



## Chapter 8: BENEFITS ANALYSIS

### 8.1 INTRODUCTION

Historically, benefits associated with ITS have been reported based on results of previous ITS deployments either within the particular region or around the country. For this plan, the ITS Deployment Analysis Software (IDAS)<sup>1</sup> has been used to assess the potential benefits resulting from the projects deployed in the Eugene-Springfield metropolitan area. IDAS is a unique benefits evaluation tool because it uses the regional travel demand model as the baseline for evaluation. The user overlays proposed ITS projects on the network and the potential benefits are calculated based on the impact to the specific regional conditions. The following sections provide an overview of the IDAS software and its functionality, why IDAS was chosen for the assessment, a description of the analysis methodology, a summary of the potential benefits, and lessons learned from using IDAS. Figure 8-1 illustrates how IDAS fits into the overall project approach as input to the implementation plan.

We would like to acknowledge Bud Reiff, Lane Council of Governments, for his time and effort to provide the travel demand model input data and for responding to numerous questions during the calibration phase. We would also like to acknowledge Robert Bertini and Sachin Karmarkar at Portland State University for converting the travel demand model data to the format required by IDAS and establishing and calibrating a base model for the benefits analysis.



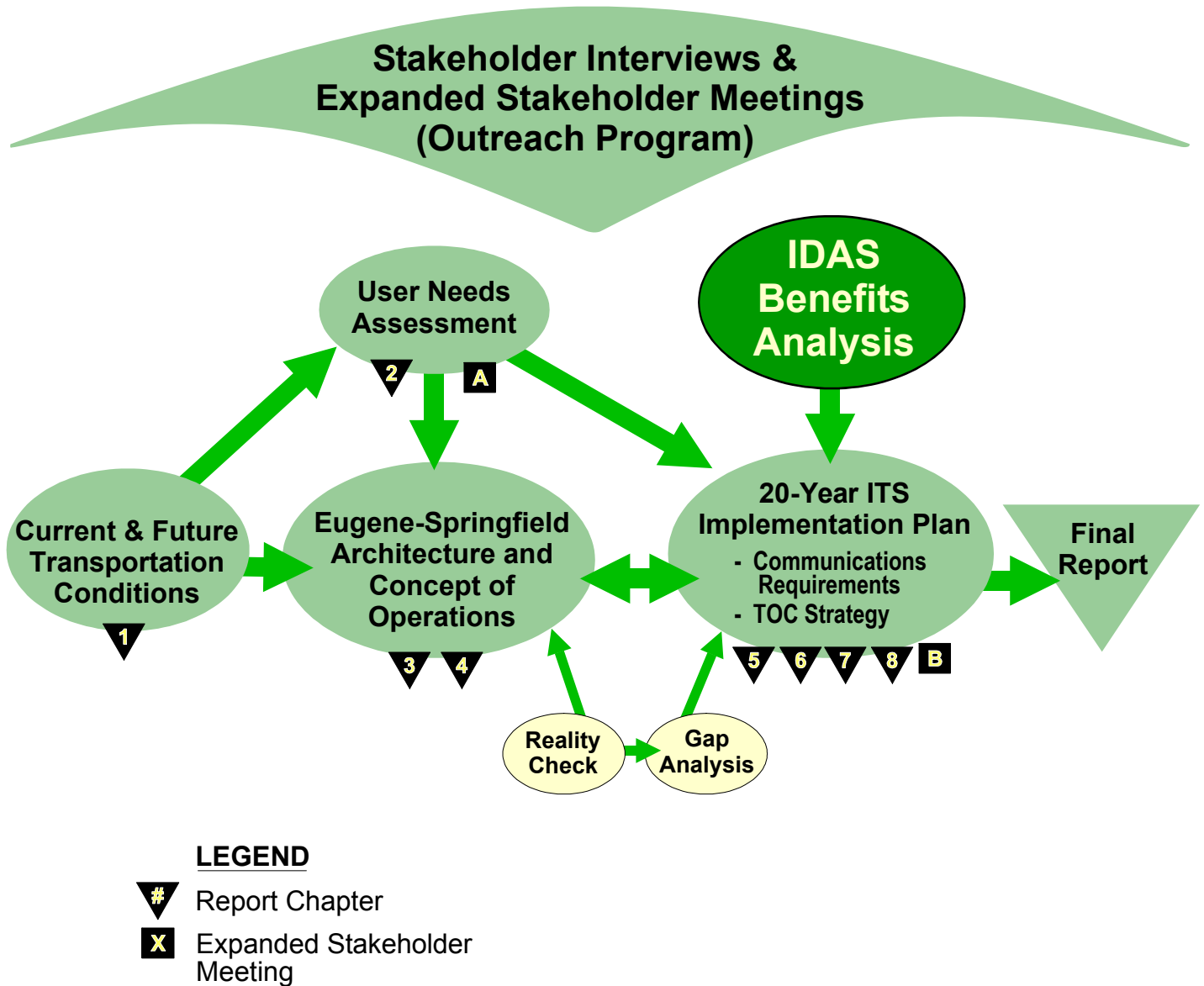
#### 8.1.1 Project Scope

For this analysis, two individual ITS projects and the ten-year (2015) deployment plan have been evaluated. The ten-year deployment plan was selected because it most closely matches the existing travel demand model forecast year of 2015. In addition to the ten-year deployment plan, the individual projects evaluated include:

- Ramp metering on Beltline Highway (Coburg Road to Pacific Highway)
- Traffic responsive signal timing on Gateway Street (Harlow Road to International Way)

<sup>1</sup> *ITS Deployment Analysis System (IDAS) Version 2.2*, developed by Cambridge Systematics under contract to the Federal Highway Administration, 2002.

## PROJECT APPROACH



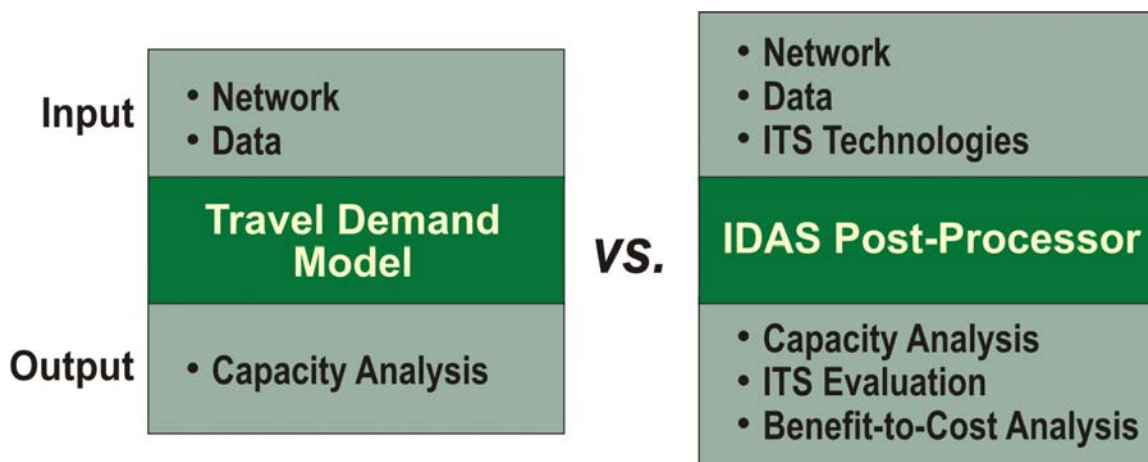
While the IDAS software can be used as an alternative analysis tool to prioritize potential projects, it was not practical to use the tool for that purpose due to the large number of proposed ITS projects. The primary purpose for using this tool with the Eugene-Springfield ITS deployment plan is to provide an assessment of the potential benefits specific to the traffic characteristics in Eugene-Springfield. Using IDAS, a more accurate presentation of potential benefits have been presented for Eugene-Springfield as opposed to simply reporting benefits from similar projects regionally and nationally.

