

**ANNUAL REPORT**  
**Iowa Highway Research Board**  
**Research and Development Activities**  
**FY 2021**



**DECEMBER 2021**

**ANNUAL REPORT  
OF  
IOWA HIGHWAY RESEARCH BOARD  
RESEARCH AND DEVELOPMENT ACTIVITIES**

**FOR THE  
FISCAL YEAR ENDING JUNE 30, 2021**

RESEARCH AND ANALYTICS BUREAU  
(515) 239-1382  
[www.iowadot.gov/research](http://www.iowadot.gov/research)

TRANSPORTATION DEVELOPMENT DIVISION  
IOWA DEPARTMENT OF TRANSPORTATION  
AMES, IOWA 50010

**DECEMBER 2021**

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## RESEARCH AND DEVELOPMENT

The Iowa DOT's Research section is dedicated to *driving a quality research program that delivers targeted solutions for Iowa's transportation future.*

This report, entitled "Iowa Highway Research Board Research and Development Activities FY2021" is submitted in compliance with Sections 310.36 and 312.3A, Code of Iowa, which direct the submission of a report of the Secondary Road Research Fund and the Street Research Fund, respectively. It is a report of the status of research and development projects in progress on June 30, 2021. It is also a report on projects completed during the fiscal year beginning July 1, 2020 and ending June 30, 2021. Detailed information on each of the research and development projects mentioned in this report is available from the Research and Analytics Bureau, Transportation Development Division, Iowa Department of Transportation.

## THE IOWA HIGHWAY RESEARCH BOARD

In developing a progressive, continuing, and coordinated program of research and development, the Iowa DOT is assisted by the Iowa Highway Research Board (IHRB). This advisory group was established in 1949 by the Iowa State Highway Commission to respond to the research denoted in Sections 310.36 and 312.3A of the Code of Iowa.

The IHRB consists of 15 regular members: seven Iowa county engineers, four Iowa DOT engineers, one representative from Iowa State University, one from The University of Iowa, and two engineers employed by Iowa municipalities. Each regular member may have an alternate who will serve at the request of the regular member. The regular members and their alternates are appointed for a three-year term. The membership of the Research Board for FY21 is listed in Tables I and II.

The Research Board held several regular meetings during the period from July 1, 2020, through June 30, 2021. Suggestions for research and development were reviewed at these meetings and recommendations were made by the Board. Meeting agenda and minutes can be found at <https://iowadot.gov/research/IOWA-HIGHWAY-RESEARCH-BOARD/Meeting-agenda-and-minutes>



Members of the IHRB are serious about the future of transportation. Understanding that every research project has the potential to strengthen the infrastructure and save lives, time, and precious resources, they work hard to make sure new methods, technologies, and materials are developed efficiently and economically for application in the real world.

