1. INTRODUCTION

Pursuant to Los Angeles Municipal Code Sec. 91.7006.2, geologic and soils reports are required to be submitted to the Department of Building and Safety (LADBS) for review and approval. These guidelines for geology and soils reports submitted to the City of Los Angeles are developed from four sources:


2. The Department of Building and Safety Information Bulletins (IB), which document LADBS requirements and guidelines for specific topics in greater detail than the Building Code. Information Bulletins are available at the Department internet home page www.ladbs.org

3. Publications of the California Geologic Survey (CGS), including CGS Notes 42, 44 and 49 which provide the guidelines to geologic report format and content and CGS Special Publication 117 (SP117) which provides guidelines for evaluating and mitigating seismic hazards in California. CGS publication are available at: www.consrv.ca.gov

4. The Southern California Earthquake Center’s (SCEC) "Recommended Procedures for Implementation of DMG Special Publication 117, Guidelines for Analyzing and Mitigating Liquefaction in California” (SCEC-Recommended Procedures) which provides more detail for implementing SP117. The SCEC-Recommended Procedures are available at www.scec.org.

Those preparing reports should first identify if the project site is to be subdivided and if it is within areas of the City that require special studies. A Parcel Profile Report available at www.ladbs.org may help in identifying whether the site is in a special study area. Those areas are:

a) Hillside Grading Areas (HGA’s) per LAMC Sect. 91.7000, requiring geologic and soil investigation,

b) State Mapped Zones requiring Liquefaction and Landsliding investigation/mitigation per Seismic Hazard Mapping Act, State of California Public Resources Code, Section 2690 et seq.,

c) Earthquake Fault Rupture (Alquist-Priolo) Hazard Zones per State of California Public Resources Code, Section 2620 et seq., requiring fault studies per I.B.P/BC2001-49 & CGS Note 49,

d) Methane Seepage Districts per LAMC Sect. 91.7100. Methane report requirements may also include areas adjoining landfills, having hydrocarbon contamination, and near oil and gas wells.

Additional requirements for special reports are discussed in Section 4 of these guidelines. Information, analyses, and recommendations provided in the reports shall be developed and reported under the responsible charge of professional signatories registered with the State of California to practice the subject discipline. Common report types and licensed professionals typically preparing them include:
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### CONTENTS OF REPORTS FOR SUBMITTAL TO THE GRADING SECTION

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Geologic reports are generally required for:
- a) all proposed subdivisions, construction, and grading in hillside areas,
- b) during and/or at the completion of tract grading,
- c) private sewage disposal systems in hillside areas,
- d) sites located in Alquist-Priolo Earthquake Fault-Rupture Hazard Zones.

The engineering geology report shall include:
- a) description of the general setting with respect to major geologic and geographic features,
- b) description of the geology of the site accompanied with geologic maps and cross-sections,
- c) description of natural materials and structural features,
- d) conclusions and recommendations regarding the effect of geologic conditions on the proposed development, and
- e) an opinion as to whether the site is suitable for the intended use.

Geologic reports for Hillside Grading Areas are commonly provided in a Combined Geology and Soils report.

As stipulated in LAMC Sec. 91.7006.3.1, the soils engineering report shall include:
- 1. data regarding the nature, distribution, and strength of existing soils,
- 2. conclusions and recommendations for grading procedures and design criteria for corrective measures, including buttress fills, when necessary, and
- 3. opinion as to whether the site is suitable for the intended use.

Reports shall be submitted in triplicate, including one unbound original for microfilming, at the downtown office or at a district office. A fourth copy of the report shall be submitted if the project is a subdivision or within State Mapped Zones for seismically induced liquefaction or land sliding investigation/mitigation. To ensure sufficient information and data are provided in these reports so that it can be reviewed in an expeditious manner, they should include, but not be limited to, the items listed.

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below. The suggested formats and information required are intended to be relatively complete, and not all items would be applicable to small projects or low risk sites. In addition, some items would be covered in separate reports by soil engineers, geologists, seismologists, civil or structural engineers.

