

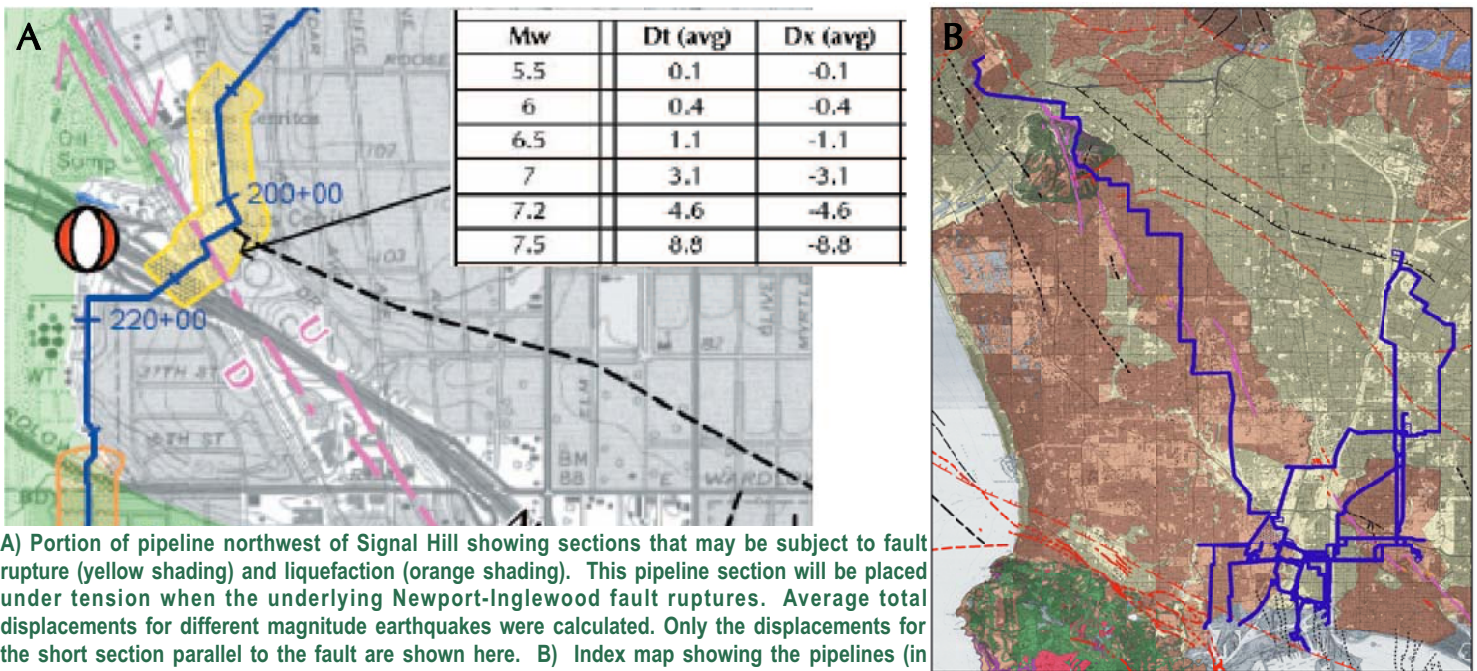


SEISMIC AND GEOLOGIC VULNERABILITY ASSESSMENT of OIL and GAS PIPELINES and ASSOCIATED FACILITIES in the LOS ANGELES BASIN, Southern California

PROJECT DESCRIPTION

Earth Consultants International was retained to evaluate the vulnerability of 42 pipelines or pipeline segments carrying petroleum products and eight associated facilities located in the Los Angeles Basin region. The purpose of the study was to identify those pipeline sections and facilities most susceptible to structural damage as a result of geologic or earthquake-induced ground deformations. Specific issues that we addressed included:

- identification of active and potentially active fault traces along the facilities or pipelines' right-of-way;
- identification of pipeline sections that will be under compression or under tension should the underlying fault traces rupture;
- estimation of the displacements (strains) across the fault crossings in the event of fault rupture considering several different possible earthquake magnitudes;
- assessment of each fault's potential to generate an earthquake in the not-too-distant future;
- identification of pipeline sections and facilities located across areas susceptible to liquefaction; and
- identification of pipeline segments and facilities susceptible to deformation due to slope failure.



A) Portion of pipeline northwest of Signal Hill showing sections that may be subject to fault rupture (yellow shading) and liquefaction (orange shading). This pipeline section will be placed under tension when the underlying Newport-Inglewood fault ruptures. Average total displacements for different magnitude earthquakes were calculated. Only the displacements for the short section parallel to the fault are shown here. B) Index map showing the pipelines (in blue) overlying the geologic units and faults mapped in the Los Angeles Basin.

SOLUTION

Approximately 150 miles of pipeline were evaluated for this study. Fifteen of the pipelines were found to extend across active faults. One of the pipelines extends across four separate faults, three pipelines extend across two separate faults, and one pipeline crosses the Newport-Inglewood fault at four separate locations, in addition to several areas where co-seismic fractures have been reported. For each fault-pipeline crossing, *Earth Consultants International* calculated the average and maximum horizontal and vertical displacements that can be expected as a result of several different possible magnitude earthquakes on that fault (from a M5.5 to the maximum magnitude earthquake that each fault is thought capable of generating given its length). Based on the angle of approach, we also determined which sections of the pipeline will be under tension or compression should the underlying fault ruptures. Only one of the pipelines is susceptible to ground deformation due to slope failure, whereas most pipelines extend across areas susceptible to liquefaction.

