

## Use of Drains to Mitigate Liquefaction



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**Start/Completion Dates:** August 2018 / August 2019

### Project Background

Vertical drains can be useful for liquefaction risk mitigation at sites where vibrations during installation must be kept to a minimum, but settlement is not as much of a concern. Earthquake (EQ) drains are an alternative to gravel drains, intended to reduce the amount of uncertainty involved with using gravel drains. Earthquake drains are corrugated plastic pipes with small orifices cut out along the length of the pipe and they are typically covered with a fabric or “sock.” This design is intended to limit the amount of uncertainty in permeability of the drain over time, by limiting the amount of sand that would be able to infiltrate the void space of the drain.

### Project Objectives

Currently, no standard design procedure exists for designing earthquake drains. Dr. Juan Pestana created a computer program, FEQDrain, in 1997 that will perform the necessary calculations to design an EQ drain, given that the user knows how to obtain the values for the input file. This project strives to produce a manual detailing the state-of-the-practice use of drains to mitigate the risk of liquefaction, to include lateral extent of required improvement and how to obtain values for the FEQDrain input parameters.

### Research Plan and Progress

A list of research tasks and key findings is provided below:

1. Conduct a literature review in order to discover the most up-to-date methods to use in conjunction with FEQDrain when designing earthquake drains. (In progress)
2. Create a sensitivity analysis to determine the degree to which various inputs in the FEQDrain input file affect the overall pore water pressure. (In progress)
3. Develop an example design for 4 sites in Central and Eastern United States (CEUS) and 4 sites in Western United States (WUS) using CPT data where liquefaction is known to have occurred in the past. (In progress)
4. Develop a manual explaining how to calculate or determine each of the values in the FEQDrain input file. (In progress)