

DATA AND INFORMATION TECHNOLOGY GROUP
Committee Triennial Strategic Plan (TSP)

Committee Name and Number: ABJ95 Visualization in Transportation

Committee Co-Chairs:

Patricia Hu, Director USDOT Bureau of Transportation Statistics

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TSP Three-Year Period: April 2015 – April 2018

Date Prepared: March 2015

Current Committee Scope

The goal of the ABJ95 Committee on Visualization in Transportation is to use visualization to identify and address critical transportation issues of today, and to develop innovative visualization approaches to meet society's transportation needs of the future.

Factors and influences that will shape the committee's activities

Visualization has far-reaching potential for communicating transportation needs to leaders who must prioritize budgets, enhancing the ability of transportation organizations to deliver timely and ever more complex programs within those budgets, educating the engineers who will make it all happen, and communicating to the traveling public the implications of transportation investments.

Visualization has become a catch-all for many visually enhanced applications, communication strategies, and analytics tools that have found their way into the transportation industry—such as modeling, animation, simulation, data mining, performance measures, and virtual reality—to improve the ability to inform funding-decisions, develop, and deliver timely, cost-effective, and safe transportation systems in synch with society's needs. Many other industries, like manufacturing, entertainment, architecture, etc. have fully embraced 3D design tools from conception to production. Similarly, the news and print media, financial sectors, and business communities have fully adopted data visualization strategies for communicating complex concepts and knowledge discovery. Transportation in general is significantly behind in using these technologies and concepts in a comprehensive way.

In broad terms, ABJ95 groups transportation visualization under four overarching areas

- Visual Analytics
 - Scientific visualization
 - Information visualization
 - Visual analytics (including GIS technologies)
- BIM for Infrastructure
- System Performance
- Interactive Visual Simulation

Factors and influences that **support** visualization include: communicating problem-solving concepts to the public; visualizing freight movement and its consequences; providing insights by

visually exploring data; merging geographic information systems and other visualization technologies; providing online resources and communities that offer new tools for the visual examination of data; facilitating collaboration between transportation planners, land use planners, and all other stakeholders in a project; ability to experiment; understand complex interactions; visualizing a variety of conditions/scenarios.

Factors and influences that **impede** visualization include: the perception that visualization is too expensive; the reality that visualization is expensive; defining the breadth of visualization, modeling, and simulation; understanding which technology to apply at what point and for what purpose; the cost of upgrading information technology infrastructure to manage and share data; developing the expertise to handle, capture, and create data; training professionals to plan for and use visualization; understanding the organizational and professional ethics related to visualization; projecting expected returns on investment compared with the costs of not using visualization; developing standards for the content, accuracy, and quality of contractor and consultant data submittals; writing effective contract language for visualization services; understanding implications for organizational work flows and opportunities to improve business practices; integrating and relating the data to the kinds of data and information already in use; rethinking position descriptions for hiring professionals and specialists; promoting visual learning environments for engineering students to develop visual communication skills; rethinking the capture of, display of, and interaction with transportation data to enable more effective executive-level decision making; effectively and accurately simulating human behavior; usability of visualization system; addressing perceptual and cognitive issues; supporting multidisciplinary collaborations; evolving graphics hardware and platform development; misconceptions surrounding visualization capabilities and terminologies; thinking that visualization is a standalone technology rather than an integrated way of thinking, communicating, and doing business.

Given these factors, the Visualization in Transportation Committee will continue to develop a proactive approach to communicating current trends, identifying and showcasing best practices, developing new research, and mainstreaming visualization into planning, construction, operations and maintenance. Our primary strategic goals for the future are:

- Increasing the awareness and use of visualization, nationally and internationally
- Enhancing the trbviz.org website to provide one-stop-shopping for information and guidance for practitioners, and to increase its utility as a planning, outreach, design, construction, information and communication tool.
- Identifying unmet visualization research needs, promoting the needed research, and disseminating quality research.

