INFORMATION SHEET FOR THE FY2025 NOAA/OAR/WPO TESTBEDS COMPETITION

To accelerate transition of research to operations and to enhance the public benefits derived from these research activities, NOAA collaborates with the external science community on cooperative research activities and provides financial support for research-to-operations (R2O) transition projects through the United States Weather Research Program (USWRP) managed by NOAA's Office of Oceanic and Atmospheric Research (OAR) Weather Program Office (WPO). WPO collaborates with a portfolio of five USWRP-supported NOAA testbeds, including the Climate Testbed (CTB), Fire Weather Testbed (FWT), Hazardous Weather Testbed (HWT), Hurricane and Ocean Testbed (HOT), and Hydrometeorology Testbed (HMT). Areas of collaboration include: coordinating with testbed managers and staff, funding R2O projects to be demonstrated, tested, and evaluated within testbeds, and providing funding support for testbed infrastructure needs. These testbeds are jointly managed by both National Weather Service (NWS) and OAR staff. WPO's USWRP Testbeds and Joint Technology Transfer Initiative Programs support advanced projects seeking to transition into operations where testbed interactions and demonstrations in a quasi-operational environment are appropriate.

The objective of NOAA's testbeds is to foster iterative and interactive information exchanges between the research and operational communities, including R2O transitions and operations-to-research communications, that are enabled through organized experimentation in a simulated operational environment. This will involve close collaboration, facilitated by the testbed staff, between funded researchers and operational forecasters. For example, NOAA operational forecasters may actually run or utilize output from experimental techniques during their operational shifts or during episodic experimental periods. Following this, they provide direct feedback to the researchers for possible improvement.

Science projects focusing on relevant hazard focus areas that are relatively mature (i.e., not in the early or middle stages of development or proof-of-concept) are appropriate for these testbeds and this funding opportunity. This includes projects that propose practical outcomes that could be transitioned operationally to NOAA in the next two to five years. Given this expectation, projects selected for funding from this announcement should be ready to test and demonstrate their new capabilities in one of the testbeds during the project period. In the parlance of NOAA and other federal agencies, this requirement translates to the higher "readiness levels". Readiness levels (RLs), 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 the five testbeds generally fall in or near the "demonstration" level of technical maturity, i.e., RLs of about 5 through 8 during the duration of

the project. Projects starting at RL 4 are also appropriate for the Fire Weather Testbed. Transitioning a mature demonstrated capability from RL 8 to 9 is beyond the scope of WPO and this funding opportunity. However, transition to operations could occur after the projects end if they are successful and approved for operational implementation.

Testing in the testbed facilities during the project performance period and working with the appropriate testbed staff to plan this testing and demonstration is a key requirement of the project. Applicants are encouraged to review each testbed's website for background on the testbed facility and its concept of operations, which varies from testbed to testbed. Given the relatively short project period, this requires mid to high RLs at project start. Ideally, the transition of a funded project from RL 5 or 6 at start to RL 8 at completion is desired. As a result, projects in early stages of development or proof-of-concept that are not ready for testbed demonstration during the project period (i.e. those with starting RLs at or below 4) are not the focus of this testbed funding opportunity.

Upon NOAA's selection of a proposal for funding, the testbed staff will coordinate with the principal investigator(s) (PIs) regarding project administration and planning, experimental schedules, and engagement with its test facility. The testbed staff will provide access to the NOAA-funded testbed facility and infrastructure (e.g. staff, computer hardware, software, and data) to facilitate the testing and evaluation in an environment that closely matches that of the operational entity. In preparation for the testing and evaluation, the PI(s) and testbed point(s) of contact will collaboratively develop a test plan within six months of the project start date describing what will be tested, what the schedule milestones are, and how each group will be involved in the evaluation process, including development and review of documentation, training, instructions, and success metrics. PIs must be involved directly in developing the test plan to make any necessary system adjustments when preparing their project for evaluation in the testbed. Performance progress will be monitored throughout the project by the testbed staff and WPO through communications and semiannual progress reports led by the PIs. 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.

In addition to test plans, PIs will also collaboratively develop R2O 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. It will also explicitly state the timelines and basic approach for how suggested product improvements might be implemented. NOAA guidance will be provided for the development of test plans and R2O transition plans.

The science focus of a specific proposed project will determine which testbed is most appropriate for a given proposal. The overarching themes of each testbed are described below. Collaboration across testbeds is also possible. If proposing to work with multiple testbeds, letters

of intent and proposals should clearly identify the testbeds, and explain collaborative properties of the proposed work.

