3.1.4 Multiple LNG DOT-113 LOC Events

As the number of cars involved in an accident increases, the number of possible release scenarios grows exponentially. For example, an accident involving five cars, each with four possible outcomes, results in 4^5 (i.e. 1,024) possible combinations. PHAST Risk requires that each outcome be modeled as a single release; for example, a small release from one car combined with a large release from a second car would need to be combined into an equivalent release scenario. Within all of these combinations, several distinct outcomes are represented. As such, the combinatorial releases were grouped by discharge rates with aggregate probabilities of LOC. The outcomes were then refined by eliminating all potential LOC events with probabilities less than 1×10^{-7}; below this probability value, the risk was assumed to be insignificant.

None of the permutations were limited to only one DOT-113 for all leak scenarios. Consolidated release rates ranged from 0 to approximately 330 lb/s depending upon the case. None of the permutations led to an equivalent catastrophic release of more than three LNG DOT-113 rail cars. The consolidated releases for accidents involving two through eleven LNG DOT-113 rail cars are shown in Table 11 through Table 20.

Table 11. Consolidated release scenarios for two LNG DOT-113s.

Equivalent release (lb/s)	Probability
0	9.12×10^{-1}
3.60	3.06×10^{-2}
7.20	2.56×10^{-4}
60.4	5.05×10^{-2}
117	6.76×10^{-4}
Catastrophic Rupture (1 DOT-113)	5.98×10^{-3}
Catastrophic Rupture (2 DOT-113s)	9.00×10^{-6}

Table 12. Consolidated release scenarios for three LNG DOT-113s.

Equivalent release (lb/s)	Probability
0	8.71×10^{-1}
5.40	4.45×10^{-2}
10.8	4.10×10^{-6}
62.2	7.35×10^{-2}
148	1.99×10^{-3}
Catastrophic Rupture (1 DOT-113)	8.95×10^{-3}
Catastrophic Rupture (2 DOT-113s)	2.69×10^{-5}