



City of Bellevue

ITS Master Plan



“Enhancing Transportation Safety and Efficiency”

Prepared by

DKS Associates

TRANSPORTATION SOLUTIONS

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ACKNOWLEDGEMENTS

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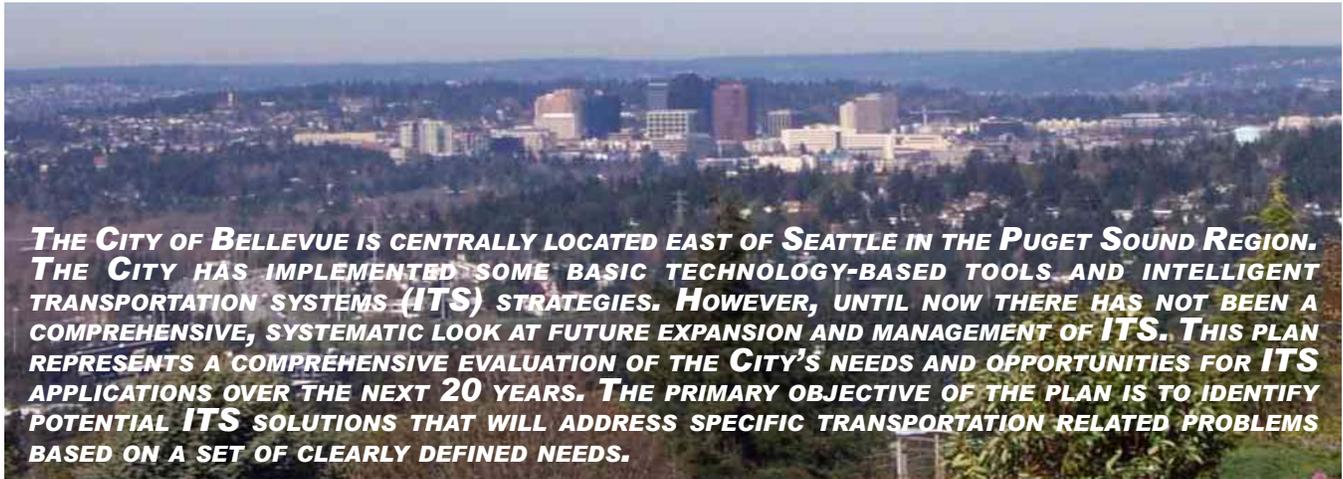
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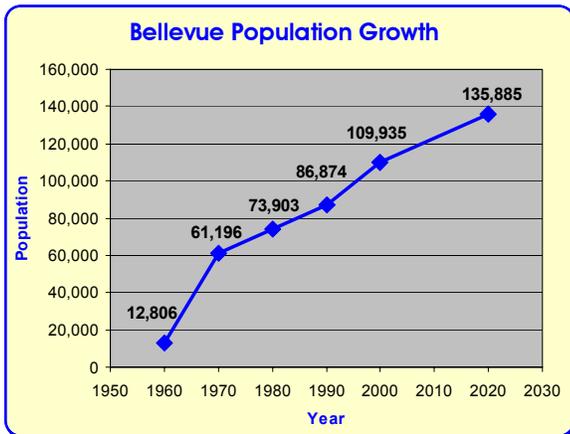


Introduction



The City of Bellevue has had steady growth in both population and employment over the past thirty years. Since 1970, the population has almost doubled, and by the year 2020, the population is expected to grow another 24 percent. The significant growth, coupled with reliance on the automobile as the primary means of transportation, has placed a tremendous burden on the City's transportation infrastructure. As the City continues to expand, a

coordinated, systematic approach will be necessary to effectively manage the transportation infrastructure. By working efficiently and cooperating with other local agencies, the City can build and manage a smarter transportation system using ITS.

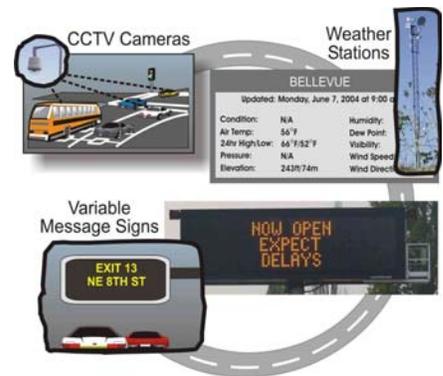


What is ITS?

ITS is the application of a range of advanced technologies and proven management techniques to enhance mobility and transportation productivity, enhance safety, conserve energy resources and reduce adverse environmental effects.