## 8.2 IDAS OVERVIEW

IDAS (ITS Deployment Analysis System) is a software program developed by the Federal Highway Administration that allows the user to approximate the potential benefits, costs, and impacts resulting from the deployment of various ITS components. The software uses the regional travel demand model as a baseline and builds on it to estimate the benefits and costs based on numerous performance measures and impacts that relate specifically to each ITS deployment. IDAS was developed as a sketch planning tool and operates as a post processor to travel demand models. The benefit of IDAS is that it expands the capability of a traditional travel demand model by adding capability to evaluate the potential benefits and costs associated with ITS components. Figure 8-2 illustrates the high level differences of IDAS as compared to a travel demand model. Over 60 types of ITS components are available for deployment categorized into 12 different ITS element categories:



- Arterial Traffic Management Systems
- Freeway Management Systems
- Advanced Public Transit Systems
- Incident Management Systems
- Electronic Payment Systems
- Railroad Grade Crossing Monitors
- Emergency Management Services
- Regional Multimodal Traveler Information Systems
- Commercial Vehicle Operations
- Advanced Vehicle Control and Safety Systems
- Supporting Deployments
- Generic Deployments



**Figure 8-2. Comparison of IDAS to a Travel Demand Model**

### 8.2.1 Why use IDAS?

In the past, the only option for assessing the potential benefits and impacts of an ITS project was to compare against similar installations and benefits results around the region and country. IDAS is designed to fill this gap and provide an assessment of the benefits, costs and impacts from ITS projects deployed within a region using the regional travel demand model. This is a benefit because the impacts from the ITS projects are determined



based on the local travel conditions and the model can reflect regional impacts to the transportation network. Since IDAS is capable of reassigning trips based on the ITS projects deployed on the network, the potential benefits and impacts associated with the proposed ITS projects can be viewed from a regional perspective. In addition, IDAS allows the user to compare several alternatives with various ITS components to prioritize and select ITS projects for deployment. IDAS is capable of estimating:

- Changes in Vehicle Miles Traveled (VMT) and Vehicle Hours Traveled (VHT). These can be reported by mode of transportation (auto, truck and transit), by facility type and by geographic area.
- Impacts to travel time, crashes and environmental factors such as emissions, noise, and fuel consumption. These can also be reported by mode of transportation (auto, truck and transit), by facility type and by geographic area.
- Life-cycle cost of the ITS improvement, including capital costs of deployment as well as continuing operations and maintenance costs.

