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Microfracture Mapping and Geochemical Analysis, Relative to Underground Natural Gas Liquids Storage Facilities, Central Kansas

Jeff Binder and Steve Hoffine

Burns & McDonnell Engineering Company, 9400 Ward Parkway, Kansas City, Missouri, 64114

Abstract

A detailed microfracture and rock jointing analysis related to natural gas liquids (NGL) was completed for a group of Underground Storage Facilities in central Kansas. The total project area for this initial study was approximately 20 square miles (mi^2) (51.8 square kilometers (km^2)), covering existing company storage areas of interest and vicinity. The study area surrounded a central area of approximately 6 square miles (15.5 km^2), which contained the existing active company storage areas, and the potential fugitive NGL areas. The project area is currently active as a storage facility, surrounded by a large number of active or plugged and abandoned, solution mined storage caverns in the area.

This study was designed to assist in tracing geochemical pathways, by high resolution mapping of microfracture and rock jointing systems, relative to the storage and fugitive migration of gases and liquids from caverns, within the facility. The study delineated and detected the microfracture and joint systems relative to existing storage caverns and possible pathways for fugitive NGL activity, with the aim of defining the pattern of the geochemical migration and possible appropriate NGL recovery programs.

A proprietary low altitude, multispectral, fracture detection method, to generate high resolution airborne data, was used to map microfracture and joint systems and to plot high fracture density areas. This data also defined geochemical sampling stations for hydrocarbon related migration into the soil, in order to delineate priority pathways of NGL movement in the fractures. The study has shown the relationship between high density rock microfractures and joints and the movement of NGL.

The multispectractal microfracture detection and geochemical method was very effective in tracing the fracture systems and the associated geochemical changes associated with the storage areas. The dominant potential fugitive areas and directions appeared to be following ancient natural geologic drainage areas which were absorbing any migrating material underground.

There appears to be no significant accumulation of fugitive NGL gas or liquids, either underground or at the surface in the vicinity of the facilities. The natural geologic drainage pathways which have been operating for thousands and possibly millions of years appear to be successfully absorbing and directing any potential fugitive NGL migration.

Key words: underground storage, multispectral microfracture detection, geochemical, natural gas liquids, joints, solution mined storage caverns, Kansas