

Office of Research, Development, and Technology

Fiscal Year 2004/2005

PERFORMANCE

PLAN

Research that is Essential, Indispensable, and Connected to our Customers.



Turner-Fairbank Highway Research Center

FY 2004/2005
**PERFORMANCE
PLAN**

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Our Vision

“Research that is Essential, Indispensable, and Connected to our Customers.”



Introduction

This Performance Plan for the Federal Highway Administration (FHWA) Office of Research, Development, and Technology (RD&T) describes the research that we will conduct and the products and services we will provide in fiscal years (FY) 2004/2005. It also serves as a guidepost that will direct our efforts for improving operations and enhancing services.

The Office of RD&T is located at FHWA's Turner-Fairbank Highway Research Center (TFHRC), a federally owned and operated research facility in McLean, VA. The center contains more than 24 indoor and outdoor laboratories and support facilities, which provide FHWA and the world highway community with advanced research and development (R&D) related to new highway innovation. More than 300 personnel, consisting of Federal and onsite contract researchers and students, are engaged in or support transportation research at the center.

RD&T provides leadership for the FHWA Research and Technology (R&T) Program, which also involves our headquarters' offices in program development and our field offices in technology and innovation (T&I). RD&T plays a key role in guiding the FHWA R&T Leadership Team as it implements the Corporate Master Plan (CMP) for research and deployment of T&I. The FHWA R&T Program directly supports the R&T goals of the U.S. Department of

Transportation (USDOT) and focuses on addressing significant transportation challenges that face our Nation today. RD&T has continuously improved its performance planning process over the past several years, beginning with the *2001/2002 Unit Plan* and the *FY 2002/2003 Performance Plan*. The *FY 2004/2005 Performance Plan* rests solidly on the foundation of its precursors and is squarely aligned with the strategic goals and objectives of USDOT and FHWA.

We hope that this document encourages you to learn more about the people, laboratories, and research conducted or managed by FHWA RD&T. Our purpose is to communicate how RD&T strives to accomplish research that is essential, indispensable, and connected. I sincerely welcome your feedback on this plan and encourage you to provide suggestions for improvements through the TFHRC Web site at <http://www.tfhrc.gov>.



Dennis C. Judycki
Associate Administrator for Research, Development,
and Technology

The Strategic Framework

The FHWA research approach emphasizes cooperation, information sharing, and research agenda development with State and local governments, academia, and the private sector. Research conducted at TFHRC is aligned with FHWA's vision, mission, and goals.

Vision and Mission

In the new FHWA mission statement, “Enhancing Mobility through Innovation, Leadership, and Public Service,” the Agency affirms that research and innovation are integral to its mission. In fact, one of FHWA's three primary roles is to be “innovators for a better future.” The rewording of the mission statement reflects R&T's important contribution to

enhancing mobility, and it underscores FHWA's commitment to organizationally “raise the bar” on T&I development and deployment.

FHWA Roles

- ▶ **Leaders for National Mobility**
- ▶ **Stewards for National Highway Programs**
- ▶ **Innovators for a Better Future**

To support the role of being “innovators for a better future,” RD&T management commits to coordinating R&D with and for our stakeholders and partners; supporting an environment that encourages innovation deployment; and creating improved T&I deployment processes. In light of these guid-

<p>DOT Vision</p> <p>Safer, simpler, smarter transportation solutions.</p>	<p>FHWA Vision</p> <p>Improving transportation for a strong America.</p>	<p>RD&T Vision</p> <p>An RD&T organization that is essential, indispensable, and connected to our partners in advancing R&T.</p>
<p>DOT Mission</p> <p>Develop and administer policies and programs that contribute to providing fast, safe, efficient, and convenient transportation at the lowest cost consistent with the national objectives of general welfare, economic growth and stability, the security of the United States, and the efficient use and conservation of the resources of the United States.</p>	<p>FHWA Mission</p> <p>Enhancing mobility through innovation, leadership, and public service.</p>	<p>RD&T Mission</p> <p>Leads in developing a nationally coordinated R&T Program; champions the advancement of highway technological innovation in support of FHWA strategic goals and performance objectives; advances knowledge through research, development, testing, and evaluation services; and provides support and assistance throughout FHWA in matters relating to RD&T.</p>

ing principles, RD&T provides the world highway community with the most advanced R&D related to new highway technologies, focusing on solutions to complex technical problems.

FHWA Goals for FY 2004

Safety—Continually improve highway safety.

Mobility and Productivity—Preserve, improve, and expand the Nation's highway transportation system while, at the same time, enhancing the operation of the existing highway system and intermodal connectors.

Global Connectivity—Promote and facilitate a more efficient domestic and global transportation system that enables economic growth.

Environment—Protect and enhance the natural environment and communities affected by highway transportation.

National Homeland Security—Improve highway security and support national defense mobility.

Organizational Excellence—Advance FHWA's ability to manage for results and innovation.

FHWA "Vital Few"

The "Vital Few" are the key areas with performance gaps that must be addressed in the short term. Achieving performance improvements in the following priority areas will require greater emphasis during FY 2004/2005:

- ▶ Safety
- ▶ Congestion Mitigation
- ▶ Environmental Stewardship and Streamlining



Corporate Role in Research and Deployment of T&I

RD&T Corporate Missions and Functions

The Office of RD&T performs several key functions to champion the advancement of technological innovation. The following examples illustrate some of the unique functions carried out by RD&T to support the Agency's role as innovators for a better future.

Highway R&D

- ▶ Research and innovation.
- ▶ Technical assistance.
- ▶ Forensic evaluation.
- ▶ Management of FHWA Highway Research Center.

Implementation of the Corporate Master Plan

- ▶ FHWA R&T Leadership Team support in implementing the CMP for research and deployment of T&I.
- ▶ Champion for corporate R&T.

Strategic Planning and Budget

- ▶ R&T budget formulation and execution.
- ▶ Legislative monitoring and analysis of R&T issues.
- ▶ R&T performance measurement framework development.
- ▶ Agency input into USDOT RD&T Plan.

Outreach, Communication, and Consultation

- ▶ Research liaison and partnership activities (such as the American Association of State Highway and Transportation Officials' (AASHTO) Standing Committee on Research (SCOR), the Research Advisory Committee (RAC), the Transportation Research Board's (TRB) R&T Coordinating Committee (RTCC), and USDOT's RTCC).
- ▶ R&T marketing.
- ▶ Publishing and promoting FHWA R&T information.
- ▶ TFHRC visits/tours.



The Corporate Master Plan for Research and Deployment of Technology & Innovation

FHWA developed an agencywide plan for R&T called the *Corporate Master Plan for Research and Deployment of Technology & Innovation*. The CMP continues to expand the effectiveness and efficiency of R&T, with special emphasis on deploying and implementing technologies and innovations that improve the quality, cost-effectiveness, and timeliness of products, procedures, processes, practices, and/or techniques. The CMP sets out a role, new focus, and guiding principles for the FHWA R&T Program to improve highway transportation. In addition, it outlines FHWA's corporate strategy for investing in and conducting cooperative research with partners and stakeholders. In implementing this plan, the Agency is committed to engaging stakeholders throughout the R&T process and effectively communicating the R&T Program. This includes publishing an agencywide R&T Performance Report. The CMP includes 26 agency commitments to address the 7 guiding principles. The plan is available on the FHWA Web site at: <http://www.fhwa.dot.gov/legsregs/directives/policy/cmp/03077.htm>.

The Seven Guiding Principles for FHWA's R&T Program

1. The FHWA R&T process, from research through implementation, is systematic and begins with the end in mind.
2. FHWA engages in advanced and applied research and in innovation deployment activities where there is an appropriate Federal role.

3. Stakeholders are engaged throughout the R&T process.
4. The R&T process is grounded in the FHWA mission and goals, and guided by multiyear plans.
5. The R&T budget allocation is based on and driven by multiyear plans and priorities.
6. FHWA measures the performance of R&T on the Agency, program, and project levels.
7. FHWA effectively communicates its R&T Program and projects.

R&T Leadership Team

To ensure a "corporate" approach to R&T and to implement the CMP, FHWA formed an R&T Leadership Team consisting of the Associate Administrators for Environment and Planning, Federal Lands, Infrastructure, Operations, Policy, Professional Development, Safety, and RD&T; the Directors of Field Services; and a member of the Division Administrators' Council. The key role of the Associate Administrator for RD&T is to champion, facilitate, and support the Leadership Team in implementing the CMP. The R&T Leadership Team, in implementing the CMP, will establish specific roles and responsibilities for an FHWA R&T Network; define a process for developing a list of priority, market-ready T&I; and develop templates for T&I deployment, and agencywide performance measures for R&T.

RD&T Challenges and Commitments

To guide our business and performance plan, the RD&T Leadership Council's vision is to conduct research and provide products and services that are *essential, indispensable, and connected to our customers and partners*. We are committed to continuing our Quality Journey (the process that FHWA uses to regularly assess its management practices); initiating program, process, and quality-of-worklife improvements; conducting outstanding research; and providing services that drive the achievement of FHWA strategic goals, and exceed customer and partner expectations. Our top four challenges and commitments for FY 2004/2005 are:

I. Effectively Deliver Needed Products and Services

- A. Develop quality research products and services that address the needs of our internal customers and external partners in a timely manner.
- B. Improve R&T collaboration and communication with the FHWA Resource Center and Division Offices.

II. Improve Business and Administrative Processes

- A. Implement the CMP within RD&T, and support the RD&T Associate Administrator in guiding the FHWA R&T Leadership Team in its oversight of the CMP implementation for the Agency.

B. Refine and implement the lab assessment process to provide regular, independent feedback to improve the quality of lab-based research and services.

C. Use research resources effectively and ensure efficient RD&T facility, organization, and program operations.

D. Define and implement methodologies/tools to evaluate projects and measure performance.

- ▶ Develop performance goals, measures, strategies, and initiatives to improve performance management in RD&T offices and laboratories.
- ▶ Monitor measurement results and analyze performance management information.
- ▶ Conduct the annual RD&T self-assessment process and apply results.
- ▶ Develop and conduct RD&T customer-satisfaction surveys.
- ▶ Assist in the implementation and review of agencywide performance-improvement initiatives within RD&T.

