



**DULLES CORRIDOR RAPID TRANSIT PROJECT  
TECHNOLOGY IMPLEMENTATION PLAN**

Dulles Corridor Task Force

Technology Task Group &  
Virginia Department of Rail and Public Transportation

PB Farradyne

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## **Executive Summary**

The Dulles Corridor Technology Task Group represents the full range of stakeholders in the Dulles Corridor's transportation system. The group's aim is to assess how advanced technology can help minimize congestion, improve mobility, enhance safety and protect the environment.

This report presents the findings and recommendations of the Group, including an implementation plan that suggests Intelligent Transportation Systems (ITS) technology concepts for the Dulles Corridor Rapid Transit Project.

### **PROJECT DESCRIPTION**

Population and job growth along the Dulles Corridor is continuing to exceed expectations. With an increased presence of information technology firms making Northern Virginia home, growth is expected to continue at a rapid pace. Dulles International Airport is also experiencing continued high growth in passenger traffic. With this in mind transportation agencies in this region have embarked on a multi-modal transit program that includes express bus and Bus Rapid Transit (BRT) services as interim steps leading to the ultimate implementation of rail in the Dulles Corridor.

Providing oversight and direction to this effort is the Dulles Corridor Task Force. Chaired by Commonwealth Transportation Board member, J. Kenneth Klinge, the Task Force is made up of executives from stakeholder transportation and planning agencies in the Dulles Corridor. The Task Force has subcommittees to recommend funding, service delivery, technology and management of the project. The Technology Task Group developed recommendations for the application of advanced technology in the Dulles Corridor project.

The goal of the Dulles Corridor Task Force - Technology Task Group is to apply technology where there is a payoff. Recommended technologies must make a real difference in the Dulles Corridor through increased ridership, reduced travel times, greater reliability, reduced cost and greater security and safety.

Representation on the Dulles Corridor Task Force - Technology Task Group includes:

- Northern Virginia Transportation Commission
- VA Department of Rail and Public Transportation
- Virginia Department of Transportation
- Washington Metropolitan Area Transit Authority
- Washington Airports Task Force
- Fairfax County
- Loudoun County
- Dulles Area Transportation Association
- Metropolitan Washington Airports Authority

## Dulles Corridor Rapid Transit Project Technology Implementation Plan

To provide rapid transit service in the Corridor, the Dulles Corridor Task Force developed an implementation program, which consists of the following four phases:

- **Phase I: Express Bus** – Starting in 1999, provides express bus service and new bus routes within Fairfax County serving Herndon/Monroe and Wiehle Avenue to Tysons Corner and the West Falls Church Metro station.
- **Phase II: Enhanced Express Bus** – Starting in 2001, provides additional bus routes and buses serving eastern Loudoun County and the City of Fairfax to Tysons Corner and the West Falls Church Metro station.
- **Phase III: Bus Rapid Transit** – Starting in 2003, provides new BRT routes and buses serving eastern Loudoun County, Dulles Airport, Reston/Herndon, Tysons Corner, and the West Falls Church Metro station.
- **Phase IV: Rail** – Starting in 2006, provides rail from Metrorail's Orange line East Falls Church station through Tysons Corner. Starting in 2010, extends rail from Tysons Corner to Reston/Herndon, Dulles Airport, and Routes 606 and 772 in Loudoun County. Although Phase IV is proposed in two parts, it is the intention of the Task Force to complete rail all the way to the vicinity of Route 772 in Loudoun County without delay.

## **RECOMMENDATIONS**

The recommended concepts are summarized in four concept packages: **Traveler Information, Electronic Payment, Safety and Security, and Operations**. A description, capital cost estimate, annual operating cost estimate, benefits and recommended phase of implementation (according to the project's four-phase program) are provided for each concept. Cost estimates are provided for planning purposes only. The estimates represent the maximum cost for stand alone systems and are likely to be significantly lower based on the selected operator's existing technology infrastructure.

### **Traveler Information Package**

The traveler information package includes technology concepts to improve information provided to transit travelers. Information on parking availability, bus/train arrival and departure information and in-vehicle next-stop information is proposed. It is expected that increases in customer convenience will occur, saving passengers time, relieving stress and uncertainty, while helping travelers make smart travel decisions. The outcome of this effort will make the transit services in the corridor more user friendly and build customer loyalty and confidence.

Transit Vehicle Tracking

Description: Global Positioning System (GPS) equipment installed on buses to pinpoint their location.

