



Office of Research, Development, and Technology

**FY 2002
PERFORMANCE
REPORT**

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



Turner-Fairbanks Highway Research Center

FY 2002

PERFORMANCE REPORT

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Welcome

This publication is the Federal Highway Administration's (FHWA) Office of Research, Development, and Technology's (RD&T) first annual performance report. It represents an effort to demonstrate and communicate our commitment to accountability in the programs and initiatives managed at the Turner-Fairbank Highway Research Center (TFHRC), a federally owned and operated research facility in McLean, VA. The report documents our 2002 accomplishments and success stories, and discusses the challenges and strategies we plan to use in addressing them. Additionally, the report highlights some changes in the research and technology (R&T) environment this year and shows how we adapted to changing circumstances by adjusting our practices. This performance report is a companion document to the *2002/2003 Performance Plan and the 2002/2003 Catalog of Products and Services*, both available on the TFHRC Web site. Our organization recently took on the leadership and coordination of the FHWA initiative to "raise the bar" in research, technology, and innovation deployment. Next year's performance report will include a section that communicates FHWA's accomplishments in this particular area.

Our R&T program directly supports the FHWA and Department of Transportation's (DOT) goals. At FHWA, our mission of "Enhancing Mobility through Innovation, Leadership, and Public Service" and our role as "Innovators for a Better Future," reinforce R&T's importance to the Nation's transportation system and our customers. FHWA's research leadership emphasizes information sharing and partnerships with State and local governments, academia, and the private sector to quickly and cost-effectively transform new technologies and concepts, into better transportation systems, processes, and services.

The TFHRC facility contains more than 24 indoor and outdoor laboratories (labs) and support facilities, which provide

advanced research and development (R&D) innovations for U.S. and international highways. TFHRC houses more than 300 Federal and contract transportation researchers, students, and support personnel. The first section of this performance report provides additional insight into our research facility, personnel skill levels, programs, and initiatives that enhance and "give back" to our community. The remainder of the report highlights our contributions to highway research and technology, and our efforts to continually improve our organizational processes. These efforts recently earned RD&T the FHWA Quality Breakthrough Award for making significant progress in quality management practices.



We hope that this report encourages you to learn more about RD&T's people, laboratories, services, and research. Our office undertakes and completes research that is essential, indispensable, and connected to our stakeholders. I sincerely welcome your feedback on this performance report and encourage you to provide comments and improvement suggestions through the TFHRC Web site at <http://www.tfhrc.gov/>. A "2002 RD&T Performance Report Feedback" link was added to our home page to encourage and facilitate your input. Thank you for letting us know how we may better serve you.

Dennis C. Judycki

Associate Administrator for Research, Development, and Technology



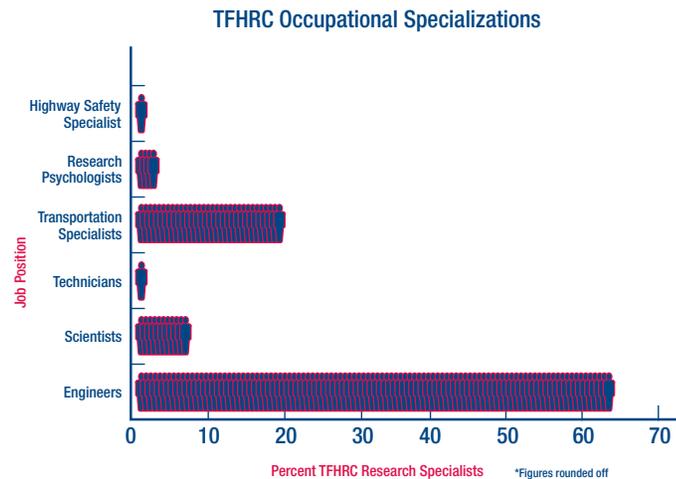
I. Who We Are and What We Do

TFHRC has six offices involved in research and program support activities. The R&D Office of Safety, Office of Operations, and Office of Infrastructure conduct R&D that continually improves highway safety, operations, and infrastructure, respectively. Our 300 employees and contractors work in a variety of occupations and specialties, and job positions include engineers, scientists, psychologists, and program support specialists from a variety of disciplines. Their activities cover major subject-matter areas such as human centered systems, materials technology, operations and intelligent transportation systems (ITS), pavements, safety, and structures. Fifty percent of RD&T staff have advanced degrees, with 20 percent holding one or more doctoral degrees.

RD&T develops and executes policy, budget, program management, and evaluations that support FHWA's R&T program. The organization serves as the focal point for FHWA participation in cooperative research activities, such as the National Cooperative Highway Research Program (NCHRP) and the Transportation Pooled Fund program. In the 2002 fiscal year (FY), the Transportation Pooled Fund included 115 FHWA-led projects valued at approximately \$38 million, with the average study valued at \$450,000. Additionally, FHWA administered 150 State-led projects valued at approximately \$50 million—with the average study valued at \$575,000. (Each project included five State partners on average.) RD&T also conducts outreach to University Transportation Research Centers and the small business community.

Our approach to research supports FHWA's emphasis on cooperation, information sharing, and formal research agenda development within DOT and across the entire

government. We continually seek to promote partnerships with State and local governments, academia, and the private sector to quickly and cost-effectively transform new technologies and concepts into better transportation systems, processes, and services. Appendices C and D of this report provide an overview of the extensive partnership activities that involve FHWA. Our emphasis on conducting world-class research includes a commitment to improve our business processes and efficiently operate the RD&T facilities, organization, and programs. We saved more than \$1 million by streamlining support contracts, and more than \$85,000 by utilizing an offsite manager for our Web-based operations as part of our cost-saving measures. For additional business process improvement highlights that enabled us to exceed our customers' and partners' expectations, see the "Challenges and Commitments" section of this report and the "Services" tables in appendix B.



We continually seek to promote partnerships with State and local governments, academia, and the private sector to quickly and cost-effectively transform new technologies, concepts, and ideas into better transportation systems, processes, and services.

Our organization regularly offers a variety of career development programs, including FHWA's professional development program, the DOT-wide Summer Transportation Intern Program for Diverse Groups (STIPDG), and Federal government-wide programs such as the Executive Leadership Program and the Executive Potential Program. RD&T benefits from the new perspectives and fresh ideas that these program participants offer, and provides new learning opportunities whenever possible. In return, the program creates more participant awareness and a better understanding of the unique highway research challenges. For more information, see appendix D.

