Abstract Submitted for the DFD05 Meeting of The American Physical Society

The scouring of granular beds by jet-driven turbulent cauldrons FABIÁN BOMBARDELLI, University of California at Davis, GUSTAVO GIOIA, University of Illinois at Urbana-Champaign — We study a sustained, jet-driven, cylindrical or axisymmetric turbulent cauldron that scours a cohesionless granular bed to form a pothole. We focus on the energetics of the turbulent cauldron and use dimensional analysis and similarity methods to derive (up to a multiplicative constant) a formula for the equilibrium depth of the pothole. The formula contains a single similarity exponent, which we show can be determined via the phenomenological theory of turbulence. Our derivation affords insight into how a state of dynamic equilibrium is attained between a granular bed and a localized turbulent flow. Our method of analysis may prove useful in developing a theoretical understanding of mine burial, bridge pier-induced erosion, and other applications in which a localized turbulent flow interacts with a granular bed.

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Date submitted: 12 Aug 2005

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