THE MOON'S NEXT STEPS: EVALUATION OF EIGHT HIGH WATER CONTENT PYROCLASTIC DEPOSITS AS POTENTIAL LANDING SITES FOR HUMAN EXPLORATION MISSIONS. H. Babcock, C. Dupree, H. Spritz, E. Anghel, and M. Adams, Waynflete School

Introduction: The purpose of the project was to evaluate multiple sites that had been identified as possible landing sites on the Moon, and determine which sites would be most viable for a future manned mission. Previous studies have shown evidence of large quantities of water (150 - 400 ppm) in several lunar pyroclastic deposits. Such quantities could indicate significant water in the bulk lunar mantle. Water is a valuable resource which could provide oxygen and fuel for a human exploration mission to the Moon. Based on these studies, eight locations previously found to have high water content were analyzed for potential viability as landing sites for a human exploration mission. Our goals were to evaluate characteristics that had made previous landing sites successful, and to explore possible new areas of study with an emphasis on the potential for valuable research and collection of Titanium Dioxide (TiO2) .

Methods: For this study we used the LROC WAC (Wide Angle Camera) and Quickmap to analyze eight sites that could be viable for a future landing on the Moon. We used the Quickmap to evaluate each site through a variety of lenses, including from TiO2 abundance, FeO abundance, rock abundance, and composition. The most emphasized factors were levels of TiO2 and surrounding geographical features; in order to have a both a stable landing site and geography that allowed for successful collecting of a variety of data/natural resources.

Results: Many of the sites were on top of or very close to multiple craters, lunar wrinkles/ridges, and lunar mare. Craters and ridges were problematic as they made landing difficult on an uneven surface. The most viable sites were previous landing sites or similarly featured sites with less craters and open, even ground to land on. Rock abundance proved minimally influential as most sites were simply lunar regolith. Composition varied from site to site with some sites being more feldspathic in composition, some mare-like in composition, and some with increasing amounts of olivine.. The most viable sites were those that had the most compositional variety.

Conclusions: Our data lead us to identify three sites which exhibited the most viability out of our original nine. The first site that we identified as viable is Humarum and Doppelmayer, located at 30S, 40W, whose similarities to previous successful missions and close proximity to a large concentration of 10% TiO2 makes it a candidate. The site is also south of pockets of rock abundant in olivine (CF value 8.4 microns). The second site we identified was Supicous Gallus, located at 20 N, 9 E. This site not only has a high concentration of TiO2 (9%), but also has diverse rock composition which would be ideal for varied and comprehensive collection, with areas rich in both olivine and feldspar. The third, and most viable site is Vaporum, located at 11N, 8E and consisting of 8-9% TiO2 and directly east of a concentration of 10% TiO2. This site is also similar in terrain to previous successful Apollo landing sites, and contains a high abundance of olivine.