Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) Suppl. #1, RPFP-20-MGS-2

Project Title: MGS with Reduced Embedment and Post Spacing over Low-Fill Culverts

Principal Investigator: Faller, R.K., Bielenberg, R.W., Lechtenberg, K.A., Rosenbaugh, S.K., Mojdeh Pajouh

Principal Contact Information Email: mojdeh.pajouh@unl.edu **Phone:** 402-472-0920

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) — October 31
- ☐ Quarter 2 (October 1 – December 31) — January 31
- ☐ Quarter 3 (January 1 – March 31) — April 30
- ☐ Quarter 4 (April 1 – June 30) — July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Project Planning & Management & CAD	$16,853.00	0.0%	$0.00	$7,525.00	44.7%	$9,328.00
2. Dynamic Bogie Testing	$78,032.00	4.9%	$3,803.00	$27,800.00	35.6%	$50,232.00
3. Dynamic Bogie Testing	$61,310.00	0.0%	$0.00	$0.00	0.0%	$61,310.00
4. Reporting and Project Deliverables	$29,717.00	0.0%	$0.00	$0.00	0.0%	$29,717.00
5.						
6.						
8. Total	$185,912	-	$3,803.00	$35,325.00	19.0%	$150,587.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Previously, MwRSF had started the research effort by conducting six (6) bogie tests to evaluate post behavior through a range of reduced embedment depths. All tests were conducted with W6x8.5 posts. Two tests were performed at each reduced embedment increment of 4 in. from the standard 40 in. MGS post embedment, to a minimum of 28 in. (embedment depths of 28 in., 32 in., and 36 in.). The data from these tests was analyzed and compared with previous testing of guardrail posts at the standard embedment depth of 40 in. The data will also be used to develop post-soil resistance input for computer simulation.

Additional bogie testing was conducted. Analysis of the initial bogie tests found that the post soil interaction forces were limited by yielding of the W6x8.5 post used in the first six bogie tests. In order to isolate the soil response at lower embedments, a second set of three bogie tests was conducted with W6x16 posts at 40 in., 34 in. and 28 in. embedments. The data from these tests was further utilized to characterize the post response for shallow embedments.

In this quarter, MwRSF developed preliminary models of the bogie tests in LS-DYNA to develop accurate post-soil models for further MGS system analysis with shallow embedments. Models of both the W6x8.5 and W6x16 dynamic component tests were developed. The W6x16 models are being calibrated to provide accurate soil response. The soil models used in the W6x16 post in soil models are then being applied to a model of W6x8.5 posts in soil with various embedment depths and compared with the previous component tests to ensure that the LS-DYNA models will produce the proper response when used to model the MGS with shallow embedment depths.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforeseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

In the upcoming quarter, MwRSF will continue to develop validated models of the post-soil interaction with reduced embedments and begin simulation analysis of potential MGS design alternatives.

Total Percentage of Project Completion:

19.0%

Research Project Quarterly Progress Report

Date: 10/31/2020 **Project Number:** TPF-5(430) Suppl. #2

Project Title: Additional Retrofit Options for Post Conflicts within AGTs

Principal Investigator: Faller, Rosenbaugh, Rasmussen, Bielenberg, Lechtenberg, Reid, Stolle

Principal Contact Information Email: srosenabugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 10/1/2018 **Project Completion Date:** 12/31/2021

Report Period:	**Due Date:**
☒ Quarter 1 (July 1 – September 30)	October 31
☐ Quarter 2 (October 1 – December 31)	January 31
☐ Quarter 3 (January 1 – March 31)	April 30
☐ Quarter 4 (April 1 – June 30)	July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total Expenses to Date	Total % of Task Completed	Remaining Budget
1. Planning & Correspondence	$27,155	100%	$3,356	$3,466	20%	$23,689
2. Design and Analysis	$106,064	0%	$0	$0	0%	$106,064
3. Bogie Testing	$99,897	0%	$0	$0	0%	$99,897
4. Reporting and Deliverables	$18,311	0%	$0	$0	0%	$18,311
5.						
6.						
7.						
8.						
9. Total	$251,429	-	$3,356	$3,466	2%	$247,963

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

A survey was created to gather information from the sponsoring DOTs and was sent out September 23rd. It asked for current AGT standard details, information on post installation issues, and any photos of installation issues.

A literature review was also initiated on previous AGTs and guardrail retrofits. TTI was also contacted to ensure that research would not be duplicated as they have a similar research project.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budget numbers presented herein do not include labor charges from September of 2020 as those expenditures had not yet been charged to the project.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforeseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

Work will continue on the literature review, and information from the DOT survey will be used to identify specific issues related to AGT post installations. Conceptual design of possible retrofits may also commence.

