Developing a Methodology for Implementing Safety Improvements on Low-Volume Roads in Montana

by

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A proposal prepared for the

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PROBLEM STATEMENT

Maintaining safety on the roadway system has become the utmost priority for most highway agencies in recent years. Traffic crashes and associated casualties remain at alarming levels in the United States, which has required all states to work relentlessly in finding various ways to improve road user safety within their jurisdictions. The safety challenge is more serious in Montana where crash rates and severities are above the national average due to the fact that the state highway system is predominantly rural, including an extensive network of local less traveled roadways.

Highway agencies have been facing tighter budgets, including funds dedicated to their ongoing safety programs. Therefore, it is essential for highway agencies to be able to identify those locations that are associated with higher crash risks for optimum use of their limited resources. To that end, highway agencies systemically screen the network to identify those sites that are expected to yield greater safety benefits, thus deserving more consideration for Highway Safety Improvement Program (HSIP) funds. Traditional methods for identifying candidate locations for safety improvements have inherent bias in favor of well-travelled roadways that experience higher crash frequencies. However, low-volume roads may be associated with higher level of risks as a result of the many nonstandard geometric and roadside features which constitute an added risk to road users. Nonetheless, above-normal crash frequencies may not be observed at those locations due to low traffic volumes and the random nature of crash occurrence. Further, many of the crashes on remote local roads, particularly those with lower severities, may go unreported. All these factors on low-volume roads make it very difficult to rely solely on crash history in determining sites that are in most need of safety improvements. The proposed research attempts to address this issue by providing a much-needed guidance on how to systemically screen the network and rank sites on local and low-volume roads that are most deserving of HSIP funds.

BACKGROUND SUMMARY

The literature review conducted in the course of a recent study done by the author found very little research in the area of assessing risks on low-volume rural roads. This lack of research becomes more evident if one exclusively considers the quantitative tools or schemes that have been developed for assessing the aforementioned risks. Therefore this review involves several major studies that were conducted on rural two-lane roads in general (regardless of volume) as well as those that proposed a framework or approach for prioritizing sites that are believed or perceived to have higher crash risks.

Mahgoub et al. (*1*) presented a quantitative assessment method for local low-volume road safety by developing a rural road safety index in South Dakota. The study considered rural two-lane roads with the Average Annual Daily Traffic (AADT) of less than 400 vehicles per day. The index ranked the road network according to five safety issues present along it: roadside obstacles, signs and delineation, cross section, alignment and access, and road surface and maintenance. Safety issues present along 500 foot segments were identified and graded from 1 (needs treatment) to 4 (no treatment needed). Crash history was not considered in calculating the index.

Qin and Wellner (*2*) developed a safety screening tool for high risk rural roads (traffic not specified) in South Dakota. The approach developed used an empirical Bayes sliding window technique in a GIS environment to identify high risk locations within segments and at points. This approach estimated the expected number of crashes for a site per year to compare to the observed crash frequency based on roadway features. From this, crash rates were then calculated to identify high risk crash locations. A largely similar approach in assessing risk was also reported in a study by Chen et al. (*3*).

Cafiso et al. (*4*) looked at the use of road safety inspections as a tool to manage safety on low-volume roads in Italy. A safety index was developed that combined an exposure factor, an accident frequency factor and an accident severity factor. Exposure was calculated as the length of a segment multiplied by AADT. The accident frequency factor was the road safety index value multiplied by the geometric design accident frequency factor (both values established by safety experts). The accident severity factor was a function of the 85th percentile speed divided by base operating speed for the segment multiplied by a roadside severity factor. When all calculations were combined, the result was the severity index. This index was then sorted in descending order to rank segments from worst to best.

Nodari and Lindau discussed a proactive method for evaluating the safety of rural two-lane road segments in Brazil by estimating a potential safety index (*5*). The approach developed by the researchers assigned weights and scores to 34 road features with the scores assigned based on field inspections. The approach developed consisted of the following steps: 1) Identify the features impacting safety, 2) Select features that compose the Potential Safety index (PSI), 3) Estimate the weights of the selected PSI features, and 4) Calculate the PSI for 1 km road sections (also incorporating a safety score from field inspections). Estimation of the PSI weights was made by considering Brazilian experience and through use of the knowledge of a panel of road safety professionals. The entire approach was done to account for sparse crash data. The professionals that were consulted included highway patrol officers, road designers, Brazilian road safety experts and international safety experts.

In discussing the implementation of Wyoming's rural road safety program, Evans, et al. touched upon how high risk rural locations were identified (6). This identification process consisted of five steps: 1) Crash data analysis, 2) Level I field evaluation, 3) Combined ranking to identify potential high risk locations, 4) Level II field evaluation, and 5) Benefit/cost analysis. Crash data from a 19 year period were used to identify road segments with a proportionally higher number of crashes compared to other segments. Based on these identified segments, a field evaluation was performed to assign an initial rating score from 0 (worst) to 10 (best). This score was combined with the initial ranking from the crash data analysis to identify the prioritized list of high risk locations. These sites received a Level II field evaluation to identify safety improvement alternatives. Finally, a benefit/cost analysis was performed to evaluate the potential countermeasures selected to address safety and identify those that would most effectively reduce crashes at the lowest cost.

In a study sponsored by Oregon DOT, Al-Kaisy et al. (7) developed a proactive approach for identifying potentially risky locations where safety treatments might be best targeted. The study used a large sample of Oregon's low volume roads to develop a risk index that assess crash risk for different road geometries and roadside features as well as crash history and traffic exposure. The economic feasibility of a suite of low-cost safety countermeasures on Oregon low-volume roads was also investigated in the study.

deLeur and Sayed developed a road safety risk index in Canada using a four step approach (*8*). The initial step was to identify the factors to be considered in the index. Next, guidelines for the index were formulated, namely the consideration of exposure, probability and consequence. This was followed by developing the procedures to obtain the risk index values, including quantifying the components of risk. Finally, the risk index was calculated as risk exposure, probability and consequence scores multiplied together. The exposure score was a function of traffic volumes on a corridor and at the point of a feature. The probability score was produced by assigning a score for each feature being evaluated on the segment from 0 to 3 (3 representing a high crash probability).

Isebrands discussed a systematic approach to rural road safety as part of an FHWA presentation on general safety improvements (*9*). The approach presented has been employed by Minnesota counties and consists of four steps. First, targeted crash types and risk factors were identified by examining statewide (or countywide) trends. The second step screened and prioritized candidate locations by identifying those where the targeted crash types and risk factors were present on the network. The Minnesota approach assigned a star to the segment or site when certain conditions that met the criteria of concern were present. The greater the number of stars assigned, the more at risk the segment or site was. Following these two primary steps, the remaining steps involved selection of low cost countermeasures and prioritizing projects. Prioritization required a decision-making process to determine which countermeasures and projects should be pursued.

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BENEFITS AND BUSINESS CASE

A number of benefits are expected to result from this research that will help MDT in their efforts of fulfilling Vision Zero initiative. First and foremost, MDT will acquire a much needed guidance that will help the agency in implementing safety improvement program on local roads while achieving an optimum use of agency resources. In 2016, low volume roads (AADT < 750 vehicles per day) in Montana claimed around 38% and 33% of fatal and total crashes in the state respectively (10). The MDT will also benefit from the knowledge gained on various safety programs implemented at other states which helps the agency assess the merits or lack thereof of existing safety program for local roads in Montana. Further, the project is expected to help the MDT engage all counties in the state in the highway safety improvement program(s) for local and low-volume roads.