In addition to educational outreach, RD&T provides a variety of marketing and communications services that support FHWA technology and innovation deployment initiatives. These services include marketing and communications strategic planning, exhibits, special events planning, and report and periodical publishing, including *Public Roads*, *Research and Technology Transporter*, and *Focus*.

"Giving Back" to the Community

Youth Educational Outreach

Part of the organizational culture at RD&T is an emphasis on societal responsibility, community involvement, and mentorship. RD&T enthusiastically encourages future transportation professionals and we offer hundreds of students the opportunity to learn first-



hand about the role of research and technology in the Nation's transportation system, and the variety of available transportation career options. These activities support

the educational community at all levels, from research fellow grants to kindergarten through senior high school (K-12) age-appropriate outreach activities. For several years now, our lab research engineers have spoken to and made presentations to local elementary schools to interest students in the engineering profession. Recently, RD&T engineers visited two elementary schools in Prince George's County, MD, and one in Washington, DC, to teach students about the profession and encourage them to explore engineering as a future career path.

Other K-12 educational outreach activities include hosting job shadowing on Groundhog Day and Take Your Son/Daughter to Work Day. RD&T also supports the National Engineer Week's Future City Competition, bringing together seventh- and eighth-grade students and engineers to develop models of



future cities. FHWA sponsors an award to the Future City team that best incorporates transportation elements in its prototypical design. This year, the RD&T staff judged and presented the team award to students from the St. Thomas More School in Baton Rouge, LA, and each winning team member received a \$100 savings bond and a framed recognition certificate.

Fairfax County Fire and Rescue Training

For the past 5 years, firefighters from two Fairfax County Fire and Rescue Departments, Fairfax, VA, practiced removing



pinned and trapped motorists (using crash dummies) from automobile crash tests at the TFHRC Federal Outdoor Impact Laboratory (FOIL). Normally, these firefighters and rescue workers practice their rescue techniques on junked cars at the Fairfax County Fire and Rescue Academy, Fairfax, VA. However, using crash test vehicles from the FOIL provides them with a more challenging training exercise, since the FOIL better simulates actual crash conditions. As a result, firemen who train at the FOIL improve their equipment skills and their rescue techniques in preparation for real-life emergencies.

Future Car Congress “Ride and Drive”

To showcase the latest environmentally friendly vehicles, RD&T hosted the “Ride and Drive” event for the Future Car Congress, which enabled attendees to drive state-of-the-art vehicles and gain hands-on experience using the technologies

highlighted during the conference. Sponsored by the U.S. Department of Energy (DOE), the U.S. Council for Automotive Engineers, and The Engineering Society of Detroit, this year’s Future Car Congress hosted more than 800 guests from 16 countries and included government officials, policy makers, analysts, researchers, engineers, industry and academic representatives, news reporters, and FHWA employees.



Facility Tours

TFHRC conducts facility tours, which create awareness with critical audiences and deliver the message that RD&T research provides innovative, real-world solutions to a number of highway-related problems. Each year, TFHRC offers tours to hun-



dreds of guests such as senior legislative and U.S. DOT decision makers, congressional staffers, international research colleagues, FHWA State and local partners, professional organi-

zation and association members, and others. Guests visit the labs and learn about research projects that benefit our Nation's transportation system.

**Combined Federal Campaign
and Other Outreach Activities**

At TFHRC, we give back to the community through a number of other programs. RD&T supports the annual Combined Federal Campaign (CFC) with fundraising and social events, such as a chili cook-off and bake sales with proceeds this year going to the Oklahoma City Scholarship Fund. Throughout the year, employees also collect donations on various holidays for a senior center in Washington, DC, and they conduct semi-annual blood drives to support the American Red Cross of the National Capital Area. During the September 11 tragedy, personnel organized a special blood drive to support and help save the lives of fellow Americans, who were injured. Other RD&T public outreach activities include exhibits on the National Mall in Washington, DC, for Public Service Appreciation Week and National Transportation Week.



II. The Strategic Framework

The FHWA R&T Program

Managing FHWA's R&T program and communicating with our partners are important components of the RD&T mission. Like the R&T program, the RD&T program directly supports FHWA's and DOT's goals. FHWA's research approach emphasizes cooperation, information sharing, and formal research agenda development with State and local governments, academia, and the private sector. The RD&T Performance Plan illustrates RD&T's alignment with the DOT and FHWA vision, mission, and goals; documents the action agenda that will produce results; and lists the RD&T products and services.

Vision and Mission

The FHWA Leadership Team recently reexamined FHWA's vision, mission, and roles. In the new mission statement, "Enhancing Mobility through Innovation, Leadership and Public Service," FHWA 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." This key rewording of the mission statement reflects R&T's important contribution to enhancing mobility, and it underscores FHWA's commitment to organizationally "raising the bar" on technology and innovation development and deployment.

FHWA's research approach emphasizes cooperation, information sharing, and developing formal research agendas.

<p>DOT Vision</p> <p>A visionary and vigilant Department of Transportation leading the way to transportation excellence in the 21st Century.</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 research and technology.</p>
<p>DOT Mission</p> <p>Serve the United States by ensuring a fast, safe, efficient, accessible, and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today, and into the future.</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 research and technology 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 research, development, and technology.</p>

FHWA Goals for FY 2002

Safety—Improve highway safety.

Mobility—Improve the public’s access to activities, goods, and services through preserving, improving, and expanding the highway transportation system, and enhancing its operations, efficiency, and intermodal connections.

Productivity—Improve the economic efficiency of the Nation’s transportation system to enhance America’s position in the global economy.

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

National Security—Improve the Nation’s national defense mobility.

Organizational Excellence—Advance FHWA’s ability to manage organizational resources, to improve customer service and satisfaction, and to successfully deploy technologies and innovations.

FHWA “Vital Few”

Safety, Congestion Mitigation, and Environmental Stewardship and Streamlining can best be described as the Agency “to do” list. These goals reflect FHWA’s desire to commit resources in areas where critical performance gaps exist and where the greatest impact can be made. In the next 3 to 5 years, our performance in these areas will define success for FHWA and affirm the need for a Federal role in highway transportation.