Total Capital Cost Estimate: \$3.9 million

Annual Operations & Maintenance Cost Estimate: \$2.0 million

Benefits: Provides more efficient and on-time operations, basis for transit traveler information (in-vehicle and wayside) and emergency response systems

Implementation Phase: Phases II, III, & IV

Parking Facility Information

Description: Dynamic (variable) message signs located at and near parking facilities showing real-time parking availability

Total Capital Cost Estimate: \$2.2 million

Annual Operations & Maintenance Cost Estimate: \$915K

Benefits: Convenience, saves customers time, relieves stress/uncertainty

Implementation Phase: Phases II, III, & IV

Wayside/In-station Traveler Information

Description: Next bus/train arrival and departure information

Total Capital Cost Estimate: \$442K

Annual Operations & Maintenance Cost Estimate: \$178K

Benefits: Convenience, saves customers time, relieves stress/uncertainty

Implementation Phase: Phases III & IV

In-Vehicle Traveler Information

Description: Next stop information

Total Capital Cost Estimate: \$2.2 million

Annual Operations & Maintenance Cost Estimate: \$879K

Benefits: Convenience, relieves stress/uncertainty, complies with Americans with Disabilities Act, and improves operational service

Implementation Phase: Phases III & IV

**Electronic Payment Package**

The electronic payment package includes ITS concepts which will make fare payment for transportation and parking more convenient for patrons as well as creating operational efficiencies for agencies. An increase in customer convenience will occur by providing one account for all electronic fare payment transactions for transportation and parking services in the corridor. This will allow for cost savings to customers and agencies. It will also save customers time by providing fast and easy access in and out of the transportation systems that require payment.

Electronic Fare Payment

Description: Pay transit fare with WMATA's SmarTrip card or other electronic media

Total Capital Cost Estimate: \$7.3 million

Annual Operations & Maintenance Cost Estimate: \$4.2 million

Benefits: Convenience, fast access in/out of the system, efficient collection for agency

Implementation Phase: Phases III & IV

Parking Facility Payment

Description: Pay parking fee with WMATA SmarTrip card, VDOT Smart Tag transponder or other electronic media

Total Capital Cost Estimate: \$4.2 million

Annual Operations & Maintenance Cost Estimate: \$2.6 million

Benefits: Convenience, fast access in/out of the system, efficient collection for agency

Implementation Phase: Phase III

In July 1999, the Federal Transit Administration (FTA) issued a Request for Proposal (RFP) for a regional demonstration of a coordinated electronic toll collection and electronic fare payment system. In response to the RFP, WMATA, on behalf of the metropolitan Washington region, submitted a proposal on October 25, 1999 for a universal electronic payment system in the region, incorporating the electronic collection of tolls, transit fares, and parking fees into one system. The Dulles portion of the proposal combines the Dulles Toll Road toll collection, transit fare and parking fees, and Dulles Airport parking fees. The goal is to provide customers with one account for all transactions.

The test transactions will be done through one clearinghouse. The anticipated benefits include faster access through systems for the user and cost savings for the agencies through increased usage of electronic fare payment and operation of one clearinghouse as opposed to three. FTA will award \$2.3 million in January 2000 to one proposer. Five proposals are being considered by FTA. If the WMATA proposal is selected, the test demonstration will be conducted within 24 months of the notice to proceed. The test demonstration could provide a starting point from which to implement a universal electronic payment system in the Corridor.

**Security/Safety Package**

The security/safety package includes technology concepts that will enhance the perceptions of patrons about security through surveillance technology. The use of video cameras is proposed in each of these concept applications. It is expected that by implementing security technology, it will relieve customer stress and uncertainty about using transit. It will also allow for cost savings by deterring vandalism and other criminal activity.

On-board Transit Security

Description: Two static video cameras and recorders per bus

Total Capital Cost Estimate: \$921K

Annual Operations & Maintenance Cost Estimate: \$368K

Benefits: Enhances customer safety, provides cost savings through reduced crime

Implementation Phase: Phase III

Transit Facility Security

Description: Video cameras at each station

Total Capital Cost Estimate: \$281K

Annual Operations & Maintenance Cost Estimate: \$112K

Benefits: Enhances customer safety, provides cost savings through reduced crime

Implementation Phase: Phases III & IV

Parking Facility Security

Description: Video cameras at each lot

Total Capital Cost Estimate: \$407K

Annual Operations & Maintenance Cost Estimate: \$163K

Benefits: Enhances customer safety, provides cost savings through reduced crime

Implementation Phase: Phase III

## **Operations Package**

The operations package will allow agencies to better manage assets and operation of equipment. Included are technology concepts to improve bus docking and vehicle maintenance. Also included are concepts to automate lane access control and emergency response. A traffic signal priority study is proposed along the corridor for a limited number of signals adjacent to the Dulles Toll Road.

