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ANALYTICAL NEEDS IN A SAMPLE RECEIVING FACILITY: INPUT FROM THE MSR OPERATION DEFINITION TEAM.

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The return of scientifically selected samples from Mars would provide a rare opportunity for investigation with the full range of the latest technology available, but to take full advantage of this opportunity, it is important to plan ahead to ensure the pristine nature of the samples upon arrival within the Earth environment until scientific investigations can begin.

The NASA/ESA science community-driven MSR Science Planning Group – Phase 2 (MSPG2) delivered recommendations and guidance regarding curation (1) and science (2, 3) activities to be performed on the samples under containment. High-level requirements for the infrastructure were also developed by MSPG2 (4). In order to prepare infrastructure-targeted input for the ESA and NASA facility studies planned in the 2022-2023 timeframe, the agency-led MSR Operational Scenarios Definition Team (MOSDT) was assembled to conceptualize the sample operations that will inform future architecture teams. Emphasis was placed on the responsibility of MOSDT to use community-defined requirements and to represent the view of the

international scientific community.

All necessary and sufficient instruments and analytical needs described in MSPG2 were integrated in MOSDT main deliverable, the operational workflow (see Hays et al, this conference). In MSPG2, notional instruments were split between curation analytical needs, and objective-driven (time-sensitive and sterilization-sensitive) science analytical needs. In MOSDT, while the first phases of curation, "pre-Basic Characterization" and "Basic Characterization" were rather streamlined and separate from other analytical needs, "Preliminary Examination" and "Science" instruments were not always physically segregated. In addition to the necessary and sufficient instruments described by MSPG2, the MOSDT recommended additional support equipment for sterilization, cleanliness and contamination monitoring.

It was sometimes necessary for the MOSDT to rely on assumptions to integrate instruments in the activity workflow. In general, the assumptions were very conservative to limit contamination and cross-contamination risks. It is expected that future work to refine limits of contamination will enable optimization of instrumentation.

The community was consulted during the course of the MOSDT work. This abstract's aim is two-fold: on one hand, inform the scientific community and overall MSR stakeholders, to bring their attention on the analytical needs currently considered as necessary and sufficient; on the other hand, to solicit feedback from a larger community audience to optimize and refine analytical needs during the next phases of MSR ground-segment preparation.

Disclaimer: The decision to implement Mars Sample Return will not be finalized until NASA's completion of the program's National Environmental Policy Act (NEPA) process. This document is being made available for informational purposes only.

[1] Tait et al. (2021) Preliminary planning for Mars Sample Return (MSR) curation activities in a Sample Receiving Facility (SRF). Astrobiology in press, doi:10.1089/ast.2021.0105. [2] Tosca et al. (2021) Time-sensitive aspects of Mars Sample Return (MSR) science. Astrobiology in press, doi:10.1089/ast.2021.0115. [3] Velbel et al. (2021) Planning implications related to sterilization-sensitive science investigations associated with Mars Sample Return (MSR). Astrobiology in press, doi:10.1089/ast.2021.0113. [4] Carrier et al. (2021) Science and curation considerations for the design of a Mars Sample Return (MSR) Sample Receiving Facility (SRF). Astrobiology in press, doi:10.1089/ast.2021.0110.