E. Advance information technologies and systems to address the unique needs of a world-class research organization.

III. Develop and Recognize Employees

A. Mentor employees and encourage training and professional development to build skills and add to capabilities and competencies.

B. Improve the award and recognition program to value achievements, link directly to team accomplishments, and advance the RD&T Leadership Council's Action Agenda.

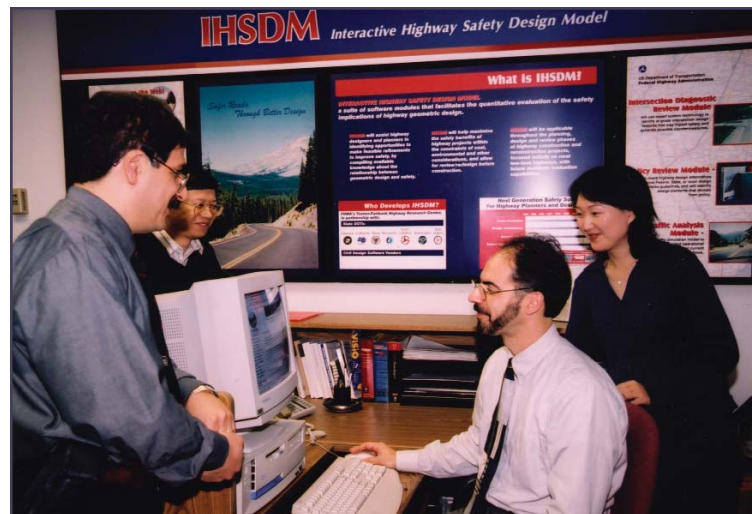
IV. Communicate the FHWA R&T Story and Future Agenda

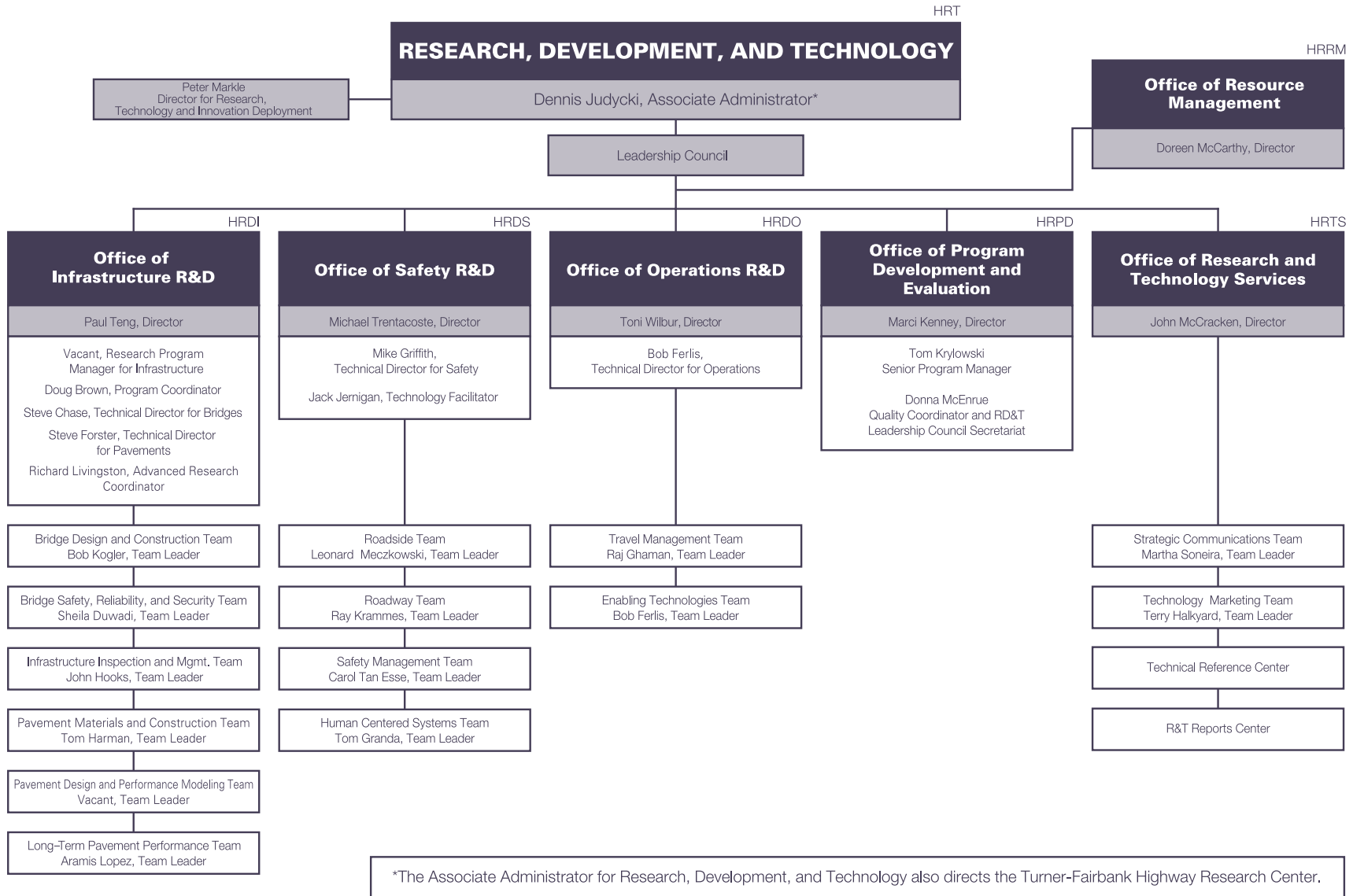
A. Improve the communication of FHWA R&T initiatives and focus areas to stakeholders.

B. Collaborate with FHWA headquarters and field offices to gather and disseminate information about achievements in FHWA T&I delivery.

C. Identify national research program priorities, resources, and funding needs with our partners.

D. Build a common advocacy to enhance the national R&T Program and legislative agenda.





RD&T Organization

Infrastructure R&D

The Office of Infrastructure (HRDI) R&D is focused on improving the performance of highway infrastructure and significantly reducing associated long-term costs. Infrastructure research includes programs for asset management, structures, and pavements that develop information for better decisionmaking, build a workforce with greater knowledge and capabilities, deliver new technologies to enhance our ability to do the job, and provide the tools to deploy the advancements made. For asset management, areas of concentration include economic analysis systems, quality management, and pavement preservation. Structures emphasis areas are the bridge of the future, stewardship and management, and bridge safety, reliability, and security. Key pavement areas include advanced design and analysis, quality systems for construction, and optimized surface characteristics for enhanced user satisfaction. HRDI also conducts advanced research to explore exciting new ideas for improving materials, systems, and technologies.

Operations R&D

The Office of Operations (HRDO) R&D conducts research to mitigate congestion and improve safety through better management and operation of the surface transportation system. The Travel Management Team produces a variety of hardware and software tools to analyze operational improvements, reduce congestion on our surface streets and freeways, and mitigate delays in work zones. The Enabling Technologies Team is developing infrastructure-based systems that will warn motorists of potential intersection collisions, promoting safety by developing decision-support tools for winter-weather maintenance, and supporting the



The Federal researchers and staff at TFHRC

development and use of safety-enabling technologies such as Dedicated Short-Range Communications and Nationwide Differential Global Positioning Systems (NDGPS).

Safety R&D

The mission of the Office of Safety (HRDS) R&D is to help reduce highway crashes and related fatalities and injuries by developing and implementing a program of nationally coordinated R&T

safety innovations. The focus is on FHWA's priority highway safety-improvement objectives related to preventing and mitigating roadway departures, managing safety, improving intersections, and protecting pedestrians. HRDS R&D provides transportation officials and practitioners with improved understanding, information, and state-of-the-art tools so that they can make informed decisions regarding highway safety improvements. HRDS R&D also conducts advanced research to determine new ways to solve highway safety problems and challenges.

Program Development and Evaluation

The Office of Program Development and Evaluation (HRPD) champions the RD&T program and those it serves. This involves developing and executing policy, budget, program management, and evaluation tools to enable FHWA to carry out its R&T Program. HRPD is also the focal point for FHWA participation in cooperative research activities such as the National Cooperative Highway Research Program (NCHRP) and transportation pooled-fund studies, and active outreach to University Transportation Centers (UTC) and the small business community.

Resource Management

The Office of Resource Management (HRRM) provides critical management support services that contribute to RD&T's research and deployment of T&I activities. The HRRM staff provides advice, assistance, and support for financial management of R&T and General Operating Expenses funding; acquisition planning and contract administration for research programs and research support activities; human resource management and employee development; information technology support for research and business applications; accountable property management; TFHRC facilities management; emergency planning; FHWA continuity of operations support; and physical security.

Research and Technology Services

The Office of R&T Services (HRTS) leads in leveraging T&I deployment, one of the Agency's key business processes. HRTS also provides a variety of marketing and communication services agencywide, as well as within RD&T. These include planning and executing the FHWA-wide exhibit program; administration of the R&T Products Distribution Center; editing, publishing, and distributing RD&T research reports; administration of TFHRC Web pages; and publishing periodicals, such as *Public Roads*, that reach customers worldwide. In addition, HRTS supports the implementation of the CMP.

Director for Research, Technology & Innovation Deployment

The Director for Research, Technology & Innovation Deployment provides key support to the Associate Administrator for RD&T in the role of FHWA's R&T champion. In addition, the Director works with FHWA leadership to "raise-the-bar" for research and deployment of T&I, and facilitates the ongoing implementation of the CMP.

RD&T Quality Coordinator/Leadership Council Secretariat

The secretariat provides leadership for the Quality Program within RD&T, which includes coordinating annual Quality Self-Assessment activities. In addition, the secretariat actively utilizes the RD&T Leadership Council to address quality-management initiatives, such as developing and implementing the laboratory assessment program and developing and tracking Leadership Council Action Agenda initiatives.