**Table I - 2020 IOWA HIGHWAY RESEARCH BOARD**

<b><u>Member</u></b>	<b><u>Term Expires</u></b>	<b><u>Alternate</u></b>
<b>Dave Claman, Vice-Chair</b> Preliminary Bridge Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1487 <a href="mailto:David.Claman@iowadot.us">David.Claman@iowadot.us</a>	12/31/2021	Ahmad Abu-Hawash Chief Structural Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1393 <a href="mailto:Ahmad.Abu-hawash@iowadot.us">Ahmad.Abu-hawash@iowadot.us</a>
William Dotzler Materials Engineer, District 3 Iowa DOT 2800 Gordon Drive Sioux City, IA 51102 (712) 239-4713 <a href="mailto:William.Dotzler@iowadot.us">William.Dotzler@iowadot.us</a>	12/31/2021	Chris Brakke Pavement Management Engineer 800 Lincoln Way Ames, IA 50010 (515) 239-1882 <a href="mailto:Chris.Brakke@iowadot.us">Chris.Brakke@iowadot.us</a>
Jeff DeVries Materials Testing Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1237 <a href="mailto:jeff.devries@iowadot.us">jeff.devries@iowadot.us</a>	12/31/2019	Daniel Harness Office of Design, Methods Section 800 Lincoln Way Ames, IA 50010 (515) 239-1727 <a href="mailto:Daniel.Harness@iowadot.us">Daniel.Harness@iowadot.us</a>
Tammy Nicholson Director, Office Location & Environment 800 Lincoln Way Ames, IA 50010 (515) 239-1052 <a href="mailto:Tamara.Nicholson@iowadot.us">Tamara.Nicholson@iowadot.us</a>	12/31/2020	Dan Sprengeler Work Zone Traffic Control Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1823 <a href="mailto:Dan.Sprengeler@iowadot.us">Dan.Sprengeler@iowadot.us</a>
Rudy Koester Public Works Director, City of Waukee 805 University Avenue Waukee, IA 50263 (515) 978-7388 <a href="mailto:rkoester@waukee.org">rkoester@waukee.org</a>	12/31/2020	Matt Cox City Engineer, City of Council Bluffs 209 Pearl Street Council Bluffs, IA 51503-0826 (712) 328-4635 <a href="mailto:mcox@councilbluffs-ia.gov">mcox@councilbluffs-ia.gov</a>
<b>Ronald Knoche, Chair</b> Director of Public Works, Iowa City 410 E. Washington Street Iowa City, IA 52240-1825 (319) 356-5138 <a href="mailto:Ron-Knoche@iowa-city.org">Ron-Knoche@iowa-city.org</a>	12/31/2021	John Joiner Public Works Director, City of Ames 515 Clark Ave Ames, IA 515-239-5165 <a href="mailto:jjoiner@city.ames.ia.us">jjoiner@city.ames.ia.us</a>
Allen Bradley The University of Iowa – Dept. Chair of CEE 4105 Seamans Center Iowa City, IA 52242 (319) 335-6117 <a href="mailto:allen-bradley@uiowa.edu">allen-bradley@uiowa.edu</a>	-----	Paul Hanley The University of Iowa – Dept. of CEE 4105 Seamans Center Iowa City, IA 52242 (319) 335-8137 <a href="mailto:paul-hanley@uiowa.edu">paul-hanley@uiowa.edu</a>
David Sanders Iowa State University, Dept. Chair of CCEE 390 Town Engineering Bldg. Ames, IA 50011 (515) 294-8044 <a href="mailto:sandersd@iastate.edu">sandersd@iastate.edu</a>	-----	Omar Smadi Iowa State University, Associate Professor, CCEE 2711 S. Loop Drive, Suite 4700 Ames, Iowa 50010-8664 (515)294-8103 <a href="mailto:smadi@iastate.edu">smadi@iastate.edu</a>
Wade Weiss, 	-----	

Greene County Engineer 114 N. Chestnut Street Jefferson, IA 50129 (515) 386-5650 <a href="mailto:wweiss@co.greene.ia.us">wweiss@co.greene.ia.us</a>	TRB Rep	
Paul Geilenfeldt III Marshall Co Engineers Office 101 East Church Street Marshalltown IA, 50158-4915 (641)-754-6343 <a href="mailto:pgeilenfeldt@co.marshall.ia.us">pgeilenfeldt@co.marshall.ia.us</a>	12/31/2020 District 1	Taylor Roll Hardin County Engineer 708 16th Street Eldora, IA 50627 (641) 858-5058 <a href="mailto:troll@hardincountyia.gov">troll@hardincountyia.gov</a>
Joel D. Fantz Fayette County Engineers Office 114 N. Vine Street West Union, IA 52175 (563) 422-3552 <a href="mailto:jfantz@co.fayette.ia.us">jfantz@co.fayette.ia.us</a>	12/31/2022 District 2	Dusty Rolando Floyd/Chichasaw County Engineer 101 S. Main St., Suite 201 Charles City, IA 50616 641-257-6151 <a href="mailto:d.rolando@chickasawcoia.org">d.rolando@chickasawcoia.org</a>
Bret Wilkinson Buena Vista County Engineer 215 East 5th Street /PO Box 368 Storm Lake, IA 50588-0368 712-749-2540 <a href="mailto:bwilkinson@bvcountyiowa.com">bwilkinson@bvcountyiowa.com</a>	12/31/2021 District 3	William Rabenberg Clay County Engineer 300 W 4th St #5 Spencer, IA 51301-3806 712-262-2825 <a href="mailto:wrabenberg@co.clay.ia.us">wrabenberg@co.clay.ia.us</a>
Steve Struble Harrison County Engineer 301 North 6th Avenue Logan, IA 51546-0171 (712) 644-3140 <a href="mailto:sstruble@harrisoncountyia.org">sstruble@harrisoncountyia.org</a>	12/31/2020 District 4	Mitchel Rydl Audubon County Engineer 2147 Highway 71 Audubon, IA 50025-7444 712-563-4286 <a href="mailto:mrydl@auduboncountyia.gov">mrydl@auduboncountyia.gov</a>
Andrew McGuire Keokuk County Engineer 101 S. Main Sigourney, Iowa 52591 (641) 622-2610 <a href="mailto:engineer@keokukcountyia.com">engineer@keokukcountyia.com</a>	12/31/2022 District 5	Brad Skinner Appanoose County Engineer 1200 HWY 2 West Centerville, IA 52544 641-856-6193 <a href="mailto:bskinner@appanoosecounty.net">bskinner@appanoosecounty.net</a>
Todd Kinney Clinton County Engineer 1900 N 3rd Street Clinton IA, 52733-2957 (563) 244-0564 <a href="mailto:tkinney@clintoncounty-ia.gov">tkinney@clintoncounty-ia.gov</a>	12/31/2021 District 6	Anthony Bardgett Delaware/Dubuque County Engineer 13047 City View Drive Dubuque, IA 52002 563-557-7283 <a href="mailto:anthony.bardgett@dubuquecounty.us">anthony.bardgett@dubuquecounty.us</a>

