**TRANSPORTATION POOLED FUND PROGRAM**

**QUARTERLY PROGRESS REPORT**

Lead Agency (FHWA or State DOT): \_\_\_**FHWA**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**INSTRUCTIONS:**

*Project Managers and/or research project investigators should complete a quarterly progress report for each calendar quarter during which the projects are active. Please provide a project schedule status of the research activities tied to each task that is defined in the proposal; a percentage completion of each task; a concise discussion (2 or 3 sentences) of the current status, including accomplishments and problems encountered, if any. List all tasks, even if no work was done during this period.*

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| **Transportation Pooled Fund Program Project #**TPF-5(475) | **Transportation Pooled Fund Program - Report Period:**X Quarter 1 (January 1 – March 31) □ Quarter 2 (April 1 – June 30) □ Quarter 3 (July 1 – September 30)□ Quarter 4 (October 1 – December 31) |
| **Project Title:**Update Precipitation Frequency Estimates for Delaware, Maryland, North Carolina, Virginia, Pennsylvania, and South Carolina (NOAA Atlas 14, Vol. 13) |
| **Name of Project Manager(s):**Megan Frye | **Phone Number:**(303) 396-9847 | **E-Mail**megan.frye@dot.gov |
| **Lead Agency Project ID:**FHWA | **Other Project ID (i.e., contract #):** | **Project Start Date:**March 19, 2021 |
| **Original Project End Date:**June 2024 | **Current Project End Date:**March 2026 | **Number of Extensions:** |

Project schedule status:

□ On schedule □ On revised schedule □ Ahead of schedule X Behind schedule

Overall Project Statistics:

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| **Total Project Budget** | **Total Cost to Date for Project** |  **Percentage of Work**  **Completed to Date** |
| $1,802,000 | $1,021,828 | 57% |

***Quarterly*** Project Statistics:

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|  **Total Project Expenses**  **and Percentage This Quarter** |  **Total Amount of Funds**  **Expended This Quarter** |  **Total Percentage of**  **Time Used to Date** |
| $188,100 / 10% | $188,100 | 83% |

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| **Project Description**:The purpose of this project is to update precipitation frequency estimates for Delaware, Maryland, North Carolina, Virginia, Pennsylvania, and South Carolina published in NOAA Atlas 14 Volume 2. Like previous NOAA Atlas 14 volumes, the estimates and associated bounds of 90% confidence intervals will be provided at 30 arc-sec resolution for durations of 5-minute through 60-day at average recurrence intervals (ARIs) of 1-year through 1,000-year. The study results will be published as NOAA Atlas 14 Volume 13, a wholly web-based publication available at Precipitation Frequency Data Server (PFDS). The publication will include the artifacts provided in previous NOAA Atlas 14 Volumes, including access through the PFDS, base grids in standard formats together with error estimates, electronic copies of maps, charts of seasonal distributions and probabilistic temporal distributions of heavy precipitation, and detailed documentation. Updated areal reduction factors, which are needed to calculate analogous areal precipitation frequency estimates, will not be developed as a part of this project. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**In this reporting period, NOAA completed conversion factors and continued to work on development and evaluation of the rainy season and mean annual maxima grids. In addition, NOAA continued quality controlling the station metadata and high outlier checks.Additional information on the status of the Atlas 14, Volume 13 work is available at: https://www.weather.gov/owp/hdsc\_current\_projects |
| **Anticipated work next quarter**:In the next quarter, NOAA will finish data collection, reformatting, and quality control on data received for 2024, which includes data from Helene. In parallel, they will finish developing MAM grids for base durations for the development of the preliminary estimates over this domain. NOAA will review maps of the resulting estimates for the 2-year and 100-year ARIs. Inconsistent estimates or unreasonable patterns are resolved on a case-by-case basis in various ways: by manually adjusting the value to reflect expected patterns, omitting the station from the analysis, or by adding anchoring estimates at critical ungauged locations. |

