Research Project Quarterly Progress Report

Date: 5/4/2024 **Project Number:** TPF-5(430) SUPPL. #46

Project Title: ILDOT Steel Railing, Type SMX

Principal Investigator: Rosenbaugh, Loken, Faller, Bielenberg

Principal Contact Information Email: srosenbaugh2@unl.edu **Phone:** (402) 472-9324

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Report Period:

January 1, 2023 to March 31, 2023

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
Project Planning, CAD, and Communications	$19,489	100%	$8,787	$10,724	80%	$8,765
Fabrication of Test Article	$111,818	0%	$0	$0	0%	$111,818
Crash Test MASH 3-11	$73,768	0%	$0	$0	0%	$73,768
Repair of Test Article	$21,830	0%	$0	$0	0%	$21,830
Crash Test MASH 3-10	$58,108	0%	$0	$0	0%	$58,108
Removal, Disposal, and Site Restoration	$15,026	0%	$0	$0	0%	$15,026
Final Reporting and Filing FHWA Eligibility Letter	$19,424	0%	$0	$0	0%	$19,424
Total	$319,463	-	$8,787	$10,724	3%	$309,523

Progress and Accomplishments this Quarter:

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

In Q1 2024, 3D SolidWorks drawings of the test specimen were created and test plans for full-scale MASH crash tests 3-11 and 3-10 were drafted. Test plans are currently being finalized to incorporate minor modifications per correspondence with ILDOT.

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 include labor charges through the end of March 2024.

No challenges have been encountered affecting the timeline of this project, and no significant delays are anticipated at this time.

Anticipated Work Next Quarter:

In Q2 2024, test plans will be provided to ILDOT for final review prior to construction. Material acquisition will also occur in Q2 2024. Pending the status of other projects requiring construction and testing, construction of the IL SMX railing may begin in Q2 2024, although Q3 2024 may be more likely.

Total Percentage of Project Completion:

3%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase I

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt-Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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, CAD, and Reporting	$8,122.00	0	$716.00	82.7	$1,404.00
2. Full Scale Crash Testing	$99,975.00	0	$0.00	76.8	$23,215.00
3. Reporting and Project Deliverables	$7,705.00	0	$0.00	0	$7,705.00
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.)

1. Project Planning, CAD, and Reporting: MwRSF received fianlization of the original contract in July 2023. Rescoping of the research effort was completed in August 2023. MwRSF is awaiting awarding of the contract in order to proceed.

2. Full Scale Crash Testing: None

3. Reporting and Project Deliverables: None

Note that the

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.)

Based on the failure of the full-scale crash test of the free-standing INDOT PCB, INDOT has requested that the project be rescoped to modify the barrier to meet MASH. MwRSF will attempt to rescope the effort to meet these goals in the upcoming quarter. It should be noted that the contract agreement for this research has was just officially completed in mid July 2203, and the rescope effort had to await the completion of the original contract so that a revised contract can be created with the rescope agreement.

The rescoped research effort was submitted in August 2023. MwRSF is awaiting final contract awarding prior to moving forward on the research. It is anticipated in 2Q 2024.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: MwRSF will begin work on the rescoped Phase I research effort when authorized.
2. Full Scale Crash Testing: None.
3. Reporting and Project Deliverables: None

Total Percentage of Project Completion:

72.1%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase II

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

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, CAD, and Reporting	$8,122.00	0	$0.00	0	$8,122.00
2. Full Scale Crash Testing	$126,812.00	0	$0.00	0	$126,812.00
3. Reporting and Project Deliverables	$7,705.00	0	$0.00	0	$7,705.00
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.)

1. Project Planning, CAD, and Reporting: None
2. Full Scale Crash Testing: None
3. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

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 failure of the free-standing PCB crash testing in Phase I of the effort has led to a rescoping of the project. As such, funds may be diverted from the Phases II and III research efforts to accommodate the rescope and project timelines and tasks may be adjusted accordingly.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: None
2. Full Scale Crash Testing: None
3. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

Total Percentage of Project Completion:

0.0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. 27 – FY22-IND-1-PCB _ Phase III

Project Title: MASH 2016 TL-3 Design and Evaluation of the Indiana F-Shape PCB in Free-Standing, Asphalt Anchored Configurations, and Transitions

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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, CAD, and Reporting	$17,433.00	0	$0.00	0	$17,433.00
2. Design and Analysis	$37,592.00	0	$0.00	0	$37,592.00
3. Full Scale Crash Testing	$202,961.00	0	$0.00	0	$202,961.00
4. Reporting and Project Deliverables	$13,704.00	0	$0.00	0	$13,704.00
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.)

1. Project Planning, CAD, and Reporting: None
2. Design and Analysis: None
3. Full Scale Crash Testing: None
4. Reporting and Project Deliverables: None

Note that Phase III will not be initiated until the successful evaluation of the barrier system in Phase I.

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 failure of the free-standing PCB crash testing in Phase I of the effort has led to a rescoping of the project. As such, funds may be diverted from the Phases II and III research efforts to accommodate the rescope and project timelines and tasks may be adjusted accordingly.

Anticipated Work Next Quarter:

1. Project Planning, CAD, and Reporting: None
2. Design and Analysis: None
3. Full Scale Crash Testing: None
4. Reporting and Project Deliverables: None

Note that Phase II will not be initiated until the successful evaluation of the barrier system in Phase I.

Total Percentage of Project Completion:

0.0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) SUPPL. #47–FY22-MNDOT-1

Project Title: MASH TL-3 Thrie Beam Bullnose Installation Manual

Principal Investigator: Robert Bielenberg

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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	$36,540.00	0.0	$0.00	8.8	$33,328.00
2. Design and Analysis	$62,171.00	35.1	$21,831.00	42.3	$35,887.00
3. Reporting and Project Deliverables	$12,051.00	0	$0.00	0	$12,051.00
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.)

1. Project Planning and Correspondence - None

2. Design and Analysis - MwRSF completed the draft of the manual and supplied the draft to MnDOT for review and comment.

3. Reporting and Project Deliverables - None

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.)

Delays occurred on the administrative side of the project related to the initiation of the project. The contract officially started in December 2022, but the contract was not awarded until July of 2023. As such, the contract award date was shifted from 12/2/2022 to 12/31/2026.

