



July 29, 2019

Blake Ford  
Environmental Coordinator  
Extraction Oil & Gas  
370 17<sup>th</sup> Street, Suite 5300  
Denver, Colorado 80202

**Subject:        Scope of Work for Investigation of District Six C6**  
Greeley Directional  
40.39134, -104.68186  
NENE 20 5N65W  
Weld County, Colorado  
Location ID: 332837

Dear Mr. Ford:

Apex Companies, LLC (Apex) is pleased to submit this scope of work to Extraction Oil & Gas (XOG) for the investigation of potential impacts to groundwater and soil vapor following District Six C6's (API # 05-123-24211) mechanical integrity test (MIT) failure at the Greeley Directional facility in Greeley, Colorado as shown on Figure 1. The groundwater and soil vapor investigation activities included herein are proposed to be completed following Form 27 (Site Investigation Workplan) approval by the Colorado Oil and Gas Conservation Commission (COGCC).

#### *Pre-Field Procedures*

Prior to advancing the soil borings described below, the following activities will be performed:

- All necessary workplan, permit, and form approvals will be obtained from the Department of Water Resources (DWR) and COGCC; and
- The drilling locations will be demarcated, OneCall will be contacted, and a private utility locator contracted to clear the drilling area of underground utilities.

#### *Groundwater*

Apex is proposing the installation of one groundwater monitoring well (MW-1) in the vicinity of well District Six C6 to investigate potential impacts to groundwater that may have originated from a breach in the well casing at approximately 60 to 75 feet below ground surface (ft bgs). Proposed groundwater monitoring well MW-1 will be located as close to District Six C6 as feasibly possible, with consideration to regional groundwater flow direction and both current and future land use (at this time, a well pad approximately 5 feet thick is scheduled to be constructed in the investigation area). The proposed location for MW-1 is shown on Figure 2.

Apex will oversee the advancement of one soil boring to approximately 100 feet bgs (95 feet below the base of the well pad) using a hollow stem auger drilling rig, operated by a state-licensed drilling contractor and equipped with 6-inch outside diameter augers. Prior to advancing the boring, the drilling location will be potholed using a vacuum air-knife rig to 6 feet bgs to verify utility clearance. Soil will be sampled at 10-foot intervals using a split-spoon sampler and used for lithologic logging and photoionization detector (PID) screening. A geologic boring log will be prepared for MW-1, which will include a classification of soils using the Unified Soil Classification System (USCS), PID readings, and a description of the monitoring well construction.

Upon reaching total depth, the boring will be converted into a single-completion groundwater monitoring well installed in accordance with State standards. MW-1 will be constructed using 2-inch diameter Schedule 40 PVC casing and 0.010-inch slotted well screens. The screened interval will be approximately 40 feet in length, extending from 60 feet bgs to 100 feet bgs. Depending on pad logistics and XOG preferences, the monitoring wells will be completed with either flush-mount traffic-rated steel well vaults with lockable j-plugs, or high-visibility lockable steel stickups.

Following well installation, MW-1 will be properly developed prior to sampling. Groundwater from MW-1 will be collected from midway between the top of the water column and assumed depth of the breach (60 to 75 ft bgs), decanted into HCl-preserved 40mL VOAs, and stored in a cooler with ice for preservation. Collected samples will be submitted to Summit Scientific (Summit) in Golden, Colorado, for laboratory analysis of methane, ethane, propane, benzene, toluene, ethylbenzene, and total xylenes under standard turnaround time.

### *Soil Vapor*

Apex is proposing the installation of four soil borings (SVP-1 through SVP-4) in the vicinity of well District Six C6 to investigate the potential presence of stray gas that may have traveled from the breach to ground surface through conduits in the subsurface. SVP-1 through SVP-4 will be located approximately 5 feet to the north, south, east, and west of District Six C6. The total depth of each soil boring will be adapted based on encountered field conditions during the groundwater monitoring well installation, with total depth being 1 foot above static water level (e.g.: if static water is found at 8 feet bgs, then total depth will be 7 feet bgs at each boring location). Each soil vapor probe location will be potholed to at least 6 feet bgs (or total depth, if shallower) using a vacuum air-knife rig, and if warranted, advanced to total depth using a hollow-stem auger equipped with 6-inch augers. The proposed locations of the soil vapor borings are shown on Figure 2.

After reaching total depth, each soil vapor probe boring will be converted into multi-nested soil vapor probes with sample points at 0.5 feet above total depth (1.5 feet above water). At each interval where a soil gas probe will be installed, a soil vapor probe tip connected to one-quarter-inch diameter Nylaflo<sup>®</sup> tubing (or equivalent) will be fed down the borehole to the desired completion depth. The annular fill around the vapor probes will consist of an appropriate sand pack extending six inches from the base of the probe to approximately six inches above the probe. Approximately one foot of dry granular bentonite will be emplaced above the sand followed by hydrated bentonite chips to seal the annular space between the vapor probes. Upon reaching the next desired vapor probe depth, the process will be repeated. The shallowest vapor probe will be sealed with hydrated bentonite chips to just below surface grade. The tubing at the top of each probe will be fitted with a valve assembly to

facilitate soil vapor sampling. A section of 2-inch-diameter PVC pipe approximately 1 foot in length with a threaded cap will be set into the bentonite 2 to 3 inches below ground surface to protect the probe tubing and provide easy access for sampling.

