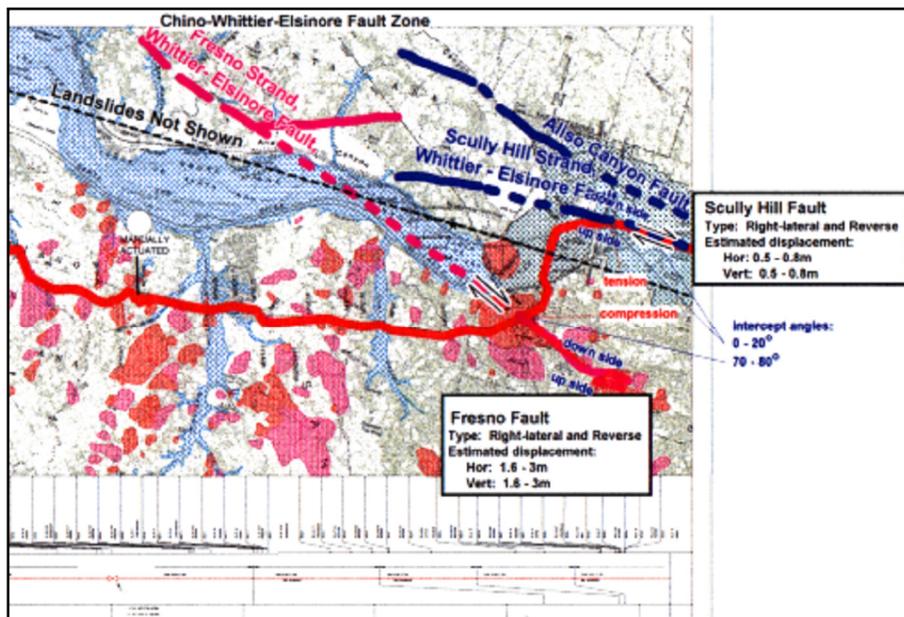




FAULTING AND LIQUEFACTION HAZARD ASSESSMENT for the Southern Trails Natural Gas Pipeline across Southern California

PROJECT DESCRIPTION

A circa 1950, 16-in to 20-in (40.6-cm to 50.8-cm) pipeline that originally carried crude oil is being modified and retrofitted to convey natural gas from New Mexico to southern California. *Earth Consultants International* was asked to review the 150-km section of the pipeline between Twenty-Nine Palms and Long Beach, California, to address the following issues: 1) identify all known active and potentially active faults that intersect or are near the pipeline; 2) quantify fault displacements, offset vectors, and rupture probabilities for all faults, 3) evaluate and calculate liquefaction-induced lateral spreading displacements along the pipeline right-of-way, 4) provide pipeline design consultation for hazard mitigation, and 5) present our findings to the State Lands Commission and Division of Mines and Geology, the two State-level regulatory agencies.



Sample map from our report showing the pipeline alignment, landslides, active and potentially active faults, and potential liquefaction zones. All the mapping was prepared in a GIS environment with comprehensive data tables for each mapped feature. Poster prints were made for State-agency presentations.

SOLUTION

Earth Consultants International calculated the horizontal and vertical displacements that can be expected as a result of an earthquake on each of the 24 active and potentially active faults at the locations where they cross the pipeline. We also calculated incidence angles and evaluated whether the pipeline will be in tension or compression at each fault crossing. We calculated seismic design parameters and estimated the amount of lateral spreading that would occur as a result of liquefaction at five critical pipeline locations, and identified an area along the pipeline that is susceptible to slope instability. Based on these findings, we recommended that the pipeline be thickened from 0.281-in to 0.375-in (0.75-cm to 0.95-cm) at all fault crossings, and recommended automated shut-off valves at the highest risk fault and landslide crossings. Special backfill and a higher grade of steel were also recommended in fault areas.