FHWA Roles

Based on discussions at the FHWA annual meeting, the Agency developed a new technology and innovation role statement, which affirms FHWA’s new mission and declares our identity:

- ▶ Innovators for a Better Future—To support the role of “Innovators for a Better Future,” TFHRC leadership commits to:
 - ▶ Coordinating R&D with and for our stakeholders and partners;
 - ▶ Supporting an environment that encourages innovation deployment; and
 - ▶ Creating improved technology and innovation deployment processes.

In light of these guiding principles, the TFHRC provides FHWA, its stakeholders, and customers—the world highway community—with the most advanced research and development related to new highway technologies—focusing on solutions to complex technical problems by developing economical, environmentally sensitive designs; efficient, quality controlled constructions practices; and durable materials, all of which will create a safer, more reliable highway transportation system.

- ▶ Leaders for National Mobility—defining future transportation systems and advocating highway system excellence.
- ▶ Stewards for National Highway Programs—“raising the bar” on performance and ensuring financial accountability.

Corporate Role in Research and Deployment of Technology and Innovation

In FY 2002, FHWA completed a restructuring assessment to examine the state of its current organizational structure. The restructuring assessment team conducted 160 focus groups and structured interviews, 85 with external stakeholders and 75 with FHWA employees.

FHWA's "raising the bar" initiative supports the Agency's role as "Innovators for a Better Future." The initiative addresses recommendations from the FHWA restructuring assessment, the Transportation Research Board (TRB) Research and Technology Coordination Committee's (RTCC) *TRB Special Report 261, The Federal Role in Highway Research and Technology*, and the recommendations from the Government Accounting Office (GAO) report on highway research. A new position of Director for Research, Technology, and Innovation Deployment was created, reporting to the Associate Administrator for RD&T. The strategy is to develop an FHWA "Corporate Master Plan for Research and Technology and Innovation Deployment." The plan will cover all phases, including setting research agendas, increasing the role of external stakeholders, using "roadmaps" (multiyear plans), evaluating research results, and deploying technology.

We have developed a lab assessment process that will allow routine expert peer review of the research conducted at TFHRC.

III. Our Business Results

RD&T Challenges, Commitments and Achievements

To guide our business and performance plan, the RD&T Leadership Council's (LC) 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 their management practices); initiating program, process, and quality of work-life improvements; conducting outstanding research; and providing services that exceed performance indicators, strategic goals, and customer and partner expectations. The following is a list of our top challenges and some key achievements related to fulfilling them:



I. Effectively Deliver Needed Products and Services

1. Develop quality research products and services that address the needs of our internal customers and external partners in a timely manner.

- ▶ RD&T's performance plan calls for the delivery of more than 86 products in the FY 2002/2003 timeframe. More than 90 percent of research projects are on schedule, and our customer surveys confirm improvements in response and delivery times. RD&T projects span many disciplines and transportation topics, from highway

design, engineering, and maintenance to economic analysis, human factors, travel surveys, outreach, and marketing. See the Project and Services Status Tables for a detailed status listing of FY 2002/2003 products.

2. Improve R&T collaboration, communication, and feedback from the FHWA Resource Centers and Division Offices.

- ▶ The findings from the RD&T annual self-assessment confirmed that there were notable improvements in communications and feedback between RD&T offices and the Resource Centers and Division Offices. Survey results indicated that relationships with our internal and external customers and stakeholders were generally positive, and reflected greater awareness of customer and partner needs and communication improvements, overall. Several RD&T offices also confirmed better response times and better product and service deliveries.
- ▶ RD&T conducted several meetings and conferences with Division Offices and Resource Centers to discuss important strategic and operational issues, in addition to standard communication activities and field office interactions. Highlights include the sessions held at the annual TRB meeting, the technology and innovation delivery conference for the Western States, and the National Research Advisory Committee meetings.

II. Improve Business and Administrative Processes

1. Develop and implement a lab assessment process to provide regular, independent feedback to improve the quality of lab services and lab-based research programs.

▶ RD&T developed a lab assessment process that will foster routine expert peer review of the research conducted at TFHRC. Planning for a pilot assessment of the Human Centered Systems Lab currently is underway.



▶ An SAIC-prepared RD&T report provided an overview of Federal laboratory assessment best practices. RD&T used this report to develop its approach and shared it with other interested agencies.

2. Effectively use research resources and ensure efficient RD&T facility, organization, and program operations.

▶ RD&T recently received the Quality Breakthrough Award, which recognizes organizations within FHWA that are making significant progress in developing clear plans, building sound processes, and achieving measurable results. The award is for the second-of-three milestones in the pursuit of the Quality Journey Award. The first milestone is the Quality Commitment Award, the second is the Quality Breakthrough Award, and the third is the Quality Excellence Award. Each office award recipient was judged using the seven Malcolm Baldrige award criteria for performance excellence. Because it is one of the highest

awards given within FHWA, receipt of a Quality Journey Award is a distinctive honor.



- ▶ RD&T improved its account coordination and reconciliation and identified corrections for FHWA R&T funds. The office used this information to develop FHWA-wide reports for all R&T funds. For contracting and procurement planning, RD&T staff developed training, which FHWA is now using for contracting officer's technical representative (COTR) refresher training requirements. RD&T staff are piloting an advanced acquisition planning system that will be adopted by the Agency.
- ▶ Technology facilitation action plans (TFAPs) are important mechanisms to ensure organizational R&T product and service delivery to our customers. RD&T and the entire Agency are using TFAPs to track research product development and deployment.
- ▶ Small Business Innovation Research (SBIR) Process Improvement—RD&T led the development and implementation of a multifaceted process improvement initiative. It established procedures for evaluating SBIR proposals and ensuring that funded projects support critical FHWA research priorities and strategic objectives. The process also provided FHWA office directors with direct roles for determining the SBIR proposals that most closely meet mission priorities. The process helps develop closer and more effective working relationships between Volpe (the organization responsible for overseeing the DOT SBIR initiative) and FHWA. Finally, the process encourages more realistic decisions regarding the number of Phase I-funded projects, given budgetary trends.

3. Define and implement methodologies/tools to evaluate projects and conduct a performance measurement of TFHRC research.