ITS uses real-time information to integrate and manage the components of a conventional transportation system (roads, transit, ramp meters, traffic signals, etc.). ITS can perform the following functions:

- Alert motorists, commercial vehicles, emergency response personnel and transit operators of congestion by collecting, processing and disseminating real-time information.
- Provide real-time transit arrival and departure information to passengers allowing them to time their departure from work or home to transit stops.
- Reduce corridor congestion by rapidly detecting and responding to traffic incidents.
- Reduce response times to incidents and emergencies for City maintenance staff and emergency services personnel through enhanced data and surveillance.





In the past, the common belief was that we could meet the demand for mobility by building and expanding highways and bridges. However, as many areas of the country have built out the roadway network, traffic congestion has increased to overfill the infrastructure and we must consider new ways of managing traffic. ITS provides new tools to compliment traditional transportation thinking and the approach is catching on worldwide.

Deployment of ITS tools and strategies, seen as the next major evolutionary stage of surface transportation, is expected to be the focus of implementation efforts early in this century, much like the highway system program was the focus of the last 60 years. ITS is no longer an alternative or option in dealing with congestion and increasing highway travel, but rather it is one of the most cost effective ways to obtain a more efficient transportation system.



What is the Bellevue ITS Plan?

The Bellevue ITS Plan is a road map to implement an integrated system of transportation strategies based on a set of identified opportunities. The plan’s purpose is to establish the need for ITS investments in the region, to identify relative priorities to direct ITS investment, and to identify specific projects to be deployed to address identified needs.

Why is the Plan Important?

An ITS plan:

- creates the framework from which ITS benefits can be realized;
- represents a comprehensive analysis of the City’s ITS goals;
- ensures that ITS projects in the City will be eligible for Federal ITS funding; and
- prioritizes financial resources for ITS opportunities.



ITS is no longer an alternative or option in dealing with congestion and increasing highway travel. It is one of the most cost effective ways to obtain a more efficient transportation system.

Table E-1. Regional ITS System Engineering Analysis Compliance

System Engineering Analysis	ITS Plan Compliance
1. Description of how project fits into the Regional ITS Architecture	
<i>Review of Applicable Market Packages</i>	Regional Architecture
<i>Regional ITS Integration Strategy</i>	Concept of Operations
<i>Other Stakeholders to Consider</i>	Concept of Operations
<i>Develop a Project Operational Concept</i>	Deployment Plan
<i>Develop a Project ITS Architecture</i>	Concept of Operations
2. Roles and responsibilities of participating agencies	Concept of Operations
3. Requirements definition	Project specific and not part of the regional plan. This will need to be developed at the time of project deployment.
4. Analysis of alternative system configurations and technology options	Project specific and not part of the regional plan. This will need to be developed at the time of project deployment.
5. Procurement options	Project specific and not part of the regional plan. This will need to be developed at the time of project deployment.
6. Applicable ITS standards and testing procedures	Regional Architecture
7. Procedures and resources necessary for operations and management of the system	Project specific and not part of the regional plan. This will need to be developed at the time of project deployment.

This plan was coordinated with regional efforts, such as the Puget Sound Region ITS Architecture, to ensure ITS strategies throughout the region are integrated and complementary. In addition, this coordination helps assure that Bellevue is eligible for Federal ITS funding. During the development of the Regional ITS Architecture, the Puget Sound Regional Council (PSRC) created a document outlining procedures for local agencies to follow to comply with the regional ITS plan and Federal guidelines. The guidance document outlined a “System Engineering Analysis” that should be followed by local ITS projects. Table E-1 summarizes how the System Engineering Analysis was incorporated into the Bellevue ITS Master Plan.



Introduction

How was the ITS Plan Developed?

The development of the ITS plan started with identifying the ITS Vision for Bellevue. This Vision maintains a consistent goal in the identification of future projects, and when coupled with the inventory of the existing ITS conditions, it helped determine the City's ITS related needs.

The data from the needs assessment and the existing conditions inventory were used to develop the Bellevue Regional Architecture, which is a view of ITS in Bellevue displayed in a format developed by the United States Department of Transportation (U.S. DOT). The Regional Architecture helped identify where interagency arrangements will be needed. The interagency relationships are documented in the Concept of Operations. All of these steps help develop the final product, which is the deployment plan. This process is shown graphically in Figure E-1.

