MARS SCIENCE LABORATORY LANDING SITE: LINKING THE PAST AND THE PRESENT WITH ARAM BASIN. NA Cabrol and EA Grin. NASA ARC. Space Science Division, MS 245-3. Moffett Field, CA 94035-1000, and SETI Institute Emails: ncabrol@mail.arc.nasa.gov and egrin@mail.arc.nasa.gov.

Introduction: Aram Chaos is a 280 km diameter impact basin located 2.5 N/338E. Its elevation ranges between -1,600 to -3,800, the basin being ~ 2.5 km deep. Aram exhibits the second largest deposit of grey hematite on Mars after Meridiani [1,2]. Both sites keep a rich record of past aqueous processes suitable to support life [1-3]. Cabrol and Grin [5] suggested evidence for sublacustrine construct. With the current missions, the presence of past abundant water can be now related to both the morphological and mineralogical records (e.g., Ares Vallis, thick deposits of layered material, chaos, hematite, and possibly kieserite [6]).

1. Science and Engineering Consideration: The data already acquired by MGS, MO, MEx from orbit, and the *in situ* measurements made by *Opportunity* in the hematite-rich Meridiani make Aram an outstanding candidate site to reach MSL's mission objectives in testing Mars past and present habitability. Because of the interest of the site and its scientific diversity, ample high-resolution data already exist to assess its safety.We had already suggested Aram for the MER mission but the landing ellipse at the time did not allow consideration [7]. While the region exhibits chaos and in places, the basin is wide enough to allow safe access to the most interesting spots (hematite and layered deposits) within a 20-km ellipse. From existing geological maps [4] and datasets, we separated two classes of materials, both scientifically highly compelling for MSL. Class 1 present engineering issues, whereas Class 2 units are safely accessible within a 20-km ellipse in many areas, and mostly covered by hematite-rich material. The excluded Class 1 units are characterized by the C (Chaos) units. Class 2 units are Plain (P) units [4]. Within P materials, the Cap unit (Pc) was not considered for selection. This unit contains erosion patterns, cliff faces, jagged contacts and etched surface [4]. All other P units are reachable within MSL constraints: They include: (1) The primary hematite unit (Ph), with 10-15% hematite content; (2) the subdued (Ps) terrain with no detectable hematite; (3) the secondary hematite (Ph2) unit, with lower concentration of hematite mantling old rock units; (4) the non-hematite (Pnh) layered unit; and (5) the outflow plain (Po) unit to the East, which includes deep channels and terraces. The latest surface water activity has been dated back to the Late Hesperian [4] (3.5 Ga-1.8 Ga depending on the cratering model). No gullies, mudflows or rock-glacier like features are observed near the potential landing area. The global map of epithermal neutron [8] does not show a high hydrogen signal either, which should satisfy the planetary protection requirement of no evidence for extant water or water-ice within one meter of the surface.

2. Candidate Landing Area: Considering safety and science, we propose to position the landing ellipse anywhere in the 2,400 km^2 covered by the Ph and Ph2 units. The setting and morphology of the basin suggest the presence of an ancient lake [3-5], with evidence including: Layered deposits likely include non-lacustrine materials as well; grey hematite, and possibly kieserite [6]. Glotch et al., [4] suggest a sequence of catastrophic expulsion or geothermal melting of a subsurface aquifer forming the chaotic terrain, followed by ponding in the crater with deposition of aqueous sediment in layers, and outflow. Aqueous diagenetic conditions lead to the formation of hematite. THEMIS suggests a surface of pebbles and basaltic sand for this area.

3. Continued Investigation of Aram: Aram is an outstanding candidate by many respects: It is the second of only three hematite sites on Mars, this one with clear morphological evidence for surface water activity. New multispectral analysis shows the presence of abundant hydrated minerals; There is a large dataset already existing acquired by past and current assets in orbit, showing the strong interest of the science community regarding this site. The infer geological history responds exactly to the objectives of MSL.

Moreover, unlike other sites on Mars, Aram will help the scientific community to link the past and the present, offering a unique continuity in 30 years of planetary surface exploration. *Opportunity* has shown the tremendous interest of the hematite and its complexity. While the rovers' endurance has surpassed all expectations, they might stop anytime and many questions will remain. Going to Aram will allow us to continue accumulating information about the hematite formation and habitability. Aram is the best of many astrobiological worlds, combining hematite, lacustrine environment, possible geothermal activity. Finally, Aram is one of the spring areas for Ares Vallis. Two previous missions investigated the materials at the debouchment of Ares: Pathfinder (1997) and Viking 1 (1976). Exploring Aram may give us clues to reexamine data from those past missions as well. Our 2 back-up sites are Gale and Holden craters.

References:

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