These concepts will improve travel times by reducing dwell times at stations and traffic signal delays. Implementation of this technology will improve equipment reliability, reduce the number of delays due to equipment failure and will improve response time to emergencies or incidents.

### Bus Rapid Transit (BRT) Station Lane Access Control

Description: Transponder gate access to median stations

Total Capital Cost Estimate: \$1.1 million

Annual Operations & Maintenance Cost Estimate: \$434K

Benefits: Enhances safety, allows only buses to enter/exit BRT median stations

Implementation Phase: Phase III

### BRT Precision Docking System

Description: Docking at BRT median stations to provide for easy passenger access/egress to/from BRT buses

Total Capital Cost Estimate: \$1.7 million

Annual Operations & Maintenance Cost Estimate: \$690K

Benefits: Safety, efficiency, saves time, easier boarding/alighting for disabled passengers

Implementation Phase: Phase III

### Transit Vehicle Monitoring/Maintenance

Description: Sensors on vehicles connected to a central control facility and maintenance schedule software

Total Capital Cost Estimate: \$428K

Annual Operations & Maintenance Cost Estimate: \$171K

Benefits: Equipment reliability, safety, and efficiency

Implementation Phase: Phase III

Traffic Signal Priority Study

Description: Study implementing traffic signal priority at multiple locations along the Dulles Corridor to enhance bus service

Total Capital Cost Estimate: \$218K

Annual Operations & Maintenance Cost Estimate: \$47K

Benefits: Enhances operations for schedule adherence

Implementation Phase: Phase II

Emergency Response

Description: Coordinated response to emergencies using global positioning satellites

Total Capital Cost Estimate: \$1.2 million

Annual Operations & Maintenance Cost Estimate: \$588K

Benefits: Faster response times, saves time

Implementation Phase: Phase III

## **PROCESS**

The process used to derive the recommendations was methodical and straightforward. Starting with a comprehensive set of Market Package concepts defined by the USDOT National ITS Architecture, the study team pared down the list of concepts based on approved evaluation criteria, logic checks with existing or planned programs, and costs. The process included:

- Using the National Architecture to identify relevant market packages to ensure a comprehensive approach.
- Developing a list of applicable ITS concepts (50 concepts identified).
- Identifying existing or planned applications in the region that would affect ITS applications along the Dulles Corridor.
- Applying evaluation criteria listed below to the preliminary list of technology concepts to identify those concepts with the greatest potential return on investment:

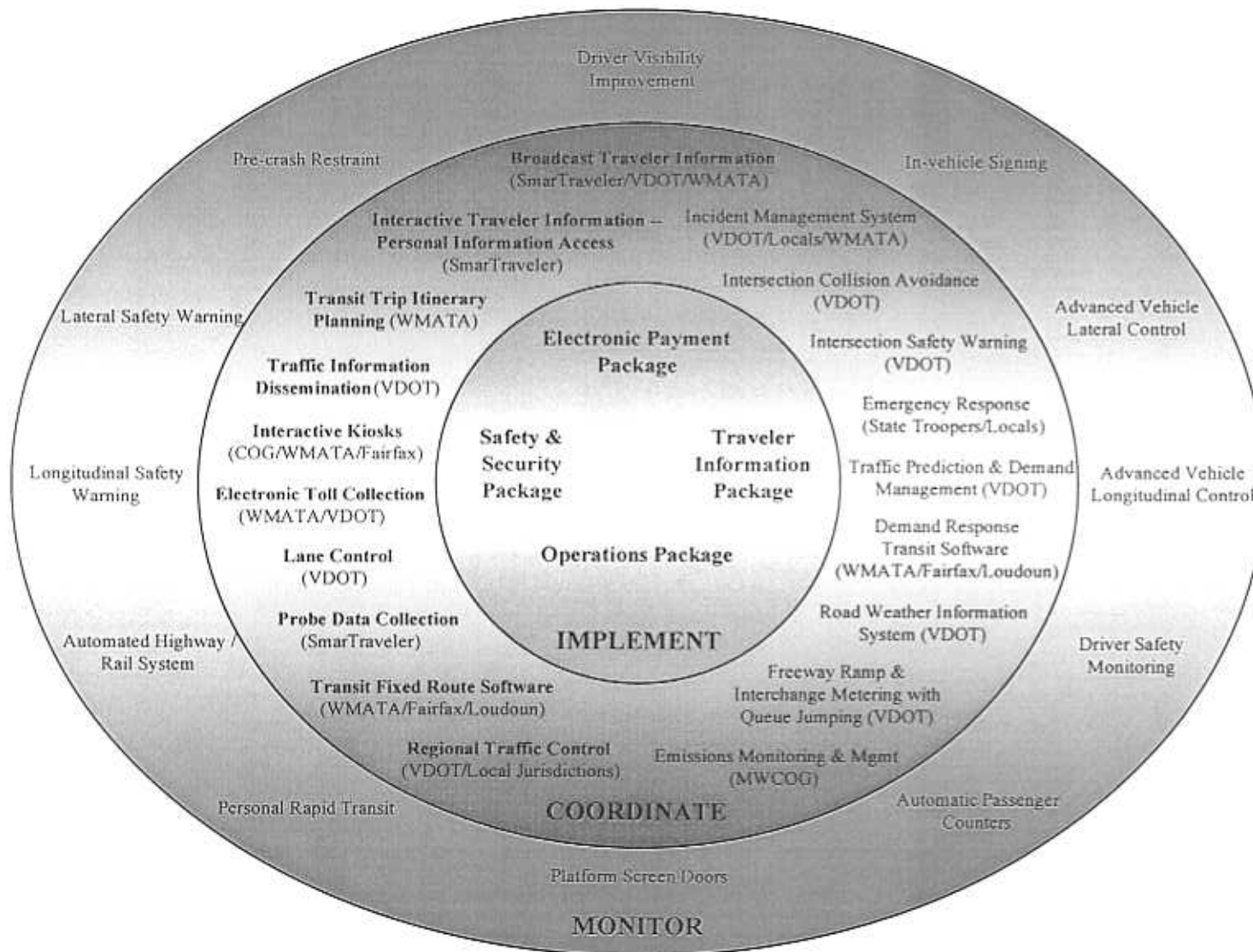
### Dulles Corridor Rapid Transit Project Technology Implementation Plan