OBJECTIVES

The main objective of this project is to develop a methodology for identifying and prioritizing locations on local roads at the network level that are more deserving of the Highway Safety Improvement Program funds. This objective is to be achieved through a series of tasks that are outlined in detail in the research plan section. The other related objective is to engage counties in the development and application of the prospective methodology working closely with the MDT on safety improvement projects. The research team plans to present the project to the Montana Association of Counties (MACo) Conference and the Montana Association of County Road Supervisors (MACRS) meeting which will be held in spring 2019 to inform counties about the ongoing project and solicit feedback and/or suggestion related to the development effort. Further, the research team plans to present the methodology at the 12th TRB International Conference on Low-Volume Roads where many local agencies in Montana will be in attendance.

RESEARCH PLAN

The research plan involves nine tasks to achieve the objectives of the project. These tasks are based on those identified in the research problem statement, ideas discussed during the project technical panel first meeting, and the guidance provided by the MDT research programs. These nine tasks are:

1. Project management
2. State of the art review
3. Develop criteria for site identification and prioritization
4. State of practice in local roads safety improvement site prioritization
5. Analyze and assess current approaches
6. Develop and recommend a Montana-specific methodology for local road safety improvement site prioritization
7. Assessing benefits of proposed methodology
8. Implementation plan
9. Final report

1.0 Project Management

Project Management is essential to ensure a successful project and efficient communication between WTI and MDT. Specific project management activities include:

- A kickoff meeting with the project Technical Panel to occur as soon as practical after a contract is in place. The Technical Panel and the WTI team will discuss the research approach to be taken (as laid out in this section of the proposal), potential information sources and agency contacts, and other items that could assist WTI in executing the project.
- Quarterly progress reports delivered to MDT assessing work accomplished on specific tasks and the percent of each task completed to date.
- Meeting with the project technical panel in person or over the phone at any time during the life of the project. Request for such meetings could be initiated by the research team or the project technical panel.
- A final meeting/conference call to present the results of the research to the Technical Panel (following a review and comment period by the panel), if such a meeting is desired and requested by the panel. This meeting would serve to conclude the project, presenting and discussing the findings of the project.

2.0 State of the Art Review

This task will involve an in-depth search and review of literature and other available information pertaining to identifying sites for safety improvements on low-volume roads which will build upon the preliminary review performed in the course of developing this proposal. The review will focus on methods for assessing risks on local and low-volume roads, risk factors on these roads, and the various risk indices that are proposed in literature, among other things. The approach taken in completing this task will employ a comprehensive literature search through sources including, but not limited to, the Transport Research International Documentation (TRID) database, the EI Compendex database, Federal Highway Administration (FHWA) websites, Transportation

Research Board (TRB) websites, Institute of Transportation Engineers (ITE) websites, American Association of State Highway and Transportation Officials (AASHTO) websites, state DOT websites, and other databases (e.g., Google Scholar). Subsections expected to be included in this task will focus on:

- Risk factors on local roads – what are the variables that contribute to increased level of risk on local and low volume roads that can be used as indicators of risk besides crash data;
- Risk assessment on local roads – what are the various approaches and methods that are proposed or applied in assessing risk on local and low-volume roads; and
- Methods for screening sites at the network level – what are the various approaches and methods for screening sites at the network level for the purpose of prioritizing safety improvement projects.

The literature review will search for peer-reviewed papers and journal articles, agency reports, agency websites, and other relevant documentation and information, including ongoing research that may also be relevant, as identified by the TRID's Research in Progress database. This task will thoroughly summarize the knowledge gained from the relevant documented literature and be included as a chapter in the final report.

3.0 Develop Criteria for Site Identification and Prioritization

In this task, the information gathered in task 1 will be synthesized and a set of criteria will be developed for the purpose of assessing the merits and limitations of any of the approaches currently used by highway agencies to be gathered in task 4. The set of criteria may involve aspects such as the risk factors and their types that are included in a particular approach, the way of quantifying risks, how crash data is used in the prioritization process, and the practicality of the subject approach, among other things. It should be understood that these criteria may vary in their significance, and therefore, some criteria may be considered as essential while other criteria may be secondary in importance.

4.0 State of Practice on Screening Sites for Safety Improvements on Local Roads

This task will establish the current state of practice related to identifying and prioritizing safety improvement sites on local and low-volume roads. This will be completed by developing a survey tool and administering the survey to gain understanding of current practices from transportation agencies in the US and Canada. The current practice as it pertains to the approaches and methods in place will be emphasized as well as risk factors involved, data needs, agency staff involved, the project selection process, the frequency of network screening process, etc. The survey tool will be reviewed, revised as needed, and ultimately approved by the Technical Panel prior to use to ensure the results reflect the most important information as determined in part by MDT. The survey will be administered using an online tool (such as Qualtrics or SurveyMonkey), with follow-up email or phone calls as necessary. It is expected that the Technical Panel may have insight into potential contact persons in other agencies to include in the prospective survey. Members of respective interest groups such as TRB and AASHTO committees could also help in obtaining the required information. The current state of practice will be documented throughout this task and included as a chapter in the final report.

5.0 Analyze and Assess Current Approaches

This task will examine all the different approaches used in practice regarding screening the network for safety improvement sites on local roads, which were gathered in the previous task. Using the different criteria developed in Task II, the research team will analyze survey results to assess the merits and limitations of the various approaches used in practice. The challenges and hurdles in implementing these approaches including required resources will be part of the analysis and assessment. At the end of this task, promising approaches and methods are identified and used as input to the following task, i.e. the development of Montana-specific methodology for improving safety on local roads. The outcomes of this task will be documented and included as a chapter in the final report.

6.0 Develop a Montana-Specific Methodology for Selecting Safety Improvement Sites on Local Roads

In this task, the research team will utilize all information acquired in the previous tasks in developing a methodology for selecting safety improvement sites on local roads in the state of Montana. Practicality is an important aspect of the prospective methodology as the objective is to come up with a method that can reasonably be implemented by local agencies / counties throughout the state. The prospective methodology should consider data availability and access as it relates to safety, highway and traffic data as well as the technical skills of local agency / county staff who are expected to use the methodology upon implementation. At the time of writing this proposal, the author foresees the possibility of the new method being similar to a promising method used in practice (if any), or a completely new method that may incorporate some aspects from various existing methods.

7.0 Assessing Benefits of Proposed Methodology

This task will assess the potential benefits of implementing the prospective methodology in selecting sites for safety improvements on local road network. Both qualitative and quantitative assessments will be considered in this task. Information on the current MDT protocols and procedures for implementing safety improvement projects on local roads will be acquired and used as a basis for comparisons. Qualitative assessment is expected to include discussions of all the merits and demerits that are associated with the use of the prospective methodology. On the other hand, the quantitative analysis will assess the economic feasibility of using the prospective methodology by quantifying all benefits and costs associated with the proposed methodology (in the form of a benefit-cost economic analysis). Costs associated with the new methodology may involve the costs of developing the methodology (this project?), any extra agency staff time required for applying and updating the methodology, and training costs, among other things. The major benefit of the proposed methodology is the added safety benefits on local roads represented by reductions in the number of crashes and casualties.

8.0 Implementation Plan

This task will recommend an implementation plan for possible changes and actions that would lead to the full implementation of the proposed methodology. The implementation plan will include recommendations and guidelines that will assist MDT in planning and programming safety improvement projects on local and low-volume roads. The implementation plan will address any known limitations or inefficiencies discovered during the previous tasks as well as specific aspects including data access, data share, recommended procedures for MDT-local agencies cooperation, network screening frequency, etc. The implementation plan will be included in an interim report at the end of this task.

9.0 Final Report

This task will include the preparation and submission of the final report. The final report will include the methods and findings from all prior tasks as well as any recommended actions stemming from these tasks. The section on Task 2.0 results (state of the art review) will include updated information to reflect new studies or reports that may have been published during the duration of the project. A dedicated chapter will also be included for the implementation plan with recommendations and guidelines for the adoption of the new methodology. A draft of the final report will be provided to the Technical Panel two (2) months prior to the completion of the project. This will allow enough time for the report to be reviewed by the Technical Panel and comments/suggestions be incorporated in the final report draft in a timely manner. If the Technical Panel desires a final project meeting then presentation materials for that meeting will also be prepared and provided to the Research Project Manager in advance of the meeting date.

