

### 3.1.8 Multiple LPG Rail Car LOC Frequency

The same strategy utilized for consolidating the LNG ISO car LOC frequencies was used for the LPG cars. As with the LNG ISO cars, the outcomes were also refined by eliminating all potential LOC events with probabilities less than  $1 \times 10^{-7}$  as this is expected to result in an outcome with negligible risk (regardless of outcome). The consolidated release scenarios for involvement of two and three LPG rail cars are provided in Table 26 and Table 27.

**Table 26. Consolidated release scenarios for two LPG rail cars.**

Equivalent release rate (kg/s)	Probability
0	$8.93 \times 10^{-1}$
2.87	$2.47 \times 10^{-2}$
35.5	$6.71 \times 10^{-2}$
68.9	$1.23 \times 10^{-3}$
Catastrophic Rupture (1 LPG car)	$1.39 \times 10^{-2}$
Catastrophic Rupture (2 LPG cars)	$4.90 \times 10^{-5}$

**Table 27. Consolidated release scenarios for three LPG rail cars.**

Equivalent release rate (kg/s)	Probability
0	$8.44 \times 10^{-1}$
3.69	$3.53 \times 10^{-2}$
36.6	$9.64 \times 10^{-2}$
69.9	$3.52 \times 10^{-3}$
103.3	$4.29 \times 10^{-5}$
Catastrophic Rupture (1 LPG car)	$2.07 \times 10^{-2}$
Catastrophic Rupture (2 LPG cars)	$1.46 \times 10^{-4}$
Catastrophic Rupture (3 LPG cars)	$3.43 \times 10^{-7}$

## 3.2 Flammable Cloud Formation

The release conditions, LNG vaporization, cloud formation and dispersion, and flammable cloud envelope as a function of time were calculated in PHAST Risk v6.7. PHAST Risk is a commercial software package developed and distributed by Det Norske Veritas (DNV). PHAST Risk combines a phenomenological release and consequence analysis model with a risk analysis sub-model to evaluate spills, sprays, and gas dispersions and the resulting toxic, fire, and explosion consequences on populations.

PHAST is widely used for the calculation of hazard distances from the release of several hazardous substances, including LNG. PHAST is approved by the U.S. Pipeline and Hazardous Materials Safety Administration (PHMSA) for evaluating LNG release exclusion zones. The