

**Quarterly Progress and Performance Indicators Report:**

**Project Number and Title:** 3.15 Nonstructural Approaches to Reduce Pollutant Runoff in Urbanized Areas

**Research Area:** Thrust 3: New Systems For Longevity and Constructability

**PI:** Vinka Oyanedel-Craver; University of Rhode Island

**Co-PI(s):** Joseph Goodwill; University of Rhode Island

**Reporting Period:** 1/1/2022-3/31/2022

**Submission Date:** 3/31/22

**Overview:**

Provide **BRIEF** highlights of activities performed during the reporting period.

- Ongoing literature review
- Determination of sampling locations
- Construction of database using ArcGIS geoprocessing capabilities in preparation of data analysis

**Meeting the Overarching Goals of the Project:**

How did the previous items help you achieve the project goals and objects? Please give one bullet point for each bullet point listed above.

- Learning from previous studies gives us insight on how to best conduct our experiment
- Careful consideration of various locations around Warwick led us to deciding on 9 sampling locations, which will be tested at over the year
- ArcGIS's capabilities allow use to summarize geographical data that will be used to determine which variables significantly contribute to stormwater pollution

**Accomplishments:**

List any accomplishments achieved under the project goals in bullet point form...

- Decided on 9 sampling location throughout Warwick, RI area
- Test runs of analytical equipment to measure concentrations in stormwater samples
- Purchase of ISCO autosampler and Vacmaster vacuum

**Task, Milestone, and Budget Progress:**

*Complete the following tables to document the work toward each task and budget*

<b>Table 1: Task Progress</b>			
<b>Task Number: Title</b>	<b>Start Date</b>	<b>End Date</b>	<b>% Complete</b>
Task 1.1: Literature review	9/1/2021	12/31/2021	75%
Task 1.2: Identification of sampling locations	11/1/2021	3/1/2022	100%
Task 1.3: Methodology Design	10/15/21	12/31/21	95%
Task 2.1: Sampling preparation and testing	10/1/2021	3/1/2022	35%
Task 2.2: Analytical equipment preparation and testing	10/1/2021	3/1/2022	35%
Task 2.3: Site preparation and dry runs	3/1/2021	3/31/2022	20%
Task 3.1: Field sampling	4/1/2021	7/30/2023	0%
Task 3.2: Cost/Benefit analysis	12/1/2022	9/1/2023	0%
Task 3.3: Improved guidelines for street sweeping	12/1/2022	9/1/2023	0%
Phase 1 Overall	9/1/2021	3/1/2022	90%
Phase 2 Overall	10/1/2021	3/31/2022	40%
Phase 3 Overall	3/15/2022	9/1/2023	0%

<b>Table 2: Milestone Progress</b>			
<b>Milestone #: Description</b>	<b>Corresponding Deliverable</b>	<b>Start Date</b>	<b>End Date</b>
Milestone 1: Field visit to select sampling location	1.2	3/15/22	3/15/22
Milestone 2: Test run of analytical equipment	2.2	2/01/22	2/10/22

<b>Table 3: Budget Progress</b>		
<b>Project Budget</b>	<b>Spend – Project to Date</b>	<b>% Project to Date (include the date)</b>
\$74,827	\$67,344	90%
\$112,240	\$33,096	30%
\$186,437	\$0	0%

**Is your Research Project Applied or Advanced?**

- Applied** *(The systematic study to gain knowledge or understanding necessary for determining the means by which a recognized and specific need may be met.)*
- Advanced** *(An intermediate research effort between basic research and applied research. This study bridges basic (study to understand fundamental aspects of phenomena without specific applications in mind) and applied research and includes transformative change rather than incremental advances. The investigation into the use of basic research results to an area of application without a specific problem to resolve.)*

**Education and Workforce Development:**

Answer the following questions (N/A if there is nothing to report):

1. Did you provide any workforce development or training opportunities to transportation professionals (already in the field)? If so, what was the training? When was it offered? How many people attended? (i.e. The research team provided an in the field training for the SAR technology for 3 maintenance crew members of the MassDOT on 3/31/2021. The members learned how to use the technology and interrupt the data.)

N/A

2. Did you hold meetings with any transportation industry organizations or DOTs? If so, what was the meeting’s purpose? When was it offered? How many people attended?

The URI research team held a second meeting with RIDOT on 2/28/22. The purpose of the meeting was to provide an update on the progress of the research, decide the study area for sampling, and determine the next steps needed to start sampling in April. We also decided to pivot the optimization model to create a road priority system rather than a more defined sweeping schedule. 2 RIDOT members attended the meeting along with 3 members of the URI research team.

3. Did you host/participant in any K-12 education outreach activities? If so, what was the activity? What was the target age/grade level of the participants? How many students/teachers attended? When was the activity held?

