FINAL TECHNICAL MEMORANDUM

Placement Above the Uppermost Aquifer Location Restriction Demonstration for the CCR Impoundments M5 and M7, Reid Gardner Station, Moapa, Nevada

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This technical memorandum (TM) presents the placement above the uppermost aquifer location restriction demonstration for the Coal Combustion Residual (CCR) Impoundments M5 and M7 at the Reid Gardner Generating Station (Station), as required by 40 CFR §257.60 of the U.S. Environmental Protection Agency's Coal Combustion Residuals (CCR) Rule. This demonstration must be placed in the Station's operating record as it becomes available, but not later than October 17, 2018 per 40 CFR §257.60(c)(1) and §257.105(e). Within 30 days of placement, the State Director must be notified as required by 40 CFR §257.106(d) and §257.106(e). Also, within 30 days of placement the demonstration posted to a publicly accessible Internet site as required by §257.107(d) and §257.107(e)).

1.0 Background

The M5 and M7 impoundments are existing CCR surface impoundments at NV Energy's Reid Gardner Generating Station (Station) near Moapa, Nevada. The Station was formerly a coal-fired electric power generating station with four units capable of providing a generating capacity of nearly 600 megawatt (MW) located approximately 45 miles northeast of Las Vegas in Moapa Valley, Nevada. Units 1 through 3 were retired in 2014 and Unit 4 ceased operations in March 2017. The Station is currently in the reclamation process whereby the plant is being dismantled. Although the Station no longer generates power or produces CCR, the impoundments contain legacy CCR waste and still accept other flows from the Station.

The M5 and M7 impoundments are located on a mesa south of and at a higher elevation than the plant area. The impoundments were formed by excavating into the existing ground along the southern and western side of the impoundments and building earthen embankments along the northern and eastern sides. The M5 and M7 impoundments were constructed with a multi-layer geosynthetic liner system (80-mil geomembrane primary liner, interstitial leak detection system, 80-mil geomembrane secondary liner) installed over a prepared subgrade. The perimeter dikes were constructed using native soils with maximum embankment slopes of 3 to 1 (horizontal to vertical). The M5 and M7 impoundments are rectangular evaporation ponds covering a combined area of approximately 28 acres. The M5 and M7

impoundments measure 23-feet deep, as measured from the bottom of the pond to the top of the lowest berm surrounding the impoundments.

The impoundments were designed, permitted, and constructed in conformance with applicable State regulations and prior to the publication of the CCR Rule. The applicable regulations included water pollution control regulations (Nevada Administrative Code [NAC] 445A), dam safety regulations (NAC 535), and the Nevada Division of Environmental Protection (NDEP), Bureau of Water Pollution Control's (BWPC) Water Technical Sheet 37 (WTS-37). Although the M5 and M7 impoundments have multi-layer geosynthetic liner systems, they are classified as existing unlined CCR surface impoundments under the CCR Rule (§257.71(a)(3)(i)). For a more detailed description of the surface impoundments refer to the Construction History for Ponds M5 and M7 (CH2M, 2016a).

As required by 40 CFR §257.60(a), existing and new surface CCR impoundments, and all lateral expansions of CCR units, must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations; including seasonal high-water table.

According to 40 CFR §257.53, uppermost aquifer is defined as "the geologic formation nearest the natural ground surface that is an aquifer, as well as lower aquifers that are hydraulically interconnected with this aquifer within the facility's property boundary. Upper limit is measured at a point nearest to the natural ground surface to which the aquifer rises during the wet season."

2.0 Local Hydrogeology

Listed from youngest to oldest, the stratigraphic units under the M5 and M7 impoundments that are pertinent to the location of the uppermost aquifer are Quaternary alluvium (if present), post-Muddy Creek Tertiary-age deposit, and the Muddy Creek Formation.

- Quaternary Alluvium: Alluvium is generally not present on the mesa, and the thin layers of unconsolidated sands present on the land surface near the impoundments may be residual soil from weathering of the deposits described below.
- Post-Muddy Creek Tertiary-age Deposit: The post-Muddy Creek Tertiary-age deposit include calcareous clay or mudstone and limestone with varying amounts of sand, silt, and gravel, and a calcareous silty to sandy conglomerate. The calcareous, strongly-cemented, coarse-grained conglomerate member of the post-Muddy Creek Tertiary-age deposit is exposed at the surface over much of the mesa and has observed in the upper 30 to 40 feet of several mesa boreholes, including the impoundment area. The post-Muddy Creek Tertiary-age channel-fill conglomerates overly the red claystone unit of the Muddy Creek Formation on the mesa and cut into the underlying green and red claystones of the Muddy Creek Formation thus creating a disconformity. This disconformity can be observed at the mesa scarp north of the impoundments.
- The Muddy Creek Formation: The Muddy Creek Formation is primarily composed of lacustrine deposits and includes an upper green claystone unit and a lower red claystone unit. The Muddy Creek Formation observed in mesa boreholes in the impoundment area are characteristic of the red claystone unit; with salmon or pale reddish-brown color; dense, hard clay layers interbedded with loose fine sand and silt; and thin beds or lenses of fine- to medium-grained, calcite-cemented sandstone; with beds tending to be discontinuous (CH2M, 2016b). Gypsum may also be present in sandstone beds. Bed orientation ranges from generally near horizontal to nearly vertical where locally faulted or folded (Stanley Consultants, Inc., 2014).

NV Energy currently monitors groundwater depth and quality at the M5 and M7 Impoundments using 7 monitoring wells (CH2M, 2018). Groundwater at the impoundment site on the mesa is located in the silt, fine sand and clay of the Muddy Creek Formation, and is part of the Muddy Creek Aquifer. The water table elevation ranges from 1,560 feet to 1,580 feet above mean sea level (amsl), with an eastward groundwater flow direction. The average surface elevation of the base of the impoundments is approximately 1,720 feet amsl, indicating that the depth to groundwater in the impoundment area is approximately 150 feet below ground surface.

3.0 Conclusions

The base of the M5 and M7 CCR impoundments is located approximately 150 ft above the upper limit of the upper most aquifer, significantly greater than the 5-foot separation requirement in the CCR rule.

4.0 Certification

This section of the assessment contains the certification by a qualified professional engineer as required by Section 257.60(b) of the CCR Rule.

This demonstration meets the requirements of 257.60(a) of the CCR Rule.

5.0 References

CH2M HILL Engineers, Inc. (CH2M). 2018. *Coal Combustion Residual 2017 Annual Groundwater Monitoring and Corrective Action Report, Reid Gardner Generating Station, Mesa Surface Impoundments M5 and M7*. January 29.

CH2M. 2016a. *Construction History, Ponds M5 and M7, Reid Gardner Generating Station*. August 26.

CH2M. 2016b. *Groundwater Monitoring Well CCR-1 through CCR-4 Installation Report Mesa Landfill and Surface Impoundments, Red Gardner Generating Station, Moapa, Nevada*. December.