 1802A.7 and 1802A.8.

1802.7 Engineering geologic reports. [OSHPD 2]

1802.7.1 Geologic and earthquake engineering reports shall be required for all proposed construction.

Exceptions:

1. Reports are not required for one-story, wood-frame and light-steel-frame buildings of Type V construction and 4,000 square feet (371m²) or less in floor area, not located within Earthquake Fault Zones or Seismic Hazard Zones as shown in the most recently published maps from California Geological Survey (CGS); nonstructural, associated structural or nonrequired structural alterations and incidental structural alterations or additions, and structural repairs for other than earthquake damage (see Section 3402A.1 for definitions of terms in this section).
2. A previous report for a specific site may be resubmitted, provided that a reevaluation is made and the report is found to be currently appropriate.

1802.7.2 The purpose of the engineering geologic report shall be to identify geologic and seismic conditions that may require project mitigations. The reports shall contain data which provide an assessment of the nature of the site and potential for earthquake damage based on appropriate investigations of the regional and site geology, project foundation conditions and the potential seismic shaking at the site. The report shall be prepared by a California-certified engineering geologist in consultation with a California-registered geotechnical engineer.

The preparation of the engineering geologic report shall consider the most recent CGS Note 48: Checklist for the Review of Engineering Geology and Seismology Reports for California Public School, Hospitals, and Essential Services Buildings. In addition, the most recent version of CGS Special Publication 42: Fault Rupture Hazard Zones in California, shall be considered for project sites proposed within an Aquist-Priolo Earthquake Fault Zone. The most recent version of CGS Special Publication 117: Guidelines for Evaluating and Mitigating Seismic Hazards in California, shall be considered for project sites proposed within a Seismic Hazard Zone. All conclusions shall be fully supported by satisfactory data and analysis.

The report shall include, but shall not be limited to, the following:

1. Geologic investigation.
2. Evaluation of the known active and potentially active faults, both regional and local.

3. Ground-motion parameters, as required by Section 1613 and ASCE 7.
4. Evaluation of slope stability at or near the site and;
5. The liquefaction and settlement potential of the earth materials in the foundation.

1802.8 Geotechnical and supplemental ground-response reports. [OSHPD 2]

1802.8.1 Geotechnical report. The geotechnical report shall provide complete evaluations of the foundation conditions of the site and the potential geologic/seismic hazards affecting the site. The geotechnical report shall include, but shall not be limited to, site-specific evaluations of design criteria related to the nature and extent of foundation materials, groundwater conditions, liquefaction potential, settlement potential and slope stability. The report shall contain the results of the analysis of problem areas identified in the engineering geologic report. The geotechnical report shall incorporate estimates of the characteristics of site ground motion provided in the engineering geologic report.

The geotechnical report shall be prepared by a geotechnical engineer registered in the state of California with the advice of the certified engineering geologist and other technical experts, as necessary. The approved engineering geologic report shall be submitted with or as part of the geotechnical report.

1802.8.2 Supplemental ground-response report. If site-specific ground-motion procedures, as set forth in ASCE 7 Chapter 21, or ground-motion time-history analysis, as set forth in ASCE 7 Chapter 16 or Section 17.3, are used for design, then a supplemental ground-response report may be required. All conclusions and ground-motion parameters shall be fully supported by satisfactory data and analysis.

1802.8.2.1 The ground-motion element shall be prepared by a registered geotechnical engineer or geophysicist (depending on the scope of the element), or engineering geologist licensed in the state of California, and having professional specialization in earthquake analysis. The ground-motion element shall present a detailed characterization of earthquake ground motions for the site, which incorporates data given in the geotechnical report. The level of ground motion considered by the ground-motion element shall be as described in ASCE 7 Chapter 21. The characterization of ground motion in the ground-motion element shall be given, according to the requirements of the analysis, in terms of:

1. Elastic structural response spectra.
2. Time-history plot of predicted ground motion at the site.
3. Other analyses in conformance with accepted engineering and seismological practice.

1802.8.2.2 The advanced geotechnical element shall contain the results of dynamic geotechnical analyses specified by the approved geotechnical report.
site response analysis, as set forth in ASCE 7 Section 21.1, is required, the response model shall be fully explained. The input data and assumptions shall be fully documented, and the surface ground motions recommended for design shall be clearly identified.

