Hydrochemistry of the Falls City Uranium Mine Tailings Remedial Action Project, Karnes County, Texas

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Acidic tailings and tailings solutions, created by sulfuric acid processing of uranium ores, were disposed of on the outcrop of the Whitsett Formation (Eocene). These solutions have recharged the sandstones of the Whitsett since the 1960's. Previous workers found a large, complex, and unexplained pattern of contamination. Our study determined the extent and nature of contamination by (1) characterizing the geology and hydrology of the two shallow aquifers at the site, (2) determining the chemistry of the contaminant source (tailings solutions), and (3) identifying geochemical reactions that have altered the composition of contaminant plumes within each aquifer.

The tailings solutions are composed of sodium chloride and neutral sulfate salts of aluminum and ammonium, with lesser amounts of iron, calcium, magnesium, potassium, and sodium sulfate. Hydrolysis of aluminum sulfate produces an acid pH (3 to 4). Also, aluminum sulfate is a pH buffer, and it controls acidity of the tailings solutions. Cation exchange and neutralization by calcite modify the tailings solutions as they migrate through the aquifers. These reactions explain chemical patterns, which delineate five separate contaminant plumes in the aquifers. In the Deweesville sandstone, cation exchange has removed ammonium from acidic contaminant plumes. However, neutralization is incomplete because of the paucity of calcite in the Deweesville. In contrast, in the calcite-rich Conquista fossiliferous sandstone, cation exchange and complete neutralization by calcite have removed most contaminant ions. Those contaminant plumes are delineated by elevated concentrations of calcium and carbon dioxide. The amount of contamination in both aquifers is much smaller than that estimated previously.

Middle Eocene through Basal Miocene Sequence Biostratigraphy of the Western Gulf Coast Region

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This study documents stratigraphic occurrences of nannofloral pulses in the middle and upper Eocene, Oligocene, and basal Miocene of the western Gulf Coastal Plain of Texas and Louisiana. The identified pulses correspond to regional foraminiferal tops, and, when plotted against geologic time, their relative magnitudes show a sinuous pattern imaging the third-order cycles of Haq et al. (1988, SEPM Special Publication No. 42, p. 71–108). Results of comparison suggest that the Reklaw is correlated with TA3.1, Queen City with TA3.2, and Weches with TA3.3. The Cook Mountain consists of three genetic units correlated with TA3.4, TA3.5, and TA3.6. The lower Yegua consists of two packages correlated with TA4.1 and TA4.2. The upper Yegua is correlated with TA4.3, Jackson with TA4.4, and Vicksburg with TA4.5. The "Transvicks," characterized by *Textularia tumidulum*, was developed during the lowest sea-level cycle, TB1.1, in the Oligocene. Two clusters of floral pulses in the Frio are correlated with TB1.2 and TB1.3. Two younger clusters of floral pulses in the Anahuac are correlated with TB1.4 and TB1.5. Absolute ages of these third-order sequences are reevaluated on the basis of occurrences of nannomarkers in corresponding floral pulses.