RD&T Leadership Council

The mission of the RD&T Leadership Council is to continuously improve the RD&T organization and its achievement of FHWA's strategic goals. The Council works on a wide range of issues related to the effective management of TFHRC and serves in an advisory capacity to the RD&T Executive Committee (which consists of the Associate Administrator for RD&T, the Director for Research, Technology & Innovation Deployment, and the RD&T Office Directors).

Council Goals and Objectives

- ▶ Develop priorities for innovative technologies and approaches to R&T.
- ▶ Set a research agenda that meets customer requirements.
- ▶ Conduct quality research that efficiently and effectively delivers products.
- ▶ Deliver high-value work that is relevant to FHWA and USDOT missions.
- ▶ Facilitate deployment of innovative products and services.
- ▶ Effectively balance the cost, time, and risk of R&T projects managed by RD&T.
- ▶ Support dissemination of best practices, solutions, and success stories.

Workgroups Reporting to the Leadership Council:

- ▶ Performance Management.
- ▶ Customer Survey.
- ▶ Information Technology.
- ▶ Communications.
- ▶ Corporate Focus.

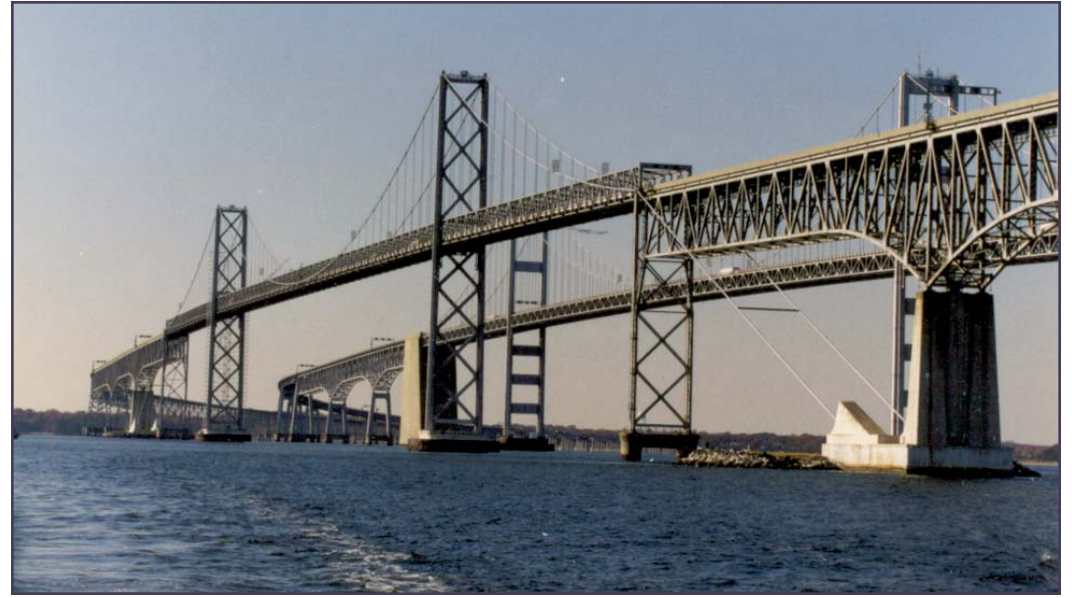


The RD&T Leadership Council



FY 2004/2005

Research Products



Infrastructure R&D

Infrastructure R&D



Office of Infrastructure R&D		
Product	Projected Goal Impact	Target Completion Date
Pavement Design and Analysis		
Impact of Dynamic Modulus on Model Prediction An investigation of the dynamic modulus obtained on field, production, and laboratory samples to improve understanding of the impact of dynamic modulus on prediction models.	Mobility and Productivity	Dec 03
Long-Term Pavement Performance (LTPP) Binder (LTPPBind) v 3.0 This software will help highway agencies and contractors select the most suitable performance grade of asphalt binder for a given project.	Mobility and Productivity	Jan 04
Strategic Analysis of Pavement Evaluations for Rehabilitation (SAPER) Software Tool The SAPER software tool will help identify appropriate repair and rehabilitation strategies for concrete pavements.	Mobility and Productivity	Jul 04
Guidance for the Use of Fiber-Reinforced Polymer (FRP) in Concrete Pavements Guidelines for the use of second-generation FRP dowels and FRP reinforcement in continuously reinforced concrete pavements.	Mobility and Productivity	Oct 04
LTPP Traffic Projection Software This software will forecast and/or backcast axle load spectra based on incomplete traffic monitoring data. This will assist State DOTs with traffic data inputs for the new <i>AASHTO Pavement Design Guide</i> .	Mobility and Productivity	Sep 05
Pavement Materials and Construction		
FHWA Dynamic Angle Validation Kit Improved identification of Superpave® gyratories compliance issues. The project is funded by NCHRP, in partnership with the TRB.	Mobility and Productivity	Oct 03
Prediction of Paving Concrete Shrinkage Guidance for estimating and limiting the shrinkage potential of paving concrete to help assure the concrete's compatibility with structural design and the construction process.	Mobility and Productivity	Oct 03

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Pavement Materials and Construction (continued)		
Mixture-Specific Procedure for Estimating Alkali-Silica Reactivity (ASR) Potential Improved test method and procedures for assessing the potential for ASR of specific concrete mixtures.	Mobility and Productivity	Dec 03
Low-Temperature Binder Characterization Refinement of the Superpave binder specification based on a detailed assessment of current and innovative laboratory low-temperature characterization procedures.	Mobility and Productivity	May 04
Guidance on Compatibility of Mixture Components Guidance, including test procedures, to enable early identification of potential compatibility problems in paving concrete mixtures.	Mobility and Productivity	Mar 05
Full-Scale Accelerated Performance Testing for Superpave and Structural Validation: Phase I—Construction Refined national Superpave binder specification to fully capture the benefit of modified binders. Pooled-fund study TPF-5(019) in partnership with the TRB Superpave Binder Expert Training Group.	Mobility and Productivity	May 05
Pavement Data and Performance		
Smoothness Specifications Improved pavement measurements made at highway speeds. Determine accelerometer requirements for inertial profilers at speeds from 24 to 113 kilometers per hour (15 to 70 miles per hour).	Mobility and Productivity	Nov 03
Warp and Curl Analysis Software Improved analysis and design of portland cement concrete (PCC) pavements. Software analysis package is being developed.	Mobility and Productivity	Nov 03
LTPP Distress Identification Manual This updated manual describes the procedures and methods to identify and quantify pavement distresses for both asphalt concrete and PCC.	Mobility and Productivity	Feb 04
Anytime Weather Software Historical weather data for North America based on LTPP files and the National Oceanic and Atmospheric Administration. Provides reliability estimates on daily weather values for pavement design and evaluation.	Mobility and Productivity	Mar 04

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Pavement Data and Performance (continued)		
<p>Weigh-in-Motion (WIM) Pavement Smoothness Specifications These specifications will be used when installing WIM equipment and/or to reduce calibration or check time. They will provide a diagnostic tool to use when data change to assist with decisions on equipment reinstallation and/or pavement corrections.</p>	Mobility and Productivity	Jun 04
<p>DataPave Online This Web application provides access to all releasable LTPP data via the Internet. Data can be extracted (exported) to a number of popular file formats to be used for analysis.</p>	Mobility and Productivity	Sep 04
<p>Fatigue Model Development of a viscoelastoplastic continuum fatigue damage model using the modified binder test sections at the Accelerated Loading Facility will enable better fatigue-performance prediction of modified binders used in Superpave.</p>	Mobility and Productivity	Sep 04
Bridge of the Future		
<p>Compilation and Evaluation of Results from High-Performance Concrete (HPC) Bridge Projects This CD-ROM presents a detailed compilation of data from 19 HPC showcase bridges, including project-specific plans, specifications, and detailed evaluations.</p>	Mobility and Productivity	Dec 03
<p>Corrugated Web Plates for Steel Girders Maximize bridge efficiency of design and capacity and maximize the efficiency of design for steel structures.</p>	Mobility and Productivity	Dec 03
<p>Curved Girder Bridge Strength Prediction Equation Provide design guidance to AASHTO. Critical input to design protocol for curved steel structures.</p>	Mobility and Productivity	Dec 03
<p>Design Guidance for Composite Timber Bridges Provide guidance and assistance in FRP and glulam composite bridge design and construction.</p>	Mobility and Productivity	Dec 03

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Bridge of the Future (continued)		
<p>HPC Database Analyze the effectiveness of new generation concrete structural materials and document the performance improvements obtained through the use of HPC.</p>	Mobility and Productivity	Dec 03
<p>Improved Fracture Toughness Specifications for High-Performance Steel (HPS) Maximize the design and performance benefits of advanced steels. Performance properties of HPS provide significant advantages in resistance to critical fracture not currently accounted for in design guidance.</p>	Mobility and Productivity	Dec 03
<p>New FRP Specifications Several new specifications were developed and adopted by code-writing organizations. This is an essential step in moving FRP materials from research into practice. Specifications have been developed and adopted for: FRP materials in general; the use of FRP in prestressing concrete; the inspection and acceptance testing of FRP bridge decks; the design and construction of bonded repairs of concrete using FRP; and the use of FRP to reinforce concrete.</p>	Mobility and Productivity	Dec 03
<p>Standard Tests Using a GeoGauge This report presents standard techniques for using a non-nuclear device to evaluate soil compaction and soil stiffness increases for pavement support and embankment construction. This device, developed through the USDOT's Small Business Innovation Research (SBIR) program, offers an alternative to nuclear devices for controlling typical highway construction operations. These standards will help promote the use of this alternative method.</p>	Mobility and Productivity	Oct 04
Safety, Reliability, and Security		
<p>Improved Seismic Design Provisions for AASHTO Bridge Specifications Provide recommended seismic design specifications for highway bridges. Recommended seismic design specifications completed and proposed to AASHTO. More work is required to adopt the specifications.</p>	Mobility and Productivity	Dec 03
<p>Seismic Retrofit Manual This manual presents an approach to assessing the vulnerability of highway bridges to earthquakes, screening methods to identify bridges at risk, and suitable criteria and techniques for retrofitting such structures. The manual, applicable to the entire United States, is for bridge engineers without specialized backgrounds in seismic engineering.</p>	Mobility and Productivity, Safety	Feb 04