Anticipated Work Next Quarter:

1. Project Planning and Correspondence - None

2. Design and Analysis - MwRSF will continue development of manual content as well as seeking further input from the relevant parties. MwRSF will atttempt to get a draft of the manual to MnDOT for review by end of March.

3. Reporting and Project Deliverables - None

Total Percentage of Project Completion:

26.6%

Research Project Quarterly Progress Report

Date: 5/4/2024 **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: 1/21/2020 **Project Completion Date:** 12/31/2022 (12/31/2023)

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%	$1,719	$18,596	70%	$8,559
2.	Design and Analysis	$106,064	0%	$0	$72,860	85%	$33,204
3.	Bogie Testing	$99,897	0%	$0	$48,330	60%	$51,567
4.	Reporting and Deliverables	$18,313	0%	$0	$0	0%	$18,313
5.							
6.							
7.							
8.							
9.	Total	$251,429	-	$1,719	$139,786	70%	$111,643

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 early 2024, the Pooled Fund sponsors were given an update on the project status and progress. Discussions on post design lead to the conclusion that both a 2-bolt and 4-bolt design would be applicable for the plastically deforming W6x15 AGT post.

The project was set to close at the end of 2023, however significant funds remained in the project. Thus, an NCE was submit to extend the project and allow time to investigate foundation requirements.

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 budgets herein include labor charges through March 202423.

The project was behind schedule, and a request for a no-cost extension was submit in late 2022. The NCE was granted and the end date was updated to 12/31/2023. A second no-cost extension request was submit in November 2023 (along with a few other Pooled Fund Year 30 projects). This NCE was accepted in the 1st quarter of 2024 and extended the project to the end of 2024.

Anticipated Work Next Quarter:

Design requirements for the concrete slab/foundation to support the retrofit transition posts will developed and evaluated.

Total Percentage of Project Completion:

70%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #4, RPFP-20-TERM-1

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

Principal Investigator: Robert Bielenberg and Cody Stolle, Faller, et al

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

Project Start Date: 1/21/2020 **Project Completion Date:** 12/31/2024

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	0%	$0.00	65.3%	$6,679.00
2. Full-Scale Crash Testing	$176,505.00	2.6%	$4,553.00	93.6%	$3,564.00
3. Design & Analysis	$39,381.00	9.2%	$3,615.00	61.8%	$11,434.00
4. Reporting & Deliverables	$22,074.00	0%	$0.00	0%	$22,074.00
5.					
6.					
7.					
8.					
9. Total	$257,208.00	3.2%	$8,168.00	83.0%	$43,751.00

Progress and Accomplishments this Quarter:

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

In this quarter, MwRSF worked on further documentation and analysis of the full-scasle testing, development of recommendations for end terminals and curbs, and completion of the summary report for the research effort.

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. MwRSF will continue to make progress on this research in the most effective manner possible moving forward.

Currently, the full-scale testing may be delayed due to its status in the MwRSF testing que. COVID-19 has reduced avaiable staff at the outdoor test facility, created increased employee leave, and created material procurement issues. These issues have created a backlog of testing ath the facility. MwRSF is trying our best to resolve the test backlog, but delays are currently expected for most projects. We will continue to update the status of the full-scale testing and its effect on the overall project timeline.

Due to other project constraints and measurement errors in film analysis of the testing, MwRSF will not finish the summary report for the research effort by the current end date. MwRSF has requested and received a NCE until 12/31/24 as funding remains available in the project.

Anticipated Work Next Quarter:

in the next quarter, MwRSF will continue work on the summary report.

Total Percentage of Project Completion:
83.0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **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: 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:** 12/31/2023

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	0.0%	$0.00	38.3%	$19,096.00
2. Design and Analysis	$177,021.00	9.0%	$15,866.00	75.2%	$43,979.00
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 continued simulations of a short-radius system that dissipates energy through inertial resistance. The simulation effort focused on simulation of additonal impact conditions/locations on the system and determining potential feasiblity issues with the design concept. These issues included effective transitioning to a bridge rail and overall system length.

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.

Due to other project constraints, MwRSF will not finish the research effort by the current end date. MwRSF has requested and received approval for a NCE until 12/31/24 as funding remains available in the project.

Anticipated Work Next Quarter:

MwRSF will make additional progress on simulation of the inertial post short-radius concept. MwRSF will also setup a meeting to review the results to date with sponsors and determine the best path moving forward for the concept as well as other potential options for treatment of intersecting roadways.

Total Percentage of Project Completion:

57.7

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #15, RPFP-21-CABLE-1

Project Title: Redesign of the High-Tension Cable Phase II

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Rosenbaugh, Steelman, Stolle

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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 Plan/Corresp, CAD, Material Certs	$16,861.00	0%	$0.00	90%	$1,131.00
2. Full-Scale Crash Testing	$217,148.00	2%	$3,900.00	90%	$4,466.00
3. Reporting & Project Deliverables	$19,887.00	0%	$0.00	0%	$19,887.00
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.)

Continued compiling the research report

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

Anticipated Work Next Quarter:

Continue writing the summary report. Internal review of draft report. Potentially submit to sponsors for review

Total Percentage of Project Completion:

80%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Supp#16 - RPFP-21-CONC-2

Project Title: Anchoring of Temporary Barrier to Asphalt - Phase II

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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	$13,939.00	0	$0.00	34.1	$8,824.00
2. Design and Analysis	$59,224.00	0	$3,145.00	100	$0.00
3. Full-Scale Crash / Bogie Testing	$122,413.00	8.4	$10,260.00	99.7	$406.00
4. Reporting and Project Deliverables	$29,295.00	0	$0.00	0	$29,295.00
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 worked toward the completion of the summary report detailing the design, simulation, and full-scale crash testing.

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 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 next quarter, MwRSF will work towards completion of the summary report.

Total Percentage of Project Completion:

82.8%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl#17 - RPFP-21-CONC-3

Project Title: MASH TL-3 Portable Barrier System

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/2024

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	$33,717.00	0	$0.00	18.9	$27,337.00
2. Design and Analysis	$81,642.00	6.4	$5,206.00	47.2	$43,091.00
3. Reporting and Project Deliverables	$32,937.00	0	$0.00	0	$32,937.00
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 surveyed the sponsors regarding alternative reinforcement options and preferered segment length. A final reinforcement option and segment length for the prototype barrier segment were selected. MwRSF developed CAD details for final prototype design. Simulations of the final system are underway.

