The Larson Institute
The Pennsylvania State University
201 Transportation Research Building
University Park, PA 16802-4710

July 27, 2015

Jon Williams, Director
NCHRP Synthesis Studies
The National Academies

Re: NCHRP Synthesis 20-05/Topic 47-15, Traffic Signal Preemption at Intersections near Highway-Rail Grade Crossings

Dear Mr. Williams,

Your consideration of our interest in preparing the NCHRP Synthesis on Traffic Signal Preemption at Intersections near Highway-Rail Grade Crossings is gratefully appreciated. Highway-rail grade crossings are critical elements in our nation’s transportation systems with unique operational and safety characteristics. Traffic signal preemption is used as a means to provide priority to specific intersection approaches to ensure that vehicle queues do not extend back onto a rail crossing when a train is approaching. Unfortunately, practices regarding traffic signal preemption at highway-rail crossings are not consistent. MUTCD guidance suggests that traffic signal preemption should be provided at traffic signals within 200 feet of rail crossings served by flashing-light signals. In reality, fewer than 25 states use this distance as the minimum distance required for the implementation of traffic signal preemption for highway-rail grade crossings; e.g., South Carolina uses a minimum distance of 500 feet, while Texas uses 1000 feet.

The principal investigator for The Pennsylvania State University team will be Dr. Vikash V. Gayah. Dr. Gayah will be assisted by a graduate student for the literature review, compilation of survey data, and report preparation phases of this project. He will also be assisted, as appropriate, by the professional staff of the Larson Transportation Institute for editing reports, travel arrangements, and other supporting tasks. Additionally, Dr. Gayah will have access to specialized service from the Survey Research Center (SRC) at Penn State, if deemed advantageous by the panel. The service may contribute to a thorough and scientific approach in preparing, conducting and analyzing a nationwide survey.

Dr. Gayah is uniquely suited for this task due to his expertise and experience in the areas of traffic operations and traffic safety, the two areas most critical to understanding signal preemption at highway-rail grade crossings. His previous research in traffic operations has focused primarily on operations of urban traffic networks and traffic signal operations. This includes studies on network-wide impacts of adaptive signal control, localized impacts of bus stops and other temporary bottlenecks near signalized intersections, and coordinated signal operations. His previous research in traffic safety includes the safety impacts of various ITS strategies—variable speed limits, ramp metering and route diversion—on crash risk, development of safety performance functions for various roadway types in Pennsylvania, and the recommendation of crash modification factors that are appropriate for use in Pennsylvania. Dr. Gayah has participated in five recent research projects for various state DOTs (Pennsylvania, Washington and Montana). Two of these involved comprehensive survey activities, including a survey of all state DOTs on practices regarding speed limits for the Montana DOT.
Dr. Gayah’s research has resulted in 30 peer-refereed journal articles and 31 fully refereed conference proceedings. Dr. Gayah is an active member of the Transportation Research Board Committee AHB45: Committee on Traffic Flow Theory and Characteristics. He has assisted in various committee activities, including reviewing and documenting statistics for historical papers, presiding over technical sessions and organizing three technical sessions during the Annual Meetings in 2013 to 2015. Dr. Gayah also serves on the editorial advisory board of Transportation Research Part B: Methodological.

As a part of this project, Dr. Gayah and his team will perform the following tasks:
- Review the relevant national and international literature available on relevant practices with respect to traffic signal preemption at intersections near highway-rail grade crossings. A detailed work plan will be provided to the NCHRP oversight panel for review.
- Survey agencies within the United States and Canada on their specific activities, guidelines, experiences and documentation from agencies funding and operating these systems. A draft survey questionnaire will be provided to the NCHRP oversight panel for review and comment.
- Identify opportunities for and document case study examples from at least three agencies.
- Summarize findings into a final report.

The topics to be considered in this synthesis will include:
- State laws, statutes and policies regarding signal preemptions near highway-rail grade crossings
- Federal regulations, such as those included in the MUTCD
- Current policies for connecting traffic signals and rail warning systems
- Signal timing policies used in preemption strategies
- Use of uninterrupted power supplies and mitigation of power/equipment failures
- Use of four-quadrant gates
- Preemption programming in signal controllers
- Configuration and asset management procedures
- Knowledge base and skillset of operators employing traffic signal preemption
- Previously developed research on multimodal traffic solutions that might be relevant

The publication of this synthesis will be an important step in implementation of signal preemption at highway rail-grade crossings and would provide a more comprehensive overview of such practices across the United States. This will help facilitate the introduction of more uniform policy recommendations regarding this practice.

