**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 #**  *(i.e, SPR-2(XXX), SPR-3(XXX) or TPF-5(XXX)* | | **Transportation Pooled Fund Program - Report Period:**  □Quarter 1 (January 1 – March 31)  □Quarter 2 (April 1 – June 30)  □Quarter 3 (July 1 – September 30)  X Quarter 4 (October 1 – December 31) | |
| **Project Title:**  Contaminant Release from Storm Water Culvert Rehabilitation Technologies: Understanding Implications to the Environment and Long-Term Material Integrity | | | |
| **Name of Project Manager(s):**  Bridget Donaldson | **Phone Number:**  434-293-1922 | | **E-Mail**  Bridget.donaldson@vdot.virginia.gov |
| **Lead Agency Project ID:** | **Other Project ID (i.e., contract #):** | | **Project Start Date:**  3/2/2016 |
| **Original Project End Date:**  2/28/2018 | **Current Project End Date:**  2/28/2018 | | **Number of Extensions:**  0 |

Project schedule status:

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

Overall Project Statistics:

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| **Total Project Budget** | **Total Cost to Date for Project** | **Percentage of Work**  **Completed to Date** |
| $630,000.00 | $63,130.48 | 8% |

***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** |
| $13,967.16 | $13,967.16 | - |

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| **Project Description**:  Studies by a subset of DOTs have discovered that the installation of advanced polymeric materials such as spray-on coatings and cured-in-place lining (CIPP) processes can release toxic chemicals into the water conveyed by the culverts. Numerous additional anecdotal accounts from the U.S and other countries have been reported regarding adverse effects to the environment and wastewater facilities. DOTs lack information on the degree that chemical leaching affects polymeric material long-term structural performance. Recent studies have shown some of the chemicals released into the environment by culvert rehabilitation polymeric materials are product ingredients intended to promote material strength and durability.  The primary project objectives are to determine the following:  (1) The scope of the problem across DOTs (i.e., the extent of use of these technologies and the scale of their impacts to water quality);  (2) The effectiveness of existing construction specifications at minimizing contaminant release from rehabilitated culverts; and  (3) The degree to which the structural integrity and longevity of rehabilitated culverts are compromised by chemical leaching.  Results of this project will enable DOTs to make informed decisions with regard to culvert rehabilitation selection and specification development. |

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| **Progress this Quarter (includes meetings, work plan status, contract status, significant progress, etc.):**  Results from Quarter 3 (Q3) indicated that many DOTs did not have field CIPP projects during Quarter 4 (Q4). As mentioned in Q3, participating DOTs believe they will have CIPP testing sites available for this project in Spring 2017 or CY 2017.  The project team is currently characterizing the degree of curing through a CIPP pipe wall exhumed from a nearby pipeline repair site to better understand what constitutes ‘cured’ CIPP. Analysis on virgin cured CIPP indicates that there are significant differences between the inner surface of the CIPP and the middle/outer surface of the CIPP. The project team is investigating the nature of this variability. Likely these differences arose due to different cure conditions between the inner and middle/outer areas (temperature and time at temp). During Q4, the project team acquired resin from a resin supplier so bench-scale experiments can be conducted and ascertain cure kinetics and map them back to conditions in the CIPP.  Uncured CIPP impregnated fabric from California (one sample with styrene based resin and another sample with low VOC resin) was obtained during Q3 and extracted in the lab during Q4 using the protocols developed to date. Extractions with two different solvents were also conducted on condensate captured from created during CIPP sites. Results revealed a wide array of tentatively identified compounds, compounds not commonly screened for in standard EPA water analysis methods. The project team is working to prioritize which compounds to identify and confirm because identifying all of them would take many months and is not necessary for the project scope. Exploration of the chemicals present however is needed so that DOTs can make appropriate specification controls. [CIPP condensate generated during a prior Alabama DOT project but diluted 10,000 times was found acutely toxic to aquatic organisms even when styrene was below its toxicity level]. If DOT’s understand the type and properties of the chemicals released they can understand how to establish requirements on contractors to prevent these compounds from entering the environment.  Cured CIPP samples from the same pipeline repair sites were also obtained and will be extracted and analyzed in the coming months. These results will enable the project team to compare the starting resin to the extractable chemicals present in the cured CIPP. It is well-known some compounds present in CIPP resins breakdown into other products during installation. Thus, chemicals present in the CIPP and released during installation could be different in type, magnitude, and properties. This too is important for DOT’s to understand so that more targeted specifications can be developed that helps avoid the potential for environmental contamination.    Cured CIPP specimens available from prior field (Alabama, Virginia, Indiana) were also extracted in the laboratory. The data is currently being examined. These specimens were created by different contractors during different years and different stormwater and sewer pipes. The value of extracting these materials is to better gauge what specific chemicals are released from cured CIPP. At present there remains a poor understanding of what chemicals are present after CIPP is installed. It is accepted that chemicals used for CIPP installation are not all consumed during installation and some can be released after contractors leave the site.  The Purdue team did not receive a response from Missouri or Wisconsin DOTs regarding the request for their construction specifications and bid documents. The Purdue team is still waiting for CIPP construction specifications and bid documents from several participating DOTs on this FHWA project. |
| **Anticipated work next quarter**:   * In Q1 2017, connect with all participating DOTs regarding scheduling and travel to a field site for this project. * Continue interpretation and follow-up confirmation of chemicals detected from the California CIPP sites as well as other CIPP samples on-hand. * Request the remaining CIPP construction specifications from DOTs that have not been received and compare them against one another. * It is possible the results obtained to date will be compiled into a formal report. This however will depend on the pace of progress on chemical identification and participating DOTs providing the project team all their CIPP construction specifications. |

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| **Significant Results:**  A variety of compounds released during CIPP installation processes have been tentatively identified. This included styrene based resin and low VOC resins. Once additional characterization is complete, the project team will have confidence in reporting the actual compounds present. |
| **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).**  It is important that the participating DOTs notify Dr. Whelton (540-230-6069, [awhelton@purdue.edu](mailto:awhelton@purdue.edu)) about CIPP installations where the project team can conduct field work in 2017. If scheduling is a challenge, DOT’s should notify Dr. Whelton as well. Alternative approaches can be instituted to support DOTs on this project if needed. The project team has obtained CIPP resin for bench-scale testing to compliment the field work. This material will be used to create composites that will be tested in the laboratory in 2017. |
| **Potential Implementation:**  Additional information will be made available upon further analysis of the construction specifications and identification of the chemicals present at the CIPP sites monitored. |