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 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 next quarter, MwRSF will continue analysis of the staggered, interlocking PCB concept. This will include simulation of the final prototype system and simulation of variable gaps between the barrier segments.

MwRSF will also attempt to setup a meeting with manufacturers for feedback on the design and fabrication of prototypes.

Total Percentage of Project Completion:

30.3

Research Project Quarterly Progress Report

Date: 5/8/2024 **Project Number:** TPF-5(430) Suppl. #18, RPFP-21-AGT-1

Project Title: Approach Guardrail Transition Behind Elevated Sidewalk

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

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 and CAD	$27,125	20%	$3,000	$11,652	40%	$15,473
2. Design and Analysis	$87,468	80%	$20,194	$54,521	60%	$32,947
3. Reporting and Project Deliverables	$31,548	0%	$0	$0	0%	$31,548
4.						
5.						
6.						
7.						
8. Total	$146,141	-	$23,194	$66,173	45%	$79,968

Progress and Accomplishments this Quarter:

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

Work this quarter was focused on validating the AGT models that had been assembled in quarter 3 of 2023. The updated 2270P pickup model from NCHRP 22-39 was used to impact models of a 31" tall AGT and a 34" tall AGT, including the upstream stiffness transition, in accordance with MASH TL-3 impact criteria. The results of these simulated impacts were compared against actual MASH crash tests on these systems. Additionally, a 31" tall TL-2 AGT model was created and simulations of the pickup truck impacting the TL-2 system were conducted and compared to physical crash tests.

Although the simulations matched reasonably well, a few edits were recommended to the models, including locking the steering (as was done in NCHRP 22-39 to obtain good vehicle trajectory curves over curbs) and a softening of the soil resistances for ¼-spacing posts in the downstream region of the AGT (models appeared to be a little too stiff on the downstream end).

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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 include labor charges through March 2024.

This project was proposed and budgeted with the understanding that the vehicle and tire models had to be updated as part of a different project prior to conducting simulated crash tests as part of this project. As such, the project was put on hold until Spring of 2023.

Anticipated Work Next Quarter:

The model validations will be completed and impacts into the AGT behind curb will begin to be simulated.

Total Percentage of Project Completion:

45%

Research Project Quarterly Progress Report

Date: 5/8/2024 **Project Number:** TPF-5(430) Suppl. #19, RPFP-21-AGT-3

Project Title: Guidelines for Flaring AGTs, Phase III

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

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 and CAD	$4,705	10%	$4,705	$4,705	100%	$0
2. Full-Scale Crash Testing	$109,854	90%	$76,982	$88,018	85%	$21,836
3. Reporting and Project Deliverables	$6,748	0%	$0	$0	0%	$6,748
4.						
5.						
6.						
7.						
8. Total	$121,307	-	$81,687	$92,723	80%	$28,584

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 the 4th quarter of 2023, Test FLAGT-4 was successfully conducted with a 2270P pickup truck impacting the downstream end of an AGT flared at a rate of 25:1 in accordance with MASH TL-3 criteria. Work this quarter continued the MASH testing on this test installation.

FLAGT-5 was conducted according to MASH Test 3-20 with the 1100C small car impacting the 25:1 flared AGT approximately 5 ft upstream from the concrete buttress. The small car was smoothly captured and redirected with very little vehicle roll or pitch. Damage to the test article was limited to minor lateral deflections and flattening of the lower corrugations of the nested thrie beam rails. The lateral OIVs and ORAs were relatively high at 37.7 ft/s and 14.1 g's, respectively. However, this was expected for a test into a stiff, flared system, and all occupant risk data satisfied MASH limits. Occupant compartment deformation was also minimal with a maximum deformation of 1.3 in. observed to the floor pan. The windshield was shattered, but that was due to deformations to the base of the A-pillar, not direct contact with the system. Thus, test FLAGT-5 PASSED MASH Test 3-20 criteria.

MwRSF is now preparing to evaluate the upstream end of the flared AGT (W-to-thrie transition).

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.)

During Phase II of the flared AGT project, tests FLAGT-1 through FLAGT-3 failed to meet MASH performance criteria. As such, the project has had to be re-scoped and system has had to be redesigned and the tests re-run. Additional project funds were necessary to complete the full-scale testing on flared AGTs. A Phase III was approved as part of the FY 2021 program, and Phase IV of the project was funded in FY 2023.

Due to the three failed crash tests and the corresponding redesign and retrofit activities, the project is behind schedule.

The budget numbers presented herein include labor charges through March 2024.

Anticipated Work Next Quarter:

Test FLAGT-6 will be conducted on the upstream, W-to-thrie region of the AGT with a 25:1 flare rate in accordance with MASH Test 3-20. Pending a successful test, crash testing may continue with the MASH 3-21 pickup test. .

Work will also continue on the test reports for the first three (FAILED) crash tests.

Total Percentage of Project Completion:

80%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #20, RPFP-21-SIGN-1

Project Title: Breakaway Systems for Ground Mounted, Large Steel Sign Support Structures

Principal Investigator: Joshua S. Steelman, Ph.D., P.E.

Principal Contact Information Email: joshua.steelman@unl.edu **Phone:** (402) 472-1972

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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 Plan/Corresp, Lit search, survey	$21,681.00	0	$0	100	$0.00
2. Sign Configuration Analysis & Selection	$28,702.00	5	$1,019	55	$4,146
3. Research Report & Deliverables	$27,357.00	5	$2,038	40	$6,293
4.					
5.					
6.					
7.					
8.					
9. TOTAL	$77,740.00	5	$3,057	62	$10,439

Progress and Accomplishments this Quarter:

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

Task 1 – No progress.

Task 2 – Reviewed analysis methodology for breakaway sign supports from literature.

Task 3 – Continued documentation of findings from Task 1 and methodology for Task 2.

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.

Anticipated Work Next Quarter:

No significant progress anticipated for the next quarter (Oct – Dec 2023). The subsequent quarter (Jan – Mar 2024) will see resumption of activity and progress:

Task 1 – Review state responses to survey. Extend literature review, if deemed necessary.

Task 2 – Analyze signs identified in Task 1 to identify critical configurations.