At least 48 hours following probe installation (to allow for sufficient equilibration), Apex will conduct soil vapor screening in the field using a 4-gas meter and PID. The 4-gas meter will be calibrated for methane (parts per million [ppm]), carbon monoxide (ppm), hydrogen sulfide (ppm), and oxygen (%).

### *Reporting*

Upon completion of the soil vapor assessment and groundwater sampling, Apex will provide the laboratory and field-testing results in a summary report to XOG and the COGCC. The report will include a narrative description of the work performed, a boring log for MW-1, well construction diagrams for MW-1 and SVP-1 through SVP-4, waste disposal information, tabulated data summaries, and figures showing the assessment locations. The final report will also include a conclusion/recommendations section based on an evaluation of the assessment data.

If you have any questions about the activities proposed, or anything else related to this effort, please do not hesitate to contact me at 925-596-1862.

Sincerely,  
**Apex Companies, LLC**

*Kevin Ambrose*

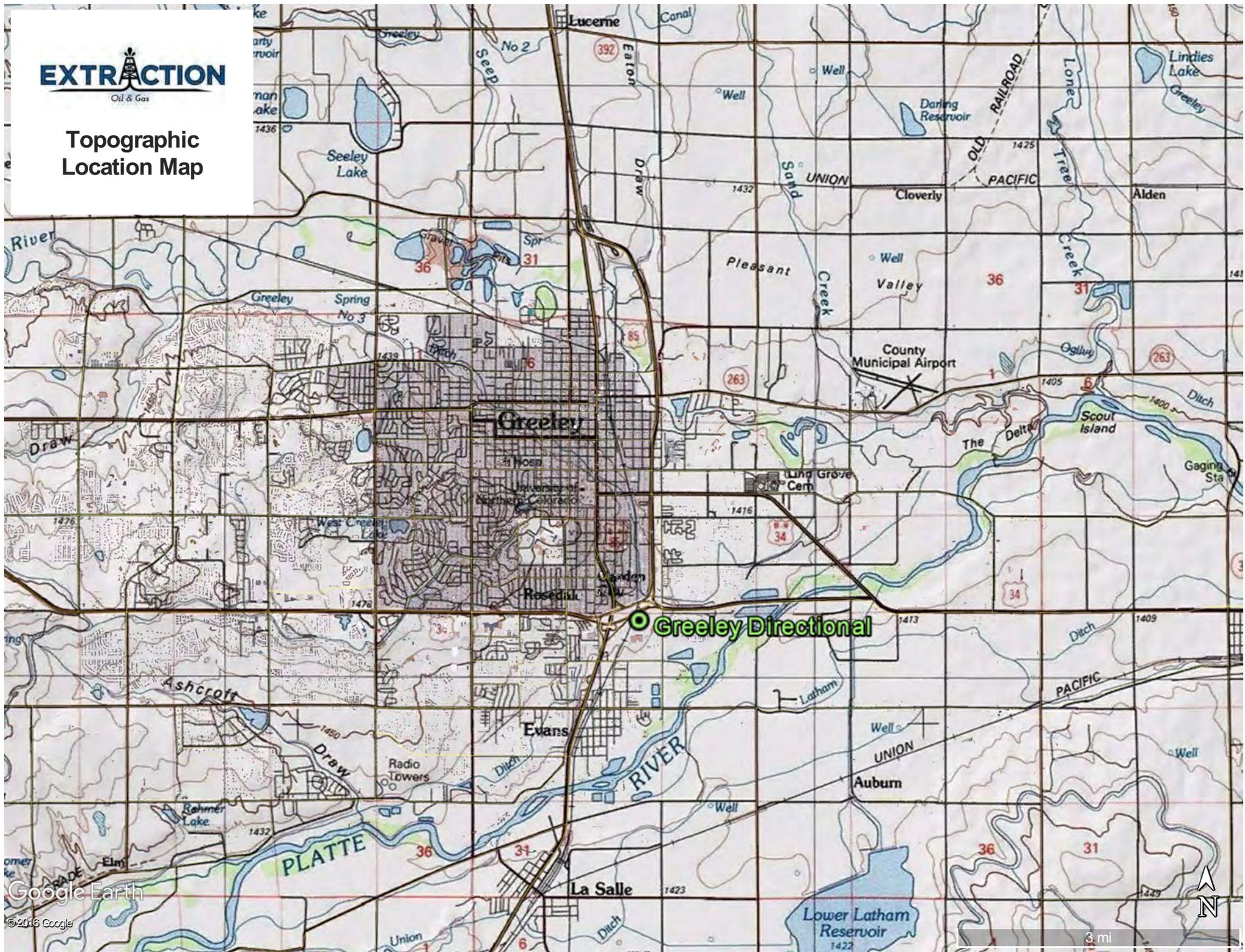
Kevin Ambrose, P.G. #9617  
Project Geologist

### Attachments:

- Figure 1 – Greeley Directional – Topographic Site Map
- Figure 2 – Greeley Directional – Proposed Boring Locations



# Topographic Location Map





District Six C6  
(Location ID: 332837)  
"Greeley Directional"