2. CONTENTS OF SOILS AND GEOLOGY REPORTS

A. SITE AND PROJECT DESCRIPTION
Identify the site address and legal descriptors (Tract, Block, Lots, Arb) for the site, this information may be checked with a Parcel Profile Report (available at www.ladbs.org). Discuss the type, size, and scope of the project, with a brief description of the proposed structures including number of floor levels and maximum anticipated design loads, existing site topography, and the extent of grading work proposed. Specify the proximity of the proposed development to any relevant ascending and descending slopes and indicate slope heights and inclinations. Identify whether the site is located in areas requiring special analyses or reports as described in Section 1 above.

B. MAP AND CROSS SECTION
Provide a scaled site map or plot plan with a north arrow showing the location and extent of the project. The map shall be based upon a topographic base map prepared by a licensed land surveyor when the site is not flat. Cross sections are usually required where a slope, basement, retaining wall, or temporary/permanent excavations greater than 5ft high or below a 1:1 from the property line is present. The map and cross sections shall clearly show the site boundaries, location and size of all existing and proposed buildings, walls, elevated decks, and pools, the location of all exploratory pits/borings, material contacts, and the extent of the proposed grading work. Cross sections shall also include depictions of ground water, temporary excavations, grades, foundations, retaining walls, sub drains, property boundaries, and slope setbacks. Topographic data and cross sections shall extend beyond the site to demonstrate that adjacent or offsite slopes do not affect the stability of the site. A geologic map and cross sections shall be provided where bedrock formations are involved. The geologic map shall present all the features required on a geotechnical map and the distribution of geologic units, faults, landslides, slumps, bedding attitudes, etc.

C. FIELD EXPLORATION
Describe the method of exploration including sampling and testing of the soil and bedrock. Detailed logs of test pits and borings shall show the locations of all samples and sampling resistance (blow counts, etc.). Ground water and seeps with observed fluctuations should be noted on the logs. For specific guidelines and requirements on hillside exploration and reporting of the results, refer to I.B. P/BC2001-68.

D. LABORATORY TESTING
All laboratory testing must be performed by a City of Los Angeles approved testing agency. Field density tests are considered to be laboratory tests. If data from previous reports are used, copies of the reports and their approval letters shall be included. If testing was done by others, provide a complete laboratory report signed and stamped by the licensed engineer, together with a responsibility statement by the new soils engineer.

Provide descriptions of all testing procedures and sample preparation and ASTM designations. Graphical presentations are required for grain size analyses, maximum density, consolidation, and shear tests. Shear graphs shall include: sample location, soil description, moisture content and dry
density at the time of shearing, and shearing rate, type of test/sample preparation (undisturbed or remolded), and if the results are peak, ultimate, or residual. The graphs shall show all test points (minimum 3), the shear strength envelope, resulting cohesion and friction angle. The approximate degree of saturation during testing shall be provided on the graph or an accompanying table. Material testing for slope stability analyses shall be in accordance with I.B. P/BC 2001-49.

E. RESPONSIBILITY STATEMENT
If previous exploration data, laboratory testing, calculations, recommendations, or conclusions by others are relied upon in the investigation, the soils engineer (and geologist if applicable) shall provide a statement of responsibility indicating that the data by others was reviewed and concurred with.

F. ANALYSES
Where more than three analyses cases are evaluated a summary table shall be provided. Analyses and justifications are required for any recommendations less conservative than Code values and for the following:

a) STATIC SLOPE STABILITY ANALYSES.
For slopes steeper than 2:1 or where adverse geologic conditions are encountered, the soils report shall provide slope stability analyses in accordance with I.B. P/BC2001-49: Slope Stability Evaluation and Acceptance Standard, and I.B. P/BC2001-50: Construction Upon Slopes Steeper Than Two Horizontal to One Vertical. Provide cross sections with X & Y coordinates for all calculations, along with the input and output data from computer analyses. Where the site is near or on a known landslide, a back-calculated shear strength of that known landslide shall be provided to verify the material strength. The analyses shall provide a complete search to demonstrate that the worst case condition has been determined. Temporary and permanent slopes require a minimum factor of safety of 1.25 and 1.5, respectively. Temporary cuts require stability analyses if the cut is more than 5-foot vertical; steeper than 1:1 above a 5-foot vertical cut; surcharged by off-site structures, for slot cuts, or adverse geologic conditions. All stability analyses must use saturated shear test data.