Task 3 – Extend documentation to include survey results and preliminary analysis findings.

Total Percentage of Project Completion:

62%

Research Project Quarterly Progress Report

Date: 05/07/2024 **Project Number:** TPF-5(430) Suppl. #21, RPFP-21-POLE-1

Project Title: Breakaway Pole Research

Principal Investigator: Faller, R.K., Bielenberg, R.W., Pajouh M.A., Fang C., and Stolle Cody

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

Project Start Date: 07/01/2021 **Project Completion Date:** 12/31/2024

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	$66,665	37.8%	$25,176	$66,665	100%	$0
2. Design and Analysis	$162,291	14.4%	$23,342	$75,283	46.4%	$87,008
3. Reporting and Project Deliverables	$40,509	0%	$0	$0	0%	$40,509
4.						
5.						
6. Total	$269,455	18.01%	$48,518	$141,948	52.7%	$127,517

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 the past quarter, poles mounted on 4-bolt slip bases with various pole heights and weights, single and dual arms were developed and simulated under MASH impact conditions (i.e., MASH 3-60, 3-61, and 3-62, with the center, left, and right quarter impact point and with 0 and 25-degree impact angles). The simulation results (i.e., OIV, roof crush, base activation, and other MASH safety criteria) were analyzed. Prevailing patterns in pole behavior and its interaction with the vehicle were identified. The potential for meeting MASH requirements for a wide range of poles was identified and discussed. These findings were presented at the April pooled fund meeting to the states. Based on the simulation results, recommendations for future full-scale crash testing were made. The report is currently being written.

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 project costs presented herein include labor charges until end of March 2024.

Anticipated Work Next Quarter:

In the upcoming quarter, the report will be completed and needs for additional simulations will be investigated.

Total Percentage of Project Completion:

52.7%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #15, RPFP-21-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Rosenbaugh, Stolle

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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	$18,573.00	10%	$2,095.00	55%	$8,657.00
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.)

Continue maintenance, repair, and upkeep of the website. Update 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 until the funds from Project No.: RPFP-20-PFCHS – TPF-5(430) Supplement #7, Project Title: Pooled Fund Center 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:

Troubleshooting and fixing any issues that have occurred during the transition. Continue maintenance, repair, and upkeep of the website. Update research hub with new completed projects.

Total Percentage of Project Completion:

55%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/2024

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	$43,823.00	50.5	$22,150.00	95.3	$2,041.00
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.)

In this quarter, MwRSF researchers used the LS-DYNA funding to continue to investigate the use of new soil modeling techniques. The funding was also used to beign the effort to implement advanced guardrail steel fracture models into existing models of the MGS.

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

Anticipated Work Next Quarter:

MwRSF will continue to use the LS-DYNA funds to support modeling needs in ongoing Midwest Pooled Fund Projects. This may include the following.

1. MwRSF has recently done an extensive amount of research in advance soil modeling techniques for use in modeling dynamic post in soil interactions. These models have been primarily developed on a component level. Research is needed to more fully developed these advanced soil modeling techniques and incorporate them into existing roadside hardware models to improve our model fidelity and allow improved investigation of soil parameters effects on roadside hardware such as post embedment, slopes, and other factors.
2. MwRSF has recently developed advanced steel fracture parameters for the GISSMO material failure command in LS-DYNA. This allows users to relate the stress state of the material to the failure strain in order to aid in predicting failure under multiple types of loading conditions. To date, the research in this area has focused mainly on the simulation of coupon samples used to develop the failure parameters. Research is needed to incorporate this steel failure methodology into existing guardrail and roadside hardware models.
3. MwRSF sees a need for advancement in concrete modeling methods. Currently several concrete material models exists and previous research at MwRSF has investigated the material models themselves. However, further research is needed to investigate the incorporation of reinforcing steel and in the concrete material and ensuring effective load transfer through the reinforcing steel. Additional investigation of bonding and development of the reinforcement is needed as well.
4. Vehicle model improvements are a constant need for Midwest Pooled Fund research efforts. Currently needed vehicle model improvements include more refined tire models, enhanced suspension models with suspension failure, and upgrades to existing TL-4 single unit truck and TL-5 tractor-trailer models. Additionally, George Mason University (GMU) plans to release a new 1100C vehicle model based on the Hyundai Accent. Conversion and troubleshooting of this new 1100C vehicle model will require a considerable effort. However, it is believed that the new vehicle model could provide much improved 1100C simulation results as the current 1100C vehicle is a 2010 Toyota Yaris that has been discontinued and is not used in MASH crash testing.

5. MwRSF sees the need for development of an improved model of the MGS. The current model is based on older modeling techniques and was validated with older vehicle models that are being phased out. It is believed that its use for studying more complex impact events and system modifications could be significantly improved if the model were updated with the new soil and steel fracture models discussed previously.

Total Percentage of Project Completion:

95.3%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. 28, RPFP-FY20220-MGS-4

Project Title: Evaluation of Increased Blockout Depth with the Midwest Guardrail System

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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, CAD, Material Certs	$25,679.00	0%	$0.00	0%	$25,602.00
2. Design & Analysis	$18,893.00	5%	$1,000.00	95%	$633.00
3. Full-Scale Crash Testing	$203,413.00	1%	$2,949.00	3%	$196,526.00
4. Reporting & Deliverables	$14,866.00	0%	$0.00	0%	$14,866.00
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.)

Complete system detail drawing.

Acquired system materials

Began constructing system

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.)

Signed contracts for the project were not received until July 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

System construction. Potentially conduct first test in the test series.

Total Percentage of Project Completion:

10%

Research Project Quarterly Progress Report

Date: 5/8/2024 **Project Number:** TPF-5(430) Suppl. #29

Project Title: Surface Mounted Strong-Post MGS

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Stolle, Rosenbaugh, Perry, and Steelman

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

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	$44,669	70%	$7,784	$7,956	20%	$36,713
2. Design and Analysis	$69,511	30%	$3,000	$3,000	5%	$66,511
3. Bogie Testing	$75,357	0%	$0	$0	0%	$75,357
4. Reporting and Deliverables	$28,303	0%	$0	$0	0%	$28,303
5.						
6.						
7.						
8.						
9. Total	$217,840	-	$10,784	$10,956	5%	$206,884

Progress and Accomplishments this Quarter:

(Provide an informative summary of tasks/activities that occurred this quarter includes meetings, work plan status,

The project kicked off with a literature review of existing systems and crash tests on surface mounted, guardrail systems. The review included both standard W-beam guardrail installations as well as guardrail transitions (typically thrie beam installations). The literature review also included a quick patent search to ensure that any ideas that evaluated within this project do not infringe upon any existing intellectual property.