Total Percentage of Project Completion:

2%

Research Project Quarterly Progress Report

Date: 10/31/2020 **Project Number:** TPF-5(430) Suppl. #3, RPFP-20-AGT-2

Project Title: Guidelines for Flaring Thrie-Beam Approach Guardrail Transitions - Phase II

Principal Investigator: Jennifer Rasmussen (Schmidt), Reid, Faller, et al.

Principal Contact Information Email: jennifer.rasmussen@unl.edu **Phone:** (402) 472-0870

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & Correspondence	$12,644.00	0%	$0.00	32%	$8,644.00
2. Full-Scale Crash Testing	$278,516.00	100%	$14,318.00	5%	$258,152.00
3. Reporting	$11,623.00	0%	$0.00	0%	$11,623.00
4.					
5.					
6.					
7.					
8.					
9. Total	$302,783.00		$14,318.00	6%	$278,419.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

CAD details for the full-scale test article were developed and sent to MwRSF's test site. Material were aquired for construction of the test article including the radiused Thrie beam segments and the end shoes with vertical slots.

Efforts were also made to complete the Phase I report, which focused on the simulation of various flare rates and the selection of the 15:1 flare for further evaluation.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The budget numbers presented herein do not include labor charges from September of 2020 as those expenditures had not yet been charged to the project.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

The test installation will be constructed, and vehicles will be preped for testing. full-scale crash testing will begin.

Total Percentage of Project Completion:

6%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) Suppl. #4, RPFP-20-TERM-1

Project Title: Further Evaluation of the End Terminals Adjacent to Curb

Principal Investigator: Jennifer Rasmussen (Schmidt), Reid, Faller, et al.

Principal Contact Information Email: jennifer.rasmussen@unl.edu **Phone:** (402) 472-0870

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☐ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☒ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning & Correspondence	$19,248.00	1%	$351.00	3%	$18,897.00
2. Full-Scale Crash Testing	$176,505.00	0%	$0.00	0%	$176,505.00
3. Design & Analysis	$39,381.00	0%	$0.00	0%	$39,381.00
4. Reporting & Deliverables	$22,074.00	0%	$0.00	0%	$22,074.00
5.					
6.					
7.					
8.					
9. Total	$257,208.00		$0.00		$256,857.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Survey questions were reviewed and completion of the survey was assigned to Cody Stolle to execute. NOTE: Jennifer Rasmussen, the PI, will be on leave between October and December, and Cody Stolle will serve as a temporary key researcher during that time.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

The MASH energy-absorbing end terminal and curb configuration will be selected by reviewing background information and sending a survey to the sponsors.

Total Percentage of Project Completion:

2%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430)_Suppl5_RPFP-20-SR-1

Project Title: Development of a Short-Radius Guardrail for Intersecting Driveways or Roadways

Principal Investigator: Jennifer Schmidt, J. Reid, R. Faller, R. Bielenberg, K. Lechtenberg, S. Rosenbaugh

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/16/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$30,952.00	1.1%	$327.00	1.1%	$30,952.00
2. Design and Analysis	$177,021.00	0.0%	$0.00	0.0%	$177,021.00
3. Reporting and Project Deliverables	$43,059.00	0.0%	$0.00	0.0%	$43,059.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter MwRSF, reviewed site conditions for treatments for intersecting roadways that were developed in a previous reseach effort for the Nebraska Department of Transportation (TRP-03-312-15). These site conditions were sent to the Midwest Pooled Fund member states along with survey questions to develop additional site condition details for use as design criteria for new design concepts.The results of the survey will be collected in the upcoming quarter.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

MwRSF will review the sitte conditions survey and discuss design criteria with the sponsors. MwRSF will then develop preliminary design concepts for the new short-radius guardrail system. Concepts from previous MwRSF short-radius and intersecting roadway treatments will be reviewed and reconsidered. Additionally, new concepts will be developed as needed to meet the states desires.

Total Percentage of Project Completion:

0.1%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(193) Suppl. #147 RPFP-19-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Jennifer Schmidt, J. Reid, R. Faller, R. Bielenberg, K. Lechtenberg, S. Rosenbaugh

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$60,647.00	0.0%	$0.00	0.0%	$60,647.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

This project allows MwRSF to be a valuable resource for answering questions with regard to roadside safety issues. MwRSF researchers and engineers are able to respond to issues and questions posed by the sponsors during the year. Major issues discussed with the States have been documented in our Quarterly Progress Reports and all questions and support are accessible on a MwRSF Pooled Fund Consulting web site.

In the past quarter MwRSF has responded to a series of state inquiries. The Quarterly Progress Report summarizing these responses has been attached to this document. The summary will also be available for download at the recently completed MwRSF Pooled Fund Consulting web site - http://mwrsf-qa.unl.edu/

We are continuing to work with and improve the MwRSF Pooled Fund Consulting web site as our experience with it grows. We would ask that all Pooled Fund member states use the new site from this point forward for their inquiries and to contact us with any issues they experience with the web site.