b) SEISMIC SLOPE STABILITY ANALYSES.
Seismic slope stability analyses shall be performed for new construction at sites having landslides, and those sites adjoining or within State of California Seismically Induced Landslide Seismic Hazard Zones for all new construction except: one or two floor level single-family dwellings (when not part of a development of four or more dwellings) and alterations or additions not exceeding either 50 percent of either the value of the existing structure or 50 percent of the existing floor area of the structure. Seismic stability analyses shall be in accordance with CGS SP117, I.B. P/BC2001-49, and I.B. P/BC2001-50.

c) LIQUEFACTION ANALYSES.
Liquefaction analysis is required at sites located within State of California Liquefaction Seismic Hazard Zones for all new construction except: one or two floor level single-family dwellings (when not part of a development of four or more dwellings), and alterations or additions not exceeding either 50 percent of either the value of the existing structure or 50 percent of the existing floor area of the structure. When such analysis is required, it shall be based on the maximum historic groundwater level in accordance with CGS Special Publication 117, the SCEC Recommended Procedures, and LAMC 91.1804.5. Seismically induced total and differential settlements and lateral spreading shall be evaluated and reported.

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d) LATERAL EARTH PRESSURE ANALYSES.
Retaining walls surcharged by slopes, structures, or adverse geology require lateral earth pressure calculations. Retaining walls over 15-foot high require lateral earth pressure calculations. Calculations shall show minimum factors of safety on mobilized shear strength of 1.5 for static lateral earth pressures and 1.25 for temporary cases. Design lateral pressures shall be equal to or greater than both: those from Table No.1 of IB P/BC2001-83: Retaining Wall Design, and those from limit equilibrium analyses (free-body diagram and vectors). Subdrains shall be provided, or walls shall be designed for full hydrostatic pressure. Walls founded in adverse geologic conditions, or on descending slope will require passive pressure analysis.

e) SETTLEMENT ANALYSES.
Settlement calculations are required where the estimated total and differential settlement of foundations exceed 2 inch and 1 inch, respectively over a 40ft span, and as deemed necessary. Estimated differential settlement between an existing structure and a proposed addition should be reported also.

f) MUDFLOW ANALYSES.
Where the site is located in the path of concentrated drainage or is in an area with a history of debris flows, recommendations conforming with the minimum guidelines of Section 91.7014.3 of the Los Angeles Municipal Code, I.B. P/BC2001-49, and I.B. P/BC2001-64 shall be provided.

G. RECOMMENDATIONS
The recommendations should cover mitigation of the effects of liquefaction and adverse geologic conditions; address the temporary and permanent cut, fill, and natural slopes; provide design parameters for shoring, foundations, retaining walls, pavement, setbacks from ascending and descending slopes; stipulate measures to handle expansive soil conditions; and specify any inspection requirements to be performed by the consulting engineer and/or geologist. Recommendations concerning subdrains, lateral deflection, and sequence of excavation/backfill shall be provided for retaining structures, as appropriate. Recommended minimum earthquake design parameters, soil profile type for use in the static lateral force procedure (LAMC Section 91, Table 16-J), or parameters for dynamic analysis procedures (LAMC Sect.91.1631) shall be provided.

3. CONTENTS OF COMPACTION REPORTS
Pursuant to Los Angeles Municipal Code Sec. 91.7006.2, which stipulates that all fills shall be compacted to a minimum of 90% of the maximum dry density as determined by ASTM D-1557, compaction reports are required to be submitted to this Department for review and approval prior to the placement of foundations. The report shall include, but not limited to, the following:

A. Site address, legal description, and the grading permit under which the work is authorized. The address shall be in the report title. The report, Certificate of Compliance, and grading permit shall all use the same address and legal description for the site.

B. Drawn to scale plot plan with north arrow, showing location, extent, and depth of fill; location and depth of compaction tests; location and height of retaining walls; location and outlets of subdrains; toe and top of slopes; property boundaries; and adjacent structures and streets. Note: Subsurface
geologic/geotechnical cross sections and elevations of sub drains may be required if deemed necessary.

C. Statement of:
   a) Purpose and use of fill: for supporting footings, floor slabs, and new fill, for supporting walkways/paving, for non-structural use (landscaping, etc.).
   b) Inspection and approval of the bottom of the excavation prior to placing fill.
   c) Inspection and approval of the sub drain pipes prior to placing gravel.