Following the literature review, the design process began with concept development. It was noted early on, that directly mounting a W6x8.5 to a surface slab would result in a stronger/stiffer post than a standard guardrail post embedded in soil. Thus, the post would need to incorporate a weakening mechanism of some kind. Various concepts for the attachment of the post to the top surface of a concrete roadway are currently being explored.

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 budgets herein include labor charges through March 2024.

Signed contracts for the project were not received until August of 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

Work will continue on concept development for the design of the new top-mounted post. After selecting a few top designs, LS-DYNA will be used to evaluate and refine the design concepts prior to component testing.

Total Percentage of Project Completion:

5%

Research Project Quarterly Progress Report

Date: 5/8/2024 **Project Number:** TPF-5(430) Suppl. #30

Project Title: Median Approach Guardrail Transition to Concrete Median Barrier

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Stolle, Rosenbaugh, Perry, and Steelman

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

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	$42,550	100%	$669	$1,235	1%	$41,315
2. Design and Analysis	$42,083	0%	$0	$0	0%	$42,083
3. Full-Scale Crash Testing	$134,051	0%	$0	$0	0%	$134,051
4. Reporting and Deliverables	$15,204	0%	$0	$0	0%	$15,204
5.						
6.						
7.						
8.						
9. Total	$233,888	-	$669	$1,235	1%	$232,653

Progress and Accomplishments this Quarter:

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

Work on this project has not yet begun. After many delays, MwRSF received signed contracts for this project (and the rest of the FY2022 Midwest Pooled Fund Program) in August of 2023. Thus, the project has only been open for little more than a quarter and efforts were focused on other Pooled-Fund projects with higher priority (e.g., older Pooled Fund projects that were closing in December 2023).

Charges this quarter were administrative and project communication related.

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 budgets herein include labor charges through March 2024.

Signed contracts for the project were not received until August of 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

The project will begin with a literature review of guardrail transitions (both roadside and median configurations), median W-beam guardrail, and concrete median barriers. The review will focus on MASH crash tested systems, but AGTs evaluated to NCHRP Report No. 350 standards may be included if more data is deemed necessary. Data collected from this literature review will be utilized to identify critical components and possible failure mechanisms for the median transition.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #31 - RPFP-FY2022-WZ-2

Project Title: MASH TL-3 Portable Barrier System – Phase II

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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	$25,089.00	0	$0.00	0	$25,089.00
2. Full-Scale Crash Testing	$291,118.00	0	$0.00	0	$291,118.00
3. Reporting and Project Deliverables	$15,412.00	0	$0.00	0	$15,412.00
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.)

1. Project Planning and Correspondence: None
2. Full-Scale Crash Testing: None
3. Reporting and Project Deliverables : None

Note that the current Phase I Design effort is underway (TPF-5(430) Suppl#17 - RPFP-21-CONC-3). The full-scale crash testing in this effort will begin once Phase I is completed.

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

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0.0

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430)_Suppl. #32, RPFP-FY2022-WZ-3

Project Title: Anchoring Temporary Barriers to Asphalt in Median Installations

Principal Investigator: B. Perry

Principal Contact Information Email: brandon.perry@unl.edu **Phone:** (402) 472-0906

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

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	$38,845.00	10.65%	$4,138.26	23.12%	$29,862.30
2. Design and Analysis	$85,108.00	18.29%	$15,567.74	46.62%	$45,430.04
3. Reporting and Project Deliverables	$31,279.00	0.0%	$0.00	0.0%	$31,279.00
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.)

1. Project Planning, CAD, and Reporting: Internal meetings to discuss LS-DYNA results

2. Design and Analysis: LS-DYNA simulation development was completed. Alternate anchor pin configurations with different impact points including saddle caps were simulated.

3. Reporting and Project Deliverables: None

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.

Anticipated Work Next Quarter:

MwRSF will continue simulating alternate anchor pin configuations and impact points, with and without saddle caps.

Total Percentage of Project Completion:

31.35%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #33 - RPFP-FY2022-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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. Annual Consulting Services Support	$65,000.00	25.7	$16,675.00	35.0	$42,262.00
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.

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

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:
35.0

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #34, RPFP-YR2022-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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	$12,111.00	3%	$366.00	0%	$10,772.00
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.)

Project progress is listed in Project No. RPFP-21-MPFW-TPF-5(430) Supplment #23

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 until the funds from Project No.: RPFP-21-MPFW – TPF-5(430) Supplement #23, Project Title: Midwest Pooled Fund Website have been exhaused.

Signed contracts for the project were not received until July 2023. Thus, the project close date was shifted back 1 year to account for this delay and allow 3 years for the project to be completed.

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #34 - RPFP-FY2022-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Bob Bielenberg

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

Project Start Date: 7/1/2022 **Project Completion Date:** 7/31/2025

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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	$40,000.00	11.6	$4,641.00	11.6	$35,359.00
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.)

In this quarter, MwRSF researchers used the LS-DYNA funding to continue to investigate the use of new soil modeling techniques. The funding was also used to beign the effort to implement advanced guardrail steel fracture models into existing models of the MGS.

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

Anticipated Work Next Quarter:

MwRSF will continue to use the LS-DYNA funds to support modeling needs in ongoing Midwest Pooled Fund Projects. This may include the following.