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- Consistency with the Technology Task Group policy statement
  - Technical feasibility
  - Customer benefits
  - Operator benefits
  - Compatibility and integration with existing/planned systems
  - Cost effectiveness
  - Community/agency impacts
- Organizing technology concepts into four categories for further review using capital and operations cost, and service delivery variables in order to focus on those to be implemented as part of the Dulles plan.
- Developing detailed capital and operating cost estimates for each phase of implementation.
- Coordinating recommended technologies with the Service Delivery Task Group.
- Providing recommendations to the Dulles Corridor Task Force.

Conducting the study in this comprehensive manner gave the study team a picture of the Dulles Corridor implementation recommendations in the context of regional efforts to implement ITS. Technology concepts were categorized into three areas. Concepts are either to be *implemented* as part of the Dulles project, *coordinated* as part of the Dulles project, or *monitored* along with the Dulles project. The following graphic, Exhibit 1, displays these concepts. There are 12 concepts that are proposed to be monitored. There are 19 concepts with which the Dulles project will need to coordinate. Of the 19 concepts, 10 concepts are existing (in bold) and 9 are proposed. There are 14 concepts that the Dulles project will implement, which are grouped into the four packages shown in the diagram.

Exhibit 1. Dulles Corridor ITS Concepts



## **ISSUES & NEXT STEPS**

Several implementation issues were identified during the course of the project. These issues, and recommended actions to address these issues, are provided below.

- It is recognized that coordination is needed across transportation agencies and represented levels of government in order for effective integration of technology to occur. Therefore the Technology Task Group will be working to enhance understanding about the technology recommendation.
- The Technology Task Group recognizes that rapid changes in technology may cause obsolescence within a short period and new technologies not imagined today may be available within the next few years. The Group will monitor evolving technologies for potential adaptation to Corridor transit systems, including feeder transit service. The Group will also monitor the development of standards in ITS in order to maximize the return on investments and ease integration.
- With the approval of the Dulles Corridor Task Force, the Technology Task Group will work with the Service Delivery Task Group during the preliminary engineering/NEPA process on a system planning effort to define system requirements for the proposed technology concepts in conjunction with regional and statewide architecture efforts. Work will also commence in parallel with the Funding Task Group to identify and secure appropriate funding sources.
- Because little quantitative information is available on the pay-off from investments in advanced technology, follow-up should occur after implementation of these recommended investments to measure their performance.
- As can be seen from the detailed description that follows, not all advanced technology investments are isolated, stand-alone systems. Many are suited for implementation as part of larger, standard transportation investments. Accordingly, implementing agencies should routinely consider ITS as part of their standard projects and set aside portions of those project budgets for monitoring, coordinating and implementing future technologies.
- The cost estimates will be refined and the cost effectiveness of concepts will be measured as the project proceeds towards implementation.