- ▶ RD&T developed and adopted a performance management framework based on FHWA's corporate management strategies. The framework was well received within the performance measurement community and obtained a favorable mention in TRB Special Report 261 and in a recent NCHRP report on performance measures.
- ▶ RD&T staff provided key recommendations to DOT for developing the Office of Management and Budget's (OMB) criteria for Federal investment in research, based on relevance, quality, and performance. The revised criteria are a variation of the original recommendations of the National Academies' Committee on Science, Engineering, and Public Policy.
- ▶ RD&T participated in the FHWA "catchball" initiative to draft performance objectives directly related to FHWA's Vital Few goals. Catchball is an FHWA goal-setting process that uses input and participation from all levels of the organization. Employees at all levels were involved in designing strategic objectives, activities, and measures for accomplishing and being held accountable for specific goals. The catchball process encouraged RD&T employees and managers to focus performance plans at the office and individual levels for achieving results in specific project areas.
- ▶ TFHRC established a performance management team with representatives from all six RD&T offices. The team's charter is to advise and assist the RD&T leadership in developing, coordinating, and implementing organizational



performance and productivity improvements. Performance management efforts currently underway include:

- ▶ Developing performance goals, measures, strategies, and initiatives to improve performance management in RD&T offices and laboratories;
- ▶ Monitoring measurement results, and analyzing performance management information;
- ▶ Conducting the annual RD&T self-assessment process and applying results;
- ▶ Developing and conducting RD&T customer satisfaction surveys;
- ▶ Contributing to special projects for RD&T performance management, such as developing and implementing the expert panel assessment process for RD&T laboratories;
- ▶ Assisting in the implementation and review of Agency-wide performance improvement initiatives within RD&T.

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

- ▶ RD&T commissioned an information technology task force consisting of representatives from all of its offices. The task force team's goal is to advance information technologies and systems at TFHRC and to improve computer system communications with our partners and customers.
- ▶ RD&T actively supported FHWA's effort to make unit performance plans accessible to FHWA offices nationwide via the *Shared Unit Performance Plan System* (SUPPS). The current RD&T performance plan, challenges, and commitments are posted in SUPPS. RD&T will use SUPPS not only

for performance planning, but also as a means of tracking Vital Few goal-related activities and resources to support FHWA's performance goals and strategies.

III. Develop and Recognize Employees

1. Mentor and encourage individual development plans (IDP) that build employee skills and add to FHWA research capacities and competencies.

- ▶ RD&T is serious about training its employees, and we encourage all employees to develop and regularly update IDPs through the *Learning and Development System* (LADS). We also encourage employees to participate in traditional classroom, video, and online training; to perform mentoring; and to actively share research ideas and results. Office directors at RD&T received training at The Federal

Executive Institute and Management Development Centers, American Association of State Highway and Transportation Officials' (AASHTO) Executive Leadership Program, and the Eno Transportation Foundation.

- ▶ The Technical Career Track (TCT) program provides an opportunity for RD&T to promote and retain employees with technical excellence in FHWA. An employee at GS-13 or GS-14 grade level in non-supervisory technical delivery position may be considered for promotions based on current accomplishments, degree of technical expertise, and current position relative to the Agency's overall goals. In 2001, FHWA promoted six RD&T employees under the TCT program, and in 2002, promoted nine RD&T employees.

2. Improve the award and recognition program to value achievements, link directly to team accomplishments, and advance the RD&T Leadership Council Action Agenda.

RD&T developed a list of potential new awards for TFHRC personnel. The Leadership Council has agreed to review the list and to discuss, revise, and approve new monetary and non-monetary methods for recognizing TFHRC personnel.

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

1. Improve the state of FHWA R&T initiatives and focus areas.

- ▶ The FHWA R&T Initiatives report discusses our work with a wide range of organizations to implement innovative technologies and progressive programs that will yield impressive returns in safety, mobility, productivity, natural environment, and national security. It also describes initiatives in 12 priority areas: advanced research, asset management, environment, intelligent transportation systems,



pavements, safety, structures, operations, policy, planning and real estate, international, and partnerships.

- ▶ To better communicate Leadership Council goals and accomplishments and increase awareness throughout FHWA about RD&T activities and initiatives, we recently established the “RD&T InfoLink,” the FHWA StaffNet intranet Web site. The InfoLink site contains easily accessible information, such as Leadership Council meeting minutes, the Leadership Council Action Agenda, and the checkpoint review progress-tracking calendar.

2. Collaborate with FHWA headquarters and field offices to gather and disseminate achievements in FHWA technology and innovation delivery.

- ▶ The first annual report on achievements in technology transfer was published in February 2002. The *Technology and Innovation Delivery Activities for Fiscal Year 2001* report compiles the technology and innovation delivery activities of all the FHWA field and headquarters offices for the previous fiscal year. FY 2001 was the first year that the 52 FHWA Division Offices received discretionary funding to implement technologies and apply innovations for individual States’ particular needs. The report details the wide variety of activities initiated with State and local partners.
- ▶ The data in this report will provide a valuable baseline to track and assess FHWA’s technology and innovation implementations in future years. The largest expenditure was for showcase projects, followed by testing and evaluation, and specifications, design guides and tools, while smaller amounts were spent on training, outreach, and communication.
- ▶ RD&T continues to document and highlight R&T success stories in *Public Roads* and other publications. The RD&T Success Stories section of this report contains some examples of key research conducted at TFHRC.

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

- ▶ The National Partnership Initiative was unprecedented in terms of outreach—hundreds of individuals and more than 170 organizations participated. The partnership initiative may become a model for involving external stakeholders as part of a national highway R&T agenda. Convened by the FHWA, AASHTO, and TRB, the partnership engages the entire highway transportation community in identifying R&T needs and examining potential benefits of partnerships formed to fulfill those needs. The partnership initiative established five working groups: safety, infrastructure renewal, policy analysis and systems monitoring, operations and mobility, and planning and environment. A report reflecting the view of the working groups and incorporating the Surface Transportation-Environment Cooperative Research Program (STECRP) findings was published in April 2002.
- ▶ FHWA is supporting interim work to develop more detailed work plans for the Future Strategic Highway Research Program (FSHRP). Program liaisons on each of the FSHRP technical panels will help ensure that the proposed work complements FHWA’s R&T program.

