MSL INVESTIGATION OF POSSIBLE CRATER LAKE SEDIMENTS IN NORTHERN SINUS MERIDIANI. L. V. Posiolova, K. S. Edgett, and M. C. Malin, Malin Space Science Systems, PO Box 910248, San Diego, CA 92191-0148.

Introduction: The 2009 Mars Science Laboratory (MSL) primary objective is to determine potential habitability on Mars, past or present. The sites where conditions might have been favorable for a past habitable environment are thought to require a persistent aqueous setting during part of their history. Lacustrine sediments, for example, might provide a record of a habitable site. We are proposing a landing site in northern Sinus Meridiani near an elliptical crater located at 5.6 N, 2.0 W. Examining layered sedimentary rock exposed by erosion on this crater's floor would test the hypothesis that the site was once a small lake; changes in chemical composition and sedimentation processes, as recorded in these rocks, would help to reconstruct the geological history and depositional environment of this region.

Site: Northern Sinus Meridiani has extensive outcrops of sedimentary rocks, as seen from orbiter images [e.g., 1]. MER-B, which has been exploring a site ~500 km southwest of our proposed MSL site, has found that the bedrock in this region is sedimentary rock [2]. Relative to the area explored by MER-B, greater exposures of light-toned, layered, sedimentary rock occur in northern Sinus Meridiani, but most of these areas are too rugged for MSL to land upon.

The region in Fig. 1 includes several craters surrounded by relatively smooth, low-albedo plains. One crater in the area is a 9 km wide elliptical depression within which lies broad, banded layering. The bedding thickness, repeatability, and erosional expression of these outcrops is different from that of sedimentary rocks in the surrounding area, suggesting a localized depositional environment. The crater might have been the site of a small lake. This site is also surrounded by other layered rock outcrops, providing ample exploration targets for an extended mission, as well. This crater and its outcrops are located at a lower stratigraphic position, relative to the rocks at the MER-B site, according to at least one recent study [1]. Landing here will thus help with reconstruction of the extended geological history of this portion of Mars.

EDL: At least two 20 km diameter ellipses can fit near the crater of interest (Fig. 1). Each is about 1.5 km below the martian datum. A number of potentially safe driving routes are visible from orbital images. The potential ellipses, currently being explored by targeting MGS MOC images, would offer a relatively flat surface for a safe landing; MSL would reach the crater by utilizing its "go-to" capability.

Summary: Our proposed site will permit MSL to test the general hypothesis that lakes were once present on the surface of Mars, by examining one fairly small and simple candidate. The site meets MSL's general mission goals and engineering requirements. Sediments deposited within a crater in a subaquaous environment have high potential as a past habitable environment and to retain evidence of changes in depositional environments.

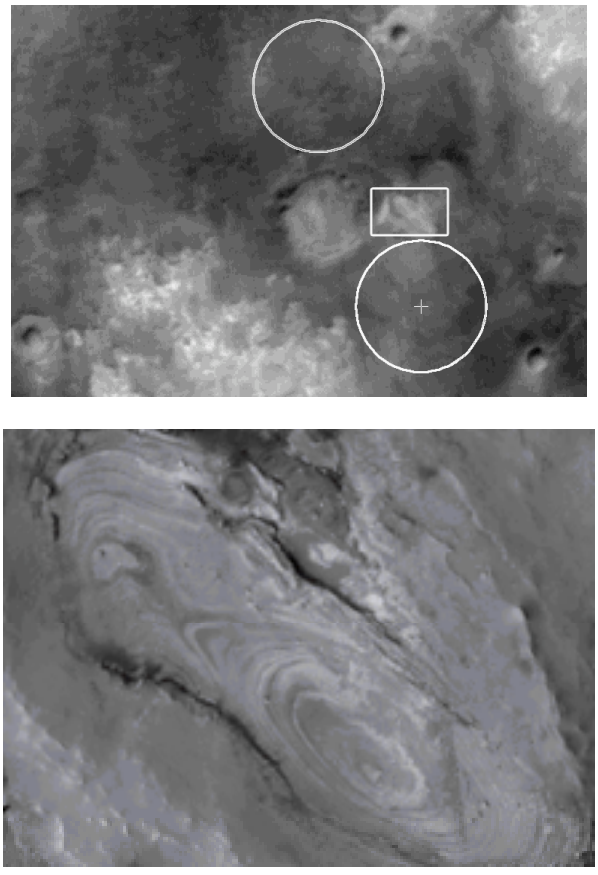

Figure 1. The top image shows two potential landing ellipses (10 km radius), and the 9 km wide elliptical crater (box). The bottom image is a detailed view of the crater with broad banded layering exposed by erosion on its floor. Testing the hypothesis of lake sediments will address MSL's mission goals of assessing potential past habitability on Mars.

References: [1] Edgett K. S. (2005) *Mars, 1,* 5–58. [2] Squyres S. W. and Knoll A. H. (2005) *Earth Planet. Sci. Lett., 240,* 1–10.