**Table II - 2021 IOWA HIGHWAY RESEARCH BOARD**

<b><u>Member</u></b>	<b><u>Term Expires</u></b>	<b><u>Alternate</u></b>
<b>Dave Claman, Chair</b> Preliminary Bridge Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1487 <a href="mailto:David.Claman@iowadot.us">David.Claman@iowadot.us</a>	12/31/2021	Ahmad Abu-Hawash Chief Structural Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1393 <a href="mailto:Ahmad.Abu-hawash@iowadot.us">Ahmad.Abu-hawash@iowadot.us</a>
William Dotzler Materials Engineer, District 3 Iowa DOT 2800 Gordon Drive Sioux City, IA 51102 (712) 239-4713 <a href="mailto:William.Dotzler@iowadot.us">William.Dotzler@iowadot.us</a>	12/31/2021	Chris Brakke Pavement Management Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1882 <a href="mailto:Chris.Brakke@iowadot.us">Chris.Brakke@iowadot.us</a>
Jeff DeVries Materials Testing Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1237 <a href="mailto:jeff.devries@iowadot.us">jeff.devries@iowadot.us</a>	12/31/2022	Daniel Harness Design Methods Section, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1727 <a href="mailto:Daniel.Harness@iowadot.us">Daniel.Harness@iowadot.us</a>
Clayton Burke WZ Traffic and Safety Engineer, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1587 <a href="mailto:Clayton.burke@iowadot.us">Clayton.burke@iowadot.us</a>	12/31/2023	Sarah Okerlund Local Systems Deputy Directory, Iowa DOT 800 Lincoln Way Ames, IA 50010 (515) 239-1291 <a href="mailto:sarah.okerlund@iowadot.us">sarah.okerlund@iowadot.us</a>
Rudy Koester Public Works Director, City of Waukee 805 University Avenue Waukee, IA 50263 (515) 978-7388 <a href="mailto:rkoester@waukee.org">rkoester@waukee.org</a>	12/31/2023	Matt Cox City Engineer, City of Council Bluffs 209 Pearl Street Council Bluffs, IA 51503-0826 (712) 328-4635 <a href="mailto:mcox@councilbluffs-ia.gov">mcox@councilbluffs-ia.gov</a>
Ronald Knoche Director of Public Works, Iowa City 410 E. Washington Street Iowa City, IA 52240-1825 (319) 356-5138 <a href="mailto:Ron-Knoche@iowa-city.org">Ron-Knoche@iowa-city.org</a>	12/31/2021	John Joiner Public Works Director, City of Ames 515 Clark Ave Ames, IA 515-239-5165 <a href="mailto:jjoiner@city.ames.ia.us">jjoiner@city.ames.ia.us</a>
Allen Bradley, The University of Iowa – Dept. Chair of CEE 4105 Seamans Center Iowa City, IA 52242 (319) 335-6117 <a href="mailto:allen-bradley@uiowa.edu">allen-bradley@uiowa.edu</a>	-----	Paul Hanley The University of Iowa – Dept. of CEE 4105 Seamans Center Iowa City, IA 52242 (319) 335-8137 <a href="mailto:paul-hanley@uiowa.edu">paul-hanley@uiowa.edu</a>
David Sanders Iowa State University, Dept. Chair of CCEE 390 Town Engineering Bldg. Ames, IA 50011 (515) 294-8044 <a href="mailto:sandersd@iastate.edu">sandersd@iastate.edu</a>	-----	Omar Smadi Iowa State University, Associate Professor, CCEE 2711 S. Loop Drive, Suite 4700 Ames, Iowa 50010-8664 (515)294-8103 <a href="mailto:smadi@iastate.edu">smadi@iastate.edu</a>

