database records the inventory of HAZMAT cargo released for each accident; whereas, the FRA database only identifies that an LOC has occurred. The PHMSA database was analyzed in order to estimate the LOC probabilities for the LNG ISO containers. The analysis assumed that LOC could only occur if the LNG ISO well car was derailed. The PHMSA database did not readily provide accident data for (b) (4) ISO portable tank containers, but it did list pressure tank car LOC accidents. Although there are differences between the (b) (4) ISO construction and a DOT-112 pressure tank car, the dynamics and consequences of LOC are reasonably similar. Thus, pressure tank cars were used as an analog to estimate the probability of an LOC if a car was derailed.

The PHMSA database listed accident data from 1971 to the present. All rail car data was queried from 1971 to 2014, for incidents including spillage, vapor (gas) dispersion, and no release. The resulting data was then filtered for pressure tank cars only, and incidents where no tank car specification was available were excluded from the analysis. The resulting 5,152 pressure tank car incidents[30] were then sorted by amount released (units are either cubic feet (ft^3) or gallons).

The PHMSA data was grouped into four release volume ranges in order to estimate the probability of a certain leak size. The categories were no release (less than 100 gallons), small release (100 to 1,000 gallons), large release (1,000-30,000 gallons), and catastrophic release (30,000+ gallons).[31,32] These volumes were chosen as the PHMSA data appeared to reflect mostly 30,000+ gallon tank cars in contrast to the 10,000 gallon ISO container used for LNG transportation.

Representative hole sizes were chosen for each release category, in line with a previous quantitative risk assessment completed for FECR.[32] Small releases were modeled using a ½-inch hole while a 2-inch hole was used for large releases. These hole sizes are consistent with appurtenance sizes on the ISO container. A catastrophic release assumes that the tank shell has been ruptured, leading to an instantaneous spill of the entire tank contents. Catastrophic releases were thus assumed to represent the PHMSA database cases where 30,000 gallons or more of contents were spilled. The resulting release probabilities are provided in Table 15.

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30 As of November 14, 2014.

31 Section 3.3.3.3, Railways, page 3.13 in *Guideline for Quantitative Risk Assessment, Part Two: Transport* (Dutch Purple Book), Publication Series on Dangerous Substances, Ministerie van Verkeer en Waterstaat (2005).

32 Exponent report titled: "Florida East Coast Railway Dual-Fuel Locomotive and LNG Tender Project Quantitative Risk Assessment Report," issued January 2, 2015.