PHOTO-GEOLOGIC MAPPING OF THE MARS 2020 LANDING SITE, JEZERO CRATER, MARS. N. R. Williams[1], K. M. Stack[1], F. J. Calef III[1], V. Sun[1], K. Williford[1], K. Farley[1], and the Mars 2020 Geologic Mapping Team. [1]Jet Propulsion Laboratory, California Institute of Technology, M/S 183-301, 4800 Oak Grove Dr., Pasadena, CA, 91109, Nathan.R.Williams@jpl.nasa.gov.

Introduction: The Mars 2020 rover landing site is Jezero crater: a ~50 km diameter Noachian-aged ancient crater lake basin inside the western edge of the Isidis impact structure [1]. Jezero hosts a well-preserved delta, inlet and outlet valleys, and infill deposits composed of diverse carbonate, mafic, and hydrated minerals [1-5]. Prior to the launch of the Mars 2020 mission, members of the Mars 2020 Science Team participated in a collaborative effort to construct a photo-geologic map of the area in and around the rover's landing site. Previous maps [1-5] had been created at a variety of map scales, levels of detail, and extents; here, we perform photo-geologic mapping in finer detail at a 1:5000 digital map scale.

Data and Methods: Our study primarily uses a ~25 cm/pixel High Resolution Imaging Science Experiment (HiRISE) [6] orthoimage basemap and a 1 m/pixel HiRISE stereo-derived digital terrain model [7] with derived slope, stereo anaglyph, artificial hillshade, colorized shaded relief, and topographic contours; plus a Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) false color mosaic [8] and a Colour and Stereo Surface Imaging System (CASSIS) false color image [9]. Data were loaded into the Campaign Analysis Mapping and Planning (CAMP) tool, part of the Multi-Mission Geographic Information System (MMGIS) open source software package [10]. CAMP provides a web-based mapping interface in which team members digitize geologic units as vector polygons.

The mapped area includes the Mars 2020 landing ellipse and surrounding terrain (see Fig. 1). We defined a 1.2 km spaced grid with a total of 166 quadrangles (quads). One to four quads were assigned to participating team members to digitize units at 1:5000 scale. These quads were also placed into six designated geographic groups (e.g. delta, crater rim, etc.). Designated mapping leads for each group assisted with preliminary unit reconciliation and ensured consistency in unit and mapping detail across quad boundaries. Map units—both bedrock and surficial—are distinguished primarily by differences in relative brightness, tone, surface texture, apparent roughness, and other topographic or morphologic distinctions.

Results: Figure 1 shows the integrated map of bedrock geology and surficial units. The crater floor and interior margin of Jezero are dominated by four light-toned rough and fractured units distinguished by differences in texture, elevation, and geographic setting. Delta deposits consist of blocky, truncated curvilinear, coarse layered, finely layered, and rough light-toned layered units. Crater rim bedrock consists of light-toned rough, light-toned layered, and blocky units, with light-toned fractured plains farther west. Surface units are divided into talus, large and small aeolian bedforms, and undifferentiated smooth material mapped as complete, moderate, or minor areal percentage covered.

Discussion: Units identified in this study are generally consistent with those identified in previously published maps, but this study maps the distribution of surficial and delta units more completely and at a higher level of detail. This study considered but could not confidently distinguish between four possible unit correlation scenarios to explain the relative age relationships of major units within the map area, including those that consider the possibility of more complex interfingering relationships and alternative interpretations of the relative age relationships than previous published interpretations. The photo-geologic map presented here will serve as the foundation for scientific hypothesis development and future strategic planning for Mars 2020's in situ mission in Jezero crater.

