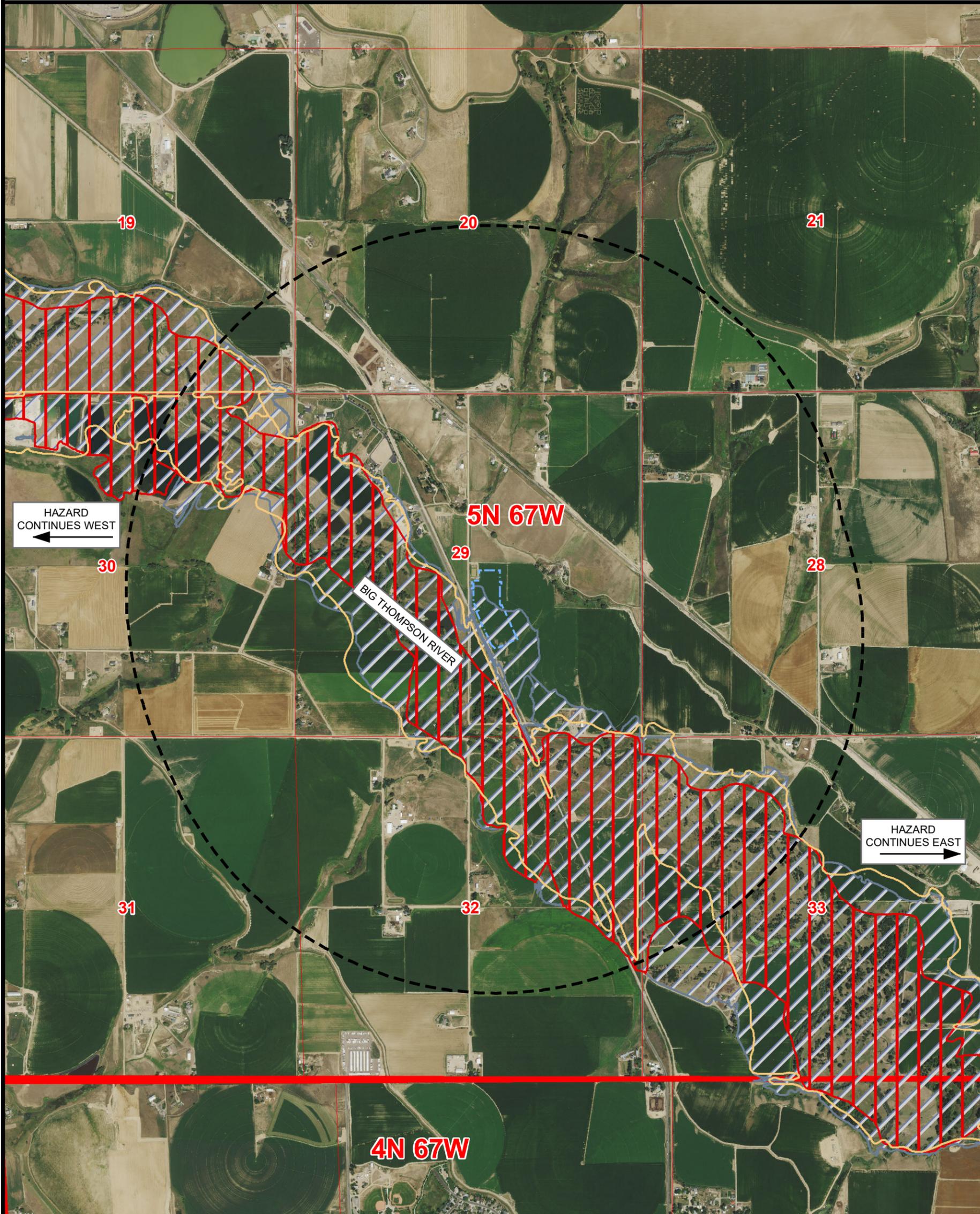


GEOLOGIC HAZARD MAP  
**PAUL NELSON 25-29HZ**

SECTION 29, TOWNSHIP 5 NORTH, RANGE 67 WEST, 6TH P.M., WELD COUNTY, COLORADO



HAZARD  
CONTINUES WEST  
←

HAZARD  
CONTINUES EAST  
→

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**Legend**

-  PROPOSED WORKING PAD SURFACE
-  1 MILE BUFFER - WORKING PAD SURFACE
-  100-YEAR FLOODPLAIN (EFFECTIVE, 2016)
-  100-YEAR FLOODWAY (PRELIMINARY, 2020)
-  100-YEAR FLOODPLAIN (PRELIMINARY, 2020)

NOTE:  
 THIS MAP IS A COMPILATION OF PUBLICLY AVAILABLE DATA. THE ACCURACY AND COMPLETENESS OF SAID DATA  
 HAS NOT BEEN VERIFIED BY 609 CONSULTING, LLC. EXISTING CONDITIONS MAY DIFFER FROM WHAT IS SHOWN.

**Kerr-McGee Oil &  
 Gas Onshore L.P.**  
 1099 18th Street  
 Denver, Colorado 80202

  
**609 Consulting, LLC**  
 LOVELAND OFFICE  
 6706 North Franklin Avenue  
 Loveland, Colorado 80538  
 Phone 970-776-4331  
 SHERIDAN OFFICE  
 1095 Saberton Avenue  
 Sheridan, Wyoming 82801  
 Phone 307-674-0609

N  
  
 NAD83 CO-Nft  
 1" = 1,500ft  
 0 750 1,500

Drawn by: BB Date: 10 Sep 2021  
 Revised: Date:



Kerr-McGee Oil & Gas Onshore LP

Geologic Hazard Plan

Paul Nelson 25-29HZ Well Pad and Facility  
NWSE Section 29, 5N 67W

Weld County, CO

November 2021

## PROFESSIONAL GEOLOGIST CERTIFICATION

I certify that I am a Professional Geologist, having met the education requirements and professional work experience required by C.R.S. § 23-41-208(b). I certify that the Geologic Hazard Plan described herein is, to the best of my knowledge, accurate and complete.



Cameron Ross, Geologist Senior

## CONTENTS

- Section 1: Site Conditions and Development
- Section 2: Site Characterization
- Section 3: Measures taken to avoid, minimize or mitigate impacts of Geologic Hazards
- Section 4: Summary
- Section 5: References

### List of Figures Referenced

Figure 1: Overview of Paul Nelson 25-29HZ within Floodplain