4. Build a common advocacy to enhance the national R&T program and legislative agenda.

- ▶ In preparation for reauthorization, FHWA Executive Director Frederick “Bud” Wright and the Associate Administrator for RD&T, Dennis Judycki, testified about FHWA’s R&T program at a Senate Committee on Environment and Public Works’ roundtable. Several senators made supportive comments about the FHWA R&T program, and many partners witnessed and provided strong support for FHWA R&T activities and leadership. AASHTO, TRB, and ten other organizations testified on behalf of FHWA’s key role in highway research.

- ▶ A surface transportation reauthorization Web site was established for reauthorization outreach, which also enables the public to make comments directly into the docket. The Web site is available at: <http://www.fhwa.dot.gov/reauthorization/index.htm>

RD&T Leadership Council Action Agenda

The Leadership Council oversees the RD&T Quality Journey and implements FHWA's corporate management strategies. The council also identifies key processes and measures for RD&T; analyzes results of RD&T-wide measures; identifies

information gaps; serves as a forum for sharing best practices and lessons learned; and develops and implements action plans. The council uses the annual office self-assessment process to obtain important customer and employee feedback in each of the seven Baldrige categories. This input then is compiled into a crosscutting list of organizational priorities and focus areas for the upcoming FY.



ODs and team leaders

Leadership Council Action Agenda Status & Milestones

Action Item	Office	Status
A. Leadership		
1. Develop and implement R&T legislative agenda and strategy	Office of Program Development and Evaluation (HRPD)	-Completed-
2. Prepare a concept paper and work plan for advanced research	Offices of Safety, Infrastructure, and Operations R&D (HRDS, HRDI, HRDO)	-Completed-
3. Prepare a white paper on the FHWA role in R&T	HRPD	-Completed- Note: An implementation plan was prepared in response to the TRB Special Report 261, The Federal Role in Highway R&T.
B. Strategic Planning		
1. Mobility	See RD&T Research Project Status Summary for FY 2002	25 projects completed to support the mobility goal in FY 2002.
2. Safety	See RD&T Research Project Status Summary for FY 2002	12 projects completed to support the safety goal in FY 2002.
3. Productivity	See RD&T Research Project Status Summary for FY 2002	5 projects completed to support the productivity goal in FY 2002.

Leadership Council Action Agenda Status & Milestones (continued)		
Action Item	Office	Status
B. Strategic Planning (continued)		
4. Human and natural environment	See RD&T Research Project Status Summary for FY 2002	3 goal-related projects completed in FY 2002 (See Infrastructure project listing).
5. Security	See RD&T Research Project Status Summary for FY 2002	RD&T worked with the AASHTO Transportation Security Task Force to develop a prioritized list of research projects. FHWA is planning to participate in three studies: 1) Rapid Bridge Replacement and Bridge Design; 2) Construction and Retrofit Strategies; and 3) State-of-the-Art Bridge Surveillance Technologies.
C. Human Resources Development and Management		
Provide a forum for outreach on work systems, training, security, and morale	Office of Resource Management (HRRM)	-Completed- HRRM developed a list of potential new awards for TFHRC personnel. The LC agreed to review the list and discuss, revise, and approve new monetary and non-monetary methods for recognizing TFHRC personnel.
D. Customer and Partner Focus		
1. Communicate the FHWA R&T Story	HRTS	-Redefined for FY 2003-
2. Update and maintain technology facilitation, strategy and action plans	HRDI/HRDS/HRDO	-Continued in FY 2003-
3. Communicate RD&T Activities (Profiles report, success stories, Innovation Connection, etc.)	HRTS	-Continued in FY 2003- Note: Will be redefined and moved to Process Management.
4. Develop a customer feedback plan for RD&T	HRPD	-Completed-
E. Information & Analysis		
Improve the RD&T Web site to enhance customer access and service	HRTS	-Completed-

Leadership Council Action Agenda Status & Milestones (continued)

Action Item	Office	Status
F. Process Management		
1. Administrative key processes		
1. Review procurement planning process, evaluate results, and document improvements	HRRM	HRRM will continue to participate in the HAAM pilot.
2. Review administrative processes, evaluate results, and document improvements	HRRM	-Completed-
2. Business Processes		
1. Replace technology and innovation process, evaluate results, and document improvements	HRTS	-Will be redefined for FY 2003- Note: Discontinue and replace the Technology Innovation Network (TIN) effort with "Raising the Bar" agency-wide initiative.
2. Develop a TFHRC lab assessment process	HRPD	-Continued in FY 2003-
3. Complete a process management improvement for FHWA participation in the SBIR process	HRPD/ HRRM	-Completed-
G. Business Results (Metrics)		
1. Develop and implement an RD&T performance evaluation program	HRPD	-Completed- See section on Our Business Results—RD&T Challenges, Commitments, and Achievements. Items II.1 (lab assessment), and II.3 (benefits evaluations). See also—Performance Management Framework.
2. Establish and support RD&T information technologies team	HRRM	-Completed- Note: RD&T information technology needs analysis will continue in FY 2003 under Information and Analysis.
3. Outreach for Work life Issues	HRRM	-Completed-

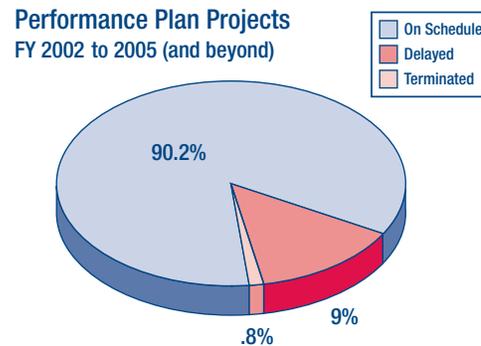
Research Project Status Summary

More than 90 percent of the research projects listed in the 2002/2003 plan currently are on schedule. RD&T will complete more than 70 percent of the projects listed in the plan by the end of 2003.

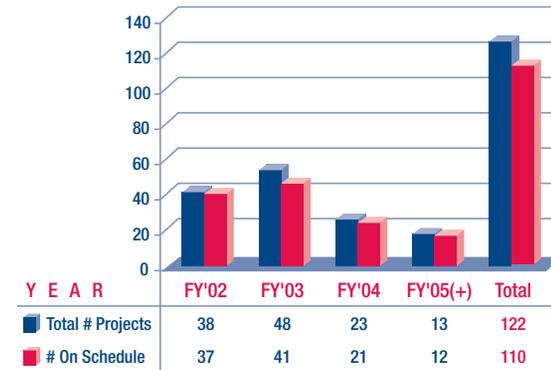
Of the projects originally scheduled for FY 2002, 37 of 38 were completed. One project on functional requirements for microsimulation-based surrogate safety measures at intersections was cancelled. The use of intelligent snowplows project was rescheduled for FY 2003 because of inadequate snowfall last winter.