Sincerely,

Vikash V. Gayah, Ph.D.
Assistant Professor of Civil Engineering
Phone: 814-865-4014; Email: gayah@engr.psu.edu

Approved,

Martin T. Pietruscha, Ph.D., P.E., F.ASCE, F.ITE
Director of the Larson Institute
Phone: 814-863-3954; Email: mtp5@psu.edu
Vikash V. Gayah
Department of Civil and Environmental Engineering
The Pennsylvania State University
231L Sackett Building
University Park, PA 16802

EDUCATION

2012 University of California, Berkeley
Ph.D., Civil and Environmental Engineering
Thesis: The aggregate effect of turns on urban traffic networks
Advisor: Carlos F. Daganzo
Minors: City & Regional Planning; Industrial Engineering & Operations

2006 University of Central Florida
M.S., Civil Engineering
Thesis: Examining route diversion and multiple ramp metering strategies for reducing real-time crash risk on urban freeways
Advisor: Mohammed Abdel-Aty
Minor: Statistics

2005 University of Central Florida
B.S., Civil Engineering
Summa Cum Laude with University Honors

RESEARCH INTERESTS

Urban mobility; traffic operations and control; transportation network modeling; traffic flow theory; traffic safety modeling and management; multimodal transportation operations

RESEARCH AND WORK EXPERIENCE

2012—present The Pennsylvania State University
Assistant Professor of Civil Engineering
Department of Civil and Environmental Engineering

2007—2012 University of California, Berkeley
Graduate Student Researcher
Volvo Center for Future Urban Transport

Traffic Engineer

2005—2007 University of Central Florida
Graduate Research Assistant
Center for Advanced Transportation Systems Simulation

2001—2005 Devo Engineering
Engineering Technician
2003 Employee of the Year
PUBLICATIONS
* indicates student that I advised
** indicates student that I served on dissertation committee or PhD student that I mentored significantly

PEER-REVIEWED JOURNAL PUBLICATIONS


**PEER REVIEWED CONFERENCE PROCEEDINGS**


**CONFERENCE PROCEEDINGS REVIEWED BY ABSTRACT**


4. Gayah, V.V. and Dixit, V.V. (2012) Using mobile vehicle probes to estimate network-wide traffic conditions. *LATSIS - 1st European Symposium on Quantitative Methods in Transportation Systems*, 4-7 September, Lausanne, Switzerland.

5. Dixit, V.V., Gayah, V.V. and Guler, S.I. (2012) Relationship between mean and variance of travel time in networks. *LATSIS - 1st European Symposium on Quantitative Methods in Transportation Systems*, 4-7 September, Lausanne, Switzerland.


**OTHER PROCEEDINGS**


**OTHER PUBLICATIONS**


RESEARCH IN THE PRESS


2. Qian, J. “Berkeley transportation commission to discuss converting 3 city streets to 2-way streets.” Daily Californian, 17 February, 2015. 
   http://www.dailycal.org/2015/02/17/berkeley-transportation-commission-consider-converting-3-city-streets-2-way-streets/

   http://www.theatlanticcities.com/commute/2013/01/case-against-one-way-streets/4549/

PRESENTATIONS

RESEARCH PRESENTATIONS AT CONFERENCES OR OTHER MEETINGS


5. Gayah, V.V. (2012) The aggregate effect of turns on urban traffic networks. Seminar for the Institute of Transportation Studies at the University of California, Berkeley, 24 February, Berkeley, California.


8. Gayah, V.V. and Daganzo, C.F. (2011) An analytical comparison of the ability of one-way and two-way street networks to serve cars and buses. 17th Annual University of
California Transportation Center Student Conference, 24-25 February, Berkeley, California.


INVITED TALKS


2. Gayah, V.V. (2014) Transportation research to solve contemporary issues: Urban mobility and traffic safety. Seminar at the University of Pittsburgh, 24 October, Pittsburgh, Pennsylvania.


5. Gayah, V.V. (2014) The impact of adaptive driving and adaptive signal control on network stability. Seminar at the University of Massachusetts, 24 April, Amherst, Massachusetts.


7. Gayah, V.V. (2013) Some observed traffic phenomena. Traffic Engineering class at the Swiss Federal Institute of Technology (ETH) Zurich, 26 November, Zurich, Switzerland. (guest lecturer)


11. Gayah, V.V. (2013) Using macroscopic models to describe traffic dynamics on urban networks. Seminar at the Swiss Federal Institute of Technology (ETH) Zurich, 8 March, Zurich, Switzerland.


