September 12, 2001

Dr. Christine M. Johnson
Program Manager, Operations
Director, ITS Joint Program Office
Federal Highway Administration
400 7th Street, S.W.
Room 3401
Washington, D.C. 20590

Dear Dr. Johnson:

We are pleased to transmit this letter report of the Transportation Research Board's (TRB) Committee for Review of the U. S. Department of Transportation's Intelligent Transportation Systems (ITS) Standards Program. This letter describes the background of the committee's study, the committee's activities, and its conclusions and recommendations based on its discussions and deliberations at the two meetings held to date.

BACKGROUND

The Department of Transportation's (DOT) Joint Program Office (JPO), which is responsible for developing a national architecture and selected standards to encourage the development and deployment of ITS technology in the United States, in 1999 asked the National Research Council's Transportation Research Board (TRB) to undertake a review of the JPO's ITS Standards Program. The NRC appointed a committee of experienced professionals in transportation systems development and management, transit operations, automotive technology, telecommunications and electronics, systems engineering, and policy studies to review and critique the strategy being used by the program to introduce ITS standards. This first committee's findings and recommendations were delivered to you in September 2000 and subsequently published as *Standards for Intelligent Transportation Systems: Review of the Federal Program* (National Academy Press, 2000).

The JPO asked TRB to continue to advise the DOT on matters arising from ongoing and planned activities of the ITS Standards Program, particularly concerning the DOT's role in achieving widespread adoption of ITS infrastructure standards in practice. JPO and TRB staff agreed these matters and their relative priorities might evolve during the course of the committee's discussions in response to the JPO's ongoing program, but envisioned the following broad questions might exemplify issues likely to arise:

- Might processes for standards development that do not rely substantially on standards-development organizations (SDOs) be effective for encouraging interoperability as well as technology innovation, and by what criteria might effectiveness be judged?

- What might the JPO do to avoid obsolescence of ITS standards and assure long-term maintenance of standards where technology is rapidly evolving?

- What is the appropriate federal posture toward participation in international standards-setting processes for deployment and maintenance of ITS-infrastructure standards?

With some changes, the study committee was reappointed to conduct this second set of deliberations. A list of the committee's present membership is shown in Attachment 1.

The study plan specified that the committee would meet three times during FY 2001 to review issues arising from the JPO's Standards Program, discuss these issues with DOT staff, and interact with other technical experts who would be invited to make presentations and participate in the committee's discussions. The plan also specified that the committee would present the outcome of its deliberations in the form of one or more letter reports. This is the first such report.

COMMITTEE ACTIVITIES

The committee has met twice since its appointment, in March and June 2001. Each meeting, approximately two days in length, was held at the NRC's facilities in Washington, D.C. Agendas of the meetings are shown in Attachment 2. A third meeting is scheduled for September 20-21, 2001.

At each meeting, JPO staff presented aspects of the Standards Program's current status, activities, and plans, concerning the DOT's role in achieving widespread adoption of ITS infrastructure standards in practice. Guests with particular knowledge and experience relevant to those aspects of the program joined the committee's discussion; these guests included individuals invited by TRB staff supporting the committee's work and consultants to the JPO. Attachment 2 includes lists of attendees at each meeting.

Committee members who had participated in the first study were generally familiar with the Standards Program. The committee was therefore able to shift its attention relatively quickly from the Standards Program as a whole to segments of the program associated with specific ITS-standards applications areas (as they have been defined by the JPO) and potential impediments to achieving widespread adoption of standards applicable to those areas. In particular, the committee's second and planned third meetings have been structured to address applications areas of more immediate concern to JPO staff. While the committee was asked initially to address such matters as overall risks of standards obsolescence and the federal role in standards maintenance, their discussions have branched into the related but more immediate concerns for standards deployment and applications, that is, simply getting the standards into use. Nevertheless, the committee has also continued to consider general institutional and technical impediments to rapidly establishing ITS infrastructure standards and other matters having broad

bearing on the Standards Program as a whole and the DOT's role in ITS development within the United States.

The following conclusions and recommendations emphasize the committee's guidance on activities to facilitate standards deployment and use. It addresses as well concerns for standards maintenance and the DOT's continuing role in using standards to encourage adoption in the United States of beneficial ITS technology.

