

Paper Title: [Modeling of Explosive Buoyant Plumes of Natural Gas](#)

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Summary:

Objective of Work Being Reported: This paper discusses work done at LANL combining the buoyant plume theories of Hanna and Briggs with (1) Turner's method for calculating atmospheric dispersion and (2) meteorological measurements of Pasquill Atmospheric Stability.

Relationship of the Work to the Overall Interests of DOE Safety Analysis: This paper provides a theoretical basis for predicting the possibility of momentum-dominated or buoyancy-dominated plumes of natural gas reaching a DOE hazardous site while retaining an explosive concentration of natural gas in air. This method has been used at LANL to screen existing and proposed locations of natural gas lines near to LANL nuclear facilities.

Results of Work: This paper discusses a synthesis of theory and measurements used at LANL to determine the hazards of subterranean natural gas lines sited proximate to nuclear material facilities (CMR, PF-4, CMRR, and TWF). Hanna and Briggs Gaussian Bent-Plume theory is used show if natural gas plume can travel to a LANL nuclear building. Standard atmospheric dispersion modeling is then employed using Pasquill Stability Classes, Turner air concentration data, and Slade power law approximations to calculate the volume percent concentration of natural gas reaching the LANL nuclear facility. This result is then compared to multi-year compilations of meteorological data to quantify the possibility and/or probability of a natural gas plume reaching a LANL nuclear facility while retaining an explosive concentration of gas in air.

Reviewed for Classification: UNCLASSIFIED

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