Because of external and/or internal factors, 8.6 percent of projects were delayed, overall. Factors contributing to delay include:

Factor	# of Occurrences
Equipment-related problems	3
Budget-related issues	1
Contractor or technical issues	3
Project technical issues	2
Regulatory issues	2



RD&T Research Products



Details regarding specific projects and project statuses are available in the Project and Services Status Tables.

RD&T Success Stories

RD&T successfully completed 37 projects during FY 2002 and delivered more than 50 products during FY 2001 to 2002 that support DOT's strategic goals and FHWA's performance goals. The following highlights showcase research implemented by FHWA and State DOTs.

Safety

- ▶ **Interactive Highway Safety Design Model (IHSDM)**
Every year, States redesign or modify about 3 million miles of two-lane roads. IHSDM helps State and other highway planners and designers assess the safety effects of specific geometric design decisions and alternative road improvements. IHSDM was developed over several years. Initial efforts focused on two-lane rural highways, since they are the largest highway class in the United States, representing approximately two-thirds of all Federal-aid highways. Beta

versions of the Policy Review and the Design Consistency modules are currently available for testing.

▶ **Rumble Strips**

Rumble strips help prevent roadway departure crashes, which account for 38 percent of all fatal crashes. As part of its R&T program, FHWA is communicating the benefits and costs of using rumble strips to all States. A survey of 8 States using rumble strips shows 18 to 72 percent in crash reductions, with a 30-to-1 benefit-to-cost ratio (with some State ratios as high as 60-to-1).

▶ **Highway Safety Information Systems (HSIS)**

HSIS is a multistate information system that contains accident data for more than 5-million crashes, information about traffic volumes, and roadway inventory data covering approximately 165,000 miles of State highway systems. FHWA staff, contractors, university researchers, and others use HSIS to study current highway safety issues, to direct research efforts, and to evaluate the effectiveness of accident countermeasures. Through HSIS, FHWA works closely with States and other partners to gather data and improve our ability to analyze roadway safety challenges. HSIS enables FHWA to direct investments to specific projects and programs that will deliver the most value in terms of saving lives and minimizing injuries.

▶ **Pedestrian and Bicycle Crash Analysis Tool (PBCAT)**

FHWA developed a crash-typing software product, PBCAT, to assist State and local pedestrian and bicycle coordinators, planners, and engineers with improving walking and bicycling safety. The Orlando Metropolitan Area used PBCAT to identify appropriate countermeasures for 10 “hot spots” that accounted for 169 crashes and 22 fatalities.

▶ **Roundabouts Information Guide**

FHWA developed *Roundabouts: An Informational Guide*, to help communities improve safety and mobility by placing

roundabouts in appropriate areas. Experiences in the U.S. show that roundabouts reduce crashes by 37 percent, and decrease crashes involving injuries by 51 percent.

▶ **Highway Design Handbook for Older Drivers and Pedestrians**

Based on the characteristics of older drivers and pedestrians, this resource provides practitioners with practical information for incorporating specific roadway features into highway design, operations, and traffic-engineering. The handbook showcases tools that address issues that enhance older driver and pedestrian safety and mobility.

Infrastructure

▶ **Superpave®**

The United States spends more than \$15 billion each year to construct and resurface roads with hot-mix asphalt (HMA). This annual investment requires at least 500-million tons of HMA, held together by about 30-million tons of liquid asphalt binder. Initially developed under the Strategic Highway Research Program (SHRP), the Superpave system is the primary mechanism used by State highway agencies to purchase liquid asphalt binder and design asphalt mixtures. In close partnership with TRB, FHWA continues its leadership role in refining the Superpave specifications and testing procedures. Recent innovations include modifying the low-temperature binder specification and incorporating an FHWA-developed device to increase laboratory mixture compaction uniformity in the gyratory.

▶ **Partnering to Save Time and Money on a Critical Infrastructure Project**

During the foundation construction for the new Woodrow Wilson Bridge, a tremie concrete seal dislodged from one of the main piers and fell to the bottom of the river. Although this had no immediate effect on the structural stability or integrity of the main pier (the tremie concrete enabled

dewatering for construction of the pier cap), there was concern about the long-term scour effects of the thicker tremie seal that was originally proposed as a solution to the problem. The Maryland Division Office, the Eastern Resource Center, and FHWA's hydraulics laboratory provided technical assistance to the Maryland State Highway Administration. FHWA tested physical models of the new pier configuration in the flume at TFHRC to estimate the long-term scour effects. The tests confirmed that bridge safety was not affected by the change, and this major project continued on schedule.

▶ **Report Estimates Cost of Corrosion in U.S.**

FHWA published the *Corrosion Cost and Preventive Strategies in the United States* report that provides a comprehensive and current estimate of the total economic effect of metallic corrosion in the United States and identifies national strategies to minimize corrosion's impact. Corrosion's total direct cost is estimated at \$276 billion per year. FHWA analyzed the effects of corrosion in 26 industrial sectors and extrapolated these results for a nationwide cost estimate. Sectors were divided into five major categories: infrastructure, utilities, transportation, production and manufacturing, and government. The conservative estimate of the indirect cost is equal to the direct cost of corrosion. The report is widely referenced as the most authoritative, comprehensive, and current study of corrosion cost in the U.S. Further information is available at <http://www.corrosioncost.com>.

▶ **Serving Internal Customers: The Office of Infrastructure R&D Delivers a New Tool to FHWA Bridge Engineers**

This project developed a Web-based system to access the National Bridge Inventory (NBI); with search and analysis capabilities that enable FHWA bridge engineers to better understand the relationship between bridges, bridge conditions and capacities, and bridge performance in the national transportation system. Web-NBI is the Web-based NBI

system that engineers may use to access and analyze NBI data. Its functionality includes the:

- ▶ Ability to download NBI files in Microsoft® Access or ASCII text format for any State;
- ▶ Ability to create dynamic queries, browse the results, and download the results;
- ▶ Ability to perform dynamic cross-tab queries and browse the results;
- ▶ Ability to generate dynamic NBI bar charts or to generate bar charts from query results;
- ▶ Access to standard queries—graphs and maps are preformatted and are readily available for browsing or downloading;
- ▶ Partial support to map bridge records from NBI queries and display significant bridge environment features such as roads, rivers, and rail lines;
- ▶ Dynamic thematic map generation that displays bridge information such as the number of deficient bridges by county; and
- ▶ Ability to generate structure inventory and appraisal reports.