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Safety, Reliability, and Security (continued)		
<p>Wind-Induced Vibration of Stay Cables This report contains a thorough review of all issues related to the excitation of bridge stay cables by wind and the combination of wind and rain. It not only reviews historical works, but also documents new groundbreaking research, analysis, and testing performed under this study. Based upon this state-of-the-art information, a new set of draft design guidelines is presented for design against and mitigation of undesirable wind-induced vibrations.</p>	Mobility and Productivity, Safety	Apr 04
<p>Examples for Design of Seismic Isolation Bearings These examples will provide detailed analysis and design of the friction and elastomeric isolation bearings used in typical bridges.</p>	Mobility and Productivity	Nov 04
<p>A Risk-Based Methodology for Assessing the Seismic Performance of Lifeline Systems Report Tool to assist State bridge engineers in assessing loss estimation of earthquake damage. A computer program was completed and a report published. This tool was calibrated and validated by a demonstration project (Northridge earthquake case study).</p>	Mobility and Productivity	Dec 04
<p>Design Procedure for Bottomless Culverts This report provides hydraulic design guidance for a three-sided culvert with a moveable bed. By preserving the aquatic habitat and eliminating abrupt changes in elevation and flow velocity, these culverts result in far less impact on migratory fish species. This report provides design guidance for issues such as compound hydraulic roughness and stream stability issues.</p>	Mobility and Productivity, Environment	Dec 04
<p>Seismic Retrofitting Manuals: Part III: Special Bridges Provide nationally applicable seismic design and retrofitting guidelines for special bridges (e.g., arches, long-span trusses, and cable-supported bridges).</p>	Mobility and Productivity	Dec 04
<p>Tacoma Narrows Technology Demonstration and Research Project This report will provide useful information on the effects of various retrofit approaches and the construction of the new Tacoma Bridge (Tacoma, WA); on the wind response of the existing Tacoma Narrows Bridge; and on the application of proven sensing technologies for monitoring the health of long-span bridges.</p>	Mobility and Productivity, Safety	Dec 05

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Stewardship and Management		
<p>Measurement of the Benefits of Infrastructure R&D This report documents a recommended framework for the quantitative and qualitative measurements of R&D benefits, focusing on typical programs, projects, and products related to infrastructure; however, the framework could be expanded or modified to other R&D programs. The framework measures benefits related to the products produced and their use, any related cost savings, environmental impacts, and user satisfaction. The use of the framework is demonstrated on several existing programs.</p>	Mobility and Productivity	Oct 03
<p>Guidelines for the Ultrasonic Inspection of Hanger Pins The report details ultrasonic technologies for the inspection of bridge pins. It provides sufficient information to specify, obtain, and oversee ultrasonic inspections of bridge pins. It also provides critical information on unique phenomena associated with ultrasonic inspection of bridge pins, and provides guidance on conducting and reporting ultrasonic inspections.</p>	Mobility and Productivity	Dec 03
<p>Guidelines for the Use of High-Energy Radiography for Structures These guidelines are based upon field-testing results for imaging defects in concrete. Field testing to evaluate capabilities of the method will continue.</p>	Mobility and Productivity	Jan 04
<p>Fatigue Retrofit Manual This manual will help States select and implement fatigue retrofits for in-service bridges.</p>	Mobility and Productivity	Apr 04
<p>Corrosion Performance of Epoxy-Coated Rebar (ECR) in Concrete (10-Year Laboratory Study) Fusion-bonded ECR has been used extensively in bridge decks for about 25 years (in more than 50,000 bridges and more than 50 million square meters (59.80 million square yards) of deck area) with very satisfactory performance in deicing salt-exposure conditions. This report provides valuable information from a long-term (10-year) study of ECR performance in a high chloride environment. Among the variables studied and reported are coating defects, holidays, single- and double-mat designs, and degree of adhesion. The data are useful for life-cycle cost analysis and prediction of long-term performance of bridge decks with epoxy-coated reinforcing steel.</p>	Mobility and Productivity	Jun 04

Office of Infrastructure R&D (continued)		
Product	Projected Goal Impact	Target Completion Date
Stewardship and Management (continued)		
<p>Ultrasonic Methods for Health Monitoring of Prestressing Tendons Technology to prevent failures due to corrosion or tendon fracture; prototype sensors built and tested; patent application being completed.</p>	Mobility and Productivity	Sep 04
<p>Bridge and Tunnel Surveillance: A State-of-the-Art Review The report is a synthesis of state-of-the-art practices related to surveillance and security of our bridge structures. It presents evaluation frameworks, tools, and techniques to select among alternative surveillance and security approaches that are consistent with vulnerability levels. The report also identifies and describes opportunities to maximize the value of these technologies by providing multiple uses.</p>	Mobility and Productivity, Security	Jan 05
<p>Guidelines for Testing Steel Bridges Prior to Painting The reliability and reproducibility of commercial test kits for determining chloride concentration on steel surfaces before bridge coating application are reported. The guidelines identify the most reliable and easiest test technique for determining chloride concentration on steel bridges before painting.</p>	Mobility and Productivity	Apr 05
<p>Best Practices Manual for Quality Bridge Coatings FHWA has expended significant resources on developing advanced corrosion-protection materials and applications for bridge structures over the past 20 years. Much of this work has focused on development of materials-based solutions. While there is still potential for greater performance in the materials area, the returns from these efforts are diminishing. Much more promising are efforts that seek to elevate the level of quality achieved during actual application of advanced corrosion-protection methods and materials. These reports document best practices in contracting (e.g., warranties, rapid turnaround), training and certification, and specific quality control/quality assurance mechanisms.</p>	Mobility and Productivity	Sep 05

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Operations R&D

Operations R&D



Office of Operations R&D		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Intelligent Vehicle Initiative (IVI) and Research Related to Human Centered Systems		
<p>Human Factors Assessment of Infrastructure-Based Intersection Collision Avoidance (ICA) Devices The goal is to evaluate alternative infrastructure-based warnings to drivers to prevent collisions (in conjunction with the Human Centered Systems Lab).</p>	Safety	Mar 04
<p>Enhanced Digital Mapping A cooperative partnership with industry to develop map database specifications that enable or improve driver safety assistance systems.</p>	Safety	Apr 04
<p>ICA and Roadway Crash Avoidance / Infrastructure Systems Concepts and Requirements The Infrastructure Consortium is organized as a pooled-fund project that is initially developing functional requirements and demonstration systems for infrastructure-based ICA systems, which use roadside sensors, processors, and warning devices; roadside-vehicle communication devices; other roadside informational or warning devices; and traffic signals to provide driving assistance to motorists and crossing assistance to pedestrians to improve safety at intersections.</p>	Safety	Jan 05
<p>Transportation Management Center (TMC) National Pooled-Fund Study Results Study of operational and human-centered issues common among agencies that manage and operate TMCs.</p>	Safety, Mobility and Productivity	Sep 06
<p>Traffic Control Device Consortium Pooled-Fund Study A consortium of State, regional, and local entities, FHWA, and other partners will evaluate innovative traffic control devices and disseminate the results for incorporation into the <i>Manual on Uniform Traffic Control Devices</i> (MUTCD) (in conjunction with the Human Centered Systems Lab).</p>	Safety, Mobility and Productivity	Dec 06
Traffic Control and Operations		
<p>Traffic Detector Handbook Handbook addressing the design, use, and maintenance of traffic loops and magnetometers and how to select and utilize video and radar sensors.</p>	Safety, Mobility and Productivity	Nov 03

Office of Operations R&D (continued)		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Traffic Control and Operations (continued)		
<p>Freeway Management Handbook Updating handbook to address institutional and technical issues associated with the planning, design, and operation of freeway networks.</p>	Mobility and Productivity	Dec 03
<p>Traffic Control Systems Handbook Updating existing <i>Traffic Control Systems Handbook</i> to include Adaptive Control Systems (ACS).</p>	Mobility and Productivity	Dec 03
<p>Winter Weather Maintenance Decision Support Systems Maintenance Decision Support System techniques and technology guidance tools will assist winter maintenance managers with treatment recommendations. The tools have the potential to keep roadways safer by improving mobility in adverse weather and promoting efficiencies in the use of chemicals, equipment, and staff.</p>	Safety, Mobility and Productivity, Environment	Dec 03
<p>ACS "Lite" Version Software Implementation of ACS to closed-loop traffic control systems.</p>	Mobility and Productivity	Jan 04
<p>Alternate Avalanche Control Ammunition Pooled-Fund Study Develop alternative ammunition that will be safe, cost effective, and more effective for use in avalanche control.</p>	Safety, Mobility and Productivity	Jun 04
<p>ACS "Lite" Field Test Field testing of the ACS "Lite" software developed to demonstrate the benefits to a real-world application.</p>	Mobility and Productivity	Sep 04
<p>Ramp Metering 2000 Software Field Demonstration Demonstrate the capabilities of the software. Ramp Metering Software 2000 provides for the design, simulation, and real-time operation of freeway ramp metering and addresses both recurring and nonrecurring congestion by having predetermined metering rates that are adjusted as conditions vary too far from the norm.</p>	Mobility and Productivity	May 05