The summary of the consulting effort for this quarter is attached with the progress update.

Note that consulting inquiries are currently being dealt with under TPF-5(193) Suppl. #147 until the funding in that effort is depleted.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The summary of the consulting effort for this quarter is typically attached with the progress update. Previously, the MwRSF website was undergoing revision and we were unable to create the summary for several quarters. The website is now operational, but issues still existing with uploading Q&A repsonses from emails. We are working on rectifying the situation with the website administrator.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward

Anticipated Work Next Quarter:

MwRSF will continue to answer questions and provide support to the sponsors during the upcoming quarter.

We would ask that all questions be submitted through the web site so that they can be answered and archived therein.

http://mwrsf-qa.unl.edu/

Total Percentage of Project Completion:
0.0%

Research Project Quarterly Progress Report

Date: 10/31/2020 **Project Number:** TPF-5(430) Suppl. #7, RPFP-20-PFCHS

Project Title: Pooled Fund Center for Highway Safety

Principal Investigator: Reid, Bielenberg, Faller, Holloway, Lechtenberg, Rosenbaugh, Rasmussen, Stolle

Principal Contact Information Email: kpolivka2@unl.edu **Phone:** (402) 472-9070

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Website Develop, Populate, and Host	$14,330.00	1%	$981.00	35%	$8,752.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Completed the transition of the site to more stable and reliable server. Troubleshooting and fixing any issues that have occurred during the transition.

Continued maintenance, repair, and upkeep of the website

Updated research hub with new completed projects.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

This is continuation funding untill the funds from Project No.: RPFP-19-PFCHS – TPF-5(193) Supplement #148, Project Title: Pooled Fund for Highway Safety have been exhaused.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

Troubleshoot and fix any issues that have occurred during the transition.

Continued maintenance, repair, and upkeep of the website

Updated research hub with new completed projects.

Total Percentage of Project Completion:

30%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) Suppl. #8, RPFP-20-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Jennifer Rasmussen (Schmidt), Reid, Faller, et al.

Principal Contact Information Email: jennifer.rasmussen@unl.edu **Phone:** (402) 472-0870

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2022

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. LS-DYNA Modeling Enhancement	$30,616.00	0.2%	$55.00	0.2%	$30,561.00
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9. Total	$30,616.00		$0.00		$30,616.00

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

The Year 30 LS-DYNA modeling enhancement support was initiated part way through the first quarter of 2020. Due to remaining funds in the Year 29 LS-DYNA modeling enhancement support, no funds will be utilized from this project until Year 29 modeling funds are depleted.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

None.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

None - due to remaining funds in the Year 29 LS-DYNA modeling enhancement support, no funds will be utilized from this project until Year 29 modeling funds are depleted.

Total Percentage of Project Completion:

0.2%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) – Suppl. #10 – FY20-WISC-1-MGS SLOPE HALF POST 1Q 2020

Project Title: MASH 2016 TL-3 Evaluation of the MGS with Half Post Spacing and 7-ft Posts Adjacent to Slope

Principal Investigator: R. Bielenberg and R. Faller,

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 1/16/2020 **Project Completion Date:** 12/31/2021

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$10,490.00	2.2%	$233.00	81.2%	$1,968.00
2. Full-Scale Crash Testing	$193,277.00	0.0%	$0.00	0.0%	$169,408.00
3. Reporting and Project Deliverables	$16,441.00	0.0%	$0.00	0.0%	$16,441.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, minimum work was completed on this effort. MwRSF previously completed the majority of the system fabrication for the barrier system including the slope formation and post installation. The system is currently behind several other systems in the testing que and will be tested as soon as posssible.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

Note that the original start date for the project was listed as October of 2019 with an end date in the 3Q of 2021 (Sept. 30, 2021). Authorization of for the project was not received until January 2020, so the end date has been pushed back accordingly to end of December 2021.

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

In the next quarter, MwRSF anticipates conducting the full-scale crash testing of the MGS with 1/2 post spacing adjacent to slope.