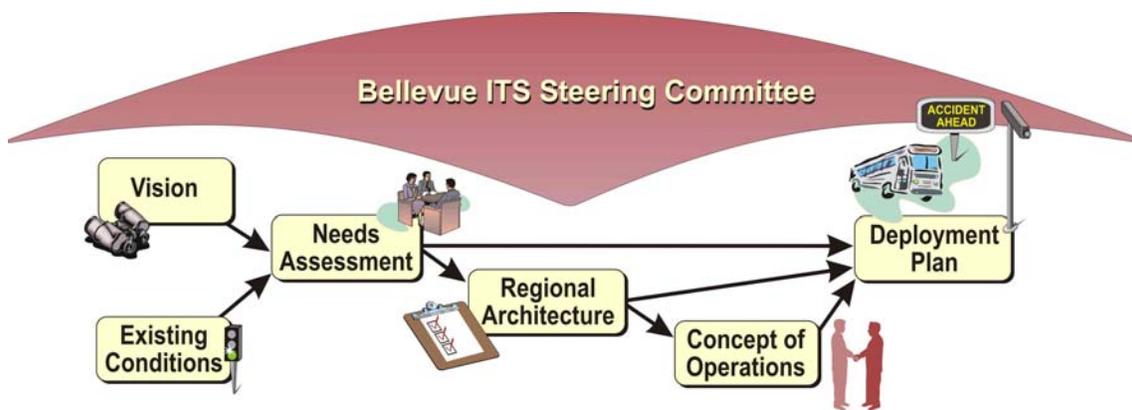


Figure E-1. ITS Planning Process



ITS Master Plan Vision

The City of Bellevue Transportation Department Executive Team developed the following four statements to capture the vision of ITS in Bellevue.

Vision Statement #1

Maximize the safety and efficiency of the City's transportation system for residents, business owners, and visitors to the City of Bellevue.

Vision Statement #2

Support Emergency Services in their efforts in saving lives and protecting the City's transportation infrastructure.

Vision Statement #3

Maximize the quality of transportation service provided by the City of Bellevue to residents, business owners, and visitors.

Vision Statement #4

Be active in and support regional ITS initiatives.



Deployment Plan

This section summarizes all of the components of the Deployment Plan, which is broken out into three phases: 0 - 5 Year Plan, 6 - 10 Year Plan, and 11 - 20 Year Plan. The capital costs and operations and maintenance costs for each phase are listed in Table E-3. All identified projects and their estimated deployment timeframe are listed in Table E-4 and are described in detail in Table E-5 at the end of this section. The high priority projects scheduled for the 0 - 5 Year Plan are highlighted following Table E-4. Figures E-7 through E-14 illustrate proposed locations for ITS equipment including variable speed limit signs, proposed weather stations, CCTV cameras, dynamic message signs, fiber optic communications, transit signal priority, flood warning sensors and real time transit arrival signs, respectively.



Table E-3. Deployment Cost Summary

Deployment Years	Capital Cost	Operations and Maintenance
0 - 5 Years	\$4,500,000	\$154,000
6 - 10 Years	\$4,600,000	\$188,000
11 - 20 Years	\$4,600,000	\$419,000
TOTAL	\$13,700,000	\$761,000



Table E-4. Deployment Schedule

Project ID	Project Title	Years	5-Year Plan					10-Year Plan					20-Year Plan									
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Travel and Traffic Management																						
TM_01	Bicycle Detection																					
TM_02	911 Computer Aided Dispatch Interface																					
TM_03	Photo Enforcement																					
TM_04	Traffic Management Center Build-out																					
TM_05	Dynamic Route Guidance																					
TM_06	Automated Commuter Alert System																					
TM_07	Downtown Parking Management System																					
TM_08	Permanent Highway Advisory Radio (HAR)																					
TM_09	Vehicle Classification Detection																					
TM_10	Driver Feedback Signs																					
TM_11	Rail Crossing Interconnect																					
TM_12	Traveler Information Kiosks																					
TM_13	Variable Speed Limit Signs																					
TM_14	City-Wide CCTV Deployment																					
TM_15	Dynamic Message Signs																					
TM_16	City-Wide Communications																					
TM_17	Communications to Isolated Signalized Intersections																					
TM_18	Arterial Congestion Map																					
TM_19	Central Signal System Replacement																					
TM_20	Center to Center Integration - Redmond and WSDOT																					
TM_21	Signal System Upgrade for TSP and TRPS																					
Public Transportation																						
PT_01	Transit Signal Priority																					
PT_02	Smart-Bus TSP Enhancements																					
PT_03	Real-Time Transit Arrival Signage																					
Emergency Management																						
EM_01	Intra-Agency Video Sharing																					
EM_02	Traffic Information on Mobile Data Terminals																					
EM_03	Remote Monitoring of City Facilities																					
EM_04	Flood Warning System																					
Information Management																						
IM_01	Traffic Data Query System																					
Maintenance and Construction																						
MC_01	Roadway Weather Information System																					
MC_02	Portable Work Zone ITS Equipment																					
MC_03	Maintenance Vehicle AVL Tracking System																					



High Priority Projects

High priority projects are identified for deployment within the first five-year timeframe. This section describes each high priority project.

