Liquefaction Hazard Mapping
Ventura County, California

Award Number 99-HQ-GR-0117

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ABSTRACT

The final products from this study include digital Quaternary geologic maps and liquefaction susceptibility maps covering twenty-three 7.5-minute quadrangles that contain all alluviated areas within Ventura County. These detailed maps (mapped at 1:12,000 to 1:24,000 scale), funded by the County of Ventura and the USGS National Earthquake Hazard Reduction Program, provide a valuable resource for mitigating potential risks to critical lifelines, petroleum pipelines, and other facilities supporting the large population and active oil industry in the Oxnard-Ventura area as well as for planning future development in Ventura County. The maps are being incorporated into the County of Ventura's county-wide GIS for characterization of potential seismic hazards to pipelines and associated facilities, for land use planning, and for emergency response planning. Geological, geotechnical, and hydrological data are compiled in a digital database compatible with that of the California Division of Mines and Geology's (CDMG) ongoing Seismic Hazards Mapping Program. The database, and the digital maps presented in this report, currently are being used in CDMG's official zonation of liquefaction hazard in Ventura County.

In accordance with CDMG guidelines, our objectives for producing liquefaction susceptibility maps of Ventura County include: (1) identification of the location, type, and age of Quaternary geologic units of greatest liquefaction hazard; (2) assessment of near-surface soil parameters on the basis of available subsurface data; and (3) delineation of liquefaction susceptibility units. We characterize surficial deposits primarily on the basis of original geologic mapping that incorporates aerial photographic interpretation, identification of geomorphic landforms, interpretation of soil stratigraphy, field reconnaissance, and evaluation of compiled borehole data. Liquefaction susceptibility is based on determination of ground motions required to initiate, or 'trigger', liquefaction within a deposit. Liquefaction susceptibility units are based on interpretation of compiled borehole data, where available, and application of a decision matrix based on CDMG-approved criteria. These regional maps show general conditions for planning purposes, and are not meant to substitute for site-specific studies.

Based on our geologic and hazard mapping, the Oxnard Plain, much of the Santa Clara River Valley, floodplains along the Ventura River, and axial portions of other populated valleys in northern and southern Ventura County are underlain by areally extensive historic and Holocene sediments. Coastal margins of Ventura County contain young coastal floodplains and estuarine sediments, beach deposits, and stream deposits. Experience from historical earthquakes shows that these sediments are highly susceptible to liquefaction when saturated.

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Program Element: I

Key words: Liquefaction; Regional Seismic Hazards; Surficial Deposits; Site Effects

Non-technical Summary

In this study, we developed maps of geologic deposits and liquefaction hazards from large earthquakes for Ventura County in southern California. Liquefaction is the process by which a saturated soil can lose its internal strength during strong groundshaking procduced by an earthquake. Our maps are being used by the County of Ventura for characterization of potential earthquakes hazards to pipelines and associated facilities, as required by recent State legislation. Our maps can also be used for countywide land-use planning (i.e. evaluation of future development decisions), and for emergency response planning.