Wade Weiss, Greene County Engineer 114 N. Chestnut Street Jefferson, IA 50129 (515) 386-5650 <a href="mailto:wweiss@co.greene.ia.us">wweiss@co.greene.ia.us</a>	----- TRB Rep	Jacob Thorius Washington County Engineers Office 210 W Main St., Ste. 2 Washington, IA, 52353-1723 (319) 653-7731 <a href="mailto:thorius@co.washington.ia.us">thorius@co.washington.ia.us</a>
Taylor Roll Hardin County Engineer 708 16th Street Eldora, IA 50627 (641) 858-5058 <a href="mailto:troll@hardincountyia.gov">troll@hardincountyia.gov</a>	12/31/2023 District 1	Jamie Johll Webster County Engineer 703 Central Ave, Suite 3 Fort Dodge, IA 50501-3895 (515) 576-3281 <a href="mailto:jjohll@webstercountyia.org">jjohll@webstercountyia.org</a>
Joel D. Fantz Fayette County Engineers Office 114 N. Vine Street West Union, IA 52175 (563) 422-3552 <a href="mailto:jfantz@co.fayette.ia.us">jfantz@co.fayette.ia.us</a>	12/31/2022 District 2	Adam Clemons Wright County Engineer 416 5th Ave SW Clarion, IA 50525-0269 515-532-3597 <a href="mailto:aclemons@co.wright.ia.us">aclemons@co.wright.ia.us</a>
Bret Wilkinson Buena Vista County Engineer 215 East 5th Street /PO Box 368 Storm Lake, IA 50588-0368 712-749-2540 <a href="mailto:bwilkinson@bvcountyiowa.com">bwilkinson@bvcountyiowa.com</a>	12/31/2021 District 3	William Rabenberg Clay County Engineer 300 W 4th St #5 Spencer, IA 51301-3806 712-262-2825 <a href="mailto:wrabenberg@co.clay.ia.us">wrabenberg@co.clay.ia.us</a>
Mitchel Rydl Audubon County Engineer 2147 Highway 71 Audubon, IA 50025-7444 (712) 563-4286 <a href="mailto:mrydl@auduboncountyia.gov">mrydl@auduboncountyia.gov</a>	12/31/2023 District 4	Travis Malone Adams County Engineer 2004 200th Street Corning, IA 50841-0028 (641) 322-3910 <a href="mailto:engineer@adamscountyia.com">engineer@adamscountyia.com</a>
<b>Andrew McGuire, Vice-Chair</b> Keokuk County Engineer 101 S. Main Sigourney, Iowa 52591 (641) 622-2610 <a href="mailto:engineer@keokukcountyia.com">engineer@keokukcountyia.com</a>	12/31/2022 District 5	Brad Skinner Appanoose County Engineer 1200 HWY 2 West Centerville, IA 52544 641-856-6193 <a href="mailto:bskinner@appanoosecounty.net">bskinner@appanoosecounty.net</a>
Todd Kinney Clinton County Engineer 1900 N 3rd Street Clinton IA, 52733-2957 (563) 244-0564 <a href="mailto:tkinney@clintoncounty-ia.gov">tkinney@clintoncounty-ia.gov</a>	12/31/2021 District 6	Anthony Bardgett Delaware/Dubuque County Engineer 13047 City View Drive Dubuque, IA 52002 563-557-7283 <a href="mailto:anthony.bardgett@dubuquecounty.us">anthony.bardgett@dubuquecounty.us</a>



## RESEARCH AND DEVELOPMENT PROJECTS

Proposals for research, development and engineering studies are reviewed by the Iowa Highway Research Board. Expenditure of research and development funds are then authorized on an individual project basis.

These expenditures may be charged to the Primary Road Research Fund, Secondary Road Research Fund or the Street Research Fund, or a combination and the costs are shared.

Table III is a record of expenditures for IHRB Projects made during the fiscal year ending June 30, 2021. Total expenditure was \$3,125,084.33