TMC Build Out

This project will provide new video displays, switching equipment and consoles for the designated TMC space at the new City Hall.



City-Wide CCTV Deployment



CCTV cameras will be used to monitor traffic conditions, monitor emergency events, optimize signal timing, view high accident locations, and monitor flooding and weather.

Driver Feedback Signs

The City would like to expand the use of Driver Feedback signs in Bellevue as a means of traffic calming. These signs notify the driver of their current speed and flash the speed when they are traveling over the speed limit. The City currently has approximately 20 signs and would like to deploy an additional 10 signs.



Variable Speed Limit Signs

This project will deploy approximately 72 variable speed limit signs in school speed zones on Bellevue streets. These signs will adjust the posted speed by time of day with respect to school schedule. The City deployed their first set of time of day signs at Lake Hills Elementary. The City would like to have the ability in the future to communicate to the signs directly from the TMC.



Dynamic Message Signs

Full function VMS signs and limited state wayfinding signs will be deployed to manage traffic during incidents such as flooding, large freeway accidents and special events in downtown



Bellevue. The need for six full function VMS signs and three wayfinding signs has been identified.

Communications to Isolated Signalized Intersections

This project will provide communications to all the signalized intersections in the City that are currently isolated from the signal interconnect network.



City-Wide Communications

This project will phase in new fiber optic cables throughout the City to communicate to the new field devices and to upgrade communications to existing field devices.



Arterial Congestion Map

This project will develop an arterial congestion map based on system detector data and future floating car data from GPS sensors. The City has an extensive deployment of system detectors that can initially be used for measuring congestion in the region. It is assumed



that GPS data will provide a more accurate measurement in the future, so it is anticipated that the system will eventually migrate to a GPS system.



Deployment Plan

Center-to-Center Integration

This project will implement center-to-center communications with Redmond's future central signal system and will re-establish the connection to WSDOT. The center-to-center communications to WSDOT requires software upgrades on the interface servers.



Signal System Upgrade for TSP and TRPS



This project will upgrade the City's Computran system to improve traffic responsive pattern selection (TRPS) and TSP operations.

Transit Signal Priority

In a joint effort with King County Metro and Sound Transit, The City of Bellevue will deploy new TSP sites near the Bellevue Transit Center as part of the Downtown Access Project. In addition, the City is starting a project to evaluate TSP along the corridor of six of the most heavily traveled transit routes in Bellevue. This project involves a joint effort with King County Metro and Sound Transit to install TSP at up to 120 sites in the next twenty years.



Real-Time Transit Arrival Signage

This project will be a joint effort with King County Metro and Sound Transit to deploy signage at major transit hubs and transfer points to notify travelers of the estimated arrival and departure

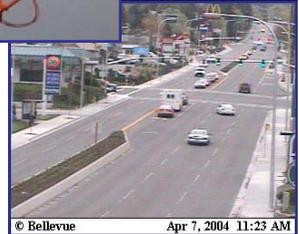
Route	Destination	Scheduled At Bay	Depart Status
236	Kingsgate P & R	1:20	10 On Time
230	REDMOND PR LAYOVER C	1:20	5 On Time
233	Avondale	1:05	6 Bus Departed
233	Avondale	1:35	6 On Time
233	BELLEVUE	1:23	1 3 Min Delay
234	BELLEVUE	1:01	1 Bus Departed
234	BELLEVUE	1:31	1 On Time
234	Northshore P & R	1:05	10 Bus Departed
234	Northshore P & R	1:35	10 On Time
240	Clyde Hill	12:59	8 Bus Departed
240	Clyde Hill	1:29	8 1 Min Delay
240	South Renton P & R	1:05	3 No Info Avail

time for specific transit routes. The high priority locations include the Bellevue Transit Center, Eastgate, South Bellevue, Wilburton and Newport Hill Park and Rides, Factoria Mall, Bellevue Square and the Crossroads Shopping Center.

Intra-Agency Video Sharing



This project will provide video to the Police, Fire, the 911 center, the Emergency Operations Center and the Bellevue Service Center.



Remote Monitoring of City Facilities



This project will monitor City facilities such as Downtown Park or water reservoirs. The monitoring may be via CCTV or other technologies.

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Flood Warning System

This project will deploy flood monitoring equipment at six critical locations in Bellevue.



Traffic Data Query System

This project will enhance the loop data management program in the Computran system to improve access to historic system detector data and provide access to automated traffic count information.



Roadway Weather Information System

Weather stations with roadway temperature monitoring will be included at six critical locations.

Road Conditions

- ▲ Above 38 F
- ▲ 33 F to 38 F
- ▲ 32 F and below
- ▲ No data