PANEL TALKS
1. Gayah, V.V. (2012) Surviving the qualifying and oral exams. UC Berkeley Graduate Student Assembly, 18 April, Berkeley, California.

2. Gayah, V.V. (2012) Civil engineering career paths. UC Berkeley American Society of Civil Engineers, 12 April, Berkeley, California.

FUNDED PROJECTS

1. (co-PI) Regionalized safety performance functions, Pennsylvania Department of Transportation, March 2015—December 2015, $121,755. (37.5%)

2. (co-PI) Speed limits set lower than engineering recommendations, Montana Department of Transportation, September 2014--April 2016, $143,332 (50%). [nationally competitive]

3. (PI) Establishing Crash Modification Factors and their use, Pennsylvania Department of Transportation, March 2014--September 2014, $74,801 (50%).


6. (PI) How can we maximize efficiency and increase person occupancy at overcrowded park and rides, Washington State Department of Transportation, October 2013--June 2014, $147,513. (80%) [nationally competitive]

7. (Collaborating Investigator) Impacts assessment of dynamic speed harmonization with queue warning, Federal Highway Association, June 2013--March 2015, $4,382. (100%) [nationally competitive]

8. (co-PI) Safety performance functions for rural roads in Pennsylvania, Pennsylvania Department of Transportation, August 2013--October 2014, $499,936. (33%)

9. (Collaborating Investigator) An examination of active travel and economic behavior, Social Science Research Institute at Penn State University, 2013, $2,470.

10. (co-PI) Integration of multimodal transportation services, Mid-Atlantic Universities Transportation Center, May 2013--June 2015, $153,301. (26%)

11. (PI) Using mobile probes to inform and measure the effectiveness of macroscopic traffic control strategies on urban networks, Mid-Atlantic Universities Transportation Center, August 2012--June 2015, $201,375. (45%)

**TEACHING EXPERIENCE**

**THE PENNSYLVANIA STATE UNIVERSITY**

**INSTRUCTOR**

Spring 2014  **CE 597: Public Transportation Systems**
Graduate course that covers the design, operation and management of public transportation systems. Topics include optimal design of fixed and flexible route systems, vehicle fleet and driver staffing requirements, and the stability of transit fleet operations.

2013—present (Fall)  **CE 423: Traffic Operations**
Undergraduate course that focuses on the engineering skills and techniques required to practice traffic engineering. Content includes an introduction to several key texts and references, such as the Manual on Uniform Traffic Control Devices, Highway Capacity Manual and ITE Trip Generation Handbook. The 2-hour laboratory component provides students with experience in field data collection and analysis.

2013, 2015 (Spring)  **CE 597: Traffic Operations on Highways and Urban Networks**
Graduate course covers tools and methods to analyze empirical traffic data, advanced traffic flow theory concepts, and models of aggregate vehicular behavior on urban traffic networks.
(Fall)  
Graduate course covers basic tools used to describe transportation systems, properties and dynamics of traffic streams, and fundamentals of queuing, probability and statistics.

**UNIVERSITY OF CALIFORNIA, BERKELEY**  
**GRADUATE STUDENT INSTRUCTOR**

Spring 2011  **CE 255: Highway Traffic Operations**  
Led 1-hour weekly discussion section; held office hours; graded all homework assignments and course projects; modified homework assignments and course projects

Fall 2010  **CE 258: Logistics Systems Analysis**  
Led 1-hour weekly discussion section; held office hours; graded all homework assignments and course projects

Spring 2010  **CE 259: Public Transportation Systems**  
Led 1-hour weekly discussion section; held office hours; graded all homework assignments; created and modified homework assignments, course projects and comprehensive course notes (both published online; see Other Publications)

**STUDENT ADVISING**

**STUDENT ADVISEES**

**Graduate**

in progress  Xueyu (Shirley) Goa (PhD)  
in progress  Xavier Harmony (MS)  
in progress  Zhengyao Yu (MS)  
in progress  Anthony Deprator (MS)  
2015  Jan-Torben Girault (co-advisor, MS ETH Zurich)  
2015  Jeffrey Gooch (co-advisor, MS)  
2014  Nicolas Muhlich (co-advisor, MS ETH Zurich)  
2014  Krae Stieffenhofer (MS)  
2014  Andrew Nagle (MS)  
2013  William Roll (MEng)  