**TABLE III**  
**FINANCIAL SUMMARY OF RESEARCH AND DEVELOPMENT PROJECT EXPENDITURES**

Project #	Project Title	Primary Road Research Fund Expenditures	Secondary Road Research Fund Expenditures	Street Research Fund Expenditures	Total Expenditures
HR140	Collection & Analysis of Streamflow Data	\$ 94,037.50	\$ 118,561.00	\$ 26,152.00	\$ 238,750.50
HR296	Iowa Local Technical Assistance Program (LTAP)	\$ 72,958.10	\$ 91,197.70	\$ 18,239.50	\$ 182,395.30
TR-375	Transportation Research Board Education for County Engineers		\$ 1,215.00		\$ 1,215.00
TR-673	Design and Performance Verification of a Bridge Column/Footing/Pile System for ABC		\$ 10,000.00	\$ 30,288.60	
TR-699	Real-time Flood Forecasting and Monitoring Systems for Highway Overtopping in Iowa			\$ 432.23	\$ 432.23
TR701	Evaluation of the Use of Link Slabs in Bridge Projects	\$ 16,819.10	\$ 14,704.90		\$ 31,524.00
TR-705	Evaluation of the Performance of a Short-Span T-Beam Bridge in Buchanan County		\$ 9,717.27	\$ 30,720.80	\$ 40,438.07
TR-710	Partially Grouted Retevment for Low Volume Road Bridges		\$ 3,123.38		\$ 3,123.38
TR-712	Evaluate, Modify and Adapt the Concrete Works Software for Iowa's Use	\$ 55,853.36			\$ 55,853.36
TR-715	Beam End Repair for Pre-Stressed Concrete Beams			\$ 1,444.14	\$ 1,444.14
TR-720	Development of Bio-Based Polymers for Us in Asphalt - Phase II			\$ 258.21	\$ 258.21
TR-721	Low-cost Rural Surface Alternatives Phase III			\$ 1,742.10	\$ 1,742.10
TR-722	Increase Service Life at Bridge Ends through Improved Abutment and Approach Slab Details and Water Management Practices		\$ 11,091.17	\$ 2,477.50	\$ 13,568.67
TR-723	Implementation of Negative Moment Reinforcement Detail Recommendations		\$ 60,837.21	\$ 14,405.10	\$ 75,242.31
TR-724	Heating Electrically Conductive Concrete Demonstration		\$ 37,744.37		\$ 37,744.37
TR-725	Low-Cost Rural Surface Alternatives Phase IV: Frost Depth Monitoring and Prediction			\$ 3,024.86	\$ 3,024.86

TR-726	Modernization of Iowa Transportation Program Management System		\$ 96,347.17		\$ 96,347.17
TR-731	Improving Concrete Patching Practices In Iowa Roadways		\$ 35,700.00		\$ 35,700.00
TR-735	Holding Strategies for Low Volume State Routes, Phase II		\$ 16,998.13	\$ 10,064.20	\$ 27,062.33
TR-737	Next Generation Life Cycle Cost Analysis Tool for Bridges in IA			\$ 652.58	\$ 652.58
TR-738	Shrinkage and Temperature Forces in Frame Piers		\$ 5,967.56		\$ 5,967.56
TR-739	Limitations for Semi-Integral Abutment Bridges		\$ 9,202.94		\$ 9,202.94
TR-740	Development of IA Pavement Analysis Technique		\$ 54,977.60		\$ 54,977.60
TR-741	Asset Management, Extreme Weather, and Proxy Indicators			\$ 6,146.66	\$ 6,146.66
TR-742	Validation of Gyratory Mix Design in Iowa Phase II		\$ 84,420.51	\$ 16,212.80	\$ 100,633.31
TR-743	Field Demonstration of an Innovative Box Beam Connection	\$ 23,781.49			\$ 23,781.49
TR-745	Development of Operations Management System for Iowa Secondary Road Departments		\$ 59,337.65		\$ 59,337.65
TR-746	Field Implementation of Internally Cured Concrete for Iowa Pavement Systems – TR-676 Phase II		\$ 8,767.41	\$ 22,041.80	\$ 30,809.21
TR-747	Use of Waste Quarry Fines as a Binding Material on Unpaved Roads		\$ 23,035.16	\$ 6,223.96	\$ 29,259.12
TR-748	Characterizing the Behavior of a Machine-Placed UHPC Bridge Deck Overlay			\$ 3,837.49	\$ 3,837.49
TR-749	Impact of Curling & Warping on Concrete Pavement Systems-Phase I		\$ 36,010.22		\$ 36,010.22
TR-752	Validation of Gyratory Mix Design in Iowa Phase II		\$ 7,665.60		\$ 7,665.60
TR-753	Evaluation of Otta Seal Surfacing for Low-Volume Roads in Iowa - Phase II		\$ 76,169.04		\$ 76,169.04
TR-754	Corn Based Deicers		\$ 340.20		\$ 340.20
TR-755	Scientific Innovations in Microsurfacing and Slurry Seal Mixture Design	\$ (46.66)			\$ (46.66)
TR-756	Feasibility Study of 3D Printing of Concrete Transportation Infrastructures		\$ 12,098.46		\$ 12,098.46
TR-757	Exploration of Ultrasound for the Evaluation and Preservation of Structures		\$ 10,909.26		\$ 10,909.26
TR-758	Use of Cold Gas Dynamic Spraying for Repair of Steel Structures		\$ 5,482.99		\$ 5,482.99
TR-759	Un-Ticketing: An Upside-Down Approach to Speed Compliance	\$ 244.94			\$ 244.94
TR-760	Reducing Uncertainties in Snow Fence Design: Development of methods for Estimation of Snow Drifting		\$ 15,693.93	\$ 1,439.00	\$ 17,132.93
TR-762	Development of Pavement Structural Analysis Tool for Iowa Local Roads	\$ 28,466.78			\$ 28,466.78
TR-763	Design of Drilled shafts in Iowa - Validation and Design Recommendations	\$ 8,193.31	\$ 62,078.18		\$ 70,271.49
TR-764	Use of Concrete Grinding Residue as a Soil Amendment	\$ 45,120.00	\$ 1,863.25		\$ 46,983.25
TR-765	Evaluation of Penetrating sealers for Concrete		\$ 58,787.33		\$ 58,787.33
TR-766	Evaluation of Galvanized and Painted - Galvanized Steel Piling		\$ 12,351.30		\$ 12,351.30

