THE GALE CRATER MOUND: A STRONG CANDIDATE LANDING SITE FOR THE 2009 MARS SCIENCE LABORATORY. J.F. Bell III[1], K.S. Edgett[2], S. Rowland[3], M.C. Malin[2]. [1]Cornell Univ., Department of Astronomy, Ithaca NY; [2]Malin Space Science Systems, San Diego, CA; [3]Univ. of Hawaii, Honolulu HI.

Introduction: The goals of the Mars Science Laboratory (MSL) are to assess the past and present geology of Mars and the potential habitability for astrobiologic studies and future human exploration. Selection of a landing site consistent with all these goals while maintaining landing safety and operational constraints is thus critical.

Gale crater is a ~140 km diameter Noachian age impact crater at 5.2°S, 222.3°W. A 40-50 km wide, ~5 km high mound of sedimentary rocks covers most of the northwestern crater floor. The mound is remarkable because it consists of hundreds of rock layers that are tens of m thick, and because the top of the mound is topographically *higher* than the rim of the crater itself [1]. Within Gale, an extensive stratigraphic section of layered rocks and obvious angular unconformities within the section record long periods of geologic time and importantly, large-scale changes in the depositional and erosional history. The interior of Gale crater also provides an outstanding environment in which to test Mars' habitability. We believe that the site also meets the EDL, Trafficability, and Planetary Protection requirements of the MSL Project, although the most interesting geological areas will require a drive from a nearby landing site.

EDL and Trafficability: There is no reason to land MSL on the mound itself because the interesting geology is exposed in the lower slopes (nor would such a landing satisfy EDL or trafficability constraints). Instead, it would be desirable to land on relatively smooth inter-crater depositional fans materials that were transported through a valley cut through the crater wall (Fig. 1). MSL would therefore utilize its planned "go to" capability to drive to the mound materials. The landing ellipse is at a MOLA-derived elevation of about -4.5 km. A number of trafficable routes to and into the mound can be identified in MOC images.

The Site and Science: A number of studies [*e.g.,* 1-4] have shown that the central mound of Gale crater consists of indurated, layered, possibly rocky materials partially covered by dust. Compositional information on these materials is thus far ambiguous because significant dust and sand cover reduces spectral contrast in currently-available remote sensing data. The distinct layering of these outcrops suggests that the rocks are sedimentary, although an igneous origin cannot be ruled out. The angular unconformities, filled and exhumed channels, and other buried and exhumed erosional surfaces record significant changes in the depositional and erosional regime of this region regardless of the rock type, and these changes record significant climatic changes on at least a regional scale *during* the Noachian. Apparently, Gale and perhaps much of the surrounding region was completely buried and exhumed, at least once.

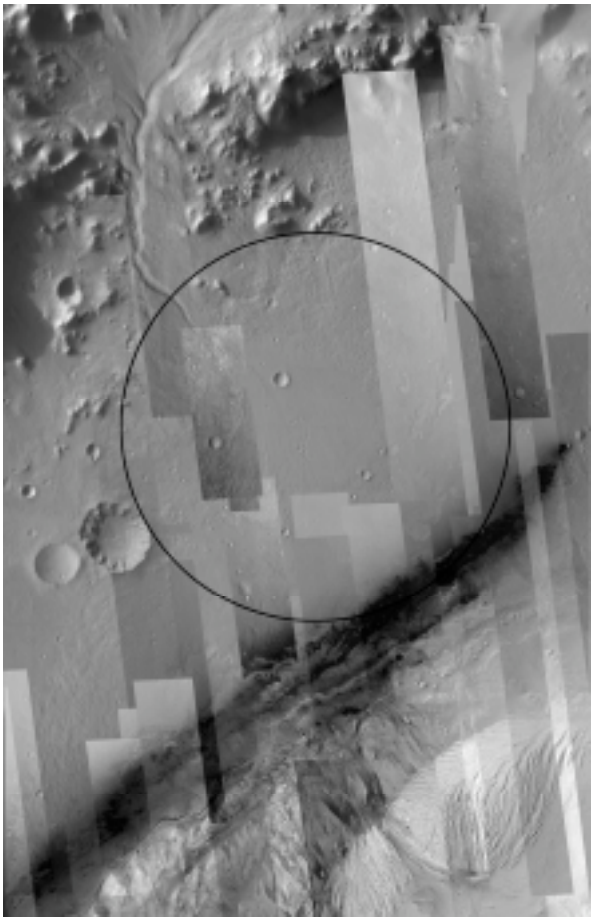

Fig. 1. Best-location 20-km diameter MSL landing ellipse in northwest Gale Crater, near 4.6°S, 222.8°W.

The objective here would be to investigate the composition and origin of the layers and the fan (within the ellipse). Exploration of the diverse range of accessible materials and geologic relationships maximizes the probability of a thorough habitability assessment during the MSL primary mission.

References: [1] Malin and Edgett (2000) *Science, 290,* 1997. [2] Cabrol *et al.* (1999) *Icarus, 139,*235. [3] Pelkey *et al.* (2002) *Icarus, 160,*228. [4] Pelkey *et al.* (2004) *Icarus, 167,*244.