The Committee does not currently have a good record of developing and successfully funding NCHRP research. The Committee has actively cosponsored many TRB joint sessions, coordinated six international symposiums, and produced a TRBNews issue (252) highlighting Visualization and published one Visualization NCHRP Synthesis Report 361 (2006). The update of the AASHTO Visualization Guide was completed in 2016, and is currently awaiting approval for release.

Committee Plan

The committee envisions that the use of visualization will eventually be as omnipresent and integral to transportation as email, cell phones, and other common technologies are to everyday life. Early word processing software required specialists to write code to print simple letters and documents; however, every professional now has the ability to simply use a word processor to meet their writing needs. Similarly, computer generated images were originally labor intensive, requiring special software, programmers, and expensive hardware to output digital images. PowerPoint and other ubiquitous software have put graphic design on most desktops; however, just because the software is readily available doesn't mean that every person can communicate clearly through the written word or presentation. Poorly designed visualization can be as ineffective as "death by PowerPoint."

Visualization spans an ever increasing area of planning, outreach, design, construction, information and communication. The continuous evolution of more powerful software and hardware provides rapidly changing choices. Visualization is used as an umbrella word to cover: the explanation and analysis of data; 3D plans that can be static, simulated, or immersive; situational awareness and control software in operations centers that manage traffic in real time. This expanding role will be challenging for a single committee to manage, much like the Highway Capacity Manual which currently has over 250 people participating in subcommittee activities.

There are many research needs statements solely focused on visualization practices, methodologies, etc., but much research in the transportation domain will likely focus on research integrated into other specific research needs (e.g. congestion, freight, safety, operations, maintenance, modeling, or simulation.) This may be addressed through liaison activities with other committees throughout TRB by providing statements that will advance the research needs of both the specific topic and the visualization component.

The Visualization in Transportation Committee is well suited to contribute to many critical and cross cutting issues in the following categories:

- Visual Analytics
 - Decision making using Performance Measures
 - Collaborative Visual Analytics
 - High Dimensional Data Visualization
 - Categorical data visualization and clustering/ranking
 - Issues relating to resolution and massive data set visualization
 - Quantifying "good" visualizations
 - Automating and simplifying the visualization process
 - Interactive Trees, Node-network graphs, 3D, and Comparisons of Datasets
- Planning
 - Environmental
 - Public Involvement
 - Context Sensitive Solutions
 - Early, continued and substantive involvement
 - Focus on comprehensive planning
 - An integrated process, with public participation
 - Performance reporting
- Construction
 - Design Criteria
 - IP and ownership issues
 - Best practices
 - Quantification of benefits

- Operations
 - Usability & Ergonomics in operations centers
 - User interface design best practices
 - Situational Awareness
 - Decision Making in complex environments
 - Asset management/tracking
 - Communications (both internally and to the traveling public)
 - Value of better visualizations in operations centers

Projects and Activities

The committee has five subcommittees and one joint subcommittee to advance its scope through the following projects and activities:

1. **Symposium**
 - a. **GOAL:** Increase the sharing of knowledge between practitioners, decision makers, and stakeholders
 - b. **STRATEGY:** Coordinate international symposium every 2 years; develop conference technical programs; identify corporate and agency co-sponsors.
 - c. **INDICATORS OF SUCCESS:** number of participants, impact of presentations
2. **Outreach**
 - a. **GOAL:** Be the central hub of information related to Visualization in Transportation
 - b. **STRATEGY:** Provide a central clearing house for other visualization websites, create and update the national website, collect case studies/examples/photographs of effective visualization projects.
 - c. **INDICATORS OF SUCCESS:** Increasing number of page views, Search engine rank, links to website, use by social media
3. **BIM for Infrastructure**
 - a. **GOAL:** To implement and integrate the Civil Integrated Management (CIM/VDC/BIM) into the entire transportation planning process. Identify ways to help guide and inform transportation agencies on how to implement the technology.
 - b. **STRATEGY:** Identify good practices and lessons learned in using visualization as an integral part of planning and design, public involvement, and construction through call for papers, presentations and case studies published on the website.
 - c. **INDICATORS OF SUCCESS:** Numbers of papers, presentations and case studies published. Number of agencies who invest in hardware, software and training.
4. **System Performance**
 - a. **GOAL:** To disseminate effective visualization strategies to communicate the performance and management of all transportation modes.
 - b. **STRATEGY:** Initiate a call for papers for each annual meeting for the next three years
 - c. **INDICATORS OF SUCCESS:** Sufficient papers to support a poster session in each year; creation of at least one subcommittee originated synthesis on either state of the practice or best practices for web publication.
5. **Inactive Simulation**