1. MwRSF has recently done an extensive amount of research in advance soil modeling techniques for use in modeling dynamic post in soil interactions. These models have been primarily developed on a component level. Research is needed to more fully developed these advanced soil modeling techniques and incorporate them into existing roadside hardware models to improve our model fidelity and allow improved investigation of soil parameters effects on roadside hardware such as post embedment, slopes, and other factors.
2. MwRSF has recently developed advanced steel fracture parameters for the GISSMO material failure command in LS-DYNA. This allows users to relate the stress state of the material to the failure strain in order to aid in predicting failure under multiple types of loading conditions. To date, the research in this area has focused mainly on the simulation of coupon samples used to develop the failure parameters. Research is needed to incorporate this steel failure methodology into existing guardrail and roadside hardware models.
3. MwRSF sees a need for advancement in concrete modeling methods. Currently several concrete material models exists and previous research at MwRSF has investigated the material models themselves. However, further research is needed to investigate the incorporation of reinforcing steel and in the concrete material and ensuring effective load transfer through the reinforcing steel. Additional investigation of bonding and development of the reinforcement is needed as well.
4. Vehicle model improvements are a constant need for Midwest Pooled Fund research efforts. Currently needed vehicle model improvements include more refined tire models, enhanced suspension models with suspension failure, and upgrades to existing TL-4 single unit truck and TL-5 tractor-trailer models. Additionally, George Mason University (GMU) plans to release a new 1100C vehicle model based on the Hyundai Accent. Conversion and troubleshooting of this new 1100C vehicle model will require a considerable effort. However, it

is believed that the new vehicle model could provide much improved 1100C simulation results as the current 1100C vehicle is a 2010 Toyota Yaris that has been discontinued and is not used in MASH crash testing.

5. MwRSF sees the need for development of an improved model of the MGS. The current model is based on older modeling techniques and was validated with older vehicle models that are being phased out. It is believed that its use for studying more complex impact events and system modifications could be significantly improved if the model were updated with the new soil and steel fracture models discussed previously.

Total Percentage of Project Completion:

11.6

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #37, RPFP-FY2023-MGS-1

Project Title: Modification & evaluation of the MGS Long Span with Increase Span Length

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Steelman, Stolle

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

Project Start Date: 12/1/2022 **Project Completion Date:** 12/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/243 - 3/31/243	4/30/24

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 Plan/Corresp, CAD, Material Certs	$28,003.00	0%	$26.00	0%	$27,746.00
2. Full-Scale Crash Testing	$331,604.00	0%	$0.00	0%	$331,604.00
3. Reporting & Project Deliverables	$18,263.00	0%	$0.00	0%	$18,263.00
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.)

None

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.)

Signed contracts for the project were not received until July 2023.

Anticipated Work Next Quarter:

Review proposed modifications from previously completed study.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 5/8/2024 **Project Number:** TPF-5(430) Suppl. #19, RPFP-21-AGT-3

Project Title: Guidelines for Flaring AGTs, Phase III

Principal Investigator: Faller, Pajouh, Bielenberg, Lechtenberg, Rosenbaugh, Steelman, and Stolle

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

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 and CAD**	$26,727	0%	$0	$98	1%	$26,629
2. **Crash Testing MASH TL-3**	$262,333	0%	$0	$0	0%	$262,333
3. **Reporting and Project Deliverables**	$21,531	0%	$0	$0	0%	$21,531
4.						
5.						
6.						
7.						
8. **Total**	$310,591	-	$0	$98	0%	$310,493

Progress and Accomplishments this Quarter:

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

Work on this project, Phase IV, has yet to begin as the research efforts are still being conducted on the previous phase of this project – see project TPF-5(430)_Supplement 19 for details on the ongoing Phase III efforts of the Flared AGT 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.)

During Phase II of the project, tests FLAGT-1 through FLAGT-3 failed to meet MASH performance criteria. As such, the project has had to be re-scoped and system has had to be redesigned and the tests re-run. Additional project funds were necessary to complete the full-scale testing on flared AGTs. A Phase III was approved as part of the FY 2021 program, and Phase IV of the project was funded in FY 2023.

Flared AGT related efforts are currently being charged to Phase III of the project (TPF-5(430)_Supplement 19). When the Phase III funds run out, charges will begin to be spent on this project's (Phase IV) funds.

The budget numbers presented herein include labor charges through March 2024.

Anticipated Work Next Quarter:

Work on this project will begin once Phase III of the flared AGT project have been completed.

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 5/1/2023 **Project Number:** TPF-5(430) -Suppl #39

Project Title: PF23 GET-1: Generic End Terminal - Further Development and Evaluation

Principal Investigator: Cody Stolle

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

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 & CAD	$43,537.00	4%	$1,800.00	12%	$38,618.00
2. Analysis, Design, Sysetm Modifications	$21,150.00	20%	$4,250.00	30%	$21,150.00
3. Dynamic Bogie Tests	$93,155.00	20%	$19,047.00	26%	$93,155.00
4. Full-Scale Tests	$253,095.00	0%	$0.00	0%	$253,095.00
5. Report	$26,289.00	0%	$0.00	0%	$26,289.00
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.)

Protoype manufacturing heads were received from the manufacturer and prototype end anchorage hardware was fabricated. Bogie test articles are awaiting construction and testing. Note that invoices for materials and construction labor accrued during 2023Q4 were received and paid during 2024Q1.

Continued discussions were held with manufacturers to seek support for constructing the terminal head for state DOTs. The objective of these discussions, which excludes domestic licensing, is to ensure there remains a standard of maintenance, guidance, best practices, and device inspections available to state DOTs which can compliment research and guidance provided by MwRSF.

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.)

Project is awaiting installation and testing in MwRSF pit. Planning completed to prepare for rapid-succession testing if results of tests are acceptable.

Anticipated Work Next Quarter:

The "pull" and "push" tests of the terminal will be conducted. The research team will analyze results and determine if full-scale testing is ready or if additional modification or redesign are warranted. Full-scale system test plans will be developed. Using the same system for the bogie testing, it is anticipated that the system will be rebuilt retested, pending acceptable outcome of the bogie testing.

Total Percentage of Project Completion:

8.1%

Research Project Quarterly Progress Report

Date: 5/1/2024 **Project Number:** PF23 MWQA-1

Project Title: Continuted revisions to MwRSF Pooled Fund Q&A website

Principal Investigator: Cody Stolle

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

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 & CAD	$6,815.00	0.5%	$52.00	1%	$6,763.00
2. Design and Analysis	$34,277.00	0%	$0.00	0%	$29,711.00
3. Reporting and Project Deliverables	$4,329.00	0%	$0.00	0%	$4,329.00
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.)

Website contractors are still delayed in implementing feedback from the PF Year 29 study. Further work is paused until previously-completed research is added to website and the research team is able to confirm it will function as desired.

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.)

Delays with the web programming team have been prolonged and difficult. Significant turnover at the hired agency and uncompleted work on paid funds are delaying project progress. Progress will resume as soon as the existing recommended updates are implemented.