Office of Operations R&D (continued)		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Traffic Control and Operations (continued)		
<p>Winter Weather Maintenance Decision Support Systems Pooled-Fund Study Study designed to help highway planners and maintenance personnel better plan and respond to winter weather and road conditions.</p>	Safety, Mobility and Productivity, Environment	Jun 05
<p>DynaMIT One of the two prototypes for the real-time Traffic Estimation and Prediction System (TrEPS) developed under the Dynamic Traffic Assignment (DTA) research project. DynaMIT will provide traffic estimation and predictive information based on real-time traffic data and will help traffic engineers at TMCs implement real-time proactive traffic management strategies. The prototype will be field tested in Los Angeles, CA, and Hampton Roads, VA.</p>	Mobility and Productivity	Dec 05
<p>Unmanned Aerial Vehicle for Aerial Surveillance Research on the parameters and characteristics of remotely piloted vehicles for incident management and traffic surveillance.</p>	Safety, Mobility and Productivity	Dec 05
<p>DYNASMART-X One of the two prototypes for the real-time TrEPS developed under the DTA research project. DYNASMART-X will provide traffic estimation and predictive information based on real-time traffic data and will help traffic engineers at TMCs implement proactive traffic management strategies in real time. The prototype will be field tested in Houston, TX.</p>	Mobility and Productivity	Jun 06
<p>Surface Transportation Security and Reliability Information System Model Deployment The iFlorida model deployment will demonstrate and evaluate how security, reliability, and safety can be enhanced through the widespread availability of real-time information.</p>	Safety, Mobility and Productivity, Security	Jun 07
Traffic Analysis Tools/ Simulation and Modeling		
<p>Emergency Vehicle Network Delay Study The objective is to conduct a simulation analysis to assess the network impacts of emergency vehicle traffic signal preemption.</p>	Mobility and Productivity	Dec 03

Office of Operations R&D (continued)		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Traffic Analysis Tools/ Simulation and Modeling (continued)		
<p>QuickZone Work Zone Delay Estimation Tool An easy-to-use, easy-to-learn delay estimation tool targeted at State and local traffic construction, operations, and planning staff, and construction contractors. QuickZone is an open-source, Microsoft® Excel-based application suitable for both urban and interurban corridor analysis.</p>	Mobility and Productivity	Dec 03
<p>Traffic Analysis Tools Selection Guide Primer Develop a guidance document that helps traffic engineers select the right tool for a given type of transportation analysis.</p>	Mobility and Productivity	Dec 03
<p>Traffic Simulation Application Guidelines Develop a guidance document that describes a process for the proper use of traffic simulation software in transportation analyses.</p>	Mobility and Productivity	Dec 03
<p>DYNASMART-P One of the two prototypes for the TrEPS for Operations Planning (TrEPS-P) developed under the DTA research project. DYNASMART-P represents a new generation of traffic analysis tools for traffic operations planning in the dynamic transportation network, particularly in the intelligent transportation systems (ITS) context.</p>	Mobility and Productivity	Jan 04
<p>CORSIM Application Guidelines Develop a set of guidelines to help users of the CORSIM traffic simulation software use the software properly to conduct transportation analyses.</p>	Mobility and Productivity	Sep 04
<p>Traffic Analysis Tools Case Studies and Best Practices Develop a document that highlights the role and benefits of traffic analysis tools by featuring real-world case studies and the applications of these tools in transportation analyses.</p>	Mobility and Productivity	Sep 04
<p>Traffic Analysis Tools Course Develop a training course that covers the material developed in the FHWA Traffic Analysis Tools Selection Guide and Primer.</p>	Mobility and Productivity	Sep 04

Office of Operations R&D (continued)		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Traffic Analysis Tools/ Simulation and Modeling (continued)		
<p>Traffic Simulation Application Course Develop a training course that covers the material developed in the FHWA <i>Traffic Simulation Application Guidelines</i>.</p>	Mobility and Productivity	Sep 04
<p>DYNAMIT-P One of the two prototypes for the TrEPS-P developed under the DTA research project. DYNAMIT-P represents a new generation of traffic analysis tools for traffic operations planning in the dynamic transportation network, particularly in the ITS context.</p>	Mobility and Productivity	Dec 04
<p>Strategic Work Zone Analysis Tools (SWAT) To address mobility and safety impacts of work zones, SWAT is a set of four tools for the design and operation of work zones. The tools are: Work Zone Delay Impact Analysis Spreadsheet (QuickZone), Expert System Software Program, Cost/Alternative Analysis Spreadsheet, and a Detailed Simulation Model.</p>	Mobility and Productivity	Dec 04
<p>QuickZone Partnership Program Takes advantage of QuickZone's open source code approach to both further improve the software and to provide State and local transportation agencies with a tool that best meets their needs.</p>	Mobility and Productivity	May 05
<p>Advanced CORSIM Course Develop a course for CORSIM traffic simulation software users that teaches advanced topics that go beyond the current introductory course.</p>	Mobility and Productivity	Sep 05
<p>Next Generation Simulation Modeling Develop and freely distribute validated microscopic traffic simulation algorithms and real-world traffic data sets.</p>	Mobility and Productivity	Sep 07

Office of Operations R&D (continued)		
Ongoing Projects in FY 2004/2005	Projected Goal Impact	Target Completion Date
Enabling Technologies		
<p>Global Positioning System (GPS) Surface Observation System Installation for Integrated Precipitable Water Vapor (IPWV) Install GPS surface observation system packages at NDGPS sites to calculate the IPWV from the accurate measurements of the GPS signal delay caused by atmospheric water vapor.</p>	Safety, Mobility and Productivity, Environment, Security	Dec 05
<p>NDGPS Reference Station Modernization Research to refine existing GPS capability.</p>	Safety, Mobility and Productivity, Environment, Security	Dec 05
<p>High-Accuracy NDGPS Provides the capability to broadcast corrections to the GPS over long ranges to achieve a better than 10-centimeter (3.94-inch) accuracy throughout the coverage area.</p>	Safety, Mobility and Productivity, Environment, Security	Dec 07

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Safety R&D

Safety R&D



Office of Safety R&D		
Products	Projected Goal Impact	Target Completion Date
Run-Off-Road Prevention: Design		
Updated Minimum Levels for Pavement Marking Retroreflectivity New recommendations will be presented based upon feedback and recently completed research.	Safety	Jan 04
Requirements for High Conspicuity Traffic Signs Evaluation of the level of fluorescence required for high conspicuity traffic signs (in conjunction with the Human Centered Systems Lab).	Safety	Mar 04
Guidelines for Maintaining Night Visibility of Traffic Signs Efforts currently underway will lead to a document providing guidance and detailed procedures for sign inspection and management programs.	Safety	Jun 04
Interactive Highway Safety Design Module—2004 Release Software that will assist highway planners and designers to estimate the safety and operational effects of geometric design decisions on two-lane rural highways.	Safety	Sep 04
Enhanced Night Visibility Project Results Information on impact of new headlighting technologies on roadway visibility.	Safety	Dec 04
Relative Effectiveness of Pavement Markings and Raised Retroreflective Pavement Markers (RRPM) Highway Driving Simulator and field research on driver performance under varying levels of marking visibility will be documented.	Safety	Dec 04
Driver Recognition of Traffic Control Color Coding Determination of the range of colors that provide acceptable color recognition for traffic control materials and devices (in conjunction with the Human Centered Systems Lab).	Safety	Jun 05
Guidelines for Maintaining Night Visibility of Pavement Markings Efforts will lead to a document that will provide guidance and detailed procedures for pavement marking inspection and management programs.	Safety	Jun 05

Office of Safety R&D (continued)		
Products	Projected Goal Impact	Target Completion Date
Run-Off-Road Prevention: Design (continued)		
<p>Visibility Requirements for Novel Pavement Marking Treatments Investigation of the effectiveness of novel pavement marking patterns, including painted rumble strips, wide centerlines, color coding, and variable intervals (in conjunction with the Human Centered Systems Lab).</p>	Safety	Sep 05
<p>Driver Performance Effects from Innovative Applications of Pavement Markings and RRPMS These efforts will test driver response in the Highway Driving Simulator to innovative applications of markings and markers.</p>	Safety	Dec 05
<p>Requirements for Light-Emitting Diode (LED) Traffic Signals Evaluation of the effectiveness of alternative LED-based traffic signals compared to existing incandescent traffic signals (in conjunction with the Human Centered Systems Lab).</p>	Safety	Jun 06
<p>Degradation of Traffic Sign Retroreflectivity and Color Evaluation of the changes in retroreflectivity and color as signs age and weather, and the resulting impact on drivers (in conjunction with the Human Centered Systems Lab).</p>	Safety	Dec 06
Run-Off-Road Mitigation: Severity Reduction		
<p>Mailbox Surrogate Test In high-speed crash tests, mailbox supports have been observed to fly back and impact the vehicle windshield with the potential to cause injuries and fatalities. A low-cost test using finite element analysis (FEA) is being developed for evaluating lightweight mailboxes that will serve as a surrogate for the more expensive full-scale tests.</p>	Safety	Jan 04
<p>Guardrail Blockout Surrogate Test Blockouts minimize the potential for wheel or bumper snagging on strong-post guardrail systems. A new surrogate test is being developed to reduce costs and still provide a realistic loading condition for proposed blockouts made of recycled plastic, rubber, wood, etc.</p>	Safety	Jan 04

Office of Safety R&D (continued)		
Products	Projected Goal Impact	Target Completion Date
Run-Off-Road Mitigation: Severity Reduction (continued)		
<p>Aesthetic Traffic Barriers The safety performance of aesthetic guardrails, stone masonry guardwalls, bridge rails, and transitions are being studied in accordance with NCHRP 350 standards, for use on park roads, parkways, and other Federal Lands highways.</p>	Safety	Mar 04
<p>Guardrail-to-Bridge-Rail Transitions FEA techniques are being developed to analyze and redesign W-beam and thrie-beam transitions. A series of retrofit designs will be developed for the Hawaii TL-4 transitions, which consist of steel posts and a nested thrie-beam rail attached to a concrete end block.</p>	Safety	Apr 04
Pedestrians and Bicyclists		
<p>Pedestrian Bicycle Crash Analysis Tool (PBCAT) v 2.0 The PBCAT software will help State and local pedestrian/bicycle coordinators, planners, and engineers improve walking and bicycling safety by analyzing crashes between motor vehicles and pedestrians or bicyclists. The updated version of PBCAT will be in a familiar Microsoft Windows® interface, provide more user options and greater customization, and offer enhanced countermeasures information.</p>	Safety	Feb 04
<p>Characteristics of Emerging Road and Trail Users and Their Safety Project will determine the characteristics of newer types of road and trail users that may affect facility design, operation, and safety. The project will also include an investigation of the effects of user activity on the safety of the operating environment. This information will be useful for individuals responsible for planning, designing, operating, and maintaining pedestrian and bicycle facilities.</p>	Safety	Mar 04
<p>Evaluation of Safety Design and Operation of Shared Use Paths Development of tools/methodologies used to evaluate the operational and safety effectiveness of various design alternatives for shared use paths. The products may be used to supplement the existing procedures in the “Bicycles” and “Pedestrians” chapters of the <i>Highway Capacity Manual</i>.</p>	Safety	Apr 04