MDT INVOLVEMENT

MDT involvement in this project will be required as follows:

- The Technical Panel will need to provide input, feedback and guidance on the research plan at the kick-off meeting and on as-needed basis afterwards whenever change or modification to the research plan is deemed appropriate by the research team.
- MDT staff will be asked to field information and data requests on an as needed basis. The two main items currently envisioned to rely on Technical Panel involvement (tentatively) include the identification of contact persons in other agencies for the State of the Practice Review as well as information regarding the current approaches for implementing safety improvement projects on local roads in Montana.
- The Technical Panel and Research Staff will review and comment on project deliverables including the final report.

PRODUCTS

The primary products resulting from this work are described below.

- Quarterly Progress Reports will be submitted documenting the work accomplished on specific tasks and the percent of each task completed to date.
- Task Reports documenting the completion of each task and the findings from that task.
- Draft and Final Surveys will be provided to the Technical Panel for review prior to use in the State of Practice Review that will query contacts from other transportation agencies.
- An implementation report, with content (text and images) provided by the researchers, formatted and published by MDT, detailing any implementation recommendations stemming from the project.
- A Final Report that presents the results of the overall research effort will be provided to the Technical Panel for review and comment. The Technical Panel's comments will then be addressed and the report re-submitted as a Final Report. The report will be delivered in both Microsoft Word and Adobe PDF formats and will comply with MDT's report requirements.
- A final report cover page photo (JPG format).
- A Project Summary Report containing a high level overview of the project and findings from the assessment.
- Contingent upon the desires of the Technical Panel, a Final Report Presentation may, or may not be provided and could either be in-person at MDT Headquarters in Helena, or via teleconference.

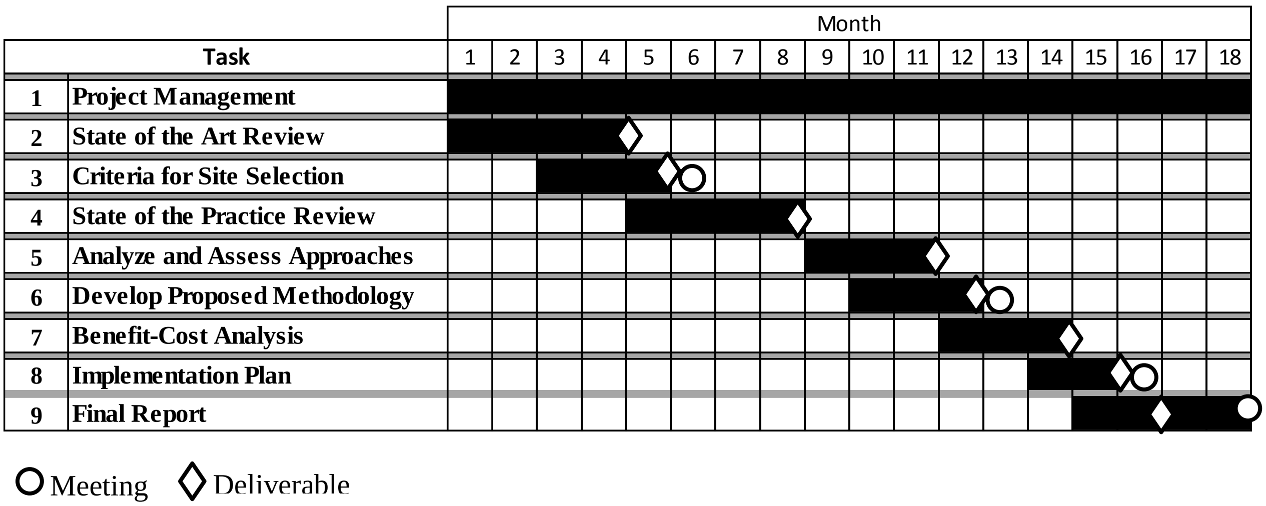
IMPLEMENTATION

The Implementation Plan included as a chapter in the final report will detail the specific recommendations and guidelines for MDT and local agencies in implementing the results from this project, i.e. a proposed methodology for identifying safety improvement sites on local and low-volume roads. This plan will be made available to MDT and local agency staff (through MDT, the sponsor agency) who are involved in the highway safety improvement program. In addition, the research team will likely also disseminate findings from this study to broader audiences, and other interested states via publication in relevant journals and presenting the findings at professional meetings.

SCHEDULE

Table 1 shows the individual task durations and timeline. This project is expected to take 18 months to complete.

Table 1: Project Schedule



BUDGET

This project is funded by the Montana Department of Transportation (MDT) and the Rural and Tribal Center on Mobility (SURTCOM) at the Western Transportation Institute (WTI). The total cost of this project will be $127,023 as summarized in Table 2. This cost includes all allocated research and support staff time, and other anticipated expenses. The budget involves $7,000 tuition for the graduate research assistant and $1850 travel expenses intended for attending the MACO Annual Meeting 2019, the 12th TRB International Conference on Low-Volume Roads to be held in Kalispell, MT in September 2019 as well as 3-4 trips to MDT offices in Helena during the life of the project. The total budget is split between the Montana Department of Transportation ($63,136) and SURTCOM ($63,887).

Table 2: Summary of Cost by Budget Category – Total Project Budget

Item	Amount
Salaries	$70,958
Benefits	$16,906
In-state Travel	$2,150
3-4 trips to Helena ($450)	
TRB Low Volume Road Conference ($1000)	
MACo Annual Conference ($350)	
MACRS Annual Meeting ($350)	
Expendable Supplies	$300
GRA Tuition	$7,000
Total Direct Cost	$97,314
Overhead	$30,084
Total Project Cost	**$127,398**

MDT BUDGET

The total MDT budget for this project is $63,511 as shown in Table 3. Pay and benefit rates for research team members are shown in Table 4 while projected expenditures by task are shown in Table 5. Further, projected expenditures by state and federal fiscal years are shown in Tables 6 and 7, respectively.

Table 3: Summary of Cost by Budget Category – MDT Project Budget

Item	Amount
Salaries	$38,972
Benefits	$9,387
In-state Travel	$2,150
3-4 trips to Helena ($450)	
Low Volume Road Conference ($1000)	
MACo Annual Conference ($350)	
MACRS Annual Meeting ($350)	
Expendable Supplies	$300
GRA Tuition	$0
Total Direct Cost	$50,809
Overhead	$12,702
Total Project Cost	**$63,511**

Table 4: Hourly and Benefit Rates

Staff Name	Hourly Rate	Benefits Rate
Ahmed Al-Kaisy	$68.25	30.4%
Graduate Student	$14.90	10.0%
Business Manager	$39.97	33.0%
Technical editor	$23.83	38.0%

Table 5: Cost by Task

Task	Cost	% of Total Cost
Task 0: Project Management	$8,037.50	12.7%
Task 1: State of the Art Review	$9,565.40	15.1%
Task 2: Criteria for Site Selection	$3,728.50	5.9%
Task 2: State of the Practice Review	$11,202.90	17.6%
Task 4: Analysis and Assessment	$5,432.50	8.6%
Task 5: Develop Proposed Methodology	$8,415.40	13.3%
Task 6: Benefit-Cost Analysis	$5,912.50	9.3%
Task 7: Implementation Plan	$5,239.15	8.2%
Task 8: Final Report	$5,976.75	9.4%
Total	**$63,510.60**	**100.0%**