Anticipated Work Next Quarter:

Upon completion of the website updates, the research team will review the updated website format, content, and data. The prototype website may be sent to state DOTs for initial review and commenting. The research team will then begin the process of reviewing additioanl questions on the Q&A site and updating content again with new filters, links, categories, and attributes to continue the work of PF Year 29 project.

Total Percentage of Project Completion:

1.3

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** RPFP-FY2023-AUTO-1

Project Title: PF23 AUTO-1: Coordination & Collaboration w/ Vehicle Manufacturers & Auto Industry

Principal Investigator: Bob Bielenberg, Cody Stolle, Ron Faller

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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.	$40,000.00	7.3	$2,928.00	7.3	$37,072.00
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.)

MwRSF continued collaboration efforts. MwRSF reached out to the Toyota Collaborative Safety Research Center to discuss potential areas of synergy between the automotive industry and roadside safety community. That meeting was February 2024. Additionally, MwRSF has been invited to present a roadside safety perspective at the 2024 SAE World Congress in April. This will consist of 4-6 hours of presentations and should provide a large number of connections with the auto industry. MwRSF also continued discussions with IIHS regarding roadside hardware compatibility testing for new vehicles. MwRSF has also been holding discussions with Telsa regarding electric vehicles, and Telsa plans to be part of a panel on the subject at the 2024 IRSC meeting in Orlando, FL.

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

Anticipated Work Next Quarter:

MwRSF will continue to discuss potential automotive research conference papers to submit and attend. Papers will focus and potential areas of overalp between roadside safety design and automotive safety as well as potential issues between EVs and current roadside hardware.

Total Percentage of Project Completion:

7.3

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #42 - RPFP-FY2023-CONSULT

Project Title: Annual Consulting Services Support

Principal Investigator: Bob Bielenberg

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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. Annual Consulting Services Support	$65,000.00	0	$0.00	0	$65,000.00
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 no funds will be applied to this effort until the previous consulting funding from previous years is fully expended.

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

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

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #43, RPFP-FY2023-MPFW

Project Title: Midwest Pooled Fund Website

Principal Investigator: Faller, Asadollahipajouh, Bielenberg, Holloway, Lechtenberg, Perry, Rosenbaugh, Stolle

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

Project Start Date: 12/1/2022 **Project Completion Date:** 12/31/2026

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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	$12,868.00	0%	$0.00	0%	$12,868.00
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.)

None

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 until the funds from Project No.: RPFP-22-MPFW – TPF-5(430) Supplement #34, Project Title: Midwest Pooled Fund Website have been exhaused.

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #44 - RPFP-FY2022-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Bob Bielenberg

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

Project Start Date: 12/2/2022 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☒ Quarter 7	January 1 – March 31	April 30

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	$40,000.00	0	$0.00	0	$40,000.00
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.)

MwRSF will use this research funding to further research efforts and advance modeling techniques with LS-DYNA.

Current efforts in this area are being funded using existing funds under TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA and TPF-5(430) Suppl. #35, RPFP-FY202-LS-DYNA. Once that funding is depleted, we will convert to using funds from this effort.

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

Anticipated Work Next Quarter:

None

Total Percentage of Project Completion:

0.0

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Supp#16 - RPFP-21-CONC-2

Project Title: Anchoring of Temporary Barrier to Asphalt - Phase II

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/24

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	$13,939.00	0	$0.00	34.1	$8,824.00
2. Design and Analysis	$59,224.00	0	$3,145.00	100	$0.00
3. Full-Scale Crash / Bogie Testing	$122,413.00	8.4	$10,260.00	99.7	$406.00
4. Reporting and Project Deliverables	$29,295.00	0	$0.00	0	$29,295.00
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 worked toward the completion of the summary report detailing the design, simulation, and full-scale crash testing.

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 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 next quarter, MwRSF will work towards completion of the summary report.

Total Percentage of Project Completion:

82.8%

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl#17 - RPFP-21-CONC-3

Project Title: MASH TL-3 Portable Barrier System

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/2024

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	$33,717.00	0	$0.00	18.9	$27,337.00
2. Design and Analysis	$81,642.00	6.4	$5,206.00	47.2	$43,091.00
3. Reporting and Project Deliverables	$32,937.00	0	$0.00	0	$32,937.00
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 surveyed the sponsors regarding alternative reinforcement options and preferered segment length. A final reinforcement option and segment length for the prototype barrier segment were selected. MwRSF developed CAD details for final prototype design. Simulations of the final system are underway.

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 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 next quarter, MwRSF will continue analysis of the staggered, interlocking PCB concept. This will include simulation of the final prototype system and simulation of variable gaps between the barrier segments.

MwRSF will also attempt to setup a meeting with manufacturers for feedback on the design and fabrication of prototypes.

Total Percentage of Project Completion:

30.3

Pooled Fund
Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) Suppl. #24, RPFP-21-LS-DYNA

Project Title: LS-DYNA Modeling Enhancement Support

Principal Investigator: Faller, Bielenberg, et al.

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

Project Start Date: 7/1/2021 **Project Completion Date:** 7/31/2024

Identify Quarter:	Identify Period of Performance:	Identify Quarterly Report Submittal Deadline:
Quarter 3	1/1/24 - 3/31/24	4/30/2024

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	$43,823.00	50.5	$22,150.00	95.3	$2,041.00
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.)

In this quarter, MwRSF researchers used the LS-DYNA funding to continue to investigate the use of new soil modeling techniques. The funding was also used to beign the effort to implement advanced guardrail steel fracture models into existing models of the MGS.

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

Anticipated Work Next Quarter:

MwRSF will continue to use the LS-DYNA funds to support modeling needs in ongoing Midwest Pooled Fund Projects. This may include the following.

