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September 19, 2023

Kylian Robinson
Hazardous Waste Bureau
New Mexico State Environment Department

Dear Mr. Robinson,

At your request, on September 18, 2023, I went to the field with you, Siona Briley, and Mitchell Schatz from NMED and several LANL officials to examine outcrops near TA-60-0017, a proposed storage facility for hazardous waste. This letter summarizes my field observations.

You and your colleagues expressed concerns about whether three north-trending, small-displacement faults mapped by Gardner et al. (1990) in Sandia Canyon to the north of the facility projected southward into the area of interest. In addition, you and your team conveyed interest in a long north-trending lineament mapped by Vaniman and Wohletz (1990) based on air photos taken prior to extensive anthropogenic development in this area. This lineament roughly coincides with the two eastern faults mapped by Gardner et al. (1990).

After touring the area immediately around the building, both NMED and LANL representatives recognized that the 200 ft (61 m) buffer zone around the proposed storage site is covered by asphalt; thus the presence or absence of faults in the parking lot cannot be determined by visual inspection.

Your team then requested an examination of the E-W oriented Bandelier Tuff cliffs on the edge of Sigma Mesa to the north and to the south of the building to ascertain whether the N-S oriented faults in Sandia Canyon cross the mesa. On our way to the north edge of the mesa, we walked to the west side TA-60 and noted a small embankment with an outcrop of the Tshirege Member of the 1.26 Ma Bandelier Tuff that stands about 1-2 m above the grade of the parking lot to the east. The presence of this outcrop implies that the area now occupied by the building and the parking lot was excavated into the tuff. Consequently, any younger material that might have overlain the tuff that could hold clues about Holocene displacement on hypothetical faults was removed during construction of the facility. We observed that ~0.5 m of eolian silt overlies the weathered top of the tuff on the embankment and in a roadbed just to the west.

Once we walked to the north side of the complex, I explained that small faults are hard to detect in areas with poor exposures. The soft, sintered tuff rarely forms discrete fault planes. Instead, faulting causes the tuff to either crumble or form conjugate joints sets that are easily eroded. Linear cooling joints were only features that we found on the north-facing slope of the mesa. Most of these joints are discontinuous and are < 10 m long. One joint directly north of the assembly tower at TA-60 was more continuous and might be the lineament noted by Vanniman

and Wohltz (1990). A similar long joint was found on the south side of the mesa. The cooling joints exhibit no displacement or kinematic indicators.

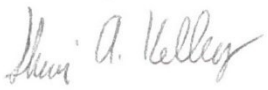
The tuff on the south side of the facility is well exposed in a road cut and along the north edge of Mortandad Canyon. Interestingly, iron staining of fractures and pervasive reddening of the tuff matrix is common on the south side of the road. The most likely source of the iron is related to rainwater and snowmelt runoff from the TA-60 facility, given the fact that metal structures were assembled and disassembled at this site.

The most noteworthy feature discovered during the field outing is in the road cut just south of the assembly tower. A curvilinear open fracture is filled with what appears to be reddish orange sediment. The fracture is ~2–3 cm wide. The reddish-orange sediment is similar to material mapped by Koning and Kelley (2018) as Qfi (intermediate alluvial fan deposit; ~74–22 ka), which is Pleistocene in age. No displacement or kinematic indicators are associated with this fracture.

In summary, the building and the parking lot obscure clues needed to assess the presence or absence of faults. Furthermore, construction at the site likely removed any sediment overlying the Tshirege Member of the Bandelier Tuff. The only possible evidence for the existence of Pleistocene sediment above the tuff is preserved in a fracture in the road cut south of the assembly tower. Evidence for faulting on the northern and southern edges of the mesa was not observed. Linear cooling joints are common in exposures of the tuff on the north and south sides of Sigma Mesa.

Please feel free to contact me if you have questions or concerns.

Best regards,



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