Office of Safety R&D (continued)		
Products	Projected Goal Impact	Target Completion Date
Pedestrians and Bicyclists (continued)		
<p>Hazard Index for Assessing Pedestrian and Bicyclist Safety at Intersections Develop hazard indices that will allow planners, engineers, and other practitioners to easily identify features, or combinations of features, at intersections that place pedestrians and bicyclists at risk. Intersection indices will be helpful in influencing future intersection design, as well as accommodating the needs of pedestrians with disabilities.</p>	Safety	Jan 05
Speed Management		
<p>Results of Field Tests on Impacts of Setting and Enforcing Rational Speed Limits A complete and systematic evaluation of the effects of establishing, publicizing, and enforcing rational speed limits in a number of dedicated participating communities during a 2-year period.</p>	Safety	Dec 05
Intersections		
<p>Guidelines for High-Volume Signalized Intersections Recommendations will be provided for improved design, traffic analysis, and safety analysis for all users applied to conventional and nonconventional high-volume intersections.</p>	Safety	Apr 04
<p>Roundabout Accessibility Study Examine several factors that determine safe access to roundabouts by pedestrians with visual impairment (in conjunction with the Human Centered Systems Lab).</p>	Safety	Jun 04
<p>Safety on Continuous-Flow Intersections Safety of motor vehicle traffic will be analyzed from a conflict perspective, and considerations for pedestrian accommodations and signal settings will be explored.</p>	Safety	Sep 05
<p>Novel Intersections—Continuous Flow and Median U-Turn Perform a human factors evaluation of signage and markings for continuous flow and median U-turn intersections. The evaluations will include assessment of current sign and marking practices, which may be followed by developing, testing, and evaluating alternative signage and marking if safety deficiencies in current practice are identified (in conjunction with the Human Centered Systems Lab).</p>	Safety	Sep 05

Office of Safety R&D (continued)		
Products	Projected Goal Impact	Target Completion Date
Intersections (continued)		
Evaluation of Separator Islands at Nonsignalized Intersections Perform a field operational test of the safety and operational effectiveness of fishtail separator islands (in conjunction with the Human Centered Systems Lab).	Safety	Sep 06
Safety Management Systems		
Rollover Causation Study Study to identify the guidelines available for identifying sites with high rollover potential.	Safety	Dec 04
SafetyAnalyst Incorporation of state-of-the-art safety management approaches into computerized analytical tools for guiding the decisionmaking process to identify safety improvement and develop a systemwide program of site-specific improvement projects.	Safety	Sep 05
Pavement Edge Drop-Off Study Final report regarding implication of different edge line designs on safety (available on CD-ROM).	Safety	Dec 05
Advanced Research—Digital Road Maps Investigation of using advanced technologies to perform real-time data collection of roadway inventory information.	Safety	Oct 06
Human Centered Systems		
Personal Transportation Technology: Segway™ HT Segway performance characteristics, such as braking distance, maneuverability, and user comfort will be evaluated (in conjunction with the Pedestrian and Bicyclist research program).	Safety	Jan 04
Infrastructure-Cooperative Systems ICA The goal is to evaluate alternative infrastructure-based warnings to drivers of the need to brake to avoid collision with a red-light runner (in conjunction with the Human Centered Systems Lab).	Safety, Mobility and Productivity	Mar 04

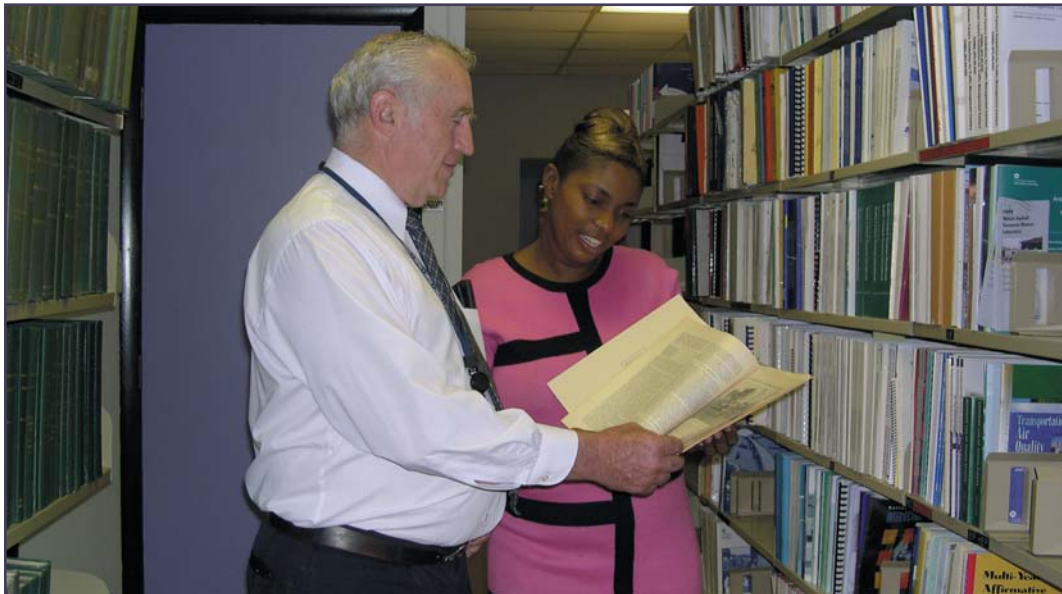
Office of Safety R&D (continued)		
Products	Projected Goal Impact	Target Completion Date
Human Centered Systems (continued)		
<p>In-Roadway Warning Lights Study Data will be collected to examine pedestrian safety and whether the effects of in-roadway warning lights at crosswalks are long lasting or the result of novelty (in conjunction with the Pedestrian and Bicyclist research program).</p>	Safety	Sep 04
<p>Sign Assessment for Infrastructure Systems The goal is to initiate and monitor projects intended to address evaluation of the infrastructure signs for the MUTCD (in conjunction with the Human Centered Systems Lab).</p>	Safety, Mobility and Productivity	Dec 04
<p>Pedestrian Decisionmaking The goal of this project is to specify guidelines for infrastructure design and engineering treatment selection at dangerous crossings by modeling pedestrian and/or driver decision criteria (in conjunction with the Pedestrian and Bicyclist research program).</p>	Safety	Sep 05
<p>Traffic Control Device Consortium Pooled-Fund Study Projects The consortium of regional, State, and local entities, appropriate organizations, and the FHWA will evaluate novel traffic control devices. Results will be disseminated for incorporation in the MUTCD (in conjunction with the Human Centered Systems Lab).</p>	Safety, Mobility and Productivity	Dec 06
Work Zone Safety		
<p>Improving Visibility of Work Zone Features to Aid Drivers Determination of visibility enhancements for work zones, including pavement marking, traffic signs, channelizing devices, and automated flaggers (in conjunction with the Human Centered Systems Lab).</p>	Safety	Mar 06
<p>Work Zone Visibility Research will address work zone visibility issues including coordinating signage, markings, barrier applications, lighting, and use of flashing and other lighting on work vehicles.</p>	Safety	Dec 06

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SERVICES

FY 2004/2005 Services



Technical Services	
Service	Description
Bridge Forensic and Specialized Engineering Services	The Bridge and Structural Teams have unique technical expertise in coating systems, corrosion protection, composite materials, HPS and HPC, structural dynamics, seismic engineering, geotechnical engineering, bridge hydraulics, and nondestructive evaluation technologies. These experts routinely provide technical assistance to other FHWA offices and State engineers. On occasion, a problem or failure occurs that falls outside of previous experience or understanding. The conduct of specialized forensic analyses is an essential Office of Infrastructure R&D mission. Examples of such services include recent studies of constraint-induced brittle fracture, expert technical assistance on the wind engineering aspects of new long-span bridges including field testing to perform dynamic characterization of bridges during various phases of construction, model tests to solve unusually complex hydraulic problems (especially those involving scour), failure analysis of coating systems, and evaluations and inspections using specialized nondestructive evaluation methods.
Pavement Forensic and Specialized Engineering Services	The Pavement Teams have technical experts in areas such as structural and mix design, specifications, construction, rehabilitation, laboratory testing, and forensic analysis. These experts routinely provide technical assistance to State highway agencies and other FHWA Offices upon request, including forensic evaluations of performance problems in pavements, and solutions and recommendations to address construction quality-assurance problems or to develop effective construction specifications. The laboratory testing capabilities and expertise have been used in support of many FHWA R&D efforts related to PCC, as, for example, coefficient of thermal expansion testing in support of the LTPP program and the new <i>AASHTO Pavement Design Guide</i> .
Models Expert Task Group	A Models Expert Task Group will be established to help implement the new <i>AASHTO Pavement Design Guide</i> and formulate the direction necessary to develop future models.
Traffic Research Laboratory (TReL) Model-Simulation and Problem-Solving Studies	The TReL supports the Advanced Traffic Management Simulator, RD&T Team, and ITS program.
Dedicated Short-Range Communications Program Support for Standards and ITS Applications	Provide technical analysis and general guidance for the development of a dedicated short-range communications standard at 5.9 gigahertz.

