Assessing the Origin of Groundwater Springs and Implications for PFAS Fate and Transport at Mountain Home Air Force Base, Idaho

Mike Shultz (mrshultz@burnsmcd.com) (Burns & McDonnell, Walnut Creek, CA)
Matt Anding (Matt.Anding@Tepa.com) (Tehama LLC, San Antonio, TX)

Background/Objectives. Mountain Home Air Force Base (MHAFB) is located in southern Idaho within the western Snake River Plain (SRP) physiographic province, approximately 40 miles southeast of Boise and 70 miles northwest of Twin Falls. MHAFB is underlain by a series of flood basalts and interbedded lakebed and fluvial sediments corresponding to the Idaho Group which form the regional aquifer. Groundwater gradients are toward the south to the Snake River Canyon. In the vicinity of MHAFB, the Snake River is impounded forming C.J. Strike Reservoir. Along the northern margin of the reservoir in the canyon wall a series of groundwater springs have been mapped in historic USGS topographic maps. Some of the springs are named and have historic significance. As PFAS has been detected in monitoring wells on MHAFB, a field reconnaissance effort was conducted in summer of 2021 to investigate the groundwater springs and assess the geologic controls on the location and elevation of the springs. This work was performed as part of a larger drinking water protection study carried out at MHAFB during 2020-2021.

Approach/Activities. Mapped spring locations were surveyed via drone imagery and spring locations were accessed from the shoreline of C.J. Strike Reservoir on foot. Drone and satellite imagery were interpreted in geologic context and verified in the field, and imagery and topographic maps were field verified and used to construct a series of geologic cross sections to assess the flow characteristics and geologic controls on spring locations.

Results/Lessons Learned. In general, the slopes of the Snake River Canyon below the basalt cap rock down to the reservoir level are completely covered by several to 10 ft of talus, consisting of reworked Idaho Group sediments and basaltic rubble derived from erosion / mass wasting of the cap rock. Where exposed, the Idaho Group consists of silt and fine-grained sands which are ripple-laminated and bioturbated indicating deposition in lacustrine conditions below wavebase in relatively deep-water sublacustrine fan or channel setting. Historical documents pertaining to the springs in the Snake River Canyon are sparse, but one document recovered describes the Halls Ferry Springs and the Weatherby Springs within the study area (Ralston and Chapman, 1968). The document estimates the flow rate for the Halls Ferry Spring at that time at 800 gallons per minute. However, during the July 2021 field reconnaissance effort no running water was observed at any of the mapped groundwater springs. The geologic origin of the springs is related to coarse-grained slope channel deposits which fed sublacustrine fan deposits during the existence of Lake Idaho. This work suggests that groundwater flow from the springs has greatly diminished since 1968, commensurate with declines in the regional groundwater level of as much as 70 ft since that time and associated reduction in pressure head from groundwater to the Snake River. Abundant vegetation is present at a majority of the springs, suggesting groundwater may still discharge ephemerally during other times of the year, or is present as subsurface saturation but seepage rates are less than evapotranspiration and plant uptake and therefore discharge to the ground surface is not apparent, and contaminant flux to the Snake River is limited.