a) Climate Testbed

The CTB mission is to accelerate improvements in high-priority operational sub-seasonal to seasonal (S2S) monitoring and prediction products. CTB is managed by the NWS Climate Prediction Center (CPC) and the NWS Environmental Modeling Center (EMC) both located in College Park, Maryland. The CTB seeks to leverage research innovations in order to improve the S2S models, products, and services at CPC and EMC. CPC's priority areas include: outlooks (including temperature, precipitation, and hazards (e.g. extreme events including drought, terrestrial and marine excessive heat/cold, coastal flooding, and excessive precipitation)) on timescales from two weeks to seasons; drought monitoring products; improvements to the S2S skill of the Global Ensemble Forecast System (GEFS) and the Seasonal Forecast System (SFS); and suite of value-added climate re-analysis products for monitoring the slowly evolving climate state and for initial conditions for reforecasts for the GEFS and SFS systems. EMC's priority is improving the UFS-based SFS and GEFS, including physical parameterizations and data assimilation, through collaborative development efforts with the numerical weather prediction (NWP) enterprise. For additional details about CTB, go to: https://www.cpc.ncep.noaa.gov/products/CTB/.

b) Fire Weather Testbed

The FWT mission is to transition advanced technologies and new applications to operational platforms as quickly as possible. The FWT is managed by the OAR Global Systems Laboratory in Boulder, Colorado, in collaboration with NWS and NESDIS. The FWT focuses on evaluating capabilities that support National Weather Service products intended to provide situational awareness; provide services to fire partners across various agencies to safely mitigate dangerous wildland fires; assist in the implementation of prescribed fire and wildfire management to optimize resource utilization, minimize negative impacts on life and property, and mitigate future fire risk; and help communities prepare for hazards before, during, and after wildland fire. For additional details about the FWT, go to: https://gsl.noaa.gov/fire-wx/fire-weather-testbed.

c) Hazardous Weather Testbed

The HWT is a facility jointly-managed by the OAR National Severe Storms Laboratory, the NWS Storm Prediction Center (SPC), and the NWS Norman Weather Forecast Office, all located at the National Weather Center in Norman, Oklahoma. The HWT serves as a critical step in the process of bringing new hazardous weather science to NWS operations by examining ways to increase the lead-time and accuracy for weather and water forecasts and warnings for severe convective weather. The HWT consists of two primary programs, which include the

Experimental Forecast Program (EFP) and the Experimental Warning Program (EWP). The EFP focuses on testing and evaluating new forecast models, techniques, and products to support SPC forecast operations. The EWP focuses on testing and evaluating new applications, techniques, and products to support NWS Weather Forecast Office severe convective weather warning operations. Projects selected for funding may be part of several experiments that are conducted throughout the year. For additional details about HWT, go to: https://hwt.nssl.noaa.gov/.

d) Hurricane and Ocean Testbed

The HOT mission is to accelerate the transfer of promising products and services, focused on tropical weather and marine phenomena, into operational forecast centers. HOT is managed by the NWS National Hurricane Center (NHC) and the OAR Atlantic Oceanographic and Meteorological Laboratory, both located in Miami, Florida. HOT's focus areas include: new analyses of observations/new observing systems for real-time assessment of hazards (i.e. wind, rain, storm surge, severe weather, waves, dangerous ocean conditions); new model guidance for forecasts of hazards (i.e. wind, rain, storm surge, severe weather, waves, dangerous ocean conditions); improvement of analysis products/forecast guidance from a social, behavioral, and economic science perspective; and product enhancements to improve the collaboration and efficiency to produce forecasts and warnings, and/or messaging and communication of forecasts (i.e. impact-based decision support services) to end users. The HOT is housed at NHC, within the William Lapenta Laboratory (the "HOT Lab"), and includes both the dedicated physical space and an isolated cloud-based virtual infrastructure for testing and evaluation. For additional details about HOT, go to: https://www.nhc.noaa.gov/hot/.

e) Hydrometeorology Testbed

The HMT sits at the NWS Weather Prediction Center in College Park, MD, partnered with OAR Physical Sciences Laboratory in Boulder, Colorado, with goals of improving forecasts of extreme precipitation (e.g. convection) that leads to flash flooding and precipitation that leads to winter weather and its impacts (i.e. snow, sleet, freezing rain, atmospheric rivers). The HMT is a naturalistic decision making environment for both a virtual and in-person experience, and seeks to generate insight via collaborative research. The HMT is people-centered, building techniques and tools for forecasters and users of meteorological forecasts and observations and seeks to facilitate both research to operations and operations to research activities.

To support forecasters and forecasts alike, how humans discover, explore, and make use of new and novel technologies is an ever present challenge. Building tools and techniques for people requires testing and evaluation. As such, the HMT hosts immersive forecast and evaluation experiments, in either real-time or retrospective formats, to evaluate new techniques, tools, and models that assist in improving forecast processes and the forecasts of precipitation. These activities include both verification and evaluation of model forecasts (i.e. AI, NWP, statistical) and of data visualization strategies that may assist forecasters in interpreting both deterministic and ensemble systems. Focus groups have been held to gather feedback on

proposed research that would assist forecasters in current or future duties, or on data sets that are under development. The HMT assists researchers in gathering useful feedback for product enhancements or improvements. HMT does this through the Flash Flood and Intense Rainfall Experiment, the Winter Weather Experiment, and the new Atmospheric River Experiment. For additional details about HMT, go to: http://hmt.noaa.gov/ and https://www.wpc.ncep.noaa.gov/hmt/.

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