Anthropogenic affects on the hydrogeology and contaminant transport in San Francisco Bay Mud an Example from Hamilton Army Airfield

[1]SPRINGER, J.E., [2]MAURER, O.G., [3]BAILEY, B.J. and [4]GREGG, J. [1]URS Greiner Woodward Clyde, USA; [2]URS Greiner Woodward Clyde, France; [3]U.S. Army Corps of Engineers, USA; [4]California Regional Water Quality Control Board, USA

Holocene San Francisco Bay Mud consists of unconsolidated, anoxic, organic-rich silty clay with minor lenses of fine-grained sand. It overlies alluvium and Pleistocene muds which overlap Mesozoic bedrock. A discontinuous veneer of fill, up to 3 m deep, overlies the Bay Mud. Land reclamation and runway construction caused consolidation and settlement of the airfield to more than 2 m below sea level. The airfield drainage system consists of storm drains connected to a perimeter ditch and dewatering pumps.

Hydraulic conductivity of the Bay Mud is on the order of 10^{-6} to 10^{-8} cm/s. Tidal influence on the water table is negligible. The depth to the water table varies from a few tens of cm in the winter to more than 2 m during the late summer.

When the water table is low, desiccation cracks form and the crack surfaces oxidize. When the water table rises, the clays swell and close the cracks. When the water table falls, the cracks reform along the oxidized surfaces. Light contaminants (LNAPLs) that float on the water table (e.g., fuels), tend to migrate along the desiccation cracks rather than spreading out as plumes. Lateral contaminant migration is largely limited to buried utilities and artificial fill. Dense contaminants (DNAPLs), particularly chlorinated solvents, have properties which allow the penetration of clay. They continue to sink up to 8 m until they degrade to lighter compounds. Because the saturated clay is anoxic, chlorinated solvents commonly degrade into vinyl chloride.