### Cite definition of Geologic Hazard:

Pursuant to § 24-65.1-103(8), C.R.S., a “Geologic Hazard” means a geologic phenomenon which is so averse to past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property. The term includes but is not limited to (a) avalanches, landslides, rock falls, mudflows, and unstable or potentially unstable slopes; (b) seismic effects; (c) radioactivity; and (d) ground subsidence.

Rule 304.c.(21) provides that if the Operator identifies any Geologic Hazards pursuant to Rule 304.b.(7).I, the Operator will submit a Geologic Hazard plan describing proposed mitigation measures.

### Section 1: Site Conditions and Development

Kerr-McGee Oil & Gas Onshore L.P. is proposing the construction and development of an oil/gas well pad and production facility, Paul Nelson 25-29HZ, located in the southeast quarter of Section 29, Township 5 North, Range 67 West in Weld County, Colorado. The Paul Nelson 25-29HZ project proposes the construction and operation of the Paul Nelson 25-29HZ well pad and production facility containing infrastructure and operations for 17 wells which will be permitted by Colorado Oil and Gas Conservation Commission (COGCC) and Weld County. Construction is currently planned for Q2 2023 with drilling to start in Q2 of 2023 (subject to change).

## **Section 2: Site Characterization**

As part of this application, a survey of geologic hazards within 1 mile of the proposed drilling location was conducted. The survey included geologic hazards that could have the potential to pose significant hazards to public health, safety, and property, including, but not limited to, floodplain, surface mines, earthquakes, landslides and sub-surface mines. The sole geologic hazard present within 1 mile of the proposed drilling location is the preliminary Zone AE floodplain of the Big Thompson River within the Working Pad Surface (WPS) of the proposed Paul Nelson 25-29HZ location.