D. Description of each of the following:
   a) Materials encountered at the bottom of the excavation.
   b) Preparation of the bottom prior to placement of fill.
   c) Fill placement, and preparation.
   d) Moisture content control method and results.
   e) Thickness of the fill layers (typically 6-8 inches) prior to compaction.
   f) Types of compaction equipment and method of mechanical compaction.
   g) Identify fill materials used with Unified Soil Classification, maximum dry density and optimum moisture content.

E. Field density testing results. Field tests should be taken at every two vertical feet or for every 500 cubic yards of fill placed, whichever is more restrictive. Test results showing less than required relative compaction are not acceptable. Description of removal and re-compaction of the unacceptable fill and its retesting shall be included.

F. Nuclear testing results. If used, it shall be performed in conformance with I.B. P/BC2001-28: At least one sandcone test (A.S.T.M. 1556) shall be taken for each five nuclear tests (A.S.T.M. 2922 and 3017). The sand cone test shall be taken at the general location and elevation as one of the five nuclear tests to verify accuracy of the nuclear test results.

G. Laboratory Testing (See Item 2.D above.)
   Results of all laboratory tests with applicable ASTM or UBC standard designation numbers and graphical presentation of maximum dry density and optimum moisture content testing. All soil testing shall be performed by a laboratory licensed by the Department's Materials Control Section. Engineers may employ an approved laboratory to perform the testing provided they furnish the Department with a letter of responsibility. A copy of the laboratory report signed and stamped by a licensed engineer shall also be provided.

H. Recommended maximum bearing capacities and minimum embedment of footings in compacted fill. Where the supporting material is Class of Material No.5 in LABC Table 18-I-A, expansion index testing shall be provided or recommendations for special design for highly expansive soil. Where design values exceed those shown in Table 18-1-A and are not recommended in an approved soils investigation report, additional tests for maximum dry density, moisture content, direct shear tests, and consolidation may be required. Shear tests are required for any import soils.

I. For buttress fills and slopes steeper than 2:1, as-built geologic cross sections and shear test results conducted on undisturbed samples are required.
J. A Certificate of Compliance that is completed, signed, and sealed by the Soils Engineer.

4. CONTENTS OF SPECIAL REPORTS

A. SUBDIVISION OF LAND
   a. The reports shall conform with I.B. P/BC2001-68 and include the contents of soils and geology reports (Item 2 above).
   b. The geologic/geotechnical map shall be based upon the proposed subdivision map and show all proposed property lines.
   c. A geologic report is generally not required if the site is not located; on a hillside or in a State Mapped Hazard Zone.

B. FINAL REPORT AND PROGRESS REPORTS FOR TRACT GRADING
   a. The report shall conform with the guidelines in LAMC 91.7008.
   b. The final geology map must be based upon the “As-Graded” plan prepared and certified by the design engineer or land surveyor. Sub drain locations shall be depicted on the plan.

C. PRIVATE SEWAGE DISPOSAL SYSTEMS

D. FAULT-RUPTURE HAZARD ZONE INVESTIGATION
   a. The report shall conform with the guidelines of I.B. P/BC2001-44 and CGS Note 49.

E. METHANE GAS REPORT
   a. The report shall be prepared by a Civil Engineer experienced in the design of subsurface gas-control systems and conform with LAMC 91.7100 and MGD-92 (I.B. P/BC2001-77 when released).
5. SELECTED DEPARTMENT REFERENCES

BUILDING CODE
LAMC Sect.91.0100 ADMINISTRATION
LAMC Sect.91.1600 STRUCTURAL DESIGN REQUIREMENTS
LAMC Sect.91.1800 FOUNDATIONS AND RETAINING WALLS
LAMC Sect.91.3300 SITE WORK, DEMOLITION, AND CONSTRUCTION
LAMC Sect.91.7000 GRADING, EXCAVATION, AND FILLS
LAMC Sect.91.7100 METHANE SEEPAGE DISTRICT REGULATIONS

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NOTE: RGA and MGD numbers enclosed in parenthesis are obsolete. The above references are periodically revised and may be supplemented or replaced by future Information Bulletins. Information Bulletin P/BC2001-77 is applicable when released.

Revision Date 12/18/2002 -tg