- a. **GOAL:** To disseminate effective uses of interactive communication through visual tools that engage users in the process of learning and discovery
 - b. **STRATEGY:** Initiate a call for papers for each Visualization and Transportation Symposium
 - c. **INDICATORS OF SUCCESS:** Sufficient papers to support a poster session in each year; creation of at least one subcommittee originated synthesis on either state of the practice or best practices for web publication.
6. **Computational Transportation and Society** (Joint Subcommittee ABJ30, ABJ60, ABJ95)
- a. **GOAL:** Stimulate research on computational, design and policy innovations needed to integrate transportation to the rapidly transforming ubiquitous information society.
 - b. **STRATEGY:** Our work will lead to technologies for the generation, analysis and visualization of innovative geospatial “big-data” as well as to models of information use, governance and design.
 - c. **INDICATORS OF SUCCESS:** number of research projects identified and funded (Lead Committee ABJ30 Urban Transportation Data and Information Systems. Partner Committees: ABJ60 Geographic Information Science and Applications; ABJ95 Visualization in Transportation)

Committee members are encouraged to become liaisons with other related TRB Committees and to communicate cross-cutting issues and opportunities to the full Committee and vice versa). Appendix A contains our current liaison list and a history of key activities. We are currently integrating the two TRB websites – trbvis.org and the social media trbvis.ning.com websites. Presentations from the previous TRB Symposia in 2006 through 2015 are hosted at www.teachamerica.com. The 2017 Symposium presentations are hosted on YouTube at <https://www.youtube.com/user/VisSym/videos>.

Membership Strategies

The Committee will continue to actively seek a geographically and demographically diverse membership that represents various disciplines, levels of government, universities, and the private sector. We actively seek out young and international members. We continually seek out visualization champions through various networks, conferences, and activities, enlist them as Committee “friends” and encourage their membership. Friends are encouraged to become members of subcommittees to aid them in obtaining travel approval and to serve as an active pool for future Committee membership.

Communication

Much of our effort will continue to be focused on communication and outreach. We have hosted seven international conferences, conducted conference presentations and sessions, and produced and disseminated videos. We are rebuilding the website to a content management system platform to increase its utility.

Proposed changes in scope

The 2015 Strategic Plan considers the role that the ABJ95 Committee plays in the larger context of TRB and ultimately the overall transportation system. The 2007 Strategic Plan covered many important issues that should be addressed. It was also more ambitious than the newly formed

TRB Visualization Committee ABJ95 could implement. The 2015 plan is simplified to focus our efforts on the most significant role that ABJ95 can play in improving the system.

MEGA GOAL: To provide multimodal transportation systems that help us live in safe, productive, sustainable and attractive communities.

MACRO GOAL - *Organizational:* The mission of the Transportation Research Board is to provide leadership in transportation innovation and progress through research and information exchange, conducted within a setting that is objective, interdisciplinary, and multimodal.

MICRO GOAL – *ABJ95 Committee:* To use visualization to identify and address critical transportation issues of today, and to develop innovative visualization approaches to meet society's transportation needs of the future.

Previous scope: To engage the transportation and non-transportation communities in order to enhance the Committee's diversity of understanding regarding leading transportation issues, advancements in visualization technology, and practice in order to organize and prompt awareness of, and for, applicable research on visualization in the transportation community.