Table 6: Expenditures by State Fiscal Year

Budget Category	Total	State Fiscal Year	
		2019	2020
Salaries	$38,971.77	$18,706.45	$20,265.32
Benefits	$9,386.71	$4,505.62	$4,881.09
Supplies & Minor Equipment	$300.00	$150.00	$150.00
Travel	$2,150.00	$1,000.00	$1,150.00
Tuition	$0.00	$0.00	$0.00
Direct Costs	$50,808.48	$24,362.07	$26,446.41
Overhead	$12,702.12	$6,097.02	$6,605.10
Total Project Cost	$63,510.60	$30,459.09	$33,051.51

Table 7: Expenditures by Federal Fiscal Year

Budget Category	Total	Federal Fiscal Year	
		2019	2020
Salaries	$38,971.77	$25,331.65	$13,640.12
Benefits	$9,386.71	$6,101.36	$3,285.35
Supplies & Minor Equipment	$300.00	$150.00	$150.00
Travel	$2,150.00	$1,900.00	$250.00
Tuition	$0.00	$0.00	$0.00
Direct Costs	$50,808.48	$33,483.01	$17,325.47
Overhead	$12,702.12	$8,256.38	$4,445.74
Total Project Cost	$63,510.60	$41,739.39	$21,771.21

STAFFING

The research team is composed of the Principal Investigator, Dr. Ahmed Al-Kaisy along with one graduate student researcher. A short biography of the Principal Investigator is provided below.

Ahmed Al-Kaisy, PhD, PE, is a professor in the Department of Civil Engineering at Montana State University (MSU) and the Program Manager for the Safety and Operations Focus Area at the Western Transportation Institute (WTI). Dr. Al-Kaisy is a registered professional engineer in the state of Montana. Dr. Al-Kaisy has long teaching and research experience in many areas of transportation engineering, including traffic operations and management, traffic flow theory, traffic safety, signal optimization and control, highway design, and intelligent transportation systems. Dr. Al-Kaisy has previously worked with the Oregon Department of Transportation on a very relevant project to assess safety risks on low-volume roads in the state. Further, Dr. Al-Kaisy lead several other safety projects including a study to assess the effectiveness of rectangular rapid flashing beacons (RRFB) at pedestrian crossings, another to examine the safety of traffic control at channelized right-turn lanes, safety benefits of variable speed limit (VSL) system along OR-217, in Portland, Oregon, among other projects. He has authored/co-authored more than a hundred refereed publications half of which are fully refereed journal publications. Dr. Al-Kaisy is an active member in many university committees and is affiliated with a number of national and international professional organizations. The resume for the Principal Investigator is provided at the end of this proposal.

The primary role of team members on this project and their level of effort are delineated by task in Table 8.

Table 8: Role and Level of Effort of Research Team Members by Task

Name or Title	Role in Study	Task									
		0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Total**
Ahmed Al-Kaisy	Principal Investigator	120	60	40	100	60	84	72	70	70	**676**
Graduate Student	Data Collection & Analysis	0	400	100	380	180	100	180	100	120	**1560**
Business Manager	Administrative Support	0	4	0	4	0	4	0	4	4	**20**
Support Staff	Technical editing	0	0	0	0	0	0	0	0	32	**32**
	Total	**120**	**464**	**140**	**484**	**240**	**188**	**252**	**174**	**226**	**2288**

The key investigators can commit the time necessary to complete this work in a timely and deliberate manner as shown in Table 9. The level of effort proposed for the principal investigator will not be changed without written consent of MDT.

Table 9: Summary of Commitments for Principal Investigator

Individual	Available Time %	Existing Commitments	
		Commitment	Time, %
Ahmed Al-Kaisy	30	Teaching	40
		MDT LVR Safety Improvements	25
		Other	5

FACILITIES

The Western Transportation Institute (WTI) is the nation's largest transportation institute focusing on rural transportation issues. The Institute was established in 1994 by the Montana and California Departments of Transportation, in cooperation with Montana State University. WTI has an annual budget exceeding $7 million and a 50-person multidisciplinary staff of professionals, students and associated faculty from engineering (mechanical/industrial/civil), computer science, fish and wildlife, ecology, business, and economics. WTI has conducted research in more than 30 states, at local, state, and federal levels.

As a department in the College of Engineering, WTI is also supported by the College and by the umbrella of MSU administrative, academic, and research resources. The research faculties at WTI are assisted by a backbone of support staff. Administrative staff helps with budgeting, procurement, contracts, and accounting. Communications staff provides technical editing, layout, graphic design, and web page support. Information Technology staff maintains network servers and individual computers, software and hardware. Given the nature of this research project, most of the work will be data/information gathering, analysis, and assessment. The research will be conducted on pc/workstations using software available at WTI and the Civil Engineering Department of the College of Engineering at Montana State University.

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ACADEMIC PREPARATION

Post-Doctoral Fellow, McMaster University, Hamilton, Ontario, Canada	1999-2000
PhD Transportation Engineering, Queen's University, Kingston, Ontario, Canada	1999
PhD Course work, Carleton University, Ottawa, Ontario, Canada	1995-1996
BSc, MSc Civil Engineering, University of Baghdad, Iraq	1985

ACADEMIC EMPLOYMENT

Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, July 2012-present.

Visiting Professor, Department of Civil Engineering, American University of Sharjah, UAE, September 2011-June 2013

Associate Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, July 2007-July 2012.

Assistant Professor, Department of Civil Engineering, Montana State University, Bozeman, Montana, 2003-2007

Assistant Professor, Civil Engineering Department, Bradley University, Peoria, IL 2001-2003

Post-Doctoral Research Associate, McMaster University, Hamilton, Ontario, Canada 1999-2000

Lecturer, McMaster University, Hamilton, Ontario, Canada 1999-2000

Research Associate, Royal Military College of Canada, Kingston, Ontario, Canada 1996-1999

Research Assistant, Queen's University, Kingston, Ontario, Canada 1996-1999

Teaching Assistant, Queen's University, Kingston, Ontario, Canada 1996-1999

PRINCIPAL AREAS OF TEACHING & RESEARCH

Traffic operations and management, traffic control, intelligent transportation systems, sustainable Transportation Systems, highway geometric design, traffic simulation and modeling, traffic flow theories, transportation safety

RESEARCH GRANTS

- *Use of Fluorescent Orange Delineators in Temporary Traffic Control Work Zones*, Montana Department of Transportation (Principal Investigator), $180,000 (Pending – Contractual Phase). Information at: https://rip.trb.org/View/1530033
- *Developing a Methodology for Safety Improvements on Low-Volume Roads in Montana*, Montana Department of Transportation (Principal Investigator), $98,000 (Pending – Contractual Phase). Information at: https://trid.trb.org/View/1518839
- *Downtown Bozeman Parking Inventory and Occupancy Study*, City of Bozeman (Principal Investigator), $30,000 (Completed February 18)
- *Improved Analysis of Two-Lane Highway Capacity and Operational Performance,* National Cooperative Highway Research Program (NCHRP), $550,000 (Co-Principal Investigator, PI: Scott Washburn, University of Florida), (completed March 18)
- *Developing Interdisciplinary Research Initiatives on Smart Cities*, COE Thorson Excellence in Engineering (TEER) Grants program (Co-PI), $25,000 (ongoing)
- *Developing Interdisciplinary Research Initiatives on Smart Cities,* Small Urban, Rural and Tribal Center on Mobility (SURTCOM), Western Transportation Institute (Co-PI), $77,241 (ongoing)
- *Assessment of Montana Road Weather Information System (RWIS),* Montana Department of Transportation (Principal Investigator), $152,000 (completed)
- *Traffic Records and Performance Measure Support,* National Highway Traffic Safety Administration (NHTSA), $182,000 (Co-Principal Investigator, PI: Eric Li from Virginia Tech, prime institution) (completed)
- *Innovative Safety Solutions with Pavement Markings and Delineation,* American Traffic Safety Services Association (ATSSA), (Principal Investigator), $30,000 (completed)
- *Risk Factors Associated with High Potential for Serious Crashes*, Oregon Department of Transportation and FHWA, $160,000 (Principal Investigator), (completed)
- *Evaluation of Variable Speed Limit/Variable Advisory Speed Systems,* Oregon Department of Transportation and FHWA, $165,000 (MSU PI, in partnership with Portland State University, PSU PI: Dr. Robert Bertini) (completed)
- *Montana Weigh-in-Motion (WIM) and Automatic Traffic Recorder (ATR) Strategy,* Montana Department of Transportation and FHWA (Investigator), $205,000 (completed)
- *Traffic Calming for Rural 2-Lane Roads,* Central Federal Land Highway Division, FHWA (Principal Investigator), $80,000 (completed)
- *Evaluation of a Variable Speed Limit System for Wet and Extreme Weather Conditions,* Oregon Department of Transportation and FHWA, (Principal Investigator), $170,000 (phase I completed, phase II pending)
- *Cost Effective Local Road Safety Planning and Implementation,* American Traffic Safety Services Association (ATSSA), (Co-Principal Investigator), $35,000 (completed)
- *Montana Rest Area Usage: Data Acquisition and Usage Estimation,* Montana Department of Transportation, (Principal Investigator), $160,000 (completed)
- *Explore ITS Technologies for Work Zones and Work Zone Impact Areas*, Western Federal Land Highway Division, FHWA (Principal Investigator), $120,000 (completed)

