total count of 65,940 accidents. The accidents are identified in the database by category and include multiple types of collisions, explosions, fires, other impacts, and other events. These types of accidents are consistent with the events necessary to lead to an LOC of LNG from a DOT-113. The FRA data was filtered for all accidents from 1997-2016 (all railroad classes), and the results were analyzed to determine accident frequency for mainline accidents and derailment probability at two different speeds. The values are summarized in Table 4 for accidents and derailments from this data. This data was used to determine accident frequency, as will be discussed below.

Table 4.   Train accident rates from FRA data.

	Statistic	1997-2016
Mainline, Speed ≤ 25 mph	Total Accidents	22,192
	Total Derailments	14,199
	% of All Accidents	33.65%
	Probability that Derailment Occurs	64.0%
Mainline, Speed > 25 to ≤ 50 mph	Total Accidents	6,580
	Total Derailments	3,501
	% of All Accidents	9.98%
	Probability that Derailment Occurs	53.2%

The raw accident numbers were then divided by train mileage to develop accident frequency estimates as accidents per train mile for the QRA. Operational data tables provided by the FRA were used to determine the total number of mainline[17] train miles for the period from 1997-2016 for all classes of railroad represented in the data.[18] The operational data tables did not subdivide the mainline train miles according to track speed; thus, only the total accident frequency per mainline train mile for all trains could be calculated. This single mainline train accident frequency value was applied to all mainline train movements regardless of train speed. By applying the total rail industry accident frequency, this provides a reasonable representation of the accidents per train mile for any subset of the data such as accidents at speeds over 25 mph, or any other subdivision. Using the total accident and total mileage values, the accident frequency (on a per train mile basis) was then calculated. The average accident frequency was found to be 2.42×10^{-6} (accidents/train mile) for the mainline travel. The 20-year data was used throughout the analysis due to the relatively large number of data points that provide a larger confidence in the position-in-train derailment probabilities (discussed in Section 3.1.2). The results are summarized in Table 5.

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[17]   All "Non-yard" miles were assumed to be mainline miles for the purpose of this analysis.

[18]   FRA Office of Safety Analysis, Report 1.02 – Operational Data Tables.