Appendix A – Committee History & Structure

Subcommittees

The following are subcommittees for the TRB Visualization in Transportation Committee and their respective chairs as of 2018.

- **2019 Symposium:** Michael Pack
- **Outreach:** Brittany Gernhard
- **BIM for Infrastructure:** Charles Hixon/Kevin Gilson/Lance Parve
- **System Performance:** Charles Lattimer
- **Interactive Simulation:** Jason Williams

Committee Secretary

Our Committee Secretary is Frank Broen, Teach America

Communication Coordinator

Our Communication Coordinator is Stephanie Camay, URS

Research Coordinator

Our Research Coordinator is Carl Springer

Membership

Membership diversity

The Committee presently has two young members, three female members and six non-Caucasian members.

Geographic distribution of membership

- Northeast: 7
- Midwest: 2
- South: 8
- Western: 4
- National Firms: 7
- International: 0

NOTE: Young members shown in parenthesis ()

Professional affiliation distribution of membership

The Committee currently has 19 total members. Below is a breakdown.

- Federal - 2
- State DOT - 5
- MPO - 1
- University – 2
- Private (consultant) - 7
- Other- 2

NOTE: The Committee has no Emeritus members, 0 international members, and 2 young members.

Friends

The Committee maintains a list of approximately 314 friends that includes individuals in the US, as well as Brazil, Germany, Finland, Canada, India, United Kingdom, Egypt, France, Sweden, New Zealand, United States Minor Outlying Islands, Italy, Poland.

Interaction with Other TRB Committees

The Visualization in Transportation Committee maintains formal liaisons with the following Committees:

- Task Force on the Highway Safety Manual, A3B05(1)
- Geometric Design, AFB10
- Safety Conscious Planning Subcommittee, ANB10(3)
- Roundabouts A3B05(4)
- Performance Measures Committee, A5022
- Statewide Data Committee
- Statewide Planning Committee
- Pedestrian Committee, ANF10
- Public Involvement in Transportation, ADA60
- Metropolitan Policy, Planning and Processes Committee, ADA20
- Jason Williams - Simulation and Measurement of Vehicle and Operator Performance, AND30
- Access Management, AHB70 Frank Broen
- Freight Transportation Data, ABJ90
- Geographic Information Science and Applications, ABJ60
- Geometric Design, AFB10
- Performance Management, ABC30
- Standing Committee on Artificial Intelligence and Advanced Computing Applications, ABJ70

Interaction with Other Organizations

- Federal Highway Administration
- Federal Rail Administration
- Bureau of Transportation Statistics
- SHRP 2 Technical Expert Task Group to Design and Implement a System for Archiving and Disseminating Data from SHRP 2 Reliability and Related Studies (Project L13A)
- FUTURE – ASCE
- AASHTO
- I-95 Coalition

International Symposium

- 2017 – Washington, DC
- 2013 – Irvine, CA
- 2011 – Chicago, IL
- 2006 – Denver, CO

- 2002 – Salt Lake City, UT
- 1999 – Orlando, FL
- 1997 – Minneapolis, MN
- 1995 – Houston, TX

Awards

- 2011 Gregg Harrington Award Winner – Prof. Ruey Long (Kelvin) Cheu
 - PUBLIC PREFERENCES ON THE USE OF VISUALIZATION IN THE PUBLIC INVOLVEMENT PROCESS IN TRANSPORTATION PLANNING
- 2009 Gregg Harrington Award Winner – Michael L. Pack, Michael VanDaniker, Darya Filippova, & Krist Wongsuphasawat
 - VISUAL ANALYTICS FOR TRANSPORTATION INCIDENT DATA SETS
- 2009 Gregg Harrington Award Winner – Benjamin Blandford
 - INTEGRATED TRANSPORTATION AND LAND USE SCENARIO MODELING, JEFFERSONVILLE IN

Publications

- TRB published a Visualization Theme Issue of TR-NEWS, Fall-2007
- Workshops at the TRB Annual Meeting
- www.trbvis.org
- www.trbvis.ning.com
- Presentations online from 2006, 2011 www.teachamerica.com
- Presentations from 2013 on YouTube <http://teachamerica.com/VIZ13/index.html>