**Undergraduate**

2015  Owen Hitchcock (REU)  
2015  Ryan Anthony (Honors BS)  

**GRADUATE COMMITTEE MEMBERSHIP**

in progress  Mehmet Unal (PhD, CEE PSU)  
in progress  Jean Doig (PhD, CEE UC Berkeley)  
2015  Shuaqi Huang (MS, CEE PSU)  
2015  Jon Crisafi (MS, CEE PSU)  
2014  Kshitij Jerath (PhD, MNE PSU)  
2014  Andrew Butsick (MS, CEE PSU)
AWARDS AND HONORS

AWARDS RECEIVED

2013—2014  Certificate of Excellence in Reviewing, Transportation Research Part B
2011—2012  Gordon F. Newell Award for Excellence in Transportation Science (given by UC Berkeley Transportation Engineering Faculty)
2011—2012  University of California Transportation Center Outstanding Student of the Year
2011—2012  FHWA Dwight D. Eisenhower Graduate Fellowship
2007—2009  UC Berkeley Graduate Fellowship
2007—2008  University of California Transportation Center Fellowship
2006  ASCE Florida Section Graduate Student of the Year
2006  University of Central Florida Center for Advanced Transportation Systems Simulation Student Scholarship
2006  Central Florida ASHE Student Scholarship
2006  1st place ASCE Southeastern Region Student Transportation Competition
2005—2006  University of Central Florida Graduate Provost Fellowship
2005  ITS Florida Graduate Student Scholarship
2005  Finalist for Order of the Pegasus (highest award given to UCF student)
2001—2005  UCF High Achievement Scholarship

AWARDS RECEIVED BY ADVISEES

2014—2015  Jeffrey Gooch, MS  Leo Russell Fellowship for Outstanding Transportation Engineering Graduate Student at Penn State
2014—2015  Andrew Nagle, MS  Mid-Altantic Universities Transportation Center (MAUTC) Student of the Year Award
2014  Nicolas Muhlich, MS  Culmann Fonds Award for Outstanding MS Thesis at ETH Zurich
2013—2014  Andrew Nagle, MS  Leo Russell Fellowship for Outstanding Transportation Engineering Graduate Student at Penn State
2013—2014  Andrew Nagle, MS  FHWA Dwight D. Eisenhower Graduate Fellowship

SERVICE AND OUTREACH ACTIVITIES

UNIVERSITY SERVICE

2014—present  Advisor, ITE Student Chapter at Penn State
2014—2015  Member, CEE Department Head Search Committee
2013—2015  Member, CEE Graduate Committee
2013, 2014, 2015  Reviewer/Poster Judge, College of Engineering Graduate Research Forum
2013  Participant, College of Engineering Strategic Planning Retreat
2013  Participant, STEM Fall Open House Dinner
2013  Poster Judge, University Graduate Exhibition
2012—2013  Member, CEE Undergraduate Committee

PROFESSIONAL SERVICE

2015  Member, International Scientific Committee of Conference on 2015 Traffic and Granular Flow
2015  Organizer, Special Call for Papers at the 94th Annual Meeting of the Transportation Research Board
2014  Organizing Committee Member, Symposium Celebrating 50 Years of Traffic Flow Theory, Portland, OR
2014  Session Chair, Symposium Celebrating 50 Years of Traffic Flow Theory, Traffic Control Session
2014—present  Editorial Advisory Board Member, Transportation Research Part B
2014—present  Member, Centre Regional Bicycle Advisory Council
2014  Organizer, Special Call for Papers at the 93rd Annual Meeting of the Transportation Research Board
2013—present  Member, Transportation Research Board Traffic Flow Theory and Characteristics Committee (AHB45)
2013—2014  Member, Institute of Transportation Engineers, Transit Council Executive Committee
2013  Session Chair, Kuhmo NECTAR Conference on Transportation Economics, Mode Choice Session
2013  Session Chair, 92nd Annual Meeting of the Transportation Research Board, Traffic Flow Theory and Characteristics Session
2012, 2013  Panelist, National Science Foundation
2012  Session Chair, LATSIS---1st European Symposium on Quantitative Methods in Transportation Systems, Value of Travel Time Session
2012—present  Member, Transportation Research Board Traffic Flow Theory and Characteristics Outreach and Diversity Subcommittee