The attached figure is a map showing the identified geologic hazard features that are located within 1 mile of the proposed Paul Nelson 25-29HZ surface drilling location. The data sources for the Geologic Hazards Features shown on the figure are Weld County, FEMA, and COGCC GIS datasets. As the figure illustrates, the location is just outside of the boundary of the historic 2016 effective floodplain (FEMA) and within the 2020 preliminary floodplain.

As a result of the location within the preliminary floodplain, KMOG contracted 609 Consulting, LLC to prepare a Weld County Flood Plain Hazard Development Permit. This permit includes an in-depth analysis of water levels anticipated during the 1-percent annual chance event. The analysis completed by a Colorado registered professional engineer highlights that the location is within the floodplain, but not the floodway. During the 1-percent annual chance event the modeled water depths do not indicate the water would be deep enough to top the Great Western railroad track that runs adjacent to the location and parallel to the Big Thompson River. Additionally, flood flow velocities of zero will not cause erosion or negatively impact soil piles or pad fill toes. During the pre-production phase modeling of a 100-year flooding event indicates less than five inches of water would be present on the location. At this depth, flood water will not overtop secondary containment berms (1.5 feet tall) placed around the separators and tanks. After the location transitions to the production phase the pad is graded back to the original elevation the anticipated water depth during a 100-year flood event is expected to be 2.8 feet. At this depth, submerged portions of well heads will include steel valves, gages, flanges, and pipes which will be sealed, waterproofed, and anchored by the buried pipelines and well sections.

## **Section 3: Measures taken to avoid, minimize or mitigate impacts of Geologic Hazards**

KMOG will employ the following mitigation strategies to ensure the safety of the surrounding area in the unlikely event that a 100-year flood occurs.

- Permanent tanks are either out of the floodplain or protected from floodwaters by secondary containment berms.
- Submerged portions of meters, electric boxes, air compressors, and manifolds will be sealed, waterproofed, and anchored.
- Any exposed electrical will be waterproofed and properly anchored to the wellhead.

- The flowlines (3-inch Schedule 80 steel) will be buried an average of 4.0 feet below grade and will transfer the full well stream north to the proposed facility, parallel to the flow of the Big Thompson River.
- Topsoil stored for final reclamation will be seeded in order to prevent erosion caused by wind, local storm runoff, and flooding of the Big Thompson River.
- KMOG also uses the Integrated Operations Center (IOC) which has the ability to shut in facilities remotely 24 hours per day seven days per week.