## 8.3 ANALYSIS METHODOLOGY

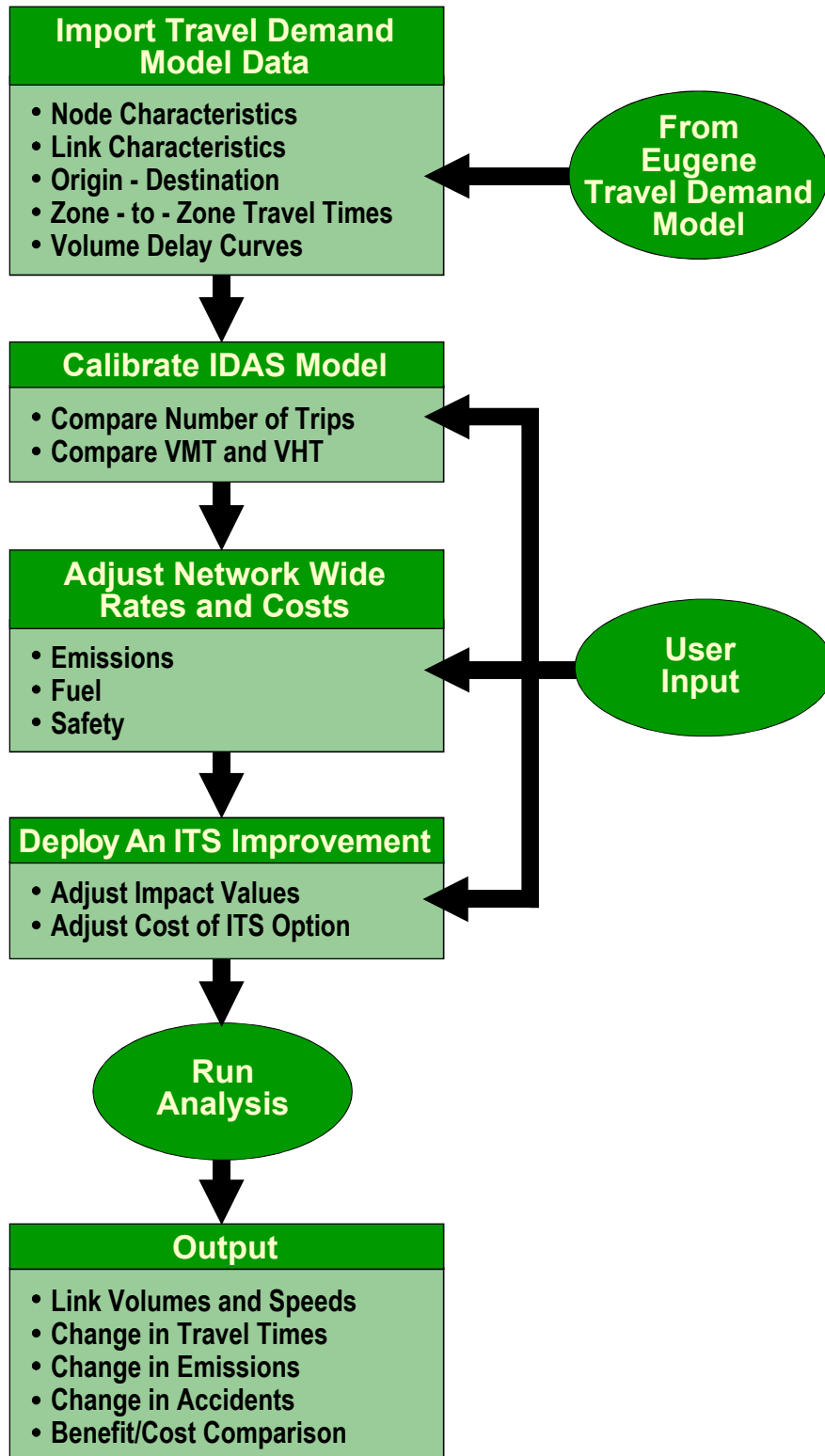
This section describes the process used to conduct the benefits analysis for two specific ITS projects and the 10-year ITS deployment plan. Figure 8-3 graphically presents the steps used to generate the projected benefits using IDAS. The remainder of this section describes the methodology used to import the baseline travel demand model data, deploy ITS projects, adjust impact values and determine proposed benefits and costs.

### 8.3.1 IDAS Subcommittee

A Subcommittee made up of members of the Eugene-Springfield ITS Steering Committee was formed to provide input on the location of ITS deployments to be evaluated and the default impact values to use. Significant inputs to the IDAS benefits analysis program are the default impact values (i.e. reduction in crashes, fuel costs, etc.). Using regional benefits and costs data, the Consultant team proposed modified impact values to more closely match the region and the Subcommittee provided input on the values. In addition, the Subcommittee provided input on equipment locations.