N/A

**Technology Transfer:**

Use the table below to complete information about conference sessions, workshops, webinars, seminars, or other events you led/attended where you shared findings as a result of the work you conducted on this project:

<b>Table 4: Presentations at Conferences, Workshops, Seminars, and Other Events</b>					
<b>Type</b>	<b>Title</b>	<b>Citation</b>	<b>Event &amp; Intended Audience</b>	<b>Location</b>	<b>Date(s)</b>
N/A	N/A	N/A	N/A	N/A	N/A

Use the table below to report any publications, technical reports, peer-reviewed articles, newspaper articles referencing your work, graduate papers, dissertations, etc. written as a result of the work you conducted on this project. Please list only completed items and exclude work in progress.

<b>Table 5: Submitted/Accepted Publications, Technical Reports, Theses, Dissertations, Papers, and Reports</b>				
<b>Type</b>	<b>Title</b>	<b>Citation</b>	<b>Date</b>	<b>Status</b>
N/A	N/A	N/A	N/A	N/A

Answer the following questions (N/A if there is nothing to report):

1. Did you deploy any technology during the reporting period through pilot or demonstration studies as a result of this work? If so, what was the technology? When was it deployed?

We have purchased the ISCO 6712 Autosampler that will be deployed during rain events to capture flow proportional stormwater samples without contamination. We have used the autosampler only in the lab to calibrate and practice using the instrument.

We have also purchased a powerful Vacmaster vacuum which will be used to collect street solids from our sampling locations to determine the accumulation rate on roads.

2. Was any technology adopted by industry or transportation agencies as a result of this work? If so, what was the technology? When was it adopted? Who adopted the technology?

N/A

3. *Did findings from this research project result in changing industry or transportation agency practices, decision making, or policies? If so, what was the change? When was the change implemented? Who adopted the change?*

N/A

4. *Were any licenses granted to industry as a result of findings from this work? If so, when? To whom was the license granted?*

N/A

5. *Were any patent applications submitted as a result of findings from this research? If so, please provide a copy of the patent application with your report.*

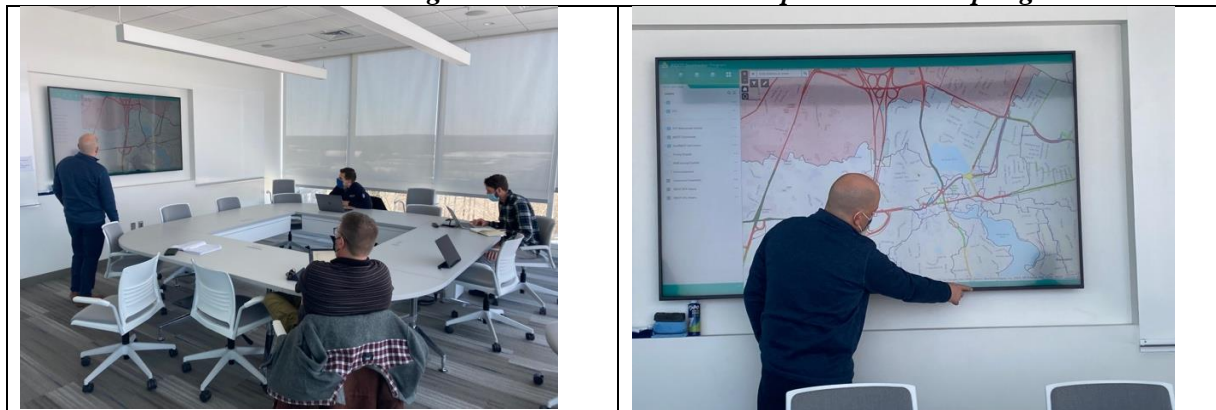
N/A

6. *Did industry organizations or DOTs provide cost-share (cash or in-kind) to your research during the reporting period? Who was the organization? Please provide an in-kind support invoice from the organization with your report (this is kept confidential and used for record keeping purposes only).*

RIDOT provided in-kind support with expertise, personnel and facilitated site visits

*Please add figures/images that can be included on the website and/or in marketing/social media materials to further clarify your research to the general public. This is very important to our Technology Transfer initiatives.*

***URI-RIDOT Coordination meeting 2/28/2022. URI Activities Updates and Sampling Sites Selection***



*Site visit 3/15/2022. From right to left: Support vehicles, outfall and resultant GIS map*



*Describe any additional activities involving the dissemination of research results not listed above under the following headings:*

**Outputs:**

*Definition: Any new or improved process, practice, technology, software, training aid, or other tangible product resulting from research and development activities. They are used to improve the efficiency, effectiveness, and safety of transportation systems. List any outputs accomplished during this reporting period:*

Ongoing development of ArcGIS capabilities including numerous geoprocessing strategies to generate important data related to study area, such as % land use, degree of slope, canopy coverage, and impervious surface area. The output of this geoprocessing is a data table portraying the data for each sampling location. These outputs have yet to be used, but once sampling begins, will be used to evaluate the relationship of sampling results and the data parameters.