CONCLUSIONS AND RECOMMENDATIONS

The committee's discussions have yielded many observations and suggestions that may prove helpful to the JPO. The following conclusions and recommendations, developed in closed deliberative sessions of the committee, represent the committee's consensus on points in five areas that may be immediately helpful in the administration of the Standards Program.

1.   Government involvement in setting ITS standards.
While federal legislation establishes the DOT's authority and responsibility to support development and deployment of ITS standards, much of the nation's ITS infrastructure will be put in place by state and local government agencies with federally provided financial assistance. There is, however, no general agreement within the ITS community that standards setting by government is necessarily beneficial. Many complex factors bear on the issue of what role, if any, the federal government should play in encouraging ITS adoption—including experience with standards development in other fields of technology, theories of how technological innovation progresses, concerns about ITS market scale and scope, and differences in practices among the 50 states and many local government agencies.

Once developed, standards must be used in practice if they are to yield benefits. The JPO has responsibility for both development and deployment of standards within its purview, and has been shifting the Standards Program's emphasis from the former to the latter activity. The committee reviewed the JPO's standards-deployment efforts and emerging products of those efforts. On balance, the committee endorses the proposition that government support for standards development and deployment can facilitate more rapid adoption of ITS technology and, in particular, that rapid adoption will be encouraged if federally supported standards are used in practice. In progressively shifting its program to focus on deployment of standards previously developed with DOT support, the JPO is appropriately allocating its resources to activities most likely to enhance the benefits ultimately derived from federal investments in ITS technology.

2.   Strengthening deployment efforts.
The JPO's efforts to encourage dissemination and use of ITS standards includes informative documents, on-line materials, and in-field testing. The committee recognizes that these efforts are still in relatively early stages for most of the ITS application areas in which federally supported standards are being developed, and recommends that the JPO can increase the effectiveness of its deployment efforts generally through the following courses of action.

- The JPO should develop materials that present more clearly what are likely to be the benefits of using federally supported ITS standards, for ITS suppliers (e.g., equipment and software producers, system integrators) and users (e.g., local and state agencies undertaking ITS procurements). These materials should also clearly present potentially adverse consequences of adopting ITS technology that does not conform to the federally supported standards. These presentations should be specific to the several ITS applications areas that the JPO is using to structure its outreach and education efforts.

- The JPO should provide sample specifications for state and local agency use in ITS procurements, incorporating those standards that have been developed and tested. These sample specifications should be presented as soon as possible, but accompanied by suitable qualifications that changes may be appropriate in those cases where lessons learned in practice may lead to modifications of underlying standards.

- The outreach and education materials being developed by the JPO should be addressed to an audience that includes not only government agency personnel concerned with the procurement of ITS technology, but also private-sector consultants and system integrators. It is these latter professionals who are most responsible for many of the technical decisions that shape ITS applications. The examples of materials shown to the committee suggest that greater effort may be helpful to assure that terminology and explanations aimed at agency staff are consistent with usage among ITS professionals.

3. Independent validation and verification.

Based on its experience in other areas of technology procurement, the committee agreed that determining whether particular products conform to standards is a difficult problem that can be effectively addressed with independent validation and verification (IV&V). IV&V involves the use of independent testing laboratories to certify that ITS equipment and software conform to standards. As a repository of knowledge on standards and their underlying technology, the IV&V laboratory can enhance the supplier's product-development effort by providing advice and guidance to developers at all stages of that effort.

The committee believes that IV&V can contribute importantly to achieving the overall goals of federal involvement in ITS applications. Based on experience in other areas of technology, it recommends

  (a) that buyers of ITS should be responsible for assuring that ITS products they purchase are subjected to IV&V, but
  (b) that suppliers should pay the immediate direct costs of contracting with an independent testing laboratory to verify that their products meet required standards.

The DOT can play a crucial role in establishing a successful ITS IV&V capability in the United States. Because the aggregate market for ITS technology is relatively small and the many state and local agency buyers have diverse concerns that must be resolved, development of IV&V capability at a national level is warranted; the U. S. ITS market may not sustain more than one or two IV&V organizations. The DOT should encourage public agencies to accept supplier-paid IV&V as evidence of standards fulfillment, without resorting to added verification by individual

state- or multi-state-sponsored laboratories such as now are widely used for testing materials and products. The DOT should proactively encourage candidate testing organizations to participate in the IV&V program and should seek to assure that a viable business model for ITS IV&V is implemented. Such a model ideally will be self-supporting, will not impose excessive costs or constrain technological innovation, and will be staged to assure that early participants do not bear a disproportionate share of start-up costs.