### 8.3.2 Input and Calibrate the Control Alternative

The first step to begin the benefits analysis is to import and calibrate the regional travel demand model for the Eugene-Springfield metropolitan area. Once the travel demand model data has been successfully imported and calibrated, this becomes the control alternative that serves as the baseline for comparison of all ITS projects deployed within the network. The travel demand model baseline data used for this analysis comes from the



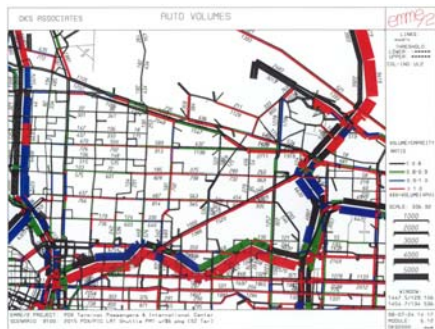
**Figure 8-3**  
**IDAS PROCESS**

existing 2015 EMME/2 regional travel demand model for Eugene-Springfield as provided by Lane Council of Governments (LCOG).



IDAS requires the regional network data to be imported in ASCII format. Many times it is necessary to take the extra effort to format this data provided by the travel demand model into a format that is applicable to IDAS. In this case, two days were spent in creating a program that converted this data<sup>2</sup>. IDAS requires that each link have a defined speed, lane capacity, number of lanes, travel mode, beginning and ending node, facility type, area type, distance, and district. It was determined that instead of manually flagging each link and defining its properties, it would be easier to create a program that did this assignment.

The travel demand model data imported to establish the baseline travel conditions for this benefits assessment include:



- Zone to district equivalence
- Node coordinate file
- Network links file
- Turn prohibitor file
- Trip origin-destination (trip table) data files
- Trip in-vehicle travel time origin-destination tables
- Trip out-of-vehicle travel time origin-destination tables

After the travel demand model input tables were successfully imported the IDAS model needed to be calibrated with the travel demand model. To compare the two models, IDAS provides the user VMT and VHT output for comparison to the VMT and VHT from the travel demand model. This comparison allows for calibration of the IDAS model being used and identifies if there are data inconsistencies between the two. If large inconsistencies are noticed, the travel demand model data may need to be re-imported. In respect to Eugene-Springfield, the VMT and VHT varied by about 10 percent between the IDAS model and the travel demand model after the initial implementation. The IDAS model produced higher values than the travel demand model and a 10 percent difference was too large.

The key to calibrating the model for Eugene-Springfield involved redefining the volume-delay curves from the IDAS default to the values used by the Eugene-Springfield travel demand model (Heinz Spiess conical delay function<sup>3</sup>). The updated volume-delay curve values are provided in Appendix Q. With the new curves implemented, the VMT and VHT results from IDAS were within three percent of those of the travel demand model. The IDAS results were however still larger. One potential reason for the difference in values could be that IDAS is limited to five volume delay curves, and the travel demand model used may have more than five based on the facility and area types. Another potential reason for the difference could be because IDAS was designed to work with a number of travel demand models and it cannot be expected to produce the exact analysis results of any one particular model. In the end, the IDAS Subcommittee was consulted and they agreed that a three percent difference was reasonable to continue with the analysis.

<sup>2</sup> Portland State University imported the travel demand model data and created the file translation program.

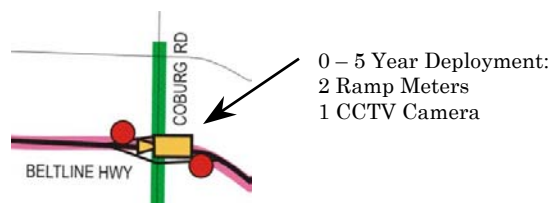
<sup>3</sup>  $1/(60*(length/FFS))*(2+SQRT(49*(1-1.0168*(V/C))^2+1.1735)+7.1176*V/C-8.083304)$  for freeways and  $1/(60*(length/FFS))*(2+SQRT(16*(1-0.8298*(V/C))^2+1.361)+3.3192*V/C-5.1666)$  for arterials.

In addition to the overall VMT and VHT comparison, the IDAS user's manual recommends performing validation on a link-to-link basis to evaluate the reasonableness of results in particular sub areas of the model. This can be very time consuming, for the user must manually select each link in the model and verify that speed, number of lanes, lane capacity, district, facility type, and area type are correct.

