Blake Ford
Extraction Oil & Gas, Inc.
2234 117th Ave, Suite 106
Greeley, CO 80634

November 14, 2017

Subject: **Coyote Trails Pad – Evaluation of Water Resources and Hydrologic Conditions**
SE¼, Section 28, T1N-R68W

Dear Mr. Ford:

At your request, Apex Companies, LLC (Apex) completed a desktop assessment of hydrologic conditions and surface and groundwater resources in the project area for the proposed Coyote Trail well pad. The assessment included a review of four assessments/studies completed on behalf of Extraction Oil & Gas, Inc. (Extraction) as part of the planning process for the Coyote Trail well pad. The assessment focused on geologic and groundwater conditions detailed in the referenced studies, and what those observations may mean for the hydrologic connectivity of surface and groundwater resources in the project area. This information along with project scope was used to evaluate potential threats to water quality for construction and operation of this location. This letter includes: a brief review of the studies evaluated as part of this effort; a discussion of surface and groundwater resources in the project area along with hydrologic conditions; a review of construction and operational plans for the proposed Coyote Trail Pad, and engineered and operational controls to protect water quality; and conclusions about potential threats to area water quality for operation of the proposed location.

Reviewed Studies

- Subsurface Exploration and Site Characterization (geotechnical report) – Terracon Consultants, Inc (September 7, 2017)
- Environmental Review and Site Inspection (planning review of potential environmental liabilities in the project area) – Apex Companies, LLC (August 28, 2017)
- Potential Waters of the United States Assessment (review of potential jurisdictional wetlands in the project area) – Apex Companies, LLC (September 8, 2017)
- Work Completion Report - Site Investigation (study of potential soil and groundwater impacts from adjacent landfill operations) – Apex Companies, LLC (May 30, 2017)

Project Scope

Apex understands that Extraction plans to construct a well pad at this site using conventional cut and fill practices. The working surface will be compacted gravel, and perimeter controls will be installed to ensure stormwater compliance and spill containment for any release which may occur at the location. During drilling and completions operations, fluids will be stored in impervious secondary containments, and the locations will be monitored daily to ensure prompt identification, reporting, and cleanup of any environmental release. During long-term operation of the location, fluids will be stored in impervious secondary containment, sized to store the entire contents of any bulk storage container, plus precipitation. In addition, onsite production tanks will be remotely monitored through automation, and all personnel associated with the operation and monitoring of the location, will be trained to identify, report, and respond to any release of fluids at the location.

Water Resources and Hydrologic Conditions

The Environmental Review and Waters of the US Assessment, documented a total of six (6) wetlands in the project area.

A total of 19 soil borings were advanced across the proposed location during the geotechnical study and evaluation of potential landfill impacts. These soil boring locations originated at the higher elevations where the pad is proposed to be located, and were completed to depths of 7 to 30 feet below ground surface (bgs). Groundwater was not encountered at any of the soil boring locations, either during initial drilling efforts, or in delayed monitoring of the same soil borings. Among other features, geology at the site includes confining layers of lean clay and claystone bedrock.

Based on subsurface evaluations completed at this site, and a review of water resources in the larger project area, it appears that hydrologic conditions supporting identified wetlands have likely resulted from ponded stormwater, surface drainage, or from the irrigation canal present at the north, south, and east extent of the elevated area where the proposed pad is located. The elevation of the canal correlates with the elevation of the highest identified wetland. Despite observed areas of ponding (during onsites and in historic aerial imagery) at higher elevations of the proposed location, the absence of wetland soils and/or plant species in these areas, along with observed geologic conditions, seems to indicate geologic confinement for surface water rather than the presence of year-round perched water tables. Based on these observations, it appears that hydrologic connectivity from the proposed pad location would result from surface drainage rather than subsurface groundwater connectivity.

Water Quality Impairment Concerns and Mitigations

As with any large-scale construction project, and especially during active earthwork, potential discharges of sediment are a concern. This threat is reduced or eliminated by constructing, inspecting, and maintaining stormwater drainage controls in accordance with a required Stormwater Management Plan (SWMP).

Concerns about spills of chemicals and production fluids during drilling, completion, and operation of the location can be limited or eliminated by deployment of appropriate secondary containments, proper training of personnel on equipment use and material handling, and timely incident reporting. In the event that a spill does occur, perimeter drainage controls serve to contain any unintended release of fluids from the location allowing for prompt cleanup.

Conclusions

Based on a review of the hydrologic conditions in the project area, and the proposed project scope; with proper deployment of stormwater and spill prevention drainage and containment structures, monitoring of operational conditions, and prompt identification and response in the event of an environmental release, this location poses minimal risk to surface or groundwater resources. There is no evidence of shallow groundwater at the project site, and connectivity to identified wetlands appears only to be at the surface.

Apex appreciates the opportunity to provide this evaluation to you. If you have questions regarding the information provided, please do not hesitate to contact me at 970-261-1127.

Sincerely,
Apex Companies, LLC

Chris Hines
Project Manager

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