Co-Sponsored Sessions (2008-2017)

2017 TRB Annual Meeting		Session
Workshop: Big Data Applications and Methods in Transportation		153
Visualization Lightning Talks		529
Building Information Modeling for Infrastructure: Advances, Innovations, and Emerging Technologies		800
Gaming, Simulation, and Participatory Visualization		883
Civil Integrated Management (CIM) Subcommittee, ABJ95(1)		
System Performance Subcommittee, ABJ95(2)		
Gaming and Participatory Simulation Subcommittee, ABJ95(3)		
Visualization in Transportation Committee		

2016 TRB Annual Meeting		Session
Applied Three-Dimensional Technologies, Tools, and Trends for Digital Project Delivery of Transportation Infrastructure Projects		110
Transportation Statistics Interest Group (TSIG) Open Meeting		

Civil Integrated Management 3D Modeling and 3D Technologies: Guidance, Best Practices, and Trends for Digital Delivery of Transportation Infrastructure Projects	201
Freight and Automatic Fare Collection Data Visualization (2)	306
New Tools and Ideas for Visualizing, Exploring, and Communicating Performance at National, State, and Local Levels	802
Civil Integrated Management (CIM) Subcommittee, ABJ95(1)	
System Performance Subcommittee, ABJ95(2)	
Gaming and Participatory Simulation Subcommittee, ABJ95(3)	
Visualization in Transportation Committee	

2015 TRB Annual Meeting	Session
Best Practices for Creating Design Data to Support Digital Project Delivery	112
Interactive Communication about Complex Concepts	113
Strategies for Improved Communication between Traffic Data Practitioners and Transportation Decision Makers	153
Advanced 3D Model-based Planning-Design-Construction CIM Best Practices, Lessons Learned, and Case Studies for Transportation Project Delivery	261
Tools and Techniques for Motivating Department of Transportation Executives to Use Performance Management Practices	666
Visualization in Transportation Committee	

2014 TRB Annual Meeting	Session
Recap of 6th International Visualization Symposium	781
Collaborative Visualization in Analytics and Operations	200
Strategies for Improved Communication Between Traffic Data Practitioners and Transportation Decision-makers	153
Big Data Informatics: Innovations in Mining Structured and Unstructured Information for Mobility Decision Making	124
Civil Integrated Management: Best Practices	744
Public Preferences in Use of Visualization in the Public Involvement Process in Transportation Planning	345

2013 TRB Annual Meeting	Session
Visualization in Transportation Committee	
549 Transportation Visualization	549
Risk Assessment, Part 1: Decision Support Models and Tools to Evaluate and Address Risk (Part 2, Session 171)	171
Reliability: Data, Analytics, and Visualization	627
Big Data Informatics: Innovations in Mining Structured and Unstructured Information for Mobility Decision Making	124
Risk Assessment, Part 1: Decision Support Models and Tools to Evaluate and Address Risk (Part 2, Session 171)	171

2012 TRB Annual Meeting	Day
Visualization in Transportation Committee	Jan 24 2012
Application of Emerging Technologies to Design and Construction Committee	Jan 24 2012
Strategic Issues Subcommittee, ADC10(1)	Jan 23 2012
Information, Images, and Data: Practical Guidance for Using and Owning Intellectual Property	Jan 22 2012
First U.S. Department of Transportation Data Visualization Student Challenge	Jan 24 2012
Virtual Design and Construction and Building Information Modeling Involving Transportation Planning, Design, and Construction: State of the Practice	Jan 25 2012
Virtual Design and Construction and Building Information Model Roadmap for Transportation Infrastructure	Jan 25 2012

