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EQLique&Settle"2" Computer Program
Introductory Features of the Program

Below are listed some introductory features of the computer program **EQLique&Settle"2"** for assessment of liquefaction potential and earthquake-induced settlements. Results of analyses for projects using this program have been reviewed and accepted as being correct by agencies such as the California Geological Survey (CGS), Los Angeles County, Los Angeles City, and for other projects in cities in Orange and San Diego Counties. There is no need to read values off any charts at all, including the values of volumetric strain above and below ground water, which are used by the program to calculate cumulative earthquake-induced settlements. The program is FULLY computerized. All of the procedural charts are built-in. **Importing field CPT data is very easy and fast, and then the analysis is run in less than 2 seconds!.**

Some features of the program are:

- ✓ Analyses are based on field data from either CPT soundings or borings. The program is capable of handling CPT data reading intervals of 0.16 ft (5 cm) up to a depth of 100 ft (or 0.08 ft intervals to a depth of 50 ft.). Also, by means of prompts (or by "copying & pasting" Excel-normalized CPT data into the appropriate columns) different CPT data tabulation formats can be handled.

- ✓ Analyses using CPT data depart from the premise that **N-Spt values obtained from CPT data are reasonable** (Robertson, February 2005 Seminar, Long Beach). ***This method of liquefaction evaluation is considered acceptable according to the NCEER report (Youd and Idriss, 1997)".*** N-Spt data are automatically obtained from CPT tip resistance, and once these data are **easily** imported into EQLique&Settle master file, the analysis is performed (**in less than 2 seconds**) in the same manner as when blow counts are obtained from a boring.

- ✓ For CPT data analyses, it includes the choice of selecting the proper analysis master file that includes either "spelled out" Soil Behavior Type (SBT) descriptions or SBT ZONE #s. The SBT data are based on "Robertson & Campanella" Soil Behaviour Chart or "Robertson" (1990) Chart, with minor format variations made by the CPT contractor for their data interpretation. According to Robertson (February 28, 2005, Long Beach, short course) there is little difference between the two charts.

- ✓ A selected or required **Factor of Safety may be introduced by a single entry**.

- ✓ Several improvements were made during the development of the program based on **feedback** from other geotechnical engineers.

- ✓ All Blow Count correction factors for borings are incorporated, including the factor that applies if an automatic trip hammer with about 90% energy is used.

- ✓ Capability to easily reconcile (at the option of the user) CPT data with actual test results at specific depths from a boring near a CPT location, or from a push-probe method of sampling that can be used by the same CPT contractor.

- ✓ Analyses simultaneously use the historically-highest and the existing groundwater levels. This is because the existing water level is <u>also</u> needed for the calculation of the effective overburden pressure (σ'_o) at <u>the time of the exploration</u> for the normalization of the strength parameter ($N1_{(60)}$) that affects the Cyclic Resistance Ratio (CRR). <u>In addition</u>, to continue the analysis, σ'_o should be changed <u>only</u> for the depth interval between the existing and the historic high water levels and should be "locked" (maintained from existing values) below the <u>existing</u> ground water to take into account that when the water is raised to the historic high level, changes in the analysis should be due <u>only</u> to <u>changes</u> in the effective overburden stress between the existing (or lower) and the historic high ground water levels (from SCEC on DMG-SP117; interpretation <u>confirmed</u> by personal communications with Dr. Marshall Lew at the SCEC Workshop at USC on June 17, 1999, and on January 22, 2007). This σ'_o (existing or changed depending on the depth) is multiplied by the CRR to obtain the Cyclic Resistance value, and also used for dividing the Cyclic Stress to obtain the CSR used for settlements.

- ✓ Automatic calculation of the Peak Ground Acceleration for the reference M7.5 EQ used in the analyses, based on the site Mag EQ and PGA entered as input.

- ✓ Capability to easily apply the Chinese Criteria at specific depths for analyses.

Support regarding the capabilities of the program is prompt, especially via e-mail.