The analysis below is intended to satisfy question 4-6 of the draft RAIs. Ultimately this analysis needs to be added to chapter 4.5 of the SAR. The calculation below was performed using MCNP version 5.

Calculation of Negative Void Coefficient of MNRC Core

The reactivity worth of a complete loss of all water inside and surround the core was calculated based on the OCC configuration with burnup levels as of 9/1/20, where excess reactivity was ~$4.50 (ambient temperatures and no xenon). Without any water inside or surrounding the reactor the reactor was found to be subcritical by $21.88 with all control rods fully withdrawn. Even if core excess was $9.25 instead of $4.50 the reactor would still remain subcritical by over $15.00 with no water and all control rods fully withdrawn. This results in a reactor negative void coefficient of approximately $0.25/1% water removed from the core. Note this is an approximate value because it is averaged throughout the core, meaning voids in different locations in the core will have different values. This gives strong evidence that during an actual LOCA event, the core will become subcritical (even with all controls rods fully withdrawn) when the reactor tank water falls to approximately half way down the active region of the fuel. This results are in general agreement with other TRIGA reactors.