GAGLIANO, SHERWOOD M., Coastal Environments, Inc., Baton Rouge, Louisiana 70802, E. BURTON KEMP III, KAREN M. WICKER, KATHLEEN S. WILTENMUTH, Coastal Environments, Inc., Baton Rouge, Louisiana 70802 and ROBERT W. SABATE, Energetix Petroleum, LC, Metairie, Louisiana 70006

Neo-Tectonic Framework of Southeast Louisiana and Applications to Coastal Restoration

This study was conducted to test the hypothesis that most of the massive land loss in coastal Louisiana during the twentieth century resulted from fault induced subsidence. A regional structural framework was developed from published maps and papers to evaluate evidence of neo-tectonic events. Surface geomorphic signatures of faults were identified for well documented modern fault events and used to locate one hundred surface traces and/or scarps of suspected faults. The first appearance and temporal changes of suspected faults were identified from maps, aerial images, published descriptions and personal interviews and these geomorphic signatures were correlated with known subsurface faults from the regional framework map and from published north-south megaregional sections. These empirically derived megaregional sections are tied into linked tectonic systems of the Gulf Coast Salt Basin, thereby, correlating the surface features and changes to ongoing tectonic processes of the basin. These linked Gulf Basin tectonic processes are driven by crustal down-warping, rifting, sediment loading, compaction, salt movement and gravity slumping.

Magnitude, rate of movement and frequency of fault events were evaluated using maps, aerial imagery, geoarchaeological data, tide gauge records and measurements from re-leveled bench marks. Tests for vertical displacement of near-surface beds were made at six locales using vibracores and McCauley auger samples.

The Prince William Sound, Alaska earthquake of March 27, 1964, with a magnitude of 8.3, sent shock waves throughout Southeastern Louisiana. It has been tentatively identified as one of the triggering mechanisms for modern regional fault movement and resulting accelerated rates of coastal land loss.

The structural model developed in this study provides a framework for systematic evaluation and understanding of fault processes, for conducting risk analysis of faults, and for planning and design of coastal restoration projects.