These capabilities are now on the desktop of every bridge engineer within FHWA to ensure the safety, reliability, and security of the Nation's highway bridges.

▶ **Long Term Pavement Performance (LTPP)**

The LTPP program is a comprehensive 20-year study of in-service pavements, with more than 1,900 asphalt and Portland Cement Concrete pavement test sections from across the U.S. and Canada. LTPP's goal is to provide the data needed to help the States and Provinces make decisions that will lead to better-performing and more cost-

effective pavements.

Since 1998, States have provided more than \$30 million to FHWA through NCHRP to continue critical, high-payoff research. LTPP data played a significant role in developing the NCHRP 2002 *Guide for the Design of New and Rehabilitated Pavement Structures* as a source for data and test procedures. The LTPP test sections and procedures may play a role in the local calibration/validation of the design guide by States. LTPP research information will continue to play a key role in developing future pavement design guides, and it represents a dynamic example of State and Federal partnerships.

▶ **HIPERPAV™**

Originally developed in 1996, the High-Performance Paving Software (HIPERPAV) is a powerful tool that helps highway organizations build long-lasting concrete pavements. When used in the design and construction phases of a concrete paving project, HIPERPAV can help engineers achieve a high-quality product at minimal cost by optimizing pavement and overlay design, optimizing mix design and temperature characteristics, and reducing long-term performance uncertainties.

With the release of HIPERPAV 3.0, the HIPERPAV modeling capabilities have been expanded to consider early-age behavior of continuously reinforced concrete pavements (CRCP) and longer-term behavior of jointed concrete pavements (JCP), in addition to the early-age JCP and bonded concrete overlay capabilities provided in early versions.

▶ **Cost-Effective Rehabilitation Strategies Using Falling-Weight Deflectometer Calibration Centers**

Billions of dollars are spent on pavement rehabilitation and resurfacing annually. To make the best possible decisions about where and when to conduct pavement rehabilitation work, State DOTs need extensive data on the pavement's

structural condition. These data are obtained by using accurately calibrated equipment. FHWA calibration centers provide a critical resource to the States, which rely on consistent and accurate data to properly assess the structural condition of our Nation's highways and allocate limited resources in the most effective manner.

▶ **High-Performance Concrete (HPC) Contributes to Rapid Bridge Reopening**

The successful rapid replacement of the I-65 Bridge in Birmingham, Alabama, demonstrated what was achieved by using innovative practices and materials developed by FHWA R&T. After closure from an accident, the bridge was replaced and traffic capacity restored in a record 67 days.

▶ **COST (Concrete Optimization Software Tool)**

High-performance concrete offers tremendous potential for improving the highway infrastructure. However, that potential relies on the correct mix components in the proper proportions for each project. COST is an online design and analysis system that enables concrete producers, engineers, and researchers to determine optimal concrete mixture proportions. COST makes the highly complex mix design process more efficient and more manageable. Available online at <http://ciks.cbt.nist.gov/cost/>, COST is the culmination of a highly-successful joint research effort by members of the Portland Cement Concrete Pavement (PCCP) team and researchers from the National Institute of Standards and Technology.

Operations

▶ **QuickZone**

The recently released QuickZone software is a work zone delay estimation software, which will provide a more complete and realistic view of total construction costs. QuickZone is a key component of FHWA's Strategic Work Zone Analysis Tools (SWAT) program .

The QuickZone partnership program enables users to take advantage of open source code to customize the software, thus providing State and local agencies with a tool that best meets their needs. With QuickZone, State highway agencies can evaluate a broad range of alternative work zone design and mitigation strategies in a relatively short time frame, resulting in better decisionmaking for highway construction projects. A recent QuickZone benefits study verified this important aspect of the program—traffic engineers were able to better predict the traffic effects of various work zone design strategies and more accurately stage their projects, thus saving money and time (see RD&T Research Benefits Case Studies).

▶ **Nationwide Differential Global Positioning System (NDGPS)**

NDGPS can pinpoint a person or vehicle's position to within 3 meters. The NDGPS directs emergency responders to the exact location of a crash, makes it easier for highway agencies to monitor and respond to hazardous pavement conditions, provides drivers with in-vehicle route guidance, and contains a host of other transportation applications. NDGPS sites will form part of a nationwide operational GPS meteorological observing system that will enable the National Weather Service to provide more accurate weather forecasting.

▶ **High Accuracy Nationwide Differential Global Positioning System (HA-NDGPS)**

As part of its ongoing research efforts, RD&T modified an existing NDGPS facility to broadcast corrections that achieve 10-centimeter horizontal accuracy. Initial testing of the HA-NDGPS indicates the new broadcast is accurate to within 10 centimeters and better in many areas. Further research is underway to modify an additional NDGPS facility to achieve faster and even more accurate navigation solutions.

IV. Performance Management

Relevance, Quality, and Performance

The OMB recently adopted relevance, quality, and performance as their investment criteria in Federal research. The criteria were established to conform to the Government Performance and Results Act (GPRA) and to reflect the inherent challenge of measuring research outcomes. R&D investment criteria are designed to help improve R&D program management, funding decisions, and public understanding of the potential benefits of investing in Federal research. The OMB expects agency R&D managers to demonstrate the extent to which their programs meet the following three tests:

RD&T recently received the Quality Breakthrough Award, which recognizes organizations within FHWA that are making significant progress in developing clear plans, building sound processes, and achieving measurable results.

Relevance. R&D programs must be able to articulate *why* this investment is

important, relevant, and appropriate. Programs must have well conceived plans that identify program goals and priorities and identify linkages to national and customer needs.

Quality. R&D programs must justify *how* funds will be allocated to ensure quality R&D. Programs allocating funds through means other than a competitive, merit-based process must justify these exceptions and document how they maintain quality.

