Project Summary

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Engineering Earthquake Ground Motion Analysis

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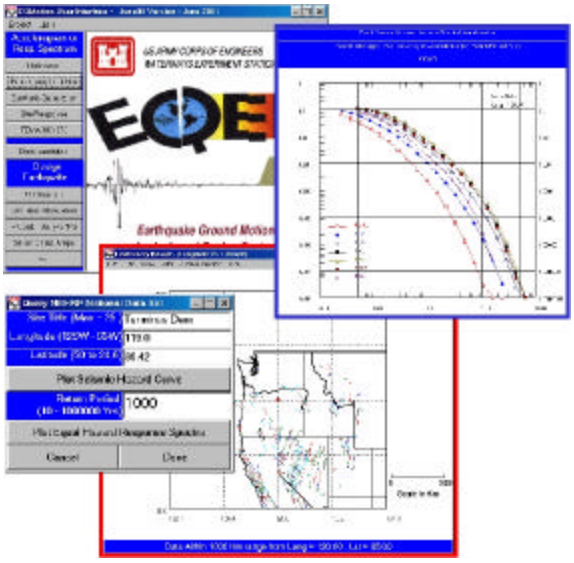
Purpose: To design and implement an earthquake ground motion analysis system. This system will provide an integrated environment in which data can be quickly updated and relationships derived that are needed for site-specific seismic hazard characterizations. This system will also assist in generation of site-specific ground motions.

Description: This system will be designed and implemented in a modular approach. Each module will perform useful independent operations which will allow bringing them on-line as they are completed which will speed up technology transfer and bring this work to bear on the problem sooner. The system will be designed and implemented to operate in an interactive graphical environment. The main system modules will be a user's interface, digital seismic database, data processing tools, procedure control modules for generating site earthquake motions, seismic hazard database, synthetic accelerogram/ response spectrum generation module and site response module.

Accomplishments: Integrated Earthquake Catalog and procedures for selecting design earthquake parameters and matching accelerograms. Catalog of available strong motion data from 5,000 records. Links to external data sources. On-line guidance of all pertinent Engineer Regulations was implemented. Integrated accelerogram processing tools. Developed a 1-D and 2-D site response modules. Developed a synthetic earthquake module containing: floating earthquake analysis, design spectrum matching (frequency domain), and source modeling for point source. Completed and fielded a Windows-based version. This set of tools was used as a training tool for Prospect Courses: Seismic Stability Analysis. Probabilistic module generates hazard curves and equal hazard response spectra.



Ground Motion Analysis System

Problem: As more information becomes available from earthquakes and seismic analyses become increasingly sophisticated, advanced characterizations of site-specific earthquake ground motions are required. Current USACE methods are based on empirical correlations; this type approach is critically

dependent on complete data sets and relationships based upon these data sets.

Also, to derive more accurate site-specific motions, selection and correlation must be based upon a more refined set of dependent parameters. Data is becoming available at a faster rate then can be assimilated into the current methods of analysis and guidelines development. Therefore, ground motion characterization is not utilizing important new data and relationships that are available. Also, advances are needed in characterizing the full wave field.

Benefits: Provide a system that will enable more accurate and documented seismic hazard site characterization, including site-specific ground motions. This system will benefit the CE by improving safety and economic design issues as they relate to seismic safety studies.