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| **Significant Results:****Data Collection and Screening** - NOAA continues to quality control the identified precipitation networks that are considered for the development of the Atlas 14 Volume 13 estimates. As with all NOAA Atlas 14 Volumes, the primary source of data is the NOAA’s National Centers for Environmental Information (NCEI). The NCEI is the most reliable data source network in the United States.**Station Metadata Screening** - NOAA continues to perform manual metadata inspection for datasets formatted (Table 2), and thus far completed the 95% of the metadata checks for all networks.**Station Cleanup –** NOAA continued efforts under this task during the reporting period.The station cleanup effort is performed to: * screen for duplicate records
* extend records at longer-duration stations using data from nearby stations
* investigate large differences in annual maximum series (AMS) at collocated stations at critical
* durations such as 1-hour and 1-day
* implement data corrections to ensure data consistency across multiple gauges
* determining if overall datasets are of good quality and should be used in the analysis

M**ean Annual Maxima (MAM) grids for base durations -** During this reporting period, NOAA evaluated two in-house approaches (Spatial regression and modified PRISM-based method) to develop mean annual maximum (MAM) precipitation grids. These two methods were assessed over the past couple of months using the same evaluation criteria, and their performance was similar. In support of and alignment with the Atlas 15 methodology, NOAA will move forward with the PRISM-based method for this project area.**Analysis of the Rainy Season -** During this reporting period, the rainy season Python code was rerun on NCEI merged data with stations with at least 20 years. Stations are spatially analyzed by rainy season beginning month, end month, duration, and a combination of begin and end month for 1-hour and 1-day AMS. Since the rainy season calculation is based on when ⅔ of the AMS are occurring, durations of 8 months or higher indicate an all-year rainy season. Preliminary results show a distinction between the northern and southern Appalachian regions and also the coastal plain.**Extraction and quality control of annual maximum series outliers -** During the previous reporting period, data was appended for many datasets (e.g. all NCEI-related datasets, RAWS, etc) through the end of 2024. During this reporting period, quality control was completed on this appended data and 1300 erroneous values and/or data periods were corrected. |
| **Circumstance affecting project or budget. (Please describe any challenges encountered or anticipated that** **might affect the completion of the project within the time, scope and fiscal constraints set forth in the** **agreement, along with recommended solutions to those problems).**Delay in finalizing the IAA with NOAA. Estimated timeline to complete the work is early 2026 now.Current schedule:* *Data collection, formatting, and initial quality control [Q4 2024; Completed]*
* Extraction of annual maximum series (AMS); additional quality control and data reliability tests (e.g., outliers, independence, consistency across durations, duplicate stations, candidates for merging)] [Q1 2025; In Progress]
* Regionalization and frequency analysis [Q1 2025; In Progress]
* Initial spatial interpolation of precipitation frequency (PF) estimates and consistency checks across durations [Q2 2025; In Progress]
* Peer review [Q2 2025; In Progress]
* Revision of PF estimates [Q2 2025]
* Remaining tasks (e.g., development of precipitation frequency estimates for partial duration series, seasonality, temporal distributions, documentation) [Q4 2025]
* Web publication [Q1 2026]
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| **Potential Implementation:** All deliverables will be accessible through the Precipitation Frequency Data Server (PFDS). That includes:* Interactive map of the United States. Via this map, IDF/DDF tables and curves will be available for any location in the project area.
* Precipitation frequency grids in GIS compatible formats.
* Metadata in Federal Geographic Data Transfer Standard format.
* Cartographic maps of precipitation frequency estimates.
* Charts of the seasonal distribution of annual maxima
* Probabilistic temporal distributions for 6-hour, 12-hour, 24-hour, and 96-hour durations in both chart and digital form
* Rainfall frequency estimates with corresponding upper and lower bounds of 90% confidence intervals will be available at 30-arc sec grid for durations of 1, 2, 3, 6, 12 and 24 hours.
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