Performance. R&D programs must be able to monitor and document *how well* this investment is performing. Program managers must define appropriate outcome measures and

milestones that can be used to track progress toward goals, and assess whether to increase or redirect funding. Descriptions of performance should not, however, be limited only to quantitative measures.

RD&T made considerable progress over the past year in areas directly related to the OMB's recommendations, most notably by developing a lab assessment process that will incorporate expert peer reviews to improve TFHRC laboratories' quality and performance. Several retrospective RD&T benefit studies were conducted to identify key performance measures and collect data that will be used to track progress and identify the research contribution to FHWA goals and outcomes. This information will be important as we better define the link between research activities and program outcomes.

Planning and Priority Setting

FHWA's Office of RD&T coordinates the research and technology program and supports FHWA and U.S. DOT strategic goals for the Nation's transportation system. The *FY 2002/2003 RD&T Performance Plan* outlines FHWA research priorities and strategies and shows a clear link between research program goals and FHWA and DOT strategic plans. Research highlighted in the FHWA RD&T plan focuses on providing solutions to complex technical problems by developing economical, environmentally-sensitive designs; efficient, quality-controlled construction practices; and durable materials. The result will be a safer, more reliable highway transportation system.

The R&D investment criteria are designed to help improve R&D program management, inform funding decisions, and increase public understanding of the potential benefits of investment in Federal research.

Stakeholder Advisory Activities and Feedback

The Research and Technology Coordinating Committee (RTCC)

The RTCC reviews, guides, and advises FHWA on research activities and provides policy-level recommendations on the overall direction of the program. ATRB committee, the RTCC consists of 18 members including top-level administrators, researchers, and practitioners from the States, academia, and private sector. The committee recently examined national highway R&T needs and roles, and in October 2001 released the *TRB Special Report 261* urging FHWA to focus on long-term, fundamental research, address gaps and emerging issues, conduct policy research, and engage in technology transfer activities. The report also recommends more substantive stakeholder involvement in making decisions, setting priorities, and allocating resources for FHWA's research program to ensure that the program addresses the needs of those building, maintaining, and using the Nation's highways.

The National R&T Partnership Initiative

The national partnership initiative was unprecedented in terms of outreach and participation—with hundreds of individuals and more than 170 organizations. Five working groups were established: Safety, Infrastructure Renewal, Policy Analysis and Systems Monitoring, Operations and Mobility, and Planning and Environment. A report reflecting the views of the working groups was released in April 2002 and is expected to form the basis of a national highway research agenda.

Performance Management Team

The primary purpose of the performance management team is to assist the RD&T leadership developing, coordinating, and implementing organizational performance improvement

efforts. 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;
- ▶ Conducting the annual RD&T self-assessment process and implementing solutions to issues raised during the process;
- ▶ Developing and conducting RD&T customer satisfaction surveys;
- ▶ Contributing to special projects related to RD&T performance management, such as developing and implementing the expert panel assessment process for RD&T laboratories; and
- ▶ Assisting in conducting and reviewing agency-wide performance improvement initiatives within RD&T.



Lab Assessment

RD&T laboratory assessments will be unbiased, independent expert or peer 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;
- ▶ Create a vehicle that will increase the opportunities for customer and stakeholder input to research activities; and

- ▶ Provide a credible, professional, and objective assessment that further improves stakeholder confidence in the value of the work performed and outcomes produced.

Performance Management Framework

One of the conclusions of *NCHRP Synthesis 300, Performance Measures for Research, Development, and Technology Programs* 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 used by unit managers. It integrates these measures and mechanisms across management functions using FHWA’s Baldrige-based corporate management strategies. This approach enables RD&T to manage, analyze, and integrate information obtained from a variety of sources. It also helps organize the various dimensions of program results analyses, such as financial performance, customer feedback, and business results. The RD&T Leadership Council uses this framework as a tool to assess unit performance measurement activities and to identify measurement gaps.

RD&T Performance Management Framework			
CMS	Definition	Related RD&T Performance Measures	Methodology
Leadership	Leadership focuses on how senior leaders guide the organization. It describes how leaders set direction 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 (LEI) 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 	<ul style="list-style-type: none"> ▶ Performance plans and action agenda ▶ Quality self-assessment ▶ Lab assessments
Customer/ Partner Focus	Customer and partner focus examines how the organization determines customer and market requirements and expectations.	<ul style="list-style-type: none"> ▶ Percent of satisfaction with RD&T products and services ▶ Number of technology facilitation plans in place ▶ Self-assessment score ▶ Lab assessment results (TBD) ▶ RD&T customer survey results (TBD) 	<ul style="list-style-type: none"> ▶ American Customer Satisfaction Index (ACSI) ▶ Technology Innovation Network (TIN) ▶ Technology Facilitation Action Plan (TFAP) ▶ Quality self-assessments ▶ Lab assessments ▶ Customer surveys

RD&T Performance Management Framework (continued)			
CMS	Definition	Related RD&T Performance Measures	Methodology
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	<ul style="list-style-type: none"> ▶ Performance measurement framework ▶ Response level and content of feedback mechanisms ▶ Self-assessment score ▶ Lab Assessment results (TBD) 	<ul style="list-style-type: none"> ▶ Performance measurement framework ▶ ACSI, TIN ▶ Quality self-assessments ▶ Lab Assessments
Human Resource Development	Human resource development and management examines how the organization enables its workforce to develop to its full potential and how the workforce is aligned with the organization's objectives	<ul style="list-style-type: none"> ▶ Self-assessment score ▶ Percent of employee satisfaction survey rating ▶ Percent of payroll spent on training and development ▶ Number of IDP's in place and in LADs ▶ Number of "priority 1" training needs met ▶ Number of vacancies filled ▶ Number of days positions are vacant ▶ Number of student interns (Number of Grant for Research Fellowships (GRF), STIPDG, etc.) ▶ Number of outreach activities 	<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 (TBD) ▶ Number of contracts on time and on budget ▶ TIN (TBD) ▶ SBIR (TBD) 	<ul style="list-style-type: none"> ▶ Quality self-assessments ▶ Lab assessments ▶ Project tracking system ▶ ACSI
Business Results	Business results show 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 of project completion ▶ Number of success stories ▶ Research benefit (TBD) 	<ul style="list-style-type: none"> ▶ Track project and services delivery ▶ RD&T success stories ▶ Pilot and case studies