Executive Summary

This report summarizes the Quantitative Risk Assessment (QRA) study conducted on the Energy Transport Solutions, LLC (ETS) proposed movement of liquefied natural gas (LNG) DOT-113 tank cars by rail in unit trains. In order to assist the process safety management of the operation, the focus of the study was to evaluate the risk for movement of the DOT-113 tank cars by rail transportation. This Executive Summary highlights Exponent's findings in the QRA. Further details are provided in the body of the report. Note that this Executive Summary does not contain all of Exponent's technical evaluations, analyses, conclusions, and recommendations. Hence, the main body of this report is at all times the controlling document.

E.1 QRA Overview

The scope of the QRA addresses unit train movements along one example route located in the Northeastern United States. The unit train movements were limited to mainline movements at high and low speeds. The hazard scenarios corresponded to accidents involving the DOT-113 type tank car, which is a double-walled vessel containing nominally 30,000 gallons of LNG. Accident event trees were constructed describing the necessary events and the frequency or probability of each step occurring to lead to a loss of containment (LOC) and ultimately a fire and/or explosion. Representative accident/failure frequency and probability values were developed from industry-available databases and FRA rail accident statistics.

Several conservative assumptions were applied during the analysis to estimate failure probabilities for the LNG DOT-113 type tank cars. The assumptions may be evaluated and changed based upon new information, and this may lead to different and likely lower (i.e., less conservative) failure probabilities (e.g., lower risk). The QRA assumed that each unit train includes LNG DOT-113 tank cars, starting at train position eleven (11), and one train movement was accomplished per day.

The QRA results are tabulated as a function of population density and train speed, providing per-route mile risk results. These per-route mile risk results can be used to determine the aggregate risk along a specific route for which population density and train speed along the route is known. An example route along the eastern portion of Pennsylvania was used to demonstrate the application of the per-route mile risk findings to determine aggregate risk along a route. Additionally, the per-route mile risk results can be used to determine distances to potentially sensitive targets, as will be discussed in more detail.

E.1.1 Evaluating the Risk

A commercially available software tool (PHAST Risk v6.7) was used to model the consequences of potential releases resulting in pool fires, flash fires, pressurized jet fires, and