Total Percentage of Project Completion:

14.7%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) Suppl. 12 – FY20-WY-1-GATE: MASH 2016 Th 3

Project Title: Evaluation of Drop-Arm Road Closure Gate

Principal Investigator: R. Bielenberg and R. Faller,

Principal Contact Information Email: rbielenberg2@unl.edu **Phone:** (402) 472-9064

Project Start Date: 2/26/2020 **Project Completion Date:** 9/30/2021

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☒ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☐ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$17,507.00	12.1%	$2,115.50	38.3%	$10,796.50
2. Design and Analysis	$10,862.00	26.3%	$2,853.18	26.3%	$8,008.82
3. Full-Scale Crash Testing	$185,441.00	0.0%	$0.00	0.0%	$185,441.00
4. Reporting and Project Deliverables	$16,147.00	0.0%	$0.00	0.0%	$16,147.00
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

In this quarter, MwRSF completed the CAD details for the full-scale crash testing of the road closure gate and reviewed the details and test setup with WYDOT. Critical Impact Angles (CIA's) and vehicle orientations were developed for test nos. 3-60, 3-61, and 3-62. MwRSF also order the luminaire poles and gate arms for use in the three full-scale crash tests. Materials are expected to arrive late in the 4th quarter of 2020. Once MwRSF receives all of the test materials, the road closure gate will be placed in the full-scale test que at the MwRSF Outdoor Test Facility for conducting the three full-scale crash tests in the project.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses may play a factor in future efforts. MwRSF has not been shut down and is still working, but much of the personnel has transitioned to working remotely, as has much of the country during this time of social distancing. This major shift in regular work operations may lead to delays and inefficiencies as well as other unforseen hurdles. Additionally, changes to businesses outside of MwRSF may lead to possible delays in material acquisition. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Anticipated Work Next Quarter:

In the next quarter, receive all of the materials required for the full-scale crash testing ready the road closure gate systems for crash testing.

Total Percentage of Project Completion:

4.2%

Research Project Quarterly Progress Report

Date: 10/30/2020 **Project Number:** TPF-5(430) Suppl. #14

Project Title: Phase 2 Review of Median Barrier Warrants and ISPE of Cable Median Barriers (CMBs) In Kansas, Median Barrier Warrants

Principal Investigator: C. Stolle, R. Faller, R. Bielenberg, K. Lechtenberg

Principal Contact Information Email: cstolle2@unl.edu **Phone:** (402) 472-4233

Project Start Date: 3/20/2020 **Project Completion Date:** 2/28/2021

Report Period: **Due Date:**

- ☒ Quarter 1 (July 1 – September 30) ---------- October 31
- ☐ Quarter 2 (October 1 – December 31) ---------- January 31
- ☐ Quarter 3 (January 1 – March 31) ---------- April 30
- ☐ Quarter 4 (April 1 – June 30) ---------- July 31

Project Schedule Status:

- ☐ **On Schedule**
- ☐ **On Approved Revised Schedule**
- ☐ **Ahead of Schedule**
- ☒ **Behind Schedule**

Progress:

Task	Total Budget	% work Completed This Quarter	Expenses This Quarter	Total % of Task Completed	Remaining Budget
1. Project Planning and Correspondence	$15,985.00	15%	$4,250.00	15%	$11,735.00
2. Crash Review & Median Warrants	$64,280.00	35%	$11,009.00	35%	$53,271.00
3. Final Report	$27,800.00	0%	$0.00	0%	$27,800.00
4.					
5.					
6.					
7.					
8.					
9.					

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status, significant progress, etc.)

Undergraduate students were hired and assigned to review crash events and make assignments of crash events, including specific identificaiton of left-side run-off-road crashes and cross-median crashes. Approximately 8,000 crash reports were reviewed, and an additional approximately 8,000 crashes remain to be reviewed.

Circumstances Affecting Project, Scope, or Budget:

(Please describe any challenges encountered or anticipated that might affect the completion of the project within the time, scope and fiscal constraints, along with recommended solution to those problems.)

The COVID-19 pandemic and business responses have produced significant difficulties in scheduling and delays to date. Due to the sensitivity of crash report analysis work, no crash report data extraction was permitte during the period of remote work. Subsequently, a significant reduction of the student workforce required engineering faculty and staff to adapt and revise the analysis strategy for the crash reporting. The new techniques developed will greatly expedite project completion and are hoped to keep the project on track, but required more expense and faculty time to set up than were expected or budgeted. The research team has implemented measures to increase the efficiency of the project completion using computer coding and a specialized extracted data set, significantly decreasing the average amount of review time required per crash. The research team will continue to update KDOT in the event of project delays.

Anticipated Work Next Quarter:

Full completion of the initial crash data assignment phase. Analysis of crash data results will be initiated to determine recommendations for median barrier placement in Kansas based on frequency, substitution analysis, and benefit-to-cost analysis of crash data. A full data set integrity review will be conducted in parallel with the analysis to ensure accuracy of the collected data. The analysis will be constructed using computer AI data throughput, meaning that any revisions made to the existing, completed dataset will be automatically implemented into the analysis in progress. Thus, upon completion of the reviewed data and the dataset integrity review, final conclusions will be drawn and presented to Kansas. Results will be tabulated in a presentation and brief written summary. A final report will be started which documents the analysis procedure, review, and recommendations.

Total Percentage of Project Completion:

35%