4. Standards maintenance.
The technologies underlying ITS continue to evolve at a rapid pace. To remain relevant and useful, ITS standards must evolve to keep pace with changing technology. If this evolution is to occur, the developers and users of ITS standards must be prepared to monitor, maintain, and update these standards. Yet the committee finds that the JPO and participating SDOs may not be prepared to devote adequate resources and put in place effective mechanisms for assuring that ITS standards are maintained. The DOT should explicitly address this matter and allocate sufficient funds to assure that federally supported ITS standards are adequately maintained. If additional funds are needed to support standards maintenance, beyond those currently authorized, the committee urges that DOT seek to secure Congressionally designated funding for this purpose.

5. Scope of government involvement.
The committee recognizes that the JPO's Standards program has been focused primarily on standards for ITS "infrastructure," as distinct from in-vehicle components, and understands the logic underlying that focus. The committee recommends, however, that the larger goals of encouraging rapid ITS adoption warrant expansion of the DOT's programs to embrace more fully the broader scope of ITS technology. The full value of such applications as dedicated short-range communications, real-time traffic routing and congestion management, and emergency management will require close integration of decisions regarding infrastructure and in-vehicle components. If additional funds are needed to support such scope expansion, beyond those currently authorized, the committee urges that DOT seek to secure Congressionally designated funding for this purpose.

We appreciate this opportunity to comment on the ITS Standards Program, and look forward to continuing to work with the DOT's staff, consultants, and the professional community as a whole on this important program.

Yours truly,

A. Ray Chamberlain
Chair, Committee for Review of the U. S. Department of Transportation's
Intelligent Transportation Systems (ITS) Standards Program (II)

Attachment 1: Committee Membership
Attachment 2: Meeting Agendas and Attendees

Attachment 1

Committee for
Review of US DOT's Intelligent Transportation Systems (ITS) Standards Program (II)

Members

Ray Chamberlain, Ph.D. (Chairman)
Parsons Brinckerhoff
Denver, CO 80264

James R. Robinson
Virginia Department of Transportation
Richmond, VA

Jules A. Bellisio, Ph.D.
Telcordia Fellow
Telcordia Technologies
Red Bank, New Jersey

Steven E. Shladover, Sc.D.
University of California
Institute of Transportation Studies
Richmond, CA

Irwin Dorros, Dr. of Eng. Science
Dorris Associates
Morris Township, NJ

William M. Spreitzer
General Motors Corp. (Ret.)
Beverly Hills, MI

Jonathan L. Gifford, Ph.D.
Department of Public &
International Affairs and the School of Public Policy
George Mason University
Arlington, VA

Scott E. Stewart
IBI Group
Toronto, Ontario

William F. Johnson, Sc.D.
Transport Canada (Ret.)
Ottawa, Ontario
Canada

Frederick M. Streff, Ph.D.
University of Michigan Transportation
Research Institute (UMTRI)
Social and Behavioral Analysis Division
Ann Arbor, MI

Samuel Krislov, Ph.D.
Professor, Political Science and Law
University of Minnesota
Minneapolis, MN

Philip J. Tarnoff, Ph.D.
University of Maryland
College Park, MD

Alexander Lopez
Metropolitan Transit Authority
of Harris County
Houston, TX 77002

James L. Wright
Minnesota Department of Transportation
Roseville, MN

Staff

Stephen R. Godwin
Transportation Research Board
Washington, DC

Andrew C. Lemer, Ph.D.
The Matrix Group, LLC
Baltimore, MD

Attachment 2

Committee for
Review of US DOT's Intelligent Transportation Systems (ITS) Standards Program (II)

