EXPLANATION (References for Horizontal geologic stresses and Vertical valley rebound phenomena)

Recent advances in the field of structural geology and tectonics have brought new light to unusual geologic features earlier attributed to simple gravitational “rebound” due to processes such as valley erosion (removal of the weight of surface rocks).

Many of these deformational features, including “pop-ups” often seen in rock quarry floors, are now better associated with the horizontal tectonic stresses produced by the large scale motion of the Earth’s tectonic plates. This is basically the stress placed on brittle surface rocks (Earth’s crust) by the “dragging” motion of the underlying Earth’s more mobile (or more plastic) “asthenosphere.”

Deformational features along the axes of valleys can now be more realistically associated with a combination of unloading (removal of rock by erosion) combined with horizontal forces that often exceed the weight of the rocks by factors of two to three at depths of as much as 3000 feet (see historic and recent references attached). References and observations prior to the late 1970s generally do not appreciate the potential contributions of the relatively new “Plate Tectonics” theory.

These deformational phenomena are now being recognized in more and more engineering projects (dam sites, mines, tunnels, large foundation excavations, quarries) as significant factors in active rock deformation and must be taken into account in design and construction.

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