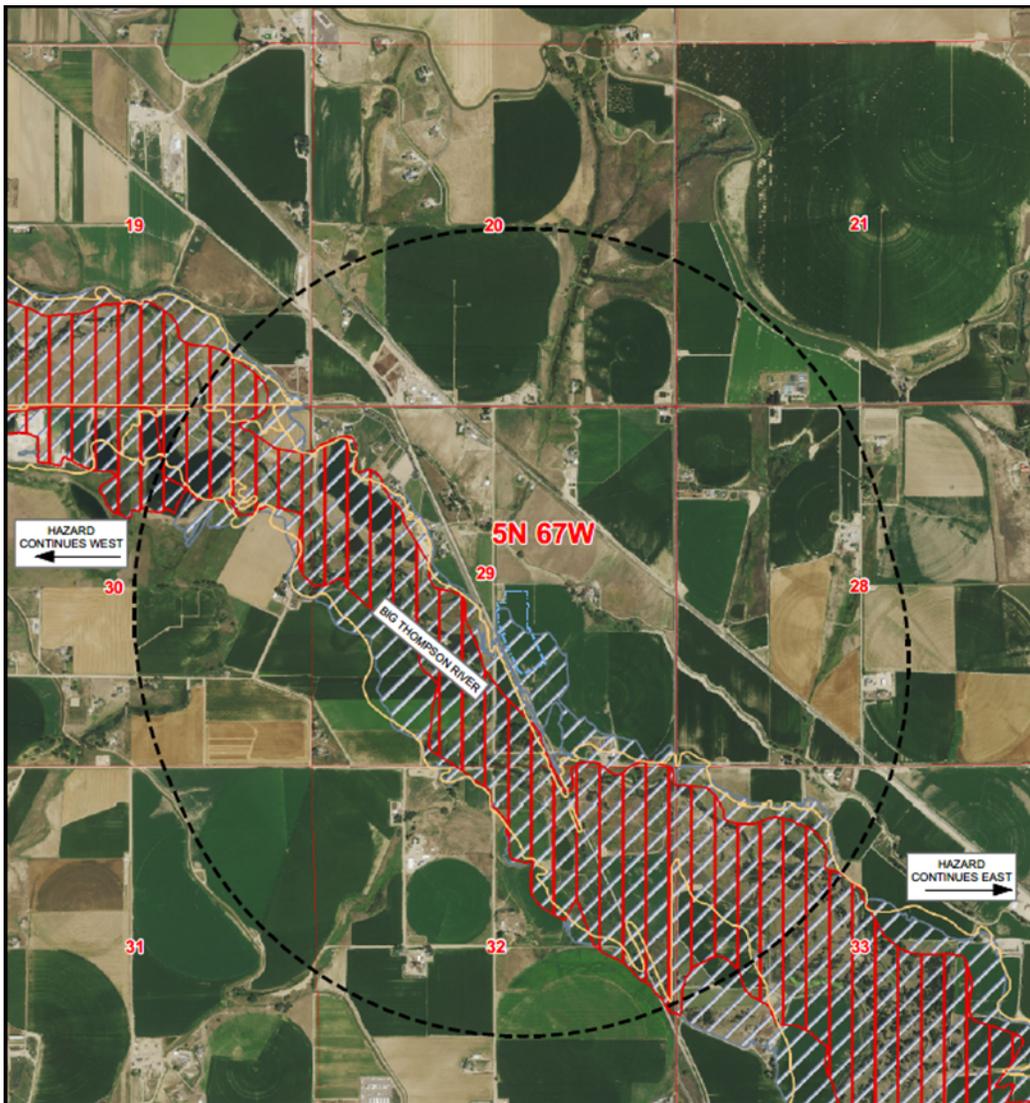
#### **Section 4: Summary**

My review and the attached figure support my conclusion that, based on the results of the geologic hazards survey, the only known geologic hazards within 1 mile of the proposed surface drilling location and access road are the preliminary and effective floodplains. The Paul Nelson 24-29HZ WPS (red polygon) is located directly outside of the 2016 effective 100-year floodplain and parts of the pad are shown to be within the 2020 preliminary 100-year floodplain (Figure 1). Based on the surveyed information less than 5 inches of water would be present over the parts of the Paul Nelson 24-29HZ WPS during the pre-production phase. KMOG intends to utilize the outlined BMPs and hence the identified preliminary floodplain will not pose a threat to the past, current, or foreseeable construction or land use as to constitute a significant hazard to public health and safety or to property.

#### **Section 5: References**

- COGCC Floodplains (FEMA)
  - [https://cogccmap.state.co.us/cogcc\\_gis\\_online/](https://cogccmap.state.co.us/cogcc_gis_online/)
  - <https://hazards-fema.maps.arcgis.com/apps/webappviewer/>
- Weld County
  - <https://www.weldgov.com/Government/Departments/Planning-and-Zoning/Floodplain-Management>

Figure 1. Overview of Paul Nelson 25-29HZ within Floodplain



### Legend

-  PROPOSED WORKING PAD SURFACE
-  1 MILE BUFFER - WORKING PAD SURFACE
-  100-YEAR FLOODPLAIN (EFFECTIVE, 2016)
-  100-YEAR FLOODWAY (PRELIMINARY, 2020)
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