Meeting Agendas and Attendees

Meeting 1, March 8-9, 2001

Attendees

Committee members	Sponsors and guests	TRB Staff
Ray Chamberlain, chair	Jeffrey Paniati	Stephen Godwin
Jules A. Bellisio	(DOT/JPO)	Andrew Lemer
Irwin Dorros	Michael Schagrin	Jocelyn Sands
Jonathan L. Gifford	(DOT/JPO)	
William F. Johnson	Gary Carver (JPL)	
Samuel Krislov	Alan Stern (JPL)	
Alexander Lopez	Anne Tsang (JPL)	
James R. Robinson	Emil Wolanin	
Steven E. Shladover	(Chief,	
William M. Spreitzer	Transportation	
Scott E. Stewart	Systems Mgt.	
Frederick M. Streff	Montgomery	
Philip J. Tarnoff	County, MD)	
James L. Wright		

Agenda

Thursday, March 8   <u>10:00 am - 12:00 noon: Closed session</u>

10:00 - 10:30	Opening statements	
	- Welcome	
	- Introductions	
	- Introduction to the NRC, TRB, study process	

10:30 - 11:30   Bias and balance discussion

11:30 - 12:00   Plan for the meeting, initial discussions of topic

12:00   Break, sponsors and guests join group

<u>12:00 noon - 8:00 pm: Open session</u>

12:30 - 1:00   Introductory remarks from sponsors
-        Introductions of sponsors and guests
-        JPO objectives in sponsoring study
-        JPO concerns regarding the widespread adoption of ITS-infrastructure standards in practice

1:00 - 5:30   Presentations and discussion on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure"

Friday, March 9   <u>8:30 - 11:30 am Open session</u>

8:30 - 9:00   Review of previous day's discussion, key points

9:00 - 11:30   Continuing discussion on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure"

<u>11:30 am - 2:30 pm: Closed session</u>

11:30 - 12:30 Committee members propose key points, findings conclusions, recommendations

12:30 - 2:00   Discussion of proposals

2:00- 2:30   Summary and report-preparation schedule

2:30   Adjournment

Meeting 2, June 11-12, 2001

<u>Attendees</u>

Committee members	Sponsors and guests	TRB Staff
Ray Chamberlain, chair	Jeffrey Paniati (DOT/JPO, Mon. only)	Andrew Lemer
Jules A. Bellisio		Jocelyn Sands
Irwin Dorros	Michael Schagrin (DOT/JPO)	
Jonathan L. Gifford	Gary Carver (JPL)	
William F. Johnson	Alan Stern (JPL)	
Alexander Lopez	Anne Tsang (JPL, Tues. only)	
James R. Robinson	Glen Hansen (Howard County (MD) Dept. of Police, Tuesday only)	
Steven E. Shladover		
William M. Spreitzer		
Philip J. Tarnoff	Robert Deroche (Peek Traffic Systems, Inc.)	

<u>Agenda</u>

Monday, June 11   <u>10:00 am - 12:00 noon: Closed session</u>

10:00 – 12:00	Opening statements
	- Welcome
	- Review of meeting objectives and standards-deployment strategy analysis framework
	- Issues related to National ITS Architecture
12:00	Break, sponsors and guests join group

<u>12:00 noon - 8:00 pm: Open session</u>

12:30 - 1:00	Introductory remarks and introduction of guests
1:00 - 3:00	Discussions on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure" with particular regard for NTCIP for DMS – review of previous discussion, DOT comments on standards status, comments by guests, followed by open discussion based on staff working paper
3:00-3:15	Break

3:15 - 5:15	Discussions on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure" with particular regard for NTCIP for Signals – review of previous discussion, DOT comments on standards status, comments by guests, followed by open discussion based on staff working paper

Tuesday, June 12   <u>8:30 - 12:30 am Open session</u>

8:30 - 9:00	Review of previous day's discussion, introduction of guests
9:00 - 11:00	Discussions on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure" with particular regard for EMS/incident management – review of previous discussion, DOT comments on standards status, comments by guests, followed by open discussion based on staff working paper
11:00 - 12:00	Preliminary discussion on "DOT's role in achieving widespread adoption of common standards for ITS infrastructure" with particular regard for "center-to-center" transit- and traffic-management standards – DOT comments on standards status, followed by open discussion based on staff working paper
12:00 - 12:30	Summary of key points from discussions on methodology and applications to DMS, EMS, NTCIP for signals and center-to-center management standards, and directions for future committee activities

<u>12:30 - 2:30 pm Closed session</u>

12:30- 2:30	Agreement on principal conclusions and recommendations to date, planning for next meeting, meeting summary and report-preparation schedule
2:30	Adjournment