

Near Surface Gas Mapping Profiles of Salt Geologic Features at the Weeks Island Strategic Petroleum Reserve Site

by

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ABSTRACT

Field sampling and rapid gas analysis techniques have been developed to survey near-surface soil gasses— including hydrogen, methane, ethylene and ethane— for geotechnical diagnostic purposes at the Weeks Island Strategic Petroleum Reserve (SPR) site in Louisiana. Several hundred soil gas samples were obtained and analyzed in the field by gas chromatography for profiling low concentrations of the target gasses at ppm to percent levels. Surveys were conducted across two sinkholes, mapped anomalous zones in the salt, and the Weeks Island SPR repository. Additionally, numerous samples were collected for laboratory analysis of target gasses at ppb levels and for stable isotope ratio analysis (SIRA) of the methane in the soil gas. Gasses in the near surface soil can originate from the oil, from within the salt, or from surface microbial activity. Methane SIRA are being used to distinguish biogenic from petrogenic methane.

Elevated levels of hydrogen and methane are associated with anomalous zones in the salt dome and with suspected salt fracture (dilatant) zones, particularly over the edges of the SPR repository. Significantly elevated areas of hydrogen, methane, and ethane were found in the vicinity of anomalous zones in the salt. We propose that the near-surface gas mapping results are useful for locating anomalous, gassy zones and other structural features at SPR sites and possibly at other salt domes. Gas analysis techniques, current data and interpretations, application of soil gas surveying to monitor and detect subsurface geologic features and fingerprinting sources of hydrocarbons are discussed.

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