Geologic and hydrologic modeling in the Uinta Basin, Utah

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Understanding the availability, natural dynamics and interaction between surface water and groundwater resources will be important in the development of oil shale resources in the Uinta Basin. Development will require groundwater to access and process oil shale deposits and water resources must also be protected from environmental impacts of oil shale utilization. The removal of this water and subsequent disposal of it will likely impact both groundwater and surface water. Understanding these impacts requires detailed knowledge of both the surface hydrology and subsurface hydrogeology of the system and their interaction. The Duchesne River and Uinta Formations form the Duchesne River-Uinta aquifer, an important basin aquifer that is about 8,000 feet thick in the north-central part of the Uinta Basin in Utah and Colorado. Ground water recharge within the Duchesne River-Uinta aquifer is derived from precipitation and from seepage losses from canals and streams, whereas ground-water discharge is to perennial streams. Hydraulic conductivity of the Duchesne River-Uinta aquifer is related to lithology and the degree of fracturing. Ground water in the Duchesne River-Uinta aquifer exists within both local and basin flow systems. The geohydrologic units considered in these models in descending order are the Duchesne River-Uinta aquifer, the Parachute Creek confining unit, the Douglas Creek-Renegade aquifer, and the Wasatch-Green River confining unit. A narrow strip (generally less than one mile wide) of alluvium occurs along perennial streams such as the Green, Duchesne, Lake Fork, Strawberry, and White Rivers, and Red Creek. Thickness of the alluvium generally is less than 50 ft. Although groundwater flows locally within the Parachute Creek, it is assumed to be a basin confining unit. Petrologic and geophysical interpretation analyses help define a geologic framework model used as a basis for developing a 3-dimensional multi-layer groundwater flow model of the entire basin. Key characteristics of pre-liminary simulated groundwater flow behavior appear to confirm the assumption of low vertical hydraulic conductivity associated with confining units. The MikeSHE/Mike11 code and other spatial programs are used to investigate the complex, coupled surface water-groundwater response and complex spatio-temporal distribution of recharge within the basin.