STUDENT SERVICE

2012  Organizer, Institute of Transportation Studies Friday Seminar Series
2011—2012, 2008—2010  President, UC Berkeley Transportation Student Organizing Committee
2010—2011  Member, 17th Annual UCTC Conference Organizing Committee
2009—2010  Member, UC Berkeley CEE Curriculum Committee
2007—2008  Vice President, UC Berkeley Transportation Student Organizing Committee
2005—2006  Member, UCF President’s Leadership Council
2005—2006  Secretary, UCF College of Engineering and Computer Science Dean’s Student Advisory Council
2005—2006  Vice President, UCF ASHE Student Chapter
2005 Chair, ASCE/AISC National STudent Steel Bridge Competition Organizing Committee
2004—2006 Vice President, UCF ASCE Student Chapter
2004—2006 Email Mentor, UCF CEPE HERO Undergraduate Outreach Program
2001—2003 Graduate, UCF LEADS Scholars Program

JOURNAL REFEREE SERVICE

Accident Analysis and Prevention
Advances in Transportation Studies
ASCE Journal of Transportation Engineering
Computer-Aided Civil and Infrastructure Engineering
EURO Journal on Transportation and Logistics
IEEE Transactions on Intelligent Transportation Systems
Journal of Intelligent Transportation Systems
Networks and Spatial Economics
Physica A: Statistical Mechanics and its Applications
Public Transport: Planning and Operations
Transportmetrica B: Traffic dynamics
Transportation Research Part B: Methodological
Transportation Research Part C: Emerging Technologies
Transportation Research Record

CONFERENCE REFEREE SERVICE

Transportation Research Board
  Traffic Flow Theory and Characteristics Committee (AHB 45)
  Freeway Operations Committee (AHB20)
  Traffic Signal Systems Committee (AHB25)
  Transportation Network Modeling Committee (ADB30)
European Symposium on Quantitative Methods in Transportation
IEEE Conference on Intelligent Transportation Systems
International Symposium on Transportation and Traffic Theory
World Conference on Transportation Research

PROPOSAL REFEREE SERVICE

National Science Foundation
Swiss National Science Foundation
University of California Transportation Center (UCConnect, formerly UCTC)

TECHNICAL SKILLS

Computer MS Office, Corel Word Perfect, \LaTeX, Matlab, AutoCAD, CorelDraw, Adobe Creative Suite, PARAMICS, VISSIM, AIMSUN, CORSIM, SYNCHRO, SAS, Limdep, HCS+, CUBE, FSUTMS
Programming languages C++, HTML, JAVA, Visual Basic, Matlab
**MEMBERSHIPS**

Transportation Research Board Committees:

- 2013—present  Traffic Flow Theory and Characteristics, Member
- 2012—present  Freeway Operations, Friend
- 2012—present  Transportation Signal Systems, Friend
- 2012—present  Transportation Network Modeling, Friend
- 2012—present  Highway Capacity and Quality of Service, Friend

- 2007—present  Institute of Transportation Engineers
- 2013—present  American Society of Civil Engineers
- 2012—present  American Society of Engineering Education

**OUTREACH/TECHNOLOGY TRANSFER**

Developed “Pennsylvania CMF Guide” for Pennsylvania Department of Transportation

**PROFESSIONAL REGISTRATION**

EIT  **State of Florida**  
*No. 110010193*
August 19, 2015

Jon Williams, Director  
NCHRP Synthesis Studies  
Cooperative Research Programs  
Transportation Research Board  
The National Academies  
500 Fifth Street, NW  
Washington, D.C. 20001

Re: Statement regarding compliance with the terms of the synthesis study contract

Dear Mr. Williams,

As you are aware, our representative has discussed synthesis contract terms with you and come to agreement with you on changes to Article XI Disputes and Article XII Jurisdiction, in that the reference to District of Columbia would be replaced with the Commonwealth of Pennsylvania. With respect to Article VIII, Section E (Insurance), proof of Penn State’s self-insurance will be provided for approval in the event an award is made, if required.

In consideration of the above, Penn State can comply with the terms of the synthesis study contract as negotiated with you.

Finally, please be advised that Penn State is a state-related institution of higher education whose research program is overseen by a cognizant federal agency, the Office of Naval Research, and is audited by the Defense Contract Audit Agency.

Sincerely,

John W. Hanold
Associate Vice President for Research and Director of Sponsored Programs
The Pennsylvania State University
Phone: 814-865-1372; Email: osp@psu.edu

College of Engineering