1. MwRSF has recently done an extensive amount of research in advance soil modeling techniques for use in modeling dynamic post in soil interactions. These models have been primarily developed on a component level. Research is needed to more fully developed these advanced soil modeling techniques and incorporate them into existing roadside hardware models to improve our model fidelity and allow improved investigation of soil parameters effects on roadside hardware such as post embedment, slopes, and other factors.
2. MwRSF has recently developed advanced steel fracture parameters for the GISSMO material failure command in LS-DYNA. This allows users to relate the stress state of the material to the failure strain in order to aid in predicting failure under multiple types of loading conditions. To date, the research in this area has focused mainly on the simulation of coupon samples used to develop the failure parameters. Research is needed to incorporate this steel failure methodology into existing guardrail and roadside hardware models.
3. MwRSF sees a need for advancement in concrete modeling methods. Currently several concrete material models exists and previous research at MwRSF has investigated the material models themselves. However, further research is needed to investigate the incorporation of reinforcing steel and in the concrete material and ensuring effective load transfer through the reinforcing steel. Additional investigation of bonding and development of the reinforcement is needed as well.
4. Vehicle model improvements are a constant need for Midwest Pooled Fund research efforts. Currently needed vehicle model improvements include more refined tire models, enhanced suspension models with suspension failure, and upgrades to existing TL-4 single unit truck and TL-5 tractor-trailer models. Additionally, George Mason University (GMU) plans to release a new 1100C vehicle model based on the Hyundai Accent. Conversion and troubleshooting of this new 1100C vehicle model will require a considerable effort. However, it is believed that the new vehicle model could provide much improved 1100C simulation results as the current 1100C vehicle is a 2010 Toyota Yaris that has been discontinued and is not used in MASH crash testing.

5. MwRSF sees the need for development of an improved model of the MGS. The current model is based on older modeling techniques and was validated with older vehicle models that are being phased out. It is believed that its use for studying more complex impact events and system modifications could be significantly improved if the model were updated with the new soil and steel fracture models discussed previously.

Total Percentage of Project Completion:

95.3%

Research Project Quarterly Progress Report

Date: 4/30/2024 **Project Number:** TPF-5(430) – Suppl. #26

Project Title: FY2022-WISDOT-1: Reduced Grading for the MGS Long-Span Guardrail System – Phase I

Principal Investigator: Robert Bielenberg

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

Project Start Date: 6/30/2021 **Project Completion Date:** 12/31/2026

Quarter:	Period of Performance:	Quarterly Report Submittal Deadline:
☐ 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
☐ Quarter 5	July 1 – September 30	October 31
☐ Quarter 6	October 1 – December 31	January 31
☐ Quarter 7	January 1 – March 31	April 30

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	$20,172.00	0	$3,277.93	16.2	$16,894.07
2. Design and Analysis	$11,731.00	0	$0.00	0	$11,731.00
3. Full-Scale Crash Testing	$171,067.00	0	$0.00	0	$171,067.00
4. Reporting and Project Deliverables	$17,801.00	0	$0.00	0	$17,801.00
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.)

1. Project Planning and Correspondence

- In this quarter, MwRSF completed a survey of WisDOT and the Midwest Pooled Fund states to determine the preferred breakaway post type used in the design (timber CRT post or steel UBSP post). The steel UBSP post was preferred by the majority of DOTs and will be used moving forward in the effort.

2. Design and Analysis

- MwRSF began assembling the test plan for the first test of the system using the survey results and the post lengths selected previously.

3. Full-Scale Crash Testing

- None

4. Reporting and Project Deliverables

- None

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

Anticipated Work Next Quarter:

In the upcoming quarter, MwRSF will work towards completion of the test setup CAD and ordering of materials for testing.

Total Percentage of Project Completion:
1.5

Research Project Quarterly Progress Report

Date: 05/07/2024 **Project Number:** TPF-5(430) Suppl. #48, RPFP-FY23-WISDOT-SLOPE-1

Project Title: Guidance for MGS Installed Adjacent to Steep Slopes at Variable Offsets – Phase I

Principal Investigator: Faller, R.K., Bielenberg, R.W., Pajouh M.A., Tewodros Yosef, and Brandon Perry

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

Project Start Date: 12/02/2022 **Project Completion Date:** 12/31/2026

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	$19,994	14.35%	$2,870	$2,870	14.35%	$17,124
2. Dynamic Component Testing	$99,482	0%	$0	$0	0%	$99,482
3. Analysis, Design, and LS-DYNA Simulation	$90,830	0%	$0	$0	0%	$90,830
4. Reporting and Project Deliverables	$29,341	0%	$0	$0	0%	$29,341
Total	$239,647	1.2%	$2,870	$2,870	1.2%	$236,777

Progress and Accomplishments this Quarter:

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

In the past quarter, the test plans for dynamic component testing (six bogie tests) were drafted and sent to the test site queue.

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 solutions to those problems.)

None

The project costs presented herein include labor charges until end of March 2024.

Anticipated Work Next Quarter:

In the upcoming quarter, bogie testing will be conducted.

Total Percentage of Project Completion:

1.2%

Research Project Quarterly Progress Report

Date: 4/30/2024 **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:** 5/9/2026

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	0.0%	$1,115.00	61.6%	$6,724.00
2. Design and Analysis	$10,862.00	0.0%	$0.00	75.1%	$2,708.34
3. Full-Scale Crash Testing	$254,880.00	0.0%	$0.00	31.7%	$173,966.00
4. Reporting and Project Deliverables	$16,147.00	0.0%	$1,513.00	9.4%	$14,634.00
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.)

MwRSF is reviewing the material from the original crash test and will prepare a meeting with WYDOT in the upcoming quarter to restart the effort.

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.)

Currently, material shipping delays and delays to the overall MwRSF test que have put the project behind schedule. MwRSF will attempt to continue to meet the proposed schedule to the degree possible.

Currently, the full-scale testing has been delayed due to its status in the MwRSF testing que. COVID-19 has reduced avaiable staff at the outdoor test facility, created increased employee leave, and created material procurement issues. These issues have created a backlog of testing ath the facility. MwRSF is trying our best to resolve the test backlog, but delays are currently expected for most projects. We will continue to update the status of the full-scale testing and its effect on the overall project timeline.

Due to these delays, MwRSF has requested and received an NCE until 9/30/2022.

As noted previously, the failure of test no. WRCG-1 required revision of the scope and budget for the project. MwRSF revised these items and provided them to WYDOT for approval. MwRSF recevied activation of the project in September 2023.

Note that the budget table included has been updated with the revised scope and budget figures.

Anticipated Work Next Quarter:

In the next quarter, MwRSF will setup a meeting with WYDOT to discuss the project to date and discuss the path forward in terms of design changes.

Total Percentage of Project Completion:
33.9%