TR-767	Fiber-Reinforced Concrete in Bridge Decks		\$ 29,714.55		\$ 29,714.55
TR-768	Design and Detailing Requirements for Columns under Collision		\$ 22,003.94		\$ 22,003.94
TR-769	Coarse Aggregate Deterioration in Granular Surfaces and Shoulders		\$ 121,764.76		\$ 121,764.76
TR-770	Quality Standards for Inclusion of High Recycled Asphalt Pavement Content in Asphalt Mixtures		\$ 93,239.57		\$ 93,239.57
TR-771	Performance Evaluation of Very Early Strength Latex Modified Concrete - Phase III	\$ 58,262.59	\$ 21,247.20		\$ 79,509.79
TR-772	Performance Evaluation of Polyester Polymer Concrete Overlays Continuation - Phase II		\$ 32,430.00		\$ 32,430.00
TR-773	Development of Non-Proprietary Ultra-High Performance Concrete (UHPC) for Iowa Bridges	\$ 3,903.26	\$ 63,270.71		
TR-774	Cold In-Place Recycling Project Selection and Guidance for Iowa Roadways	\$ 31,364.62	\$ 45,512.78		
TR-776	Concrete Box Culvert Earth Pressure Monitoring	\$ 42,580.00	\$ 45,399.39		\$ 87,979.39
TR-777	Development of a Smartphone-Based Road Performance Data Collection Tool		\$ 79,581.90		\$ 79,581.90
TR-778	2020 Secondary Road Research Support		\$ 12,119.25		\$ 12,119.25
TR-779	Evaluation of Performance of A709 Grade QST 65 Steel	\$ 21,759.14	\$ 14,236.17		
TR-781	Development of Approaches to Quantify Superloads and Their Impacts on the Iowa Road Infrastructure System	\$ 55,542.47			\$ 55,542.47
TR-782	Guide to Remediate Bridge Deck Cracking	\$ 65,000.00	\$ 5,000.00		\$ 70,000.00
TR-783	Improving the Performance of Granular Roadways with Organosilanes	\$ 54,650.82			\$ 54,650.82
TR-784	Iowa's Pavement Preservation Guide	\$ 13,798.07			\$ 13,798.07
TR-785	Load and Resistance Factor Rating of Iowa DOT Standard Bridges designed LRFDF	\$ 63,748.80	\$ 73,131.79	\$ 3,247.75	\$ 140,128.34
TR-786	2021 Iowa Secondary Roads Research Support	\$ 131,818.02			\$ 131,818.02
TR-787	Utilization of Ground Tire Rubber for Energy Efficient Pavements	\$ 104,155.94			\$ 104,155.94
TR-788	Mitigation of Chloride-Induced Corrosion through Chemisorption	\$ 30,865.44			\$ 30,865.44
TR-789	Accelerated Bridge Construction (ABC) Methodology for Integral Abutments	\$ 14,824.48			\$ 14,824.48
TR-790	Alternative Funding Approaches for Iowa Roads	\$ 69,948.80	\$ 17,487.20		\$ 87,436.00
TR-791	Bridges Designed for Minimum Maintenance	\$ 13,250.00			\$ 13,250.00
TR-792	Assessing the Flood Reduction Benefits of On-Road Structures	\$ 2,439.72			\$ 2,439.72
TR-793	Superabsorbent Polymers In Concrete to Improve Durability	\$ 863.62	\$ 475.16		\$ 1,338.78
TR-794	Iowa Public Works Service Bureau Phase II	\$ 33,023.93	\$ 16,034.76		\$ 49,058.69
TR-795	Next Generation Life-Cycle Cost Analysis Tool for Bridges in Iowa - Phase II	\$ 23,760.39			\$ 23,760.39
Project Total		\$ 1,180,988.03	\$ 1,745,045.02	\$ 199,051.28	\$ 3,125,084.33

## SECONDARY ROAD RESEARCH FUND

Section 310.34 of the Iowa Code authorizes the Iowa Department of Transportation to set aside each year an amount not to exceed 1½% of the receipts to the Farm-to-Market Fund in a fund to be known as the Secondary Road Research Fund. This authorization was first made in 1949; it was repealed in 1963 and reinstated in 1965. When the fund was reinstated, the fund was designated to finance engineering studies and research projects. The Iowa Department of Transportation accounting procedure for the Secondary Road Research Fund is based on obligations for expenditures on research projects and not the actual expenditures.