**Outcomes:**

*Definition: The application of outputs; any changes made to the transportation system, or its regulatory, legislative, or policy framework resulting from research and development activities. List any outcomes accomplished during this reporting period:*

N/A

**Impacts:**

*Definition: The effects of the outcomes on the transportation system such as reduced fatalities, decreased capital or operating costs, community impacts, or environmental benefits. The reported impacts from UTCs are used for the assessment of each UTC and to make a case for Federal funding of research and education by demonstrating the impacts that UTC funding has had on technology and education. NOTE: The U.S. DOT uses this information to assess how the research and education programs (a) improve the operation and safety of the transportation system; (b) increase the body of knowledge and technologies; (c) enlarge the pool of people trained to develop knowledge and utilize technologies; and (d) improves the physical, institutional, and information resources that enable people to have access to training and new technologies. List any outcomes accomplished during this reporting period:*

N/A

**Participants and Collaborators:**

*Use the table below to list individuals (compensated or not) who have worked on the project other than students.*

<b>Table 6: Active Principal Investigators, faculty, administrators, and Management Team Members</b>				
<b>Individual Name &amp; Title</b>	<b>Dates involved</b>	<b>Email Address</b>	<b>Department</b>	<b>Role in Research</b>
Dr. Vinka Oyanedel-Craver	10/1/21 – 3/31/22	craver@uri.edu	Civil and Environmental Engineering	Co-PI
Dr. Joseph Goodwill	10/1/21 – 3/31/22	goodwill@uri.edu	Civil and Environmental Engineering	Co-PI

*Use the table below to list **all** students who have participated in the project during the reporting period. (This includes all paid, unpaid, intern, independent study, or any other student that participated in this project.) **ALL FIELDS ARE REQUIRED.***



**Table 7: Student Participants during the reporting period**

Student Name	Start Date	End Date	Advisor	Email Address	Level	Major	Funding Source	Role in research
Andrew Sheerin	10/1/21	3/31/22	Dr. Craver/ Dr. Goodwill		Masters	Civil and Environmental Engineering	TIDC, URI	Literature review; methodology development; Sampling preparations

Use the table below to list any students who worked on this project and graduated or received a certificate during this reporting period. Include information about the student's accepted employment during the reporting period

**Table 8: Students who Graduated During the Reporting Period**

Student Name	Degree/Certificate Earned	Graduation/Certification Date	Did the student enter the transportation field or continue another degree at your university?
N/A	N/A	N/A	N/A

Use the table below to list any students that participated in Industrial Internships during the reporting period:

**Table 9: Industrial Internships**

Student Name	Degree/Certificate Earned	Graduation/Certification Date	Did the student enter the transportation field or continue another degree at your university?
N/A	N/A	N/A	N/A

Use the table below to list **organizations** that have been involved as partners on this project and their contribution to the project during the reporting period.



**Table 10: Research Project Collaborators during the reporting period**

Organization	Location	Contribution to the Project				
		Financial Support	In-Kind Support	Facilities	Collaborative Research	Personnel Exchanges
RIDOT	Warwick, RI		X	X	Helped with decision making of sampling locations  Provide personnel and vehicles for site visit for the selection of sampling locations	GIS data transfer

Use the table below to list **individuals** that have been involved as partners on this project and their contribution to the project during the reporting period. (**List your technical champion(s) in this table.** This also includes collaborations within the lead or partner universities who are not already listed as Pis; especially interdepartmental or interdisciplinary collaborations.)

**Table 11: Other Collaborators**

Collaborator Name and Title	Contact Information	Organization and Department	Date(s) Involved	Contribution to Research
Mark Nimiroski		RIDOT	2/28/22 – 3/14/22	Coordination with RIDOT
Joseph Baker		RIDOT	2/28/22 – 3/14/22	Coordination with RIDOT
Ian Kirby		RIDOT	3/15/22	Site visit and sampling location selection
David Messier		RIDOT	3/15/22	Site visit and sampling location selection
Allison Hamel		RIDOT	3/5/2022-3/25/2022	GIS information and support

Use the following table to list any transportation related course that were taught or led by researchers associated with this research project during the reporting period:

**Table 12: Course List**

Course Code	Course Title	Level	University	Professor	Semester	# of Students
N/A	N/A	N/A	N/A	N/A	N/A	N/A

### **Changes:**

*List any actual or anticipated problems or delays and actions or plans to resolve them.*

*List any changes in approach and the reasons for the change...*

- Decided to change the formulation of the optimization model to create a road priority system rather than an optimized street sweeping schedule. The road priority system depicts which roads are more important to sweep based on various parameters, such as land use, canopy coverage, road quality, slope, etc. The reason for the change is because a schedule will be infeasible to follow exactly due to the unpredictability of weather.

### **Planned Activities:**

*List the activities planned during the next quarter.*

- Begin street solid sampling using a vacuum to measure street solid accumulation rates
- Begin deploying the autosampler during rain events to analyze concentrations of pollutants of concern in stormwater
- Perform data analysis of analysis results to understand the relationship of various parameters and street solid accumulation/pollutant concentrations
- Continue development of road priority system optimization model
- Continue GIS analysis to simulate stormwater runoff and transport of pollutants.