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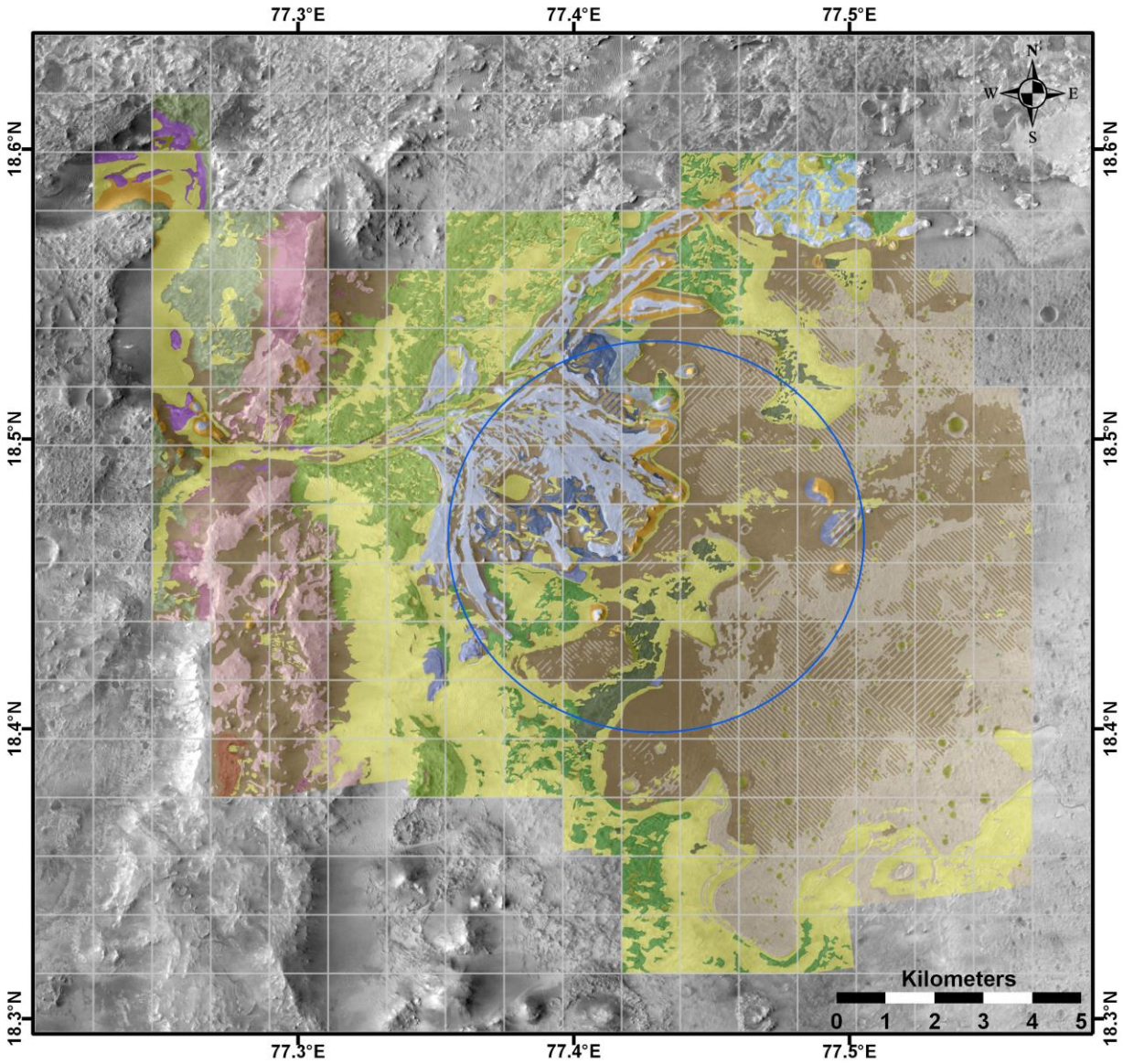

Legend

- M2020 Ellipse
- 1.2 km grid

Surface Units

- Undifferentiated Smooth (US)
- Moderate % Cover US
- Minor % Cover US
- Talus
- Large Aeolian Bedforms
- Small Aeolian Bedforms

Bedrock Units

- Crater rim light-toned rough
- Crater rim light-toned layered
- Crater rim blocky
- Inlet valley light-toned layered
- Delta blocky
- Delta truncated curvilinear
- Delta coarse layered
- Delta finely layered
- Delta rough light-toned layered
- Plains light-toned fractured
- Margin light-toned rough
- Crater floor light-toned rough
- Crater floor light-toned fractured 1
- Crater floor light-toned fractured 2

Fig. 1: Photo-geologic map of Jezero crater quads showing exposed bedrock and surficial units.