Technical Services (continued)	
Service	Description
Ultrawide-Band Radar Technology Coordination	Provide technical support for other FHWA offices on spectrum planning and allocation through the National Telecommunications and Information Administration and support the Office of the Secretary of Transportation (OST) in their efforts to better understand the implications of ultrawide-band radar technology on existing users of the radio spectrum.
Frequency Spectrum Coordination for FHWA	Support various organizations in FHWA to find the appropriate spectrum for specific applications and work with the field and the U.S. Coast Guard to ensure the availability of the spectrum for various applications.
Traffic Software Integrated System (TSIS) Support	Maintain the TSIS suite of traffic software, which includes the CORSIM traffic simulator, TRAFED graphical input processor, and TRAFVU output viewer and animator.
ICA Test Facility	Support research on collision-avoidance systems being developed by the Infrastructure Consortium and research on advanced signal control systems, new ICA technologies, data collection, and software and hardware testing.
IVI Infrastructure Consortium Coordination and Leadership	Provide technical leadership in developing ICA services.
United States-Japan ITS Joint Research Program	Identify promising opportunities for collaboration and assemble technical materials to share with Japan.
Highway Safety Information Systems Data	Research methods support and provide Highway Safety Information Systems data to requesting parties on an ongoing basis.
Photometric and Radiometric Measurements of Light Sources (Including Traffic Signals, Vehicle Headlamps, and Roadway Lighting)	<p>Spectro-radiometric measurement of LED traffic signal lights for Institute for Transportation Engineers (ITE); support for colorimetric requirements in ITE specification.</p> <p>Spectro-radiometric measurement of high-intensity discharge headlights on hold pending National Highway Traffic Safety Administration approval of selection of items to be measured.</p> <p>(Ongoing effort: responding to other requests as appropriate.)</p>

Technical Services (continued)	
Service	Description
Photometric and Colorimetric Measurements of Signing and Marking Materials (Including Coefficient of Retroreflectivity and Fluorescence) of Signing and Marking Materials	Round-robin measurement of weathered sheeting for National Transportation Product Evaluation Program. Round-robin measurement of samples used by Highway Innovative Technology Evaluation Center for evaluation of handheld retroreflectometers. Series of bispectral measurements of fluorescent sheeting in support of proposed rulemaking for the Office of Transportation Operations. (Ongoing effort: responding to other requests as appropriate.)

Corporate Support Services	
Service	Description
Strategic Planning	Contribute to USDOT and FHWA strategic plans; compile input to USDOT R&T strategic plan; participate in USDOT RTCC.
Performance Plan	Contribute to FHWA performance plan; lead development of RD&T plan.
Performance Report	Contribute to FHWA performance report; lead development of RD&T report.
Legislative Monitoring and Analysis	Monitor Congressional developments; participate in the Legislative Advisory Working Group; and respond to Congressional queries, requests for technical assistance, etc.
R&T Budget Development	Develop R&T budget proposal and compile budget justification; develop budget delivery plan.
Performance Measures	Contribute to development of performance measures for R&T; develop RD&T performance measures; collect success stories; manage lab assessment process.
Performance and Budget Integration	Contribute to interagency and agency dialogue on budget and performance integration; reflect appropriate performance measures in R&T budget.

Corporate Support Services (continued)	
Service	Description
Partnership and Customer Outreach Activities To Define and Implement a National Highway Research Agenda	<ul style="list-style-type: none"> ▶ National Partnership Initiative. ▶ Future Strategic Highway Research Program liaison. ▶ Liaison to State DOT research programs, SCOR, RAC. ▶ Guidance to field and States on State planning and research funds (field handbook). ▶ Coordination of FHWA participation in NCHRP. ▶ Liaison with UTCs. ▶ SBIR. ▶ Manage pooled-fund program.
International	Support FHWA and USDOT activities with the Organization for Economic Cooperation and Development, and serve as the focal point for cooperative R&T efforts with foreign governments.
Customer Surveys	Support the development of an RD&T customer feedback process, including working with Headquarters Corporate Management on FHWA State and Metropolitan Planning Organization Customer Satisfaction Survey.
Outreach for Reauthorization	Support USDOT and FHWA reauthorization outreach activities on behalf of R&T; and contribute to RD&T communications plan by identifying stakeholder groups and views on reauthorization, developing reauthorization message points, identifying opportunities to communicate these message points to decisionmakers and stakeholders, etc.
Information Analysis/Program Analysis	Conduct studies and develop analytical products to assess the effectiveness of research programs.
Periodical Publications <ul style="list-style-type: none"> ▶ <i>Public Roads</i> (bimonthly) ▶ <i>Transporter</i> (monthly) ▶ <i>Focus</i> (monthly) 	Develop issue themes and articles to support FHWA research, development, technology transfer, best practices, lessons learned, and outreach. Develop article(s) content and guide writers for appropriate story angle and audience. Cradle-to-final-product publication services; including all writing/editing phases, style guidelines and design layout, other camera-ready preparation services, printing, Web site HTML conversion, distribution list preparation, and initial distribution.

Corporate Support Services (continued)	
Service	Description
Strategic Marketing and Communications Plans	Work with Contracting Officer's Technical Representatives and Project Managers on marketing and/or communications plans to reach goals, including suggesting the appropriate marketing tools for reaching the target audience(s), such as events, public affairs, publications, and videos. Set production schedules.
RD&T Research Reports and Other Publications	Cradle-to-final-product publication services, including all writing/editing phases, style guidelines and design layout, other camera-ready preparation services, printing, Web site HTML conversion, distribution list preparation, and initial distribution.
Editing and Printing (RD&T Performance Plans, Directories, Brochures, Pamphlets, Laboratory Fact Sheets, etc.)	Cradle-to-final-product publication services, including all writing/editing phases, style guidelines and design layout, other camera-ready preparation services, printing, Web site HTML conversion, distribution list preparation, and initial distribution. Develop marketing brochure/pamphlet contents. Strategic marketing and communications plans and products.
Other Publications ▶ <i>Technology Talks (TT) Newsletter</i>	Develop story ideas; complete editing and final printing/distribution; compile TT newsletter; and distribute electronically.
Full-Service RD&T Web Site Content and HTML Programming Support	Complete document preparation with HTML coding, and PDF preparation for thousands of pages of RD&T reports, directories, newsletters, brochures, etc.
RD&T Tour Services	Full-service support. Prepare agendas and handout materials for tour groups; schedule and coordinate tours with RD&T labs and speakers; and arrange for meeting room(s), audio/visual needs, and refreshments (lunches, coffee breaks).
FHWA Exhibit Events Program Support Services	Warehouse storage and shipping of FHWA program displays and conference handouts. Full-service support of FHWA program office exhibitions for FHWA and OST.
FHWA R&T Products Distribution Center	Manage R&T Report Center, distributing hard-copy publications, CD-ROMs, and other information products to FHWA customers, nationally and abroad.
FHWA Meeting and Conference Support Services	Full-service support for logistics planning and support of FHWA-sponsored meetings for program offices. Services include hotel meeting space rental, meeting invitations and announcements, invitational travel, speaker(s) support, etc.

Corporate Support Services (continued)	
Service	Description
Audio/Visual/Computer Marketing Productions (Photography, VHS Tape or Digital Filming, Computer Presentation Services, and CD Reproductions)	Multimedia services for RD&T program offices for still photography, VHS or digital filming services, computer presentations preparation, and CD-ROM production or duplication (photographs, promotional VHS tapes, short movies, Microsoft PowerPoint® presentations, CD-ROM productions for presentations).
T&I Deployment	Meetings and other logistical arrangements. Assist with preparing documents and meeting handout materials, purchase and supply TRB reports, and other support activities.
Technology Delivery	Supports the Agency in the development of near-term R&T Program plans. Supports the program offices and the resource centers in developing and delivering new technologies, and assists in the design and implementation of feedback systems to evaluate the effectiveness of new technologies. This includes the annual report to the U.S. Congress on technology-deployment activities.
Technology Transfer Assistance	Provides assistance and service to the program offices and resource centers in support of cross-cutting technology transfer services and expertise, including marketing, developing technology packages, and fostering partnerships for technology sharing.
Communications and Marketing Assistance	Provides and maintains communication and marketing assistance, outreach, and coordination services for all R&T related activities, including FHWA-wide media (publications such as <i>Public Roads</i> , <i>Transporter</i> , and <i>Focus</i>); Web site development; CD-ROM production; support for presentations, exhibits, and speech writing; and marketing support (marketing expertise, coordination with other FHWA marketing specialists).
International Scanning Program	Member of the Agency team of panelists evaluating international scanning proposals.
Technology Innovation Committee (TIC)	Represents FHWA in the USDOT TIC.
Technology Implementation Group (TIG)	Actively supports and assists the AASHTO TIG.
Data Quality	Member of FHWA Information Quality Forum.

Corporate Support Services (continued)	
Service	Description
Raise-the-Bar on T&I	Actively supports and participates in the effort to develop the FHWA CMP.
R&T Budget Execution	Provides research and reconciliation support for all R&T funding.
FHWA-Wide Report Development	Develops the annual National Science Foundation Report for all FHWA research activities; develops the SBIR reports of funding forecasts and actual assessments for FHWA.
FHWA Advance Acquisition Planning System Development	Serves as pilot site for the development and testing of the new automated acquisition system for eventual use throughout FHWA.
Research Facility Strategic Development	Maintains a world-class research center; develops a strategic plan to ensure TFHRC's ability to continue to support state-of-the art research efforts in the future.
Emergency Planning and Support for FHWA	TFHRC serves as one of the identified Disaster Recovery Sites for FHWA in the event an emergency forces the Agency out of its headquarters building. Significant planning and coordination are needed to ensure a state-of-emergency readiness is maintained.

Organizational Support Services
Service
Financial Management
Acquisition Planning
Contract Administration and Purchase Card Management
Employee and Organizational Development
Human Resources Management
Information Technology Planning and Support
Facility Management
Physical Security
Emergency Planning and Support
Accountable Property Management
Administrative Support



Performance Management at RD&T

How Do We Measure Success?

The Office of RD&T uses criteria established by the Office of Management and Budget: Relevance, Quality, and Performance. These are the bases for assessing the need, relevance, appropriateness, quality, and performance of our research activities. Our approach to performance management builds on our planning process.

- ▶ **Relevance.** RD&T program managers must be able to articulate *why* an investment is important, relevant, and appropriate. Our research activities, products, and services outlined in this plan are designed to support the Agency's goals and address customer needs.
- ▶ **Quality.** RD&T program managers must justify how funds will be allocated to ensure quality research. Programs allocating funds through means other than a competitive, merit-based process must justify these exceptions and document *how* quality will be maintained. Quality is also assessed periodically through independent lab assessments.
- ▶ **Performance.** RD&T program managers must be able to monitor and document *how well* this investment is performing. Program managers track R&T projects to determine whether the projects are on time and within budget, and assess whether to increase or redirect funding.