- *Effect of Speed, Alignment and Roadside Features on Crash Experience along a Rural Corridor,* Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *City of Bozeman Parking Study,* City of Bozeman, (Principal Investigator), $28,000 (completed)
- *Effect of Alignment and Sight Distance on Drivers' Speed Selection in the Gallatin Canyon,* Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *Channelized Right-Turn Lanes at Signalized Intersections: Traffic Control Empirical Investigation*, US Department of Transportation through Western Transportation Institute, Bozeman, MT, (Principal Investigator), $25,000 (completed)
- *FWS Traffic Monitoring Assessment and Demonstration Project – Phase I,* Central Federal Lands Highway Division, FHWA, (Principal Investigator), $100,000 (completed)
- *Operational Effectiveness of Passing lanes on Two-Lane Highways,* Western Transportation Institute, UTC Graduate Transportation Award, Bozeman, MT, $69,500 (completed)
- *Use of Rural Transportation Infrastructure in Evacuation Operation for the North Gulf Coastal Region,* Center for Urban Rural Interface Studies, Mississippi State University, National Oceanic and Atmospheric Administration (NOAA), (Co-Principal Investigator), $75,000 (completed)
- *Bozeman Pass Wildlife Channelization ITS Project*, Federal Highway Administration and Montana Department of Transportation, (Co-Investigator), $82,498 (completed)
- *Indicators of Performance on Two-Lane Highways*, Western Transportation Institute, UTC Graduate Transportation Award, $69,500 (completed)
- *Effectiveness of Yield-to-Pedestrian Channelizing Devices,* Pennsylvania Department of Transportation, (Co-Investigator), $50,000 (completed)
- *Development of New Analysis Procedures for Two-Lane Highways,* Western Transportation Institute, UTC Graduate Transportation Award, $47,000 (completed)
- *Static Warning Signs for Occasional Hazards: Survey of Practice,* University Transportation Center, US Department of Transportation through the Western Transportation Institute, Bozeman, MT, (Principal Investigator), $25,000 (completed)
- *The Intelligent Transportation System Lab,* Econolite and MSU, $156,000 (completed)
- *Weather Responsive Signal Control: Practical Guidelines,* Western Transportation Institute, NSF REU Program (completed)
- Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones, Western Transportation Institute, NSF REU Program, $12,000 (completed)
- *A New Approach for Developing Passenger Car Equivalency Factors for Heavy Vehicles on Congested Freeways,* Graduate Research Assistant Sponsored Project Award (GRASP), $35,000 (completed)
- *Nighttime Construction: Evaluation of Construction Operations*, Illinois Transportation Research Center (ITRC), Springfield, Illinois, (Co-Principal Investigator), $150,000 (completed)
- *Nighttime Construction: Evaluation of Lighting for Highway Construction*, Illinois Transportation Research Center (ITRC), Springfield, Illinois, (Co-Principal Investigator), $150,000 (completed)
- *Assessing the Occlusion Effect of Heavy Vehicles on the Visibility of Freeway Guide Signs*, Graduate Research Assistant Sponsored Project Award (GRASP), $35,000 (completed)
- *Assessing the Effect of Peak Hour Factor Approximation on Intersection Delay*, Bradley University Caterpillar Faculty Fellowship, $25,000 (completed)

- *Freeway Capacity at Long-Term Reconstruction Zones*, Natural Sciences and Engineering Research Council of Canada (NSERC), (Investigator), (completed)
- *Quality of Service on Freeway facilities,* Natural Sciences and Engineering Research Council of Canada (NSERC), (Investigator), (completed)

PUBLICATIONS

Refereed Journal Articles

1. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Passing Lane Optimum Length on Two-Lane Highways," Canadian Journal of Civil Engineering (CJCE), in press.
2. **Jafari, A.**[1] and Al-Kaisy, A. (2018) "Investigation of Side-by-Side Passing Lane Length and Spacing on Two-Lane Highways" Journal of Advances in Transportation Studies, in press.
3. Al-Kaisy, A., **Jafari, A.**, Washburn, S., Luttinen, T. and Dowling, R. (2018) "Performance Measures on Two-Lane Highways: Survey of Practice," Research in Transportation Economics, Elsevier, in press.
4. Al-Kaisy, A., **Jafari, A.**, and Washburn, S., Luttinen, T. and Dowling, R. (2018) "Traffic Operations on Rural Two-Lane Highways: a Review on Performance Measures and Indicators," Transportation Research Records, Journal of the Transportation Research Board, Sage Publications, ISSN: 0361-1981, Available at: https://doi.org/10.1177/0361198118774743.
5. Al-Kaisy, A., and Ewan, L. (2017) "Prioritization Scheme for Proposed RWIS Sites: Montana Case Study," Transportation and Transit Systems: *Frontiers in Built Environment*, 3:45. doi: 10.3389/fbuil.2017.00045.
6. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Measuring Performance on Two-Lane Highways: Empirical Investigation," *in Transportation Research Record 2615*, Journal of the Transportation Research Board, DOI is 10.3141/2615-08.
7. Al-Kaisy, A., ***Miyake, G.***[2], Stasczuk, J., and Scharf, D. (2016) "Motorists' Voluntary Yielding of Right of Way at Uncontrolled Mid-Block Crosswalks with Rectangular Rapid Flashing Beacons*"* *Journal of Transportation Safety and Security*, ISSN: 1943-9962 (Print) DOI: 10.1080/19439962.2016.12- -67827.
8. Al-Kaisy, A., Ewan, L., and **Hossain, F.** "Economic Feasibility of Safety Improvements: Oregon's Low-Volume Roads Case Study," *Journal of Transportation Safety and Security*, Taylor & Francis, ISSN: 1943-9962 (Print) 1943-9970 (Online), DOI: 10.1080/19439962.2016.1212446, pp. 1-14.
9. Ewan, L., Al-Kaisy, A., and **Hossain, F.** (2016) "Safety Effects of Road Geometry and Roadside Features on Low-Volume Roads," *Transportation Research Record 2580*, Journal of the Transportation Research Board, pp. 47-55.
10. Wang, Y., Veneziano, D., Russel, S. and Al-Kaisy, A. (2016) "Traffic Safety along Tourist Routes in Rural Areas," *Transportation Research Record 2568*, Journal of The Transportation Research Board, pp.55-63.
11. Ismeik, M., Al-Kaisy, A. and Al-Ansari, K. (2015) "Perceived Risk of Phoning while Driving: a Case Study from Jordan," *Journal of Safety Science*, Elsevier, volume 78, pp. 1-10.
12. ***Watson, D.***, Al-Kaisy, A. and ***Anderson, N.*** (2014) "Examining the Effect of Speed and Roadway Geometry on Crash Experience along a Rural Corridor," *Journal of Modern Transportation*, Springer, Vol. 22, Issue 2, pp. 84-95.