The supplemental ground-response report shall be submitted to the Office of Statewide Health Planning and Development for review and approval. The review shall determine whether the ground-motion response evaluations of the site are adequately represented. The enforcement agency, in consultation with its advisors, may require additional information, analysis or clarification of potential ground-response issues reported in the supplemental ground-response report for the proposed building site.

SECTION 1803
EXCAVATION, GRADING AND FILL

1803.1 Excavations near footings or foundations. Excavations for any purpose shall not remove lateral support from any footing or foundation without first underpinning or protecting the footing or foundation against settlement or lateral translation.

1803.2 Placement of backfill. The excavation outside the foundation shall be backfilled with soil that is free of organic material, construction debris, cobbles and boulders or a controlled low-strength material (CLSM). The backfill shall be placed in lifts and compacted, in a manner that does not damage the foundation or the waterproofing or dampproofing material.

Exception: Controlled low-strength material need not be compacted.

1803.3 Site grading. The ground immediately adjacent to the foundation shall be sloped away from the building at a slope of not less than one unit vertical in 20 units horizontal (5-percent slope) for a minimum distance of 10 feet (3048 mm) measured perpendicular to the face of the wall. If physical obstructions or lot lines prohibit 10 feet (3048 mm) of horizontal distance, a 5-percent slope shall be provided to an approved alternative method of diverting water away from the foundation. Swales used for this purpose shall be sloped a minimum of 2 percent where located within 10 feet (3048 mm) of the building foundation. Impervious surfaces within 10 feet (3048 mm) of the building foundation shall be sloped a minimum of 2 percent away from the building.

Exception: Where climatic or soil conditions warrant, the slope of the ground away from the building foundation is permitted to be reduced to not less than one unit vertical in 48 units horizontal (2-percent slope).

The procedure used to establish the final ground level adjacent to the foundation shall account for additional settlement of the backfill.

1803.4 Grading and fill in flood hazard areas. In flood hazard areas established in Section 1612.3, grading and/or fill shall not be approved:

1. Unless such fill is placed, compacted and sloped to minimize shifting, slumping and erosion during the rise and fall of flood water and, as applicable, wave action.

2. In floodways, unless it has been demonstrated through hydrologic and hydraulic analyses performed by a registered design professional in accordance with standard engineering practice that the proposed grading or fill, or both, will not result in any increase in flood levels during the occurrence of the design flood.

3. In flood hazard areas subject to high-velocity wave action, unless such fill is conducted and/or placed to avoid diversion of water and waves toward any building or structure.

4. Where design flood elevations are specified but floodways have not been designated, unless it has been demonstrated that the cumulative effect of the proposed flood hazard area encroachment, when combined with all other existing and anticipated flood hazard area encroachment, will not increase the design flood elevation more than 1 foot (305 mm) at any point.

1803.5 Compacted fill material. Where footings will bear on compacted fill material, the compacted fill shall comply with the provisions of an approved report, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of compacted fill material.

2. Specifications for material to be used as compacted fill.

3. Test method to be used to determine the maximum dry density and optimum moisture content of the material to be used as compacted fill.

4. Maximum allowable thickness of each lift of compacted fill material.

5. Field test method for determining the in-place dry density of the compacted fill.

6. Minimum acceptable in-place dry density expressed as a percentage of the maximum dry density determined in accordance with Item 3.

7. Number and frequency of field tests required to determine compliance with Item 6.

Exception: Compacted fill material less than 12 inches (305 mm) in depth need not comply with an approved report, provided it has been compacted to a minimum of 90 percent Modified Proctor in accordance with ASTM D 1557. The compaction shall be verified by a qualified inspector approved by the building official.

1803.6 Controlled low-strength material (CLSM). Where footings will bear on controlled low-strength material (CLSM), the CLSM shall comply with the provisions of an approved report, which shall contain the following:

1. Specifications for the preparation of the site prior to placement of the CLSM.

2. Specifications for the CLSM.

3. Laboratory or field test method(s) to be used to determine the compressive strength or bearing capacity of the CLSM.
FIGURE D-1 SEISMIC DESIGN CATEGORIES
- SITE CLASS D

REFERENCES
FIGURE D-1 SEISMIC DESIGN CATEGORIES
- SITE CLASS D (continued)