Performance Management Framework

One of the conclusions of *NCHRP Synthesis 300: Performance Measures for Research, Development, and Technology Programs: A Synthesis of Highway Practice* was that "different types of evaluation methods are appropriate for different types of research projects." This holds true across organizational functions, as well. The RD&T Performance Management Framework chart identifies existing performance measures and assessment mechanisms that are utilized by unit managers and integrates them across management functions using the Agency's Baldrige-based Corporate Management Strategies (CMS). This approach helps us manage, analyze, and integrate information obtained from a variety of sources and mechanisms. It also helps us keep in mind the various dimensions for analyzing program results, such as financial performance, customer feedback, and business results. The RD&T Leadership Council utilizes this framework as a tool to assess relevance, quality, and performance, and to identify gaps in measurement.

CMS	Definition	Related RD&T Performance Measures	Methodology
Leadership	Leadership focuses on how senior leaders guide the organization. It describes how leaders set directions and high performance expectations, project a strong customer focus, and communicate clear and visible values to employees.	<ul style="list-style-type: none"> ▶ Leadership Effectiveness Inventory results. ▶ Action items completed. ▶ Performance plan items fulfilled. ▶ Self-assessment score. 	<ul style="list-style-type: none"> ▶ 360-degree feedback. ▶ Action agenda. ▶ Performance plans. ▶ Quality self assessments.
Strategic Planning	Strategic planning examines how the organization sets strategic goals and develops key action plans.	<ul style="list-style-type: none"> ▶ Action items completed. ▶ Self-assessment score. ▶ Progress made on goals established from lab assessment. 	<ul style="list-style-type: none"> ▶ Performance plans and action agenda. ▶ Quality self assessments. ▶ Lab assessments.
Customer/ Partner Focus	Customer focus examines how the organization determines requirements and expectations of customers and markets.	<ul style="list-style-type: none"> ▶ Percent satisfaction with RD&T products and services. ▶ Number of technology facilitation plans in place. ▶ Self-assessment score. ▶ Lab assessment results. ▶ RD&T customer survey results (to be determined). 	<ul style="list-style-type: none"> ▶ FHWA Satisfaction Survey. ▶ Technology Facilitation Action Plan. ▶ Quality self assessments. ▶ Lab assessments. ▶ Customer surveys. ▶ Web feedback links.
Information and Analysis	Information and analysis examines the management, effective use, and analysis of data and information to support key organization processes, to include the organization's performance management system.	<ul style="list-style-type: none"> ▶ Performance management framework. ▶ Level and content of response on feedback mechanisms used. ▶ Self-assessment score. ▶ Lab assessment results. 	<ul style="list-style-type: none"> ▶ Performance management framework. ▶ Quality self assessments. ▶ Lab assessments. ▶ Customer surveys. ▶ Web feedback links.
Human Resource Development	Human resource development and management examines how the organization helps its workforce develop its full potential and how the workforce is aligned with the organization's objectives.	<ul style="list-style-type: none"> ▶ Self-assessment score. ▶ Percent employee satisfaction survey rating. ▶ Percent payroll spent on training and development. ▶ Number of Individual Development Programs in place/in the Learning and Development System (LADS). ▶ Number of priority 1 training needs met. ▶ Number of vacancies filled. ▶ Number of days positions are vacant. ▶ Number of student interns. ▶ Awards and recognition. 	<ul style="list-style-type: none"> ▶ Quality self assessments. ▶ Employee satisfaction survey. ▶ LADS.
Process Management	Process management examines aspects of how key production/delivery and support processes are designed, managed, and improved.	<ul style="list-style-type: none"> ▶ Number of process improvements documented. ▶ Lab assessment. ▶ Number of contracts on time and on budget. 	<ul style="list-style-type: none"> ▶ Quality self assessments. ▶ Lab assessments. ▶ Project tracking system. ▶ Workload analyses.
Business Results	The business results component examines the organization's performance and improvement in its key business areas: customer satisfaction, financial and marketplace performance, human resources, supplier and partner performance, and operational performance. The category also examines how the organization performs relative to competitors.	<ul style="list-style-type: none"> ▶ Percent project completion. ▶ Number of success stories. ▶ Research benefit. 	<ul style="list-style-type: none"> ▶ Track project and services delivery/ track deployment of T&I. ▶ RD&T success stories. ▶ Pilot/case studies.

Performance Management Workgroup

The primary purpose of the Performance Management Workgroup is to help the RD&T leadership develop, coordinate, and implement organizational performance-improvement efforts. The workgroup also helps RD&T leadership improve the management of research programs and assists in the adoption of effective practices. Performance-management efforts currently underway include:

- ▶ Developing performance goals, measures, strategies, and initiatives to improve organizational performance management in RD&T offices and laboratories.
- ▶ Monitoring results of measures and analyzing performance-management information.
- ▶ Coordinating the annual self-assessment process and supporting the RD&T Leadership Council in implementing solutions to issues raised during the process.
- ▶ Contributing to special projects related to RD&T performance management.
- ▶ Providing support for agencywide performance-improvement initiatives.

Retrospective Reviews

Retrospective reviews of whether investments were well directed, efficient, and productive are essential for validating program design and instilling confidence that future investments will be appropriate. Retrospective RD&T benefit studies are conducted periodically to document the benefits of research products.

Customer Feedback

To determine whether our research products are meeting the needs of our customers, RD&T seeks and obtains customer feedback through such mechanisms as formal surveys, Web links, and focus group meetings. A Customer Survey Workgroup is helping the Leadership Council:

- ▶ Identify existing mechanisms for receiving customer feedback.
- ▶ Develop and implement an RD&T customer survey.

RD&T Lab Assessment Process

RD&T laboratory assessments are unbiased, independent expert reviews of the technical and scientific merit of research conducted at TFHRC. The assessment process is designed to:

- ▶ Enhance laboratory performance and quality by providing feedback to laboratory managers.
- ▶ Provide an opportunity to exchange views among technical experts.
- ▶ Create a feedback method that will increase the opportunities for customer and stakeholder input to research activities.
- ▶ Provide a credible, professional, and objective assessment that further improves stakeholder confidence in the value of the work performed and outcomes produced.

A lab assessment handbook has been developed to guide the assessment panel in examining the relevance, quality, and performance of laboratory research. The assessment focuses primarily on the conduct of research, but also examines whether the research activities have high potential value and whether they have achieved stated objectives. The review process is continuous, with each laboratory having the benefit of an assessment every 3–4 years.

A pilot lab assessment of the Human Centered Systems Lab was conducted in FY 2003. We plan to conduct full-scale lab assessments in the FY 2004/2005 time period, and produce a summary report reflecting assessment results.

Agencywide R&T Program

To continue to improve its R&T leadership role, its program processes, and its effectiveness in working with partners to deliver T&I, the FHWA has developed a *Corporate Master Plan for Research and Deployment of Technology & Innovation*, as stated above. The plan is available at: <http://www.fhwa.dot.gov/legisregs/directives/policy/cmp/03077.htm>. Guiding principle 6 focuses on improving R&T performance measurement on the program and Agency levels. At the Agency level, this will include deployment and impact measures. This will increase objectivity in assessing the contribution of the FHWA R&T Program toward achieving the organization's overall goals and objectives. The FHWA R&T Leadership Team is committed to producing an agencywide R&T Performance Report in the FY 2004/2005 timeframe.



Abbreviations

List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials	HRTS	Office of Research and Technology Services
ACS	Adaptive Control Systems	ICA	Intersection Collision Avoidance
ASR	Alkali-Silica Reactivity	IPWV	Integrated Precipitable Water Vapor
CMP	Corporate Master Plan for Research and Deployment of Technology & Innovation	ITE	Institute for Transportation Engineers
CMS	Corporate Management Strategies	ITS	Intelligent Transportation Systems
DOT	Department of Transportation	IVI	Intelligent Vehicle Initiative
DTA	Dynamic Traffic Assignment	LADS	Learning and Development System
ECR	Epoxy-Coated Rebar	LED	Light-Emitting Diode
ETG	Expert Task Group	LTPP	Long-Term Pavement Performance
FEA	Finite Element Analysis	LTPPBind	Long-Term Pavement Performance Binder
FHWA	Federal Highway Administration	MUTCD	Manual on Uniform Traffic Control Devices
FRP	Fiber-Reinforced Polymer	NCHRP	National Cooperative Highway Research Program
FY	Fiscal Year	NDGPS	Nationwide Differential Global Positioning System
GPS	Global Positioning System	OST	Office of the Secretary of Transportation
HPC	High-Performance Concrete	PBCAT	Pedestrian Bicycle Crash Analysis Tool
HPS	High-Performance Steel	PCC	Portland Cement Concrete
HRDI	Office of Infrastructure Research and Development	R&D	Research and Development
HRDO	Office of Operations Research and Development	R&T	Research and Technology
HRDS	Office of Safety Research and Development	RD&T	Research, Development, and Technology
HRPD	Office of Program Development and Evaluation	RAC	Research Advisory Committee
HRRM	Office of Resource Management	RRPM	Raised Retroreflective Pavement Marker
		RTCC	Research and Technology Coordinating Committee

SAPER	Strategic Analysis of Pavement Evaluations for Rehabilitation
SBIR	Small Business Innovation Research
SCOR	Standing Committee on Research
SWAT	Strategic Work Zone Analysis Tools
T&I	Technology and Innovation
TT	Technology Talks
TFHRC	Turner-Fairbank Highway Research Center
TIC	Technology Innovation Committee
TIG	Technology Implementation Group
TMC	Transportation Management Center
TRB	Transportation Research Board
TReL	Traffic Research Laboratory
TrEPS	Traffic Estimation and Prediction System
TrEPS-P	Traffic Estimation and Prediction System for Operations Planning
TSIS	Traffic Software Integrated System
USDOT	United States Department of Transportation
UTC	University Transportation Center
WIM	Weigh-In-Motion

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