[1] Names in bold indicate supervised graduate students.
[2] Names in bold italic indicates supervised undergraduate students.

13. Al-Kaisy, A., ***Krieder, T and Pothering, R.*** (2013) "Speed Selection at Sites with Restrictive Alignment: The US-191 Case Study," *Journal of Advances in Transportation Studies*, Issue 29. pp. 71-82.
14. **Ewan, L.**[3], Al-Kaisy, A. and Veneziano, D. (2013) "Weather Sensing and Road Surface Conditions: Is Technology Mature for Reliable ITS Applications?" *TRB Transportation Research Record 2329*, Journal of the Transportation Research Board, pp. 8-16.
15. **Freedman, Z.** and Al-Kaisy, A. (2013) "Investigation of Performance and Lane Utilization within a Passing Lane on a Two-Lane Rural Highway" *The International journal for Traffic and Transport Engineering*, Vol. 3, issue 3, pp. 279-290.
16. Al-Kaisy, A., Veneziano, D. Dorrington, C., and **Kirkemo, Z.** (2012) "Practical Guidelines for Estimation of Rest Area Use on Rural Interstates and Arterial Highways" *Transportation Research Record 2303*, Journal of the Transportation Research Board, pp. 117-124.
17. Al-Kaisy, A. and **Roefaro, S.** (2012) "Channelized Right-Turn Lanes at Signalized Intersections: The U.S. Experience," *Advances in Transportation Studies*, Vol. 26, pp.57-68.
18. Al-Kaisy, A., **Roefaro, S.** and Veneziano, D. (2012) "Effectiveness of Signal Control at Channelized Right Turning Lanes: An Empirical Study" *Journal of Transportation Safety and Security*, Vol. 4, Issue 1, pp. 19-34.
19. Al-Kaisy, A., **Church, B.**, Veneziano, D. and Dorrington, C. (2011) "Investigation of Parking Dwell Time at Rest Areas on Rural Highways," *Transportation Research Record 2255*, Journal of the Transportation Research Board, pp. 156-164.
20. Al-Kaisy, A., **Kirkemo, Z.**, Veneziano, D. and Dorrington, C. (2011) "Traffic Usage of Rest Areas on Rural Highways: A Recent Empirical Study" *Transportation Research Record 2255*, Journal of the Transportation Research Board, pp. 146-155.
21. Al-Kaisy, A. and **Freedman, Z.** (2011) "Estimating Performance on Two-Lane Highways: Case Study Validation of a New Methodology," *Transportation Research Record 2173,* Journal of the Transportation Research Board, pp. 72-79.
22. **Freedman, Z.** and Al-Kaisy, A (2010) "Empirical Examination of Passing Lane Operational Benefits on Rural Two-Lane Highways," *Journal of Transportation Research Forum*, Vol. 49, No. 3, pp. 53-68.
23. Al-Kaisy, A. and **Karjala, S.** (2010) "Car-Following Interaction and the Definition of Free-Moving Vehicles on Two-Lane Rural Highways." *Journal of Transportation Engineering,* ASCE Publications, Vol.136, Issue 10, pp. 925-931.
24. Ismeik, M. and Al-Kaisy, A. (2010) "Characterization of Cell Phone Use while Driving: The Jordan Experience," *Transport*, Taylor & Francis, Vol. 25, Issue 3, pp. 252-261.
25. Al-Kaisy, A., and Nassar, K. (2009) "Developing a Decision Support Tool for Nighttime Construction in Highway Projects" ASCE *Journal of Construction Engineering & Management*, Volume 135, Issue 2, pp. 119-125.
26. Al-Kaisy, A. and **Durbin, C.** (2009) "Platooning on Two-Lane Two-Way Highways: An Empirical Investigation" *Journal of Advanced Transportation,* Volume 43, Number 1, pp. 71-88.
27. Al-Kaisy, A. and **Karjala, S.** (2008) "Indicators of Performance on Two-Lane Rural Highways: An Empirical Investigation" *In Transportation Research Record 2071*, Journal of the Transportation Research Board, pp. 87-97.
28. Nassar, K. and Al-Kaisy, A. (2008) "A Discrete Event Simulation Model for the Effect of Placement Location on Sign Occlusion in Buildings" *Journal of Automation in Construction*, Elsevier, Volume 17, issue 7, pp. 799-808.

29. Al-Kaisy, A. and **Durbin, C.** (2008) “Evaluating New Methodologies for Estimating Performance on Two-Lane Highways” Canadian Journal of Civil Engineering, Volume 35, Number 8, pp. 777-785.
30. Al-Kaisy, A., Hardy, A., and ***Nemfakos, C.*** (2008) “Static Warning Signs of Occasional Hazards: Do They Work?” The Institute of Transportation Engineers, *ITE journal*, pp. 38-42, June 2008.
31. Rakha, H., Ingle, A., Hancock, K., and Al-Kaisy, A. (2007) “Estimating Truck Equivalencies for Freeway Sections” *In Transportation Research Record 2027,* Journal of the Transportation Research Board, pp. 73-84.
32. Al-Kaisy, A. and ***Freedman, Z.*** (2006) “Weather Responsive Signal Control: Practical Guidelines,” *In Transportation Research Record 1978,* Journal of the Transportation Research Board, pp. 49-60.
33. Al-Kaisy, A. and ***Kerestes, E.*** (2006) “Evaluation of the Effectiveness of Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones” *Canadian Journal of Civil Engineering,* Vol. 23, No. 9, pp 1217-1226.
34. Al-Kaisy, A. (2006) “Passenger Car Equivalents for Heavy Vehicles at Freeways & Multilane Highways: Some Critical Issues” The Institute of Transportation Engineers, *ITE journal*, March 2006.
35. Hardy, A., **Lee, S.**, and Al-Kaisy, A. (2006) “Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: A Case Study in Rural Montana” *In Transportation Research Record 1973,* the Journal of the Transportation Research Board, pp. 64-72.
36. Rakha, H. A., Katz, B., and Al-Kaisy, A. (2006) “Field Evaluation of Truck Weigh-in-Motion Operations,” *Journal of Intelligent Transportation Systems,* Taylor & Francis, Volume 10, No. 2. pp. 49-57.
37. Al-Kaisy, A. and Nassar, K. (2005) “Nighttime Construction Issues Revisited,” *Journal of Construction Research*, volume 6, part 1, pages 139-156
38. Al-Kaisy, A., **Jung, Y.**, and Rakha, H. (2005) “Developing Passenger Car Equivalency Factors for Heavy Vehicles during Congestion” *Journal of Transportation Engineering,* American Society of Civil Engineers (ASCE), Vol. 131, issue 7, pp 514-524.
39. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2005) “Modeling the Effect of Heavy Vehicles on Sign Occlusion at Multilane Highways,” *Journal of Transportation Engineering,* American Society of Civil Engineers (ASCE), Volume 131, issue 3, pp. 219-229.
40. Al-Kaisy, A. and **Jung, Y.** (2004) “Examining the Effect of Heavy Vehicles on Traffic Flow during Congestion,” *Road and Transport Research,* Vol. 13, No. 4, pp. 3-14.
41. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2004) “Assessing the Effect of Heavy Vehicles on the Visibility of Traffic Signs at Multilane Highways,” *Journal of Transportation Engineering,* ASCE Publications, Vol. 130, No. 5, pp. 648-657.
42. Al-Kaisy, A. and Hall, F. L. (2003) "Guidelines for Estimating Capacity at Freeway Reconstruction Zones” *Journal of Transportation Engineering,* American Society of Civil Engineers (ASCE), Vol. 129, No. 5, pp. 572-577.
43. Nassar, K., Al-Kaisy, A., and **Abu Hilal, L.** (2003) “Simulation of Asphalt Paving Operations Under Lane Closure Conditions,” *Journal of Automation in Construction*, Elsevier Science, Vol. 12, No. 5, pp. 527-541.
44. Al-Kaisy, A., Hall, F. L., and ***Reisman, E.*** (2002) " Developing Passenger Car Equivalents for Heavy Vehicles During Queue Discharge Flow" *In Transportation Research - Part A,* Elsevier Science, Vol. 36, no. 8, pp 61-78.

