NORTHERN SINUS MERIDIANI LANDING SITES FOR THE 2009 MARS SCIENCE LABORATORY.
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To address the Mars Science Laboratory (MSL) habitability science objective, we recommend consideration of sites that provide MSL with access to 10s to 100s of meters of well-exposed, ancient, stratified rock. The more strata that MSL can examine, the more diverse the climate/history record and the broader the statement about past habitability that the research can address. In other words, how do you know whether you've adequately addressed the habitability objective, unless you've looked at a lot of material?

More than 800 m of stratigraphic section of mostly light-toned, layered rock have been exposed by erosion in northern Sinus Meridiani [1]. However, the outcrops are generally rugged at 10s of meter scales, and landing on one of these surfaces is not recommended. Instead, a dozen or more candidate "go-to" sites can be identified along the northern margins of the most geologically diverse areas in the region. Presented in Fig. 1 is one of these possibilities, a "go-to" site centered near 2.7°N, 1.2°W, at elevation ~ –1.5 km relative to the martian datum.

The objective at this or any of the dozen or so locations that provide access to 10s–100s of meters of northern Sinus Meridiani strata is to investigate diverse layered materials interpreted to be sedimentary rocks. MER-B, which landed on Meridiani Planum, up to now has had access to < 1% of the known stratigraphic section in the region [1, 2]. Diversity of rock units is implied by differences in erosional expression and bedding style among the materials exposed near the proposed landing site. Access to diversity over relatively short distances (3–10 km) will improve the odds that a thorough habitability assessment can be performed during the MSL primary mission.

Assessment of the slopes and thermophysical properties, plus acquisition of additional MOC images of the site and other potential "go-to" locales in northern Sinus Meridiani is underway. The dark surface of the landing ellipse likely resembles that of the MER-B site, in this case with the ~100 μm-sized mafic sand but without the granule-sized spherules of hematite. Near the center of the proposed ellipse in Fig. 1 occurs three sub-kilometer-sized buttes that pose a potential hazard to EDL, thus the statistical probability of hitting one of these will need to be examined.

Northern Sinus Meridiani presents key access to a greater diversity and a larger fraction of the region's stratigraphy than would a return by MSL to the plains upon which MER-B has been operating. While the rock types are not presently known, bedding styles and erosional expressions suggest that a variety of materials are present in the northern Sinus Meridiani outcrops [1]. Because the northern Sinus Meridiani rocks are stratigraphically lower than those at the MER-B site, they—like those at the MER-B site—might all have been subjected to diagenesis in the presence of groundwater [3, 4]. Gray hematite does not occur in sufficient abundance (*i.e.*, if present, it does not have sufficient particle size to form a lag) to be detected in MGS TES spectra of these outcrops [5], and Mars Express OMEGA results suggest that there is at least some variety of detectable minerals present in the region [6].

References: [1] Edgett, K. S. (2005) *Mars, 1*, 5–58, doi:10.1555/mars.2005.0002. [2] Grotzinger, J. P. *et al.* (2005) *Earth Planet. Sci. Lett., 240*, 11–72, doi:10.1016/j.epsl.2005.09.039. [3] Christensen, P. R. et al. (2003) *Science, 300*, 2056–2061. [4] Hynek, B. M. (2004) *Nature, 431*, 156–159. [5] Christensen, P. R. et al. (2000) *JGR, 105*(E4), 9623–9642. [6] Arvidson, R. E. et al. (2005) *Science, 307*, 1591–1594.

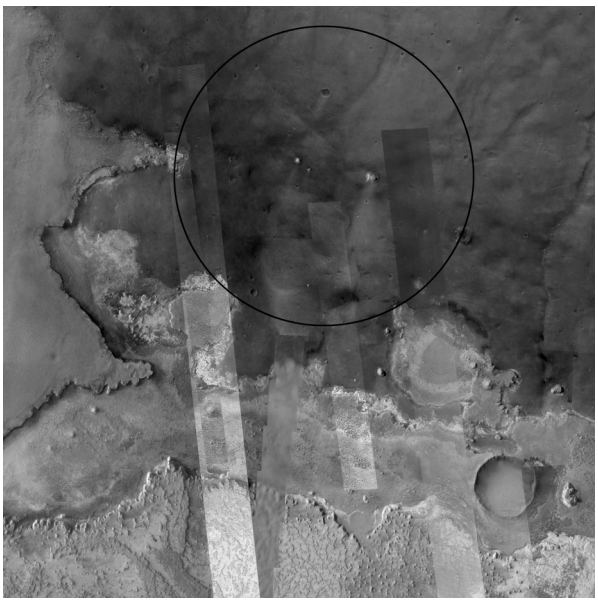

Figure 1. One of several possible 20 km diameter landing 'ellipses' in northern Sinus Meridiani that would provide MSL with "go-to" access to 10s to 100s of meters of stratified rock. The 20 km diameter circle is centered near 2.7°N, 1.2°W, and lies at an elevation ~ –1.5 km. This is a mocaic of MGS MOC and Odyssey THEMIS VIS image subframes.