Projects: Where Are We Headed?	
Regional Transportation Performance Measurement Visualization	Jan 25 2012
Visualization: Past, Present, and a Roadmap to the Future	Jan 25 2012
2011 TRB Annual Meeting	
	Day
Visualization in Transportation Committee	Jan 26 2011
Application of Emerging Technologies to Design and Construction Committee	Jan 24 2011
Data for Transportation Operations Subcommittee, AHB10(3)	Jan 24 2011
Visualize It! Using Visualization to Communicate and Enhance the Public's Involvement in Transportation	Jan 23 2011
Virtual Design and Construction for Transportation: Terminologies, Opportunities, Benefits, and Barriers	Jan 23 2011
State of Affairs in Visualization Research	Jan 23 2011
Enhancing Communications: Engaging and Promoting Active Communications	Jan 23 2011
Pervasive Data for Transportation: Innovations in Distributed and Mobile Information Discovery in Intelligent Transportation Systems and Location-Based Services	Jan 23 2011
Cybersecurity Strategies: Keeping Our Nation Safe from Manmade and Natural Cyber Events	Jan 24 2011
Application of Driving Simulation to Highway and Traffic Engineering Problems	Jan 26 2011
Data Quality and the Quest for Asset Performance Information	Jan 26 2011
Visualization in Transportation Research	Jan 26 2011
2010 TRB Annual Meeting	
	Day
Visualization in Transportation Committee	Jan 12 2010
Visualization Technology for Transportation Design and Construction	Jan 10 2010
Electronic Participation: Changing Face of Public Involvement?	Jan 10 2010
Performance Measurement	Jan 11 2010
Knowledge Management: Successful Practices for Succession Planning	Jan 12 2010
Performance-Based Reauthorization, Bolder and More Innovative, Part 1: How Do We Prepare and Respond? (Part 2, Session 679; Part 3, Session 708)	Jan 12 2010
Research on Multiple Uses of Visualization	Jan 12 2010
How Departments of Transportation Can Implement Automated Machine Guidance Nationwide	Jan 12 2010
Performance-Based Reauthorization, Bolder and More Innovative, Part 2: Data Issues (Part 1, Session 466; Part 3, Session 708)	Jan 13 2010
Information Analytics: New Opportunities for Improving Information for Transportation Decision Makers	Jan 13 2010
Performance-Based Reauthorization, Bolder and More Innovative, Part 3: Research Challenges and Data Needs (Part 2, Session 679; Part 1, Session 466)	Jan 14 2010
2009 TRB Annual Meeting	
	Day
Visualization in Transportation Committee	Jan 14 2009
Visualization for Performance Measurement	Jan 11 2009
Visual Analytics	Jan 12 2009
Visualization and Simulation Tools and Applications	Jan 12 2009
Visualization Tools for Better Understanding of Effects of Land Development with Transportation	Jan 14 2009
Intersecting Ripples: Propagation of Ideas in Transport Survey Research	Jan 14 2009
Beyond Three-Dimensional: Progressive Visualization for Geometric Design	Jan 15 2009
2008 TRB Annual Meeting	
	Day

Visualization for Performance Measurement	Jan 12 2008
Visualization in Transportation Committee	Jan 14 2008
Visualization: Key to Communication of Goods Movement Needs	Jan 14 2008
Land Development Research	Jan 14 2008
Intersections: Sharing Advancements in Design, Safety, and Operations (See also Sessions 570 and 592)	Jan 14 2008
Light Detection and Ranging Surveys of Obstructions and Visualization Technologies for Airports	Jan 14 2008
FTA Public Transportation Participation Pilot Program	Jan 15 2008
Intersection Mega Session, Part 2: Sharing Advancements in Design, Safety, and Operations (Part 1, Session 570; see also Session 383)	Jan 15 2008
Future and Evolution of Geometric Design and Design Efficiencies	Jan 16 2008

Website and Communication Tools

The Visualization in Transportation Committee has developed and maintained a national websites at www.trbvis.org. The committee is considering implementing a new web delivery content management system to improve the functionality of the website, to incorporate social media elements and provide a better way to find information.

