ASTROBIOLOGY INPUT TO LANDING SITE SELECTION FOR MARS 2020: AN IN-SITU EXPLORATION AND SAMPLE CACHING ROVER. L. E. Hays[1], D. W. Beaty[1], K. Williford and K. Farley[2], [1]Mars Program Office, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA 91109. (dwbeaty@jpl.nasa.gov), [2]California Institue of Technology, Pasadena, CA 91125.

Abstract: The Mars 2020 rover mission has two objectives of high importance to astrobiology: 1) Carry out in-situ exploration operations, including evaluations of habitability, preservation potential, and the presence of potential biosignatures, and 2) Collect samples of martian material and seal them in individual tubes for possible return to Earth for detailed analysis, including assessment of whether any potential biosignatures are in fact definitive biosignatures [1]. This mission also has other important scientific objectives, but the scope of this abstract is limited to the astrobiology components.

Mars has different kinds of geological targets to explore, and within those targets, different kinds of samples are available to be collected. In order to maximize the chances of making a major astrobiological discovery through one of these two lines of scientific inquiry, it is crucial to select a landing site for Mars 2020 that offers the highest chances of addressing these life-related objectives. The Mars 2020 landing site selection process is open to all [2], and includes all sub-disciplines of science, but at AbSciCon we are seeking specific input related to desired astrobiological attributes of the landing site and rationale for prioritizing these attributes. This paper, in conjuction with a separate plenary, seeks to foster broader intellectual inputs from the astrobiology community, and the outputs of this discussion will be provided the Mars 2020 landing site selection committee.

Background: The process of selecting the 2020 Mars Project landing site began with a first workshop held in Crystal City, VA in May, 2014. The second workshop held in Pasadena, CA in August 2015 will focus on further evaluation of candidate sites introduced at the first workshop as well as new candidate sites. An important aspect of the second workshop presentations will be the identification of specific regions of interest (ROI) within the landing ellipse and any "Go To" regions where science investigations could enable achieving mission science objectives. The Mars 2020 Rover project would like to understand how far and over what terrain the rover must traverse at a prospective landing site in order to fulfill the science objectives.

Primary Questions:

What kinds of sites on Mars would be of greatest interest to the astrobiology community for in situ exploration, given the instrument payload that has already been selected for the Mars 2020 rover? Between Mastcam-Z, SuperCam, PIXL and SHERLOC, the instrumentation on the Mars 2020 rover will allow for very detailed in situ investigations.

What are the primary astrobiology investigations that could be explored with returned samples collected by M2020, and what kinds of samples are needed to support those investigations? Mars 2020 will be the first martian rover with the capability to drill and encapsulate geological samples for potential return by a later mission, so landing and exploring a place where high-priority samples may exist is an important consideration. What are those priorities?

What are the primary features of interesting locations for the investigations most relevant to astrobiology that could be measured remotely by MRO's HiRISE or CRISM cameras during the landing site selection process? With both a strong in situ science instrument package and the potential for returned samples, what environments would be the best to target for these investigations? As landing site selection is primarily informed by measurements made from orbiting spacecraft, what are the features of these environements that would be most easily detected remotely?

References: [1] Mustard, J. F. et al. (2013): Report of the Mars 2020 Science Definition Team. http://mepag.jpl.nasa.gov/reports/MEP/Mars_2020_SDT_Report_Final.pdf [2] Grant, J. and Golombek, M. (2015) 2020 Landing Site Selection for Mars Rover Mission. http://marsnext.jpl.nasa.gov/index.cfm