45. Al-Kaisy, A., and Stewart, J. A. (2001) "New Approach for Developing Warrants of Protected Left-Turn Phase at Signalized Intersections," *In Transportation Research – Part A*, Elsevier Science, Vol. 35, no. 6, pp 561-574.
46. Al-Kaisy, A., and Hall, F. L. (2001) "Examination of the Effect of Driver Population at Freeway Long-Term Reconstruction Zones" *In Transportation Research Record 1776*, Transportation Research Board, pp. 35-42.
47. Hall, F. L., Wakefield, S., and Al-Kaisy, A. (2001) "Freeway Quality of Service: What Matters the Most to Drivers and Passengers" *In Transportation Research Record 1776*, Transportation Research Board, pp. 17-23.
48. Al-Kaisy, A., Zhou, M., and Hall, F. L. (2000) "New Insights into Freeway Capacity at Work Zones: An Empirical Case Study" *In Transportation Research Record 1710*, Transportation Research Board, pp. 154-160.
49. Al-Kaisy, A. and Hall, F. L., (2000) "The Effect of Darkness on the Capacity of Long-Term Freeway Reconstruction Zones," In *Transportation Research Circular E-C018*. pp. 164-175.
50. Al-Kaisy, A., Stewart, J. A., and Van Aerde, M. (1999) "A Simulation Approach for Examining Capacity and Operational Performance at Freeway Diverge Areas" *Canadian Journal of Civil Engineering*, Vol. 26, pp. 760-770.
51. Al-Kaisy, A., Stewart, J. A., and Van Aerde, M. (1999) "Microscopic Simulation of Lane Changing Behavior at Freeway Weaving Sections," *Canadian Journal of Civil Engineering*, Vol. 26, pp. 840-851.
52. Al-Kaisy, A., Ewan, L., and **Hossain, F.** "Development of Crash Risk Index on Low-Volume Rural Roads," Transportation and Transit Systems: Frontiers in Built Environment, in review.
53. Jafari, A., Al-Kaisy, A., and Washburn, S. (2018) "Investigation of Passing Segment Optimal Length on 2+1 Highways," Transportation Research Records, TRB, Washington, DC, in review.
54. Bell, M., Wang, Y., and Al-Kaisy, A. (2018) "Risk Mapping Wildlife-Vehicle Collisions across the State of Montana," Transportation Research Records, TRB, Washington, DC, in review.

<u>Peer-Reviewed Articles in Conference Proceedings</u>

55. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Passing Lane Optimum Length on Two-Lane Highways," Submitted for presentation at the 98th Transportation Research Board Annual Meeting, Washington, DC, 12-16 January 2019.
56. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Investigation of Passing Lane Effective Length on Two-Lane Two-Way Highways," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.
57. **Jafari, A.**, Al-Kaisy, A., and Washburn, S. (2018) "Evaluation of Passing Lane Design Configurations on Two-Lane Highways," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.
58. Al-Kaisy, A., **Jafari, A.**, and Washburn, S. (2018) "Traffic Operations on Rural Two-Lane Highways: a Review on Performance Measures and Indicators," Presented at the 97th TRB Annual Meeting, January 7-11, 2018.
59. Al-Kaisy, A., and **Siddiqui, S.** (2017) "Drivers' Compliance with a Variable Advisory Speed System along an Urban Freeway Corridor," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.

60. **Siddiqui, S.,** and Al-Kaisy, A. (2017) "Assessing the Safety Effects of an Advisory Variable Speed Limit System along an Urban Freeway Corridor," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
61. **Siddiqui, S.,** and Al-Kaisy, A. (2017) "Effect of Advisory Variable Speed Limit on The Fundamental Flow Diagrams along Urban Freeway," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
62. Al-Kaisy, A., and Ewan, L. (2017) "Prioritization Scheme for Proposed RWIS Sites: Montana Case Study," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
63. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Following Status and Percent Followers on Two-Lane Two-Way Highways: Empirical Investigation," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
64. Al-Kaisy, A., **Jafari, A.,** and Washburn, S. (2017) "Measuring Performance on Two-Lane Highways: Empirical Investigation," Presented at the 96th TRB Annual Meeting, January 8-12, 2017.
65. Al-Kaisy, A., **Jafari, A.**, Washburn, S., Luttinen, T and Dowling, R. (2016) "Performance Measures on Two-Lane Highways: Survey of Practice," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
66. Al-Kaisy, A., Ewan, L., and **Hossain, F.** (2016) "Economic Feasibility of Safety Improvements: Oregon's Low-Volume Roads Case Study," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
67. Ewan, L., Al-Kaisy, A., and **Hossain, F.** (2016) "Safety Effects of Road Geometry and Roadside Features on Low-Volume Roads," Presented at the Transportation Research Board 95th Annual Meeting, January 10-14, 2016.
68. Wang, Y., Veneziano, D., Russel, S. and Al-Kaisy, A. (2016) "Traffic Safety along Tourist Routes in Rural Areas," Presented at the committee meeting for the Transportation Needs of National Parks and Public Lands Committee (ADA40) during the TRB 95th Annual Meeting, January 10-14, 2016.
69. Sangster, J, Rakha, H., and Al-Kaisy, A. (2015) "Comparative Analysis of the Through-about, Roundabout, and Conventional Signalized Intersection Designs" Presented at the TRB 94th Annual Meeting, January 2015.
70. **Ewan, L**., Al-Kaisy, A. and Veneziano, D. (2013) "Weather Sensing and Road Surface Conditions: Is Technology Mature for Reliable ITS Applications?" Presented at the Transportation Research Board 92nd Annual meeting in Washington DC, January 13-17.
71. Al-Kaisy, A., Veneziano, D. Dorrington, C., and **Kirkemo, Z.** (2012) "Usage Estimation at Rest Areas on Rural Interstate and Arterial Highways: Practical Guidelines" Presented at the Transportation Research Board 91st Annual Meeting in Washington, D.C., January 22-26.
72. Al-Kaisy, A. and **Durbin, C.** (2011) "Platooning on Two-Lane Two-Way Highways: An Empirical Investigation" Proceedings of the 6th International Symposium on Highway Capacity and Quality of Service, Stockholm, Sweden, June 28-July 1, Elsevier, Volume 16.
73. Al-Kaisy, A. and **Freedman, Z.** (2011) "Empirical Examination of Passing Lane Operational Benefits on Rural Two-Lane Highways," Proceedings of the 6th International Symposium on Highway Capacity and Quality of Service, Stockholm, Sweden, June 28-July 1, Elsevier, Vol. 16.
74. Al-Kaisy, A., **Roefaro, S.** and Veneziano, D. (2011) "Effectiveness of Signal Control at Channelized Right Turning Lanes: An Empirical Study" Presented at the 90th TRB Annual meeting, Jan. 23-27.
75. Al-Kaisy, A., **Church, B.** Veneziano, D. and Dorrington, C. (2011) "Investigation of Parking Dwell Time at Rest Areas on Rural Highways," Presented at the 90th TRB Annual meeting, Jan. 23-27.
76. Ismeik, M. and Al-Kaisy, A. (2011) "Characterization of Cell Phone Use while Driving: The Jordan Experience," Presented at the 90th TRB Annual meeting, January 23-27.

