

Europa Reconnaissance Traceability Matrix										Priority	Areal coverage (km)		Number of sites imaged		Incidence angle range (degrees)		Spatial resolution (m/pixel)		Local time of day range (hr)		Spectral characteristics	Coincident instrument	Rationale for Change	
Goal	Objective	Investigation	Measurement	Short name	Model Instrument		Baseline	Floor	Baseline	Floor	Baseline	Floor	Baseline	Floor	Baseline	Floor		Baseline						
Characterize Scientifically Compelling Sites, and Hazards, for a Potential Future Landed Mission to Europa	Assess the distribution of surface hazards, the load-bearing capacity of the surface, the structure of the subsurface, and the regolith thickness of at least 15 sites of interest for a future landed mission.	SC.1 Determine the distribution of blocks and other roughness elements within a potential landing site at scales that represent a hazard to landing.	SC.1a Measure the occurrence of blocks protruding 1 m and more above the surface, and the abundance and nature of surface roughness elements at scales as small as 1 m.	Blocks	Reconnaissance Camera (RC)	R1	5x10	2x10	40 total sites over the life of the mission; Up to 4 (stereo) images are anticipated to be obtained when the trajectory dips sufficiently below 50 km c/a altitude and 1 when c/a altitude is approximately 50 km; any image must meet baseline lighting conditions to count against the baseline total	15 total sites over the life of the mission; Up to 4 (stereo) images are anticipated when the trajectory dips sufficiently below 50 km c/a altitude and 1 when c/a altitude is approximately 50 km; any image must meet baseline lighting conditions to count against the floor total	45-70			0.5	0.5			Monochromatic	Recon camera	General: (1) Addition of columns for Baseline and Floor "Number of sites imaged" and "Goal" under "Incidence angle range (degrees)." Columns added for clarity and need to identify Baseline and Floor for number of sites based on discussion with the Project Scientist. Specific: (1) Addition of wording to quantify the baseline and floor number of sites to be imaged. Based on discussion with the engineering team, Louise Prockter, and the Project Scientist; (2) Clarify that the incidence angle range of 45 to 70 degrees is a goal rather than a baseline or floor; based in discussion with the Project Scientist and Louise Prockter; (3) The Reconnaissance Goal was modified based on conversation among the Project Scientist, Project Manager, Program Scientist, and Program Executive.				
					Thermal Imager (ThI)	R2	5x10	2x10									better than or equal to 250	better than or equal to 250	10-3 pm		10-3 pm	2+ spectral channels	Recon camera	
		SC.2 Determine the distribution of slopes within a potential landing site over baselines relevant to a lander.	SC.2a Measure surface slopes of up to 25° on a 3 m baseline for all azimuths by acquiring stereo paired images with a spatial resolution of better than or equal to 0.75 m/pixel.	Slopes	Reconnaissance Camera (RC)	R1	5x10 (>90% cross- and down-track overlap)	2x10 (>90% cross- and down-track overlap)					20-70 (each pair); 15-30 convergence angle			better than or equal to 0.75 m/pixel					Monochromatic	Recon camera	Restores original measurement and requirements; Change to revert to original discussed by project science and technical team at 2 June 2014 meeting and concurred by full SDT at 3 June 2014 meeting	
					Ice Penetrating Radar (IPR)	R3	SAME AS SCIENCE TRACEABILITY MATRIX														Recon camera			
		SC.3 Characterize the regolith cohesiveness and slope stability within a potential landing site.	SC.3a Determine the regolith-component thermal inertia (distinct from blocks) of the upper decimeter-scale surface layer by measuring the contrast in thermal emission between at least 2 spectral channels at local times of day between 10 AM and 3 PM and at a spatial resolution on the surface of better than or equal to 250 m/pixel. Require sufficient albedo accuracy to facilitate accurate reduction of temperature data.	Regolith cohesion	Thermal Imager (ThI)	R3	SAME AS 1B																	
					Reconnaissance Camera (RC)	R3	SAME AS 1A														(1) For the measurement, specify that stereo image data will be acquired; based on engineering team analysis and discussion with Louise Prockter and the Project Scientist			
