A Framework for Science Driven Contamination Knowledge and Curation

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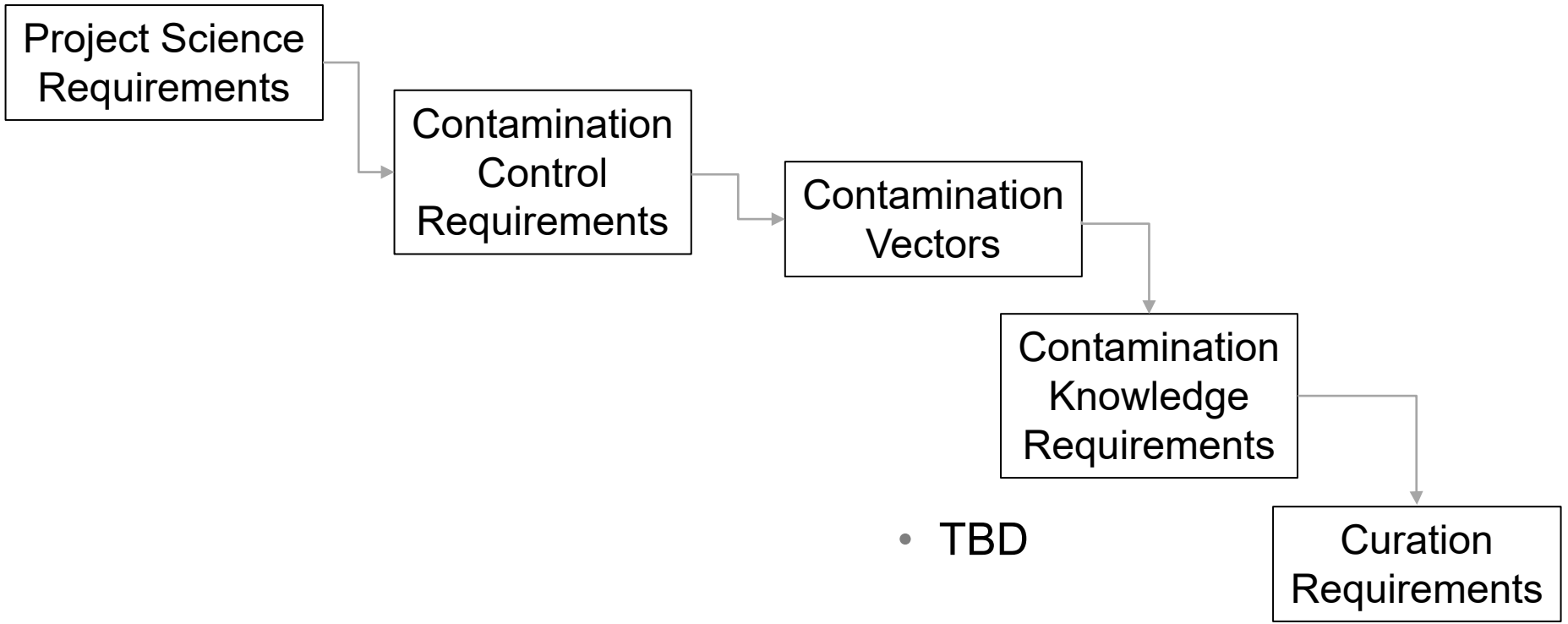
Introduction

- This presentation outlines a basic framework for establishing a science driven contamination knowledge and curation program for a landed sampling mission.

Contamination Knowledge Framework Flow



- TBD

Contamination Requirements

- Contamination requirements are driven by science requirements / goals
- Ex: M2020 Tier 1 constraint of < 1 ppb per sample

Table Tier 1 Constrained Compound Classes and Example Compounds

Tier 1 Containment Class	Example Compounds
Nucleic Acid	DNA
Spores	Dipicolinic Acid
Bacterial and Fungal Cell Walls	N-Acetylglucosamine
Amino Acids	Glycine
Alanine	
Lipids	Palmitic Acid
Squalene	
Hydrocarbon Markers	Pristane
Martian Organics	Chlorobenzene Dichloromethane
Polycyclic aromatic hydrocarbons (PAHs)	Naphthalene
Nitrogenous Compounds	Urea
Short-chain Carboxylic Acid	Acetic Acid
Polyhydroxy Compound	Glycerol

Contamination Classes

- Organic
- Inorganic
- Biological

- Depending on the project science requirements contamination control and contamination knowledge requirements may be defined for all three contamination classes.

Organic Contamination Vectors

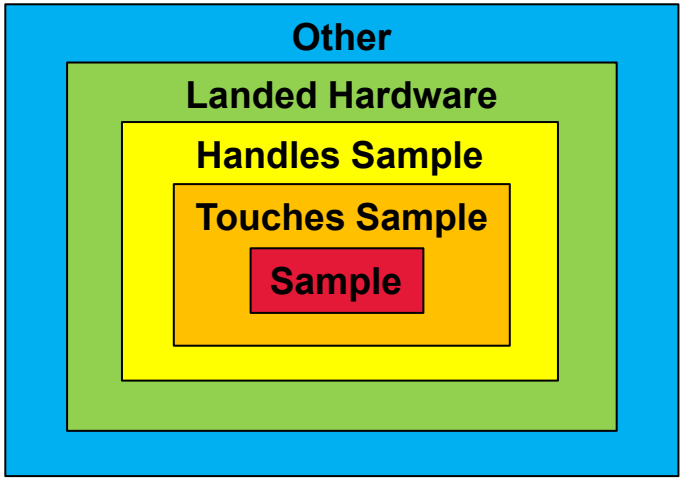
- Volatile organics
  - Material outgassing products
  - Thruster plume byproducts
  - Lander/Rover venting products (e.g. ECLSS)
- Organic non-volatile residue (NVR) contact transfer
- Organic particulate
  - mechanism wear products
  - particulate contamination present at time of launch

Contamination Knowledge (CK) Capture

- CK consists of identifying and characterizing both potential and realized contamination to better inform scientific investigations.
  - Characterization of volatile organic sources (composition and spatial and temporal distribution)
  - Chemical analysis of flight lot-identical science critical components
  - Characterization of organic particulate and molecular deposition products
  - Preflight and flight witnesses
  - Archival of relevant lot-identical hardware, materials, witness plates, and swabs for possible future contamination assessment.

Contamination Knowledge – Levels of Influence

- There are 4 basic levels of influence for determining the extent of the contamination knowledge and curation effort for a landed sampling mission



Contamination Knowledge (CK) Curation

- Contamination knowledge curation is the act of archiving CK data and samples for future use by the science community to support sample science.
- The NASA Astromaterials Acquisition and Curation Office at Johnson Space Center is the official NASA organization responsible for the curation of extraterrestrial samples from NASA's past and future sample return missions.
  - The group is also responsible for collecting and curating CK associated with NASA sample return missions.

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