77. Al-Kaisy, A., **Kirkemo, Z.**, Veneziano, D. and Dorrington, C. (2011) "Traffic Usage of Rest Areas on Rural Highways: A Recent Empirical Study" Presented at the 90th TRB Annual meeting, January 23-27.
78. Al-Kaisy, A. and **Roefaro, S.** (2010) "Channelized Right-Turn Lanes at Signalized Intersections: A Review of Practice," The Fourth International Symposium on Highway Geometric Design, Valencia, Spain, June 1-5.
79. Al-Kaisy, A., ***Kreider, T.*** and ***Pothering, R.*** (2010) "Speed Selection at Sites with Restrictive Geometries: A Case Study," The 20th Canadian Multidisciplinary Road Safety Conference, Niagara Falls, Canada, June 6-9.
80. Al-Kaisy, A. and **Freedman, Z.** (2010) "Estimating Performance on Two-Lane Highways: Case Study Validation of a New Methodology," Presented at the Transportation Research Board 89th Annual Meeting, January 10-14.
81. Al-Kaisy, A., Hardy, A., and ***Nemfakos, C.*** (2009) "Static Warning Signs of Occasional Hazards: Do They Work?" The Canadian Multidisciplinary Road Safety Conference, Saskatoon, Canada, June 7-10.
82. Al-Kaisy, A. and **Karjala, S.** (2008) "Indicators of Performance on Two-Lane Rural Highways: An Empirical Investigation." Presented at the Transportation Research Board 87th Annual Meeting, Washington D.C., January 13-17.
83. Al-Kaisy, A. and **Karjala, S.** (2008) "Car-Following Interaction and the Definition of Free-Moving Vehicles on Two-Lane Rural Highways." Presented at the Transportation Research Board 87th Annual Meeting, Washington D.C., January 13-17.
84. Al-Kaisy, A. and **Durbin, C.** (2007) "Estimating Percent Time Spent Following on Two-Lane Highways: Field Evaluation of New Methodologies" Presented at the Transportation Research Board 86th Annual Meeting, January 21-25.
85. Rakha, H., Hancock, K., and Al-Kaisy, A. (2007) "Estimating Truck Equivalencies for Freeway Sections" Presented at the Transportation Research Board 86th Annual Meeting, January 21-25.
86. Al-Kaisy, A. and **Freedman, Z.** (2006) "Weather Responsive Signal Control: Practical Guidelines," Presented at the Transportation Research Board 85th Annual Meeting, January 22-26.
87. Hardy, A., **Lee, S.**, and Al-Kaisy, A. (2006) "Effectiveness of Animal Advisory Messages on Dynamic Message Signs as a Speed Reduction Tool: A case study in rural Montana" Presented at the Transportation Research Board 85th Annual Meeting, January 22-26.
88. Al-Kaisy, A. and ***Kerestes, E.*** (2005) "Evaluation of the Effectiveness of Single-Lane Two-Way Traffic Control at Maintenance & Reconstruction Zones" Presented at the Transportation Research Board 84th Annual Meeting, Washington, D.C., 9-13 January.
89. Al-Kaisy, A., **Bhatt, J.**, and Rakha, H. (2003) "Modeling the Effect of Heavy Vehicles on Sign Visibility at Multilane Highways," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.
90. Rakha, H. A., Katz, B., and Al-Kaisy, A. (2003) "Field Evaluation of Weigh-in-Motion Screening on Truck Weigh Station Operations," IEEE Intelligent Vehicle Symposium, Columbus, OH, June 9-11.
91. Al-Kaisy, A., **Bhatt, J.** and Rakha, H. (2003) "Assessing the Effect of Heavy Vehicles on the Visibility of Traffic Signs at Multilane Highways," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.
92. Al-Kaisy, A. and Nassar, K. (2003) "Nighttime Construction Issues Revisited," presented at the Transportation Research Board 82nd Annual Meeting in January 2003.
93. Katz, B., Rakha, H., and Al-Kaisy, A. (2003) "A Modeling Framework and Case Study Evaluation of Weigh Station Operations" presented at the Transportation Research Board 82nd Annual Meeting, Jan. 2003.

94. Al-Kaisy, A., and **Bhatt, J.** (2002) "A Simulation Approach to Investigate the Effect of Heavy Vehicles on Sign Visibility" Proceedings of the TRB 16th Biennial Symposium on Visibility and Simulation, June 2002, Iowa City, Iowa
95. Al-Kaisy, A. and Hall, F. L. (2002) "Guidelines for Estimating Freeway Capacity at Long-Term Reconstruction Zones" Presented at the Transportation Research Board 81st Annual Meeting, Washington, D.C., January 2002.
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103. Bertini, R., Downey, M., Al-Kaisy, A., Ewan, L., and Veneziano, D. (2014) "Evaluation of Weather Responsive Variable Advisory Speed System in Portland, Oregon," Proceedings of the 21st World Congress on Intelligent Transport Systems, Detroit, Michigan, September 2014.
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105. **Ewan L.**, Al-Kaisy, A. and Veneziano, D. (2013) Development of Weather-Responsive Variable Speed Limit System, National Rural ITS Conference, St. Cloud, Minnesota, August 25-28, 2013.
106. Al-Kaisy, A., Veneziano, D. and **Ewan, L.** (2012) "Weather Based Variable Speed Limits" Presented at the Northwest Transportation Conference, Kiewit Center for Infrastructure and Transportation, Oregon State University, Corvallis, Oregon, February 7-9, 2012.
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HONORS AND AWARDS

- Recipient of the *College of Engineering Excellence in Research Award 2018*
- Nominee for the *College of Engineering Excellence in Research Award 2017*
- Recipient of the Albert Nelson Marquis Lifetime Achievement Award 2017
- Editorial Board Member, Transportation and Transit Systems, Frontiers in Built Environment
- Editorial Board Member, International journal for Traffic and Transport Engineering (IJTTE)
- Recipient of the Iraqi Talent Award, Iraqi Academic Conference, The National Academies, Washington, DC, March 14-15 2009.
- Member, Iraqi American Academic and Professional Community (IAAPC) – Civil Engineering Committee
- Leadership MSU Program 2008-2009
- Recipient of Caterpillar Fellowship, Bradley University 2003
- GRASP Award, Bradley University, 2001 and 2002
- Queen's Graduate Fellowship; 1998-1999
- Queen's Graduate Awards; 1998-1999, 1997-1998, 1996-1997
- Samuel McLaughlin Fellowship; 1997-1998
- Carleton University Graduate Award and Fellowship; 1996-1997
- Sabbatical leave, 2011-2012

Professional Affiliations

- Professional Engineer: State of Montana, License # 18377
- Member, Institute of Transportation Engineers, 2003-present
- Member, American Society for Engineering Education (ASEE), 2008-2010, 2016-present
- Member, TRB Joint Sub-Committee ABG10(1) "Ahead of the Curve: Mastering the Management of Transportation Research"
- TRB University Representative 2004-present
- Canadian Association of Road Safety Professionals, 2004 and 2009-2011
- Member, ROI subcommittee, TRB Visualization in Transportation Committee (ABJ95), 2009
- Transportation Research Board (TRB) individual affiliate 1998-2006
- American Society of Civil Engineers 2001-2003
- Canadian Society of Civil Engineering 1999-2000, 2004-2005
- Member, Council on Undergraduate Research (CUR) 2009-present
- International Society of Iraqi Scientists 2001-present
- Iraqi Society for Higher Education Abroad 2005-present
- Order of the Engineers 2007-present