DOE-ID NEPA CX DETERMINATION
Idaho National Laboratory

CX Posting No.: DOE-ID-INL-16-097

SECTION A. Project Title: National Aeronautics and Space Administration (NASA) Mars Methane Plume Tracer

SECTION B. Project Description and Purpose:

The Mars Methane Plume Tracer Field Experiment will be conducted under NASA Science Mission Directorate (SMD) Planetary Science Division (PSD) funding to support Astrobiology Science and Technology for Exploring Planets (ASTEP). Specifically, a grant under the ASTEP program to Cornell University was awarded to study the nature of astrobiologically relevant plumes on Mars and to develop techniques to detect such plumes and optimally navigate to their sources.

Martian conditions have extremes of atmospheric stability, and we expect that plume detectability will be greatest at nighttime, when atmospheric stability is at its highest. At this time, ground-level plume sources should be most easily detected by surface in situ instrumentation. An ideal site to simulate Martian plumes is a relatively smooth, desert environment, with relatively predictable diurnally varying steady winds (preferably light), and high nighttime static stability. The Idaho National Laboratory (INL) is an ideal location for simulating the behavior of Martian effluent plumes and testing techniques used to identify and navigate to their sources.

The project would use the previously established Grid III tracer dispersion test area on the INL Site located north of the Idaho Nuclear Technology and Engineering Center (INTEC) and east of the Advanced Test Reactor Complex (ATR). The Grid III test facility was established in the early 1960s and has been occasionally used for dispersion tests of this type. The Grid III test facility has established tracer sampling arcs with access roads extending 50 to 3200 m from the center of the release point.

Controlled methane releases will occur from portable tanks at sites chosen to optimize the preferred environmental conditions and to enable navigation with off-road vehicles carrying sampling equipment in the downwind direction from the release sites. Only established trails and roads will be used. Releases are anticipated to occur on 4-5 nights (and days) and from 4-5 different sites (typically one site per day). Test scenarios will simulate the landing and navigation of a rover to a nearby plume source on Mars. The methane release rate will be approximately 0.3 g s-1, with 5 kg of methane released per test day. Thus, a total of 25 kg of methane is planned to be released during the entire field deployment. A rudimentary examination of the ignition potential of the methane plume using the National Oceanic and Atmospheric Administration (NOAA) model ALOHA® indicates that the concentration at the release point remains below the 60% lower explosive limit of 26,400 ppm. This means that ignition is highly improbable. Nevertheless, institutional controls will be placed around the release point to prevent the entry of any potential ignition source (e.g., vehicles) into the plume at a distance of 15 m. The ALOHA® model also predicts concentrations of less than the Temporary Emergency Exposure Limit (TEEL)-1 limit of 3,000 ppm at the source. Thus, the plume remains below any toxicity concerns. Personnel will only occasionally enter the restricted area around the release to monitor the flow rate of the methane release. NASA will report the amount of methane released to the atmosphere during this field deployment in its annual greenhouse gas emission report as required by Executive Order (E.O.) 13693 or its successor.

The actual test process will entail establishing the methane release site and then choosing a downrange distance and azimuth to start the navigation and identification testing. Depending on performance of the sensors, atmospheric stability, and wind speed, the estimated starting range is 1-2 km from the source. Typically, samples are taken for ~20 minutes (or the typical meander time for the local flow if it is longer than 20 minutes), and then estimating a new position to move to and continue sampling. Using the concentration measurements and the wind measurements at the sampling sites allows for improved estimates of the source location, and thus choose optimal navigation moves to most efficiently find the source. We will test several algorithms and approaches to the navigation in these tests.

The period of the test will be from October 3-7, 2016.

SECTION C. Environmental Aspects or Potential Sources of Impact:

Air Emissions

Air Emissions - Methane Gas will be released as a key part of the experiment. Minor amounts of fugitive dust would be generated while traveling to and from the study locations on existing gravel roads, two track trails and off-road.

Disturbing Cultural or Biological Resources

Project activities have the potential to disturb biological and cultural resources.

Generating and Managing Waste

Generating and Managing Waste - Project activities are expected to generate only minor amounts of uncontaminated industrial waste. The small amount of waste that may be generated could include uncontaminated garbage such as plastic water bottles or other miscellaneous waste. All waste would be disposed of in appropriate recycling containers at INL facilities or in the INL Landfill Complex through Waste Generator Services (WGS). Project personnel would incorporate waste minimization measures by using reusable materials where practical.

Using, Reusing, and Conserving Natural Resources

Using, Reusing and Conserving Natural Resources - Fuel would be used in vehicles while traveling to and from the study locations. Project personnel would carpool and/or use alternative fuel vehicles when appropriate. Project personnel would incorporate waste minimization measures by using reusable materials and recycling where practical.

SECTION D. Determine Recommended Level of Environmental Review, Identify Reference(s), and State Justification: Identify applicable categorical exclusion from 10 Code of Federal Regulation (CFR) 1021, Appendix B, give the appropriate justification and the approval date.

For Categorical Exclusions (CXs), the proposed action must not: (1) threaten a violation of applicable statutory, regulatory, or permit requirements for environmental, safety, and health, or similar requirements of Department of Energy (DOE) or Executive Orders; (2) require siting and construction or major expansion of waste storage, disposal, recovery, or treatment or facilities; (3) disturb hazardous substances, pollutants, contaminants, or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)-excluded petroleum and natural gas products that pre-exist in the environment such that there would be uncontrolled or unpermitted releases; (4) have the potential to cause significant impacts on environmentally sensitive resources (see 10 CFR 1021). In addition, no extraordinary circumstances related to the proposal exist that would affect the significance of the action. In addition, the action is not “connected” to other action actions (40 CFR 1508.25(a)(1) and is not related to other actions with individually insignificant but cumulatively significant impacts (40 CFR 1608.27(b)(7)).

References: 10 CFR 1021, Appendix B, B3.6, "Small-scale research and development, laboratory operations, and pilot projects"

Justification: Project activities are consistent with 10 CFR 1021, Appendix B, B3.6, "Siting, construction, modification, operation, and decommissioning of facilities for small-scale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment."

Is the project funded by the American Recovery and Reinvestment Act of 2009 (Recovery Act) ☐ Yes ☒ No

Approved by Jack Depperschmidt, DOE-ID NEPA Compliance Officer on: 8/16/2016