The fiscal year 2021 financial summary is:

Beginning Balance 7-1-20		\$1,093,169.03
Receipts		
State Road Use Tax Fund		
(1½% of receipts)	\$1,599,072.23	
Federal Aid Secondary		
(1½% of receipts)	0.00	
Research Income	<u>\$ 0.00</u>	
Sub-Total	\$1,599,072.23	
Total Funds Available		\$2,692,241.26
Obligation for Expenditures		
Obligated for		
Contract Research	\$746,910.58	
Non-Contract		
Engineering Studies	<u>\$ 0.00</u>	
Total Expenditures		\$746,910.58
Ending Balance 6-30-21		\$1,945,330.68

## STREET RESEARCH FUND

The Street Research Fund was established in 1989 under Section 312.3A of the Iowa Code. Each year \$200,000 is set aside from the street construction fund for the sole purpose of financing engineering studies and research projects. The objective of these projects is more efficient use of funds and materials available for construction and maintenance of city streets. The Iowa Department of Transportation accounting procedure for the Street Research Fund is based on obligations for expenditures on research projects and not the actual expenditures. The fiscal year 2021 financial summary is:

Beginning Balance (7-1-20)	\$10,188.82
Correction Funds from Previous Projects	\$(5,808.38)
FY21 Street Research Funding	<u>\$200,000.00</u>
Total Funds Available for Street Research	\$204,380.44
Total Obligated for Expenditure FY21	( <u>\$194,072.55</u> )
Ending Unobligated Balance 6-30-21	\$10,307.89

## PRIMARY ROAD RESEARCH FUND

The Primary Road Research Fund is sourced from non-obligated funds of the Primary Road Fund. These funds can only be expended on projects for which the funds were reserved, such as contracted research and project-specific research supplies or equipment. An estimate of Primary Road Research Fund expenditures is made prior to the beginning of each fiscal year. The amount expended for contract research from the Primary Road Research Fund for FY21 was \$1,180,988.03 and the estimate for obligations for FY22 is \$1,500,000.

## PROJECTS INITIATED DURING FY 2021

The following projects were initiated in FY 21.

<b>TR-790</b>	Alternative Funding Approaches for Iowa roads
<b>TR-791</b>	Bridges Designed for Minimum Maintenance
<b>TR-792</b>	Assessing the Flood Reduction Benefits of On-Road Structures
<b>TR-793</b>	Superabsorbent Polymers In Concrete to Improve Durability
<b>TR-794</b>	Iowa Public Works Service Bureau – Phase II
<b>TR-795</b>	Next Generation Life-Cycle Cost Analysis Tool for Bridges in Iowa - Phase II
<b>TR-796</b>	Iowa Granular Road Structural Design Tool
<b>TR-797</b>	Feasibility of Granular Road and Shoulder Recycling Phase II

**8 Projects Initiated**

## PROJECTS COMPLETED DURING FY 2021

The following projects were presented to the Iowa Highway Research board during FY 2021 and project Final Reports were approved. Links to the available final reports are provided.