		SC.4 Determine the regolith thickness and whether subsurface layering is present within a potential landing site.	SC.4a Characterize the depth of regolith to "bedrock/ice" at the cm-scale by measuring the daytime and nighttime contrast in thermal emission between at least 2 spectral channels for a spatial resolution on the surface of better than or equal to 15 km/pixel and at local times of day between 10 AM and 3 PM and 3 AM and 6 AM. Require sufficient albedo accuracy to facilitate accurate reduction of temperature data.	Regolith thickness	Thermal Imager (ThI)	R2	5x10	2x10									better than or equal to 15000	better than or equal to 15000	10-3 pm, 3 - 6 am	10-3 pm, 3 - 6 am	2+ spectral channels	Recon camera		
					Reconnaissance Camera (RC)	R3	SAME AS 1A														(1) For the measurement, specify that stereo image data will be acquired; based on engineering team analysis and discussion with Louise Prockter and the Project Scientist			
		SV. Characterize the scientific value of potential landing sites on Europa	Assess the composition of surface materials, the geologic context of the surface, the potential for geologic activity, the proximity of near surface water, and the potential for active upwelling of ocean material of at least 15 sites of interest for a future landed mission.	SV.1 Characterize the composition and chemistry of potential landing sites with an emphasis on understanding the spatial distribution and degradation state of endogenically derived compounds.	SV.1a Identify the presence of relevant endogenically derived compounds by measuring surface reflectance over the wavelength range of 850 to 5000 nm at a spatial resolution of better than or equal to 300 m/pixel.	Composition	Shortwave Infrared Spectrometer (SWIRS)	R1	5x10	2x10												Less than 2500 nm @ 10nm spectr. res., 2500-5000 @ 20 nm spectr. res.	Recon camera	General: Modification to goal based on discussion between NASA Program Scientist, Program Executive, and the Project Scientist
					SV.2a Identify small scale landforms diagnostic of the local geologic history of potential landing sites from monochromatic stereo image data at a spatial resolution on the surface of better than or equal to 0.5 m/pixel.	Degradation	Reconnaissance Camera (RC)	R2	SAME AS 1A														(1) For the measurement, specify that stereo image data will be acquired; based on engineering team analysis and discussion with Louise Prockter and the Project Scientist	
				SV.2b Identify landforms diagnostic of the regional geologic history of the surface that include potential landing sites through imaging at a spatial resolution on the surface of better than or equal to 50 m/pixel.	Topographic Imager (TI)	R2	100x100	25x100				45-70 (prefer 70)	20-80	5	50						Stereo	Recon camera		
				SV.3a Identify and characterize the nature of subsurface thermal or compositional horizons and structures related to the current or recent presence of water or brine within the region from 100 meters to 3 km at 10-meter vertical resolution.	Crustal water	Ice Penetrating Radar (IPR)	R2	SAME AS SCIENCE TRACEABILITY MATRIX														Recon camera		
SV.3b Acquire surface topography on the order of 250-m horizontal scale and better than or equal to 20-m vertical resolution and accuracy extending a lateral distance from the ground trace sufficient to cover the width of the subsurface profiles.	Topographic Imager (TI)	R2	SAME AS SCIENCE TRACEABILITY MATRIX														Recon camera							
SV.4 Characterize anomalous temperatures (that are significantly out of equilibrium with expected nominal diurnal cycles) indicative of current or recent upwelling of ocean material at or near potential landing sites	SV.4a Determine the presence of surface temperatures in excess of diurnal equilibrium indicative of active or recent extrusion, upwelling, or outgassing at each potential landing site by measuring thermal emission at local times of day between 10 AM and 3 PM and at a spatial resolution on the surface of better than or equal to 250 m/pixel.	Temperature	Thermal Imager (ThI)	R3	5x10	2x10									better than or equal to 250	better than or equal to 250	10-3 pm	10-3 pm	1 spectral channel	Recon camera				