### 8.3.3 Deploy an ITS Improvement

Once the network is calibrated, ITS improvements can be deployed on the network. To deploy an ITS improvement the user drags an ITS component from the list of over 60 ITS components and drops it on the network map. From this point, the user is able to identify the following for each ITS component:

- Type of ITS equipment
- Quantity of equipment
- Location where the equipment is deployed
- Deployment schedule



In addition, the user may specify whether a specific component is installed new, existing, not installed or shared with other equipment. This inventory of ITS equipment serves as the primary input to the cost analysis in IDAS.

### 8.3.4 Adjust Network Wide Parameters

Prior to running any analysis, the user is provided with numerous default values and parameters to consider for refinement to reflect local conditions. These values and parameters include accident rates, emission rates, fuel consumption rates, cost of fuel, value of time, value of accidents, and others. The default values are based on national rates often developed from research conducted by the Federal Highway Administration. Each of these values is available for the user to adjust to reflect local conditions. The following provides a summary of the adjustments made for the Eugene-Springfield model:

- **Accident rates** – Default values are based on Federal Highway (FHWA) research<sup>4</sup>. No adjustment was made to the default rates for this analysis.
- **Emission rates** – IDAS provides the option to use Mobile 5a or the Emissions Factor (EMFAC)<sup>5</sup> model. Based on discussions with ODOT Environmental<sup>6</sup>, the Mobile 5b data has been used for Eugene-Springfield in the past. Efforts were made to update the Mobile 5a data to the Mobile 5b data, but incomplete data was available for Mobile 5b. Based on additional discussions with ODOT Environmental and LCOG<sup>7</sup> it was determined that the differences between Mobile 5a and Mobile 5b were minimal so the default values were not changed for this analysis.
- **Fuel consumption rates** – Default values are based on Environmental Protection Agency (EPA) rates. No adjustment was made for this analysis.
- **Cost of fuel** – These values were adjusted to reflect the average price of fuel in 2003.

<sup>4</sup> *Highway Safety Performance*, U.S. Department of Transportation, Federal Highway Administration, Jan. 1995 and *Traffic Safety Facts*, National Highway Traffic Safety Administration, 1993.

<sup>5</sup> EMFAC (short for EMISSION FACTOR) is an emissions monitoring tool used in California.

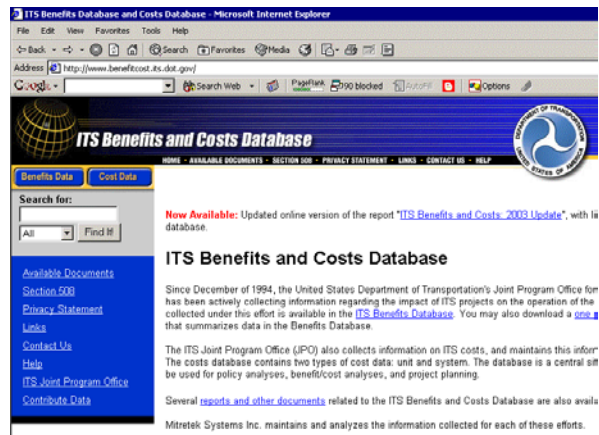
<sup>6</sup> Phone and e-mail correspondence with Vince Carrow, ODOT Environmental.

<sup>7</sup> Phone conversations with Bud Reiff, Lane Council of Governments.

- **Value of time** – Default values are based on U.S. Department of Transportation (U.S. DOT) research<sup>8</sup>. No adjustment was made for this analysis.
- **Value of accidents** – The default accident values within IDAS for fatalities, injuries and property damage is based on FHWA research<sup>9</sup>. The values used by ODOT are based on these FHWA numbers and no adjustment to the default values was made as part of this analysis.