<b>Project Number</b>	<b>Title</b>
TR-715	Beam End Repair for Pre-Stressed Concrete Beams, <a href="http://publications.iowa.gov/33910/">http://publications.iowa.gov/33910/</a>
TR-720	Development of Bio-Based Polymers for Use in Asphalt - Phase II, <a href="http://publications.iowa.gov/35986/">http://publications.iowa.gov/35986/</a>
TR-723	Implementation of the Negative Moment Reinforcing Detail Recommendations, <a href="http://publications.iowa.gov/35987/">http://publications.iowa.gov/35987/</a>
TR-735	Holding Strategies for Low Volume State Routes - Phase II, <a href="http://publications.iowa.gov/35239/">http://publications.iowa.gov/35239/</a>
TR-737	Next Generation Life Cycle Cost Analysis Tool for Bridges in Iowa, <a href="http://publications.iowa.gov/33246/">http://publications.iowa.gov/33246/</a>
TR-741	Asset Management, Extreme Weather, and Proxy Indicators, <a href="http://publications.iowa.gov/35310/">http://publications.iowa.gov/35310/</a>
TR-746	Field Implementation of Internally Cured Concrete for Iowa Pavement Systems - Phase II, <a href="http://publications.iowa.gov/36060/">http://publications.iowa.gov/36060/</a>
TR-754	Innovative Project: Corn Based Deicers, <a href="http://publications.iowa.gov/33802/">http://publications.iowa.gov/33802/</a>
TR-756	Innovative Project: Feasibility Study of 3D Printing of Concrete for Transportation Infrastructures, <a href="http://publications.iowa.gov/33805/">http://publications.iowa.gov/33805/</a>
TR-757	Innovative Project: Exploration of Ultrasound for the Evaluation and Preservation of Structures, <a href="http://publications.iowa.gov/35311/">http://publications.iowa.gov/35311/</a>
TR-758	Innovative Project: Use of Cold Gas Dynamic Spraying for Repair of Steel Structures, <a href="http://publications.iowa.gov/35989/">http://publications.iowa.gov/35989/</a>
TR-760	Reducing Uncertainties in Snow Fence Design: Development of Methods for Estimation of Snow Drifting and the Snow Relocation Coefficient, <a href="http://publications.iowa.gov/33824/">http://publications.iowa.gov/33824/</a>
TR-768	Design and Detailing Requirements for Columns Under Collision, <a href="http://publications.iowa.gov/35240/">http://publications.iowa.gov/35240/</a>
TR-785	Load and Resistance Factor Rating of Iowa DOT Standard Bridges, <a href="http://publications.iowa.gov/38566/">http://publications.iowa.gov/38566/</a>

**14 Projects Completed and Approved**

## STATE TRANSPORTATION INNOVATION COUNCIL



Since 2015, the Iowa Highway Research Board serves as the *State Transportation Innovation Council* for the State of Iowa. The Federal Highway Administration (FHWA) *State Transportation Innovation Council* (STIC) Incentive program provides resources to help STICs foster a culture for innovation and make innovations standard practice. Through the program, funding up to \$100,000 of STIC Incentive Federal Funding is awarded to the State per Federal fiscal year. This funding is

available to support or offset the costs of standardizing innovative practices for Iowa's transportation agencies. STIC Incentive funding may be used to conduct internal assessments; build capacity; develop guidance, standards, and specifications; implement system process changes; organize peer exchanges; offset implementation costs; or conduct other activities the STIC identifies to address innovation implementation goals and to foster a culture for innovation or to make an innovation a standard practice in the state. The requirements for eligibility of a project or activity are:

- The project must have a statewide impact in fostering a culture for innovation or in making an innovation a standard practice.
- The project/activity for which incentive funding is requested must align with innovation goals.
- The project/activity must be eligible for Federal-aid assistance and adhere to applicable federal requirements.
- The proposed project/activity must be started as soon as practical (preferably within 6 months, but no later than 1 year) after notification of approval for STIC Incentive funding and the funds must be expended within 2 years.

The following projects have been initiated through the STIC Incentive Fund program for the State of Iowa. Links to final reports are available for completed projects:

2014, "Design and performance verification of a bridge column/footing/pile system for accelerated bridge construction" <http://publications.iowa.gov/32763/>

2014, "Develop an implementation plan for using 3D tools for structural detailing"

2015, "Technical guidance and training on the implementation of a self-cleaning culvert technology" <http://publications.iowa.gov/27298/>

2015, "Expand the use of mobile devices for e-Construction in field inspection applications"

2016, "Expand the use of mobile devices for e-Construction in field inspection applications"

2016, "Innovations in Transportation Conference"

2016, "Deployment of Iowa DOT Traffic Operations Open Data Service" <http://publications.iowa.gov/27382/>

2019, "In Situ Modulus Measurement Using Automated Plate Load Testing (APLT) to Support the Implementation of Pavement Mechanistic-Empirical (ME) Design"



2018, “Virtual Reality Implementation for Public Engagement”

2019, “Updating Statewide Design Guidance with Complete Streets Considerations”

2020, “Evaluating Electrical Resistivity as a Procedure to Aid in Characterizing Subsurface Conditions”

2021, “Development of Digital As-Built: Incorporating As-Built Information into the I-80/I-380 Building Information Model (BIM) for Use in Future Asset Management Applications”

2021, “eTicketing: Implementation in Rural Areas”

2021, “Guidebook for Application of Polymer-modified Asphalt Overlays: from Decision-Making to Implementation”

2021, “UHPC Preservation and Repair: Peer Exchange with Iowa DOT”

