INFORMATION SHEET FOR THE FY2019 NOAA/OAR/OWAQ *AIR QUALITY RESEARCH AND FORECASTING* COMPETITION

NOAAA collaborates with the external science community on improving NOAA's air quality forecasting capabilities through applied research and provides financial support for research-to-operations (R2O) transition projects through the U.S. Weather Research Program to accelerate their transition to operations and to enhance the public benefits derived from these projects. To get a sense for the types of current and past air quality research and forecasting projects funded by OWAQ, please go to http://owaq.noaa.gov/GrantsandProjects.aspx and sort by the "Air Quality Forecasting" theme.

The National Air Quality Forecasting Capability (NAQFC) provides nationwide operational predictions of ozone, suspended fine particulate matter (PM), and wildfire smoke, as well as airborne dust from dust storms over the contiguous lower 48 states. NOAA predictions are currently produced for two days at 12 km resolution and 1 hour time intervals and are distributed in numerical and graphical format at http://airquality.weather.gov/. Ozone and PM prediction are achieved by coupling the NOAA National Centers for Environmental Prediction (NCEP) operational regional mesoscale meteorology forecasts with inventory-based emissions estimates from the EPA, natural source emissions from wildfire smoke and dust, and chemical processes within the EPA Community Multiscale Air Quality (CMAQ) model. The NCEP North American Model (NAM) provides the meteorology driver for NAQFC currently. However, by 2021 NAM will be replaced by the NOAA Unified Forecast System (UFS) Finite Volume-3 (FV3) dynamic core meteorological model which will be a major transition.

The NOAA Hybrid Single Particle Lagrangian Integrated Trajectory (HYSPLIT) model is used to provide standalone predictions of wildfire smoke and dust storm predictions, both of which have highly variable intermittent sources. Smoke emissions are estimated from sources based on NOAA/NESDIS analysis of satellite imagery for fire location combined with U.S. Forest Service's BlueSky framework. Dust source locations are based on satellite climatology of the frequency of dust emissions. Dust is emitted in the model when threshold near-surface friction velocity is exceeded and modulated by real time soil moisture predictions. Routine verification relies on the EPA AIRNow network of observations from surface monitors, whereas verification of smoke and dust predictions relies primarily on satellite retrievals of smoke and dust column integrals. Dust predictions were implemented in 2012.

Emissions used for ozone and PM2.5 predictions are updated regularly with improvements including projected changes in emissions from point and mobile sources (reducing NOx emissions especially in the eastern US), and inclusion of smoke and dust sources in CMAQ with updates to NAM and CMAQ chemistry. In February 2017, the CMAQ model that provides operational ozone predictions was upgraded to use a newer CB05 chemical mechanism and includes the AERO6 module and real-time smoke and dust emissions to provide operational PM2.5 predictions from the same system.

Projects focusing on air quality research and forecasting that are relatively mature and not in the early stages of development or proof-of-concept are appropriate for this funding opportunity. This includes those projects that propose practical outcomes that could be transitioned operationally to NOAA in the next 3-5 years. In the parlance of NOAA and other federal agencies, this requirement translates to

the higher “technology readiness levels”. Readiness levels, as adopted by NOAA per NAO 216-105B, have been described in the associated NOFO for this competition and announcement in Section I.A “Program Objectives”. Please refer to that section for additional information.

Projects that are most appropriate for this competition generally fall in or near the “demonstration” level of technical maturity, i.e., readiness levels of about 5 through 8 during the duration of the project. Ideally, the transition of a funded project from, say, readiness level 5 or 6 at start-up to 8 at completion is OAR’s driving goal in funding these projects. On the other hand, projects in early stages of development or proof-of-concept during the project period (those with start-up readiness levels of 4 or below) are not the focus of this funding opportunity. Transitioning a mature demonstrated capability from level 8 to 9 is beyond the scope of this funding opportunity but could occur after the projects end if they are successful and approved for operational implementation by the NWS. Completed projects satisfying NWS metrics for success and operational constraints (e.g., added value, ease of use, computational efficiency, etc.) may be selected later for operational implementation by appropriate NWS operational offices.

PIs selected for funding will collaboratively develop Research-to-Operations Transition Plans in coordination with designated NWS staff within six months of the project start date. This plan will outline how the project outcomes are envisioned to be transitioned to NWS operations. NOAA guidance will be provided.