Research Problem Statements

An overview of past research statements related to Visualization in Transportation is provided below:

Highway Safety as an Asset: Incorporating Safety Performance Metrics in State Level Planning and Programming
Committee: ABJ20, Statewide Transportation Data and Information Systems
Date Posted: 6/20/2007 Date Modified: 6/20/2007

Synthesis for Visualizing Roadway, Traffic, and Crash Data Integration
Committee: ABJ20, Statewide Transportation Data and Information Systems
Date Posted: 6/20/2007 Date Modified: 6/20/2007

How Do We Convince Locals to Participate in Statewide Highway Safety Data Programs
Committee: ABJ20, Statewide Transportation Data and Information Systems
Date Posted: 6/20/2007 Date Modified: 6/20/2007

Application of Data Visualization and Visual Analytics to Freight Operations and Logistics at the Sub-National Level
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/6/2009 Date Modified: 7/6/2009

Current and Future Impacts of 'Serious Gaming' to the Visualization Applications in Transportation
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/26/2007 Date Modified: 7/27/2007

The Visualization of System Operation: The Need to Integrate Modeling and Simulation
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 8/3/2007

Toward the Integrated Use of Google Earth within the Planning and Engineering Phases of Transportation System Development
Committee: ABJ95, Visualization in Transportation

Date Posted: 7/23/2007 Date Modified: 7/24/2007

The Effective Integration of Visualization within the Work Flow of the Transportation System Development Process
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 7/26/2007

The Development of a Cost Breakdown Structure Upon Which to Base and Assessment of the Benefits and Costs of Visualization Within the Transportation Systems Development Process
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 7/24/2007

Development of an Education and Training Curriculum and Courseware for Transportation Visualization
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 8/3/2007

The Development of 'Guidance' for the Use of Visualization within the Transportation Planning Process
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 8/3/2007

Evaluation on Benefits of Roundabout Education Tools
Committee: ANB75T, Task Force on Roundabouts
Date Posted: 4/2/2011 Date Modified: 1/16/2012

Rapid Development of 3D BIM Elements from Scanning Technologies
Committee: AFH30, Emerging Technology for Design and Construction
Date Posted: 1/31/2011 Date Modified: 1/31/2011

The Design of a Roadway Lidar System for Micro DEM Mapping and Rutting Assessment for Roadways
Committee: AFH30, Emerging Technology for Design and Construction
Date Posted: 1/28/2011 Date Modified: 7/18/2011

Application of Data Visualization and Visual Analytics to Freight Operations and Logistics at the Sub-National Level
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/6/2009 Date Modified: 7/6/2009

Using Visualization to Communicate the Benefits of Access Management to the Public
Committee: AHB70, Access Management
Date Posted: 12/2/2008 Date Modified: 12/2/2008

Applications of Geographic Information Technology to Improve the Travel Demand Forecasting Process
Committee: ABJ60, Geographic Information Science and Applications
Date Posted: 8/15/2007 Date Modified: 8/15/2007

Current and Future Impacts of 'Serious Gaming' to the Visualization Applications in Transportation
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/26/2007 Date Modified: 7/27/2007

The Development of a Cost Breakdown Structure upon Which to Base and Assessment of the Benefits and Costs of Visualization Within the Transportation Systems Development Process
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 7/24/2007

Development of an Education and Training Curriculum and Courseware for Transportation Visualization
Committee: ABJ95, Visualization in Transportation
Date Posted: 7/23/2007 Date Modified: 8/3/2007

Data Models for Visualizing Spatial Information

Committee: ABJ20, Statewide Transportation Data and Information Systems

Date Posted: 6/20/2007 Date Modified: 6/20/2007

Use of 4D-CAD for Planning, Designing, and Constructing Transportation Projects

Committee: AFH30, Emerging Technology for Design and Construction

Date Posted: 3/21/2007 Date Modified: 1/6/2009

Best Practices for Effective Project Visualization

Committee: AFB40, Landscape and Environmental Design

Date Posted: 12/29/2006 Date Modified: 4/14/2007