### 8.3.5 Adjust Project Specific Impact Values

In addition to the network wide parameters, IDAS uses a defined set of default impact values based on each ITS deployment. When an ITS option is deployed, the impact values and equipment costs associated with the project deployed become available. For example, when a ramp meter is deployed the user has the option to adjust the percentage reduction in crashes, the percentage increase in capacity on the freeway and the percentage reduction in capacity on the on-ramp. The default values are based on the analysis of the data presented in the U.S. Department of Transportation's ITS Benefits and ITS Unit Costs databases as well as on a literature review conducted by IDAS developers during the creation of the software. The user has the option to use the default values or adjust the values to reflect local conditions.



For this project, benefits from projects within Oregon were used as much as possible to determine the appropriate impact values. Where Oregon specific benefits data were lacking, data from the U.S. DOT ITS Benefits and Costs web site<sup>10</sup> was used for comparison purposes. Based on these sources, recommended impact values were presented to the IDAS Subcommittee for review, and were further refined to better represent the Eugene-Springfield region. The IDAS default values and the adjusted values used for this analysis are included in Appendix R.

### 8.3.6 Adjust Project Specific Costs



IDAS estimates the life-cycle expenditures by year and the average annual costs for ITS improvements. Each ITS component deployed on the network includes public sector costs (design and construction) and public sector operating and maintenance costs that can be adjusted by the user. The default cost values are based on the United States Department of Transportation ITS Joint Program Office's (JPO) ITS unit costs database.

<sup>8</sup> In-vehicle time based on U.S. Department of Transportation Memorandum on *Departmental Guidance for Valuation of Travel Time in Economic Analysis*, April 9, 1997.

<sup>9</sup> *The Cost of Highway Crashes*, prepared by The Urban Institute for U.S. Department of Transportation, Federal Highway Administration, Oct. 1991 and *Federal Highway Cost Allocation Study*, U.S. Department of Transportation, Federal Highway Administration, 1997.

<sup>10</sup> ITS Benefits and Cost Database, U.S. Department of Transportation, Federal Highway Administration, <http://www.benefitcost.its.dot.gov/>

For this analysis, many deployment, operating and maintenance costs were adjusted based on experience from other ITS projects by the Oregon Department of Transportation.

## 8.4 ITS OPTIONS EVALUATED

This section describes in more detail the two individual ITS projects and the ten-year (2015) deployment plan evaluated using the IDAS software. The ten-year deployment plan was selected because it most closely matches the existing travel demand model forecast year of 2015. The two individual projects evaluated include:

- Ramp metering on Beltline Highway (Coburg Road to Pacific Highway)
- Traffic responsive signal timing on Gateway Street (Harlow Road to International Way)

For each individual project and the ten-year deployment plan an overall assessment of the benefit-to-cost analysis is provided. Complete detailed output results are provided in Appendix T.

Since the Eugene-Springfield travel demand model used for the analysis was a daily model, the benefits assessment assumes the ITS project deployed is active for the entire day. For example, the ramp meter benefits assessment assumes the ramp meters deployed are active for the entire day. However, it is more likely that the ramp meters would only be active for peak periods. Since IDAS does not allow the user to designate times of day when a device may be operational, the user must import a separate travel demand model to reflect the time period when the device may be operational. Due to the limited scope for this analysis, it was not realistic to import and calibrate two or three separate travel demand models to reflect different time periods. It was determined that the daily model would be used because the majority of projects in the ten-year deployment plan would be active for the entire day.

### 8.4.1 Proposed Ramp Meter Deployment on Beltline Highway



The purpose for installing ramp meters on Beltline Highway is to reduce the existing recurrent congestion during the AM and PM peak periods. Ramp meters meter the flow of traffic entering the highway and have proven to improve travel time on the highway and reduce crashes resulting from merging traffic. For this analysis, pre-set ramp meters were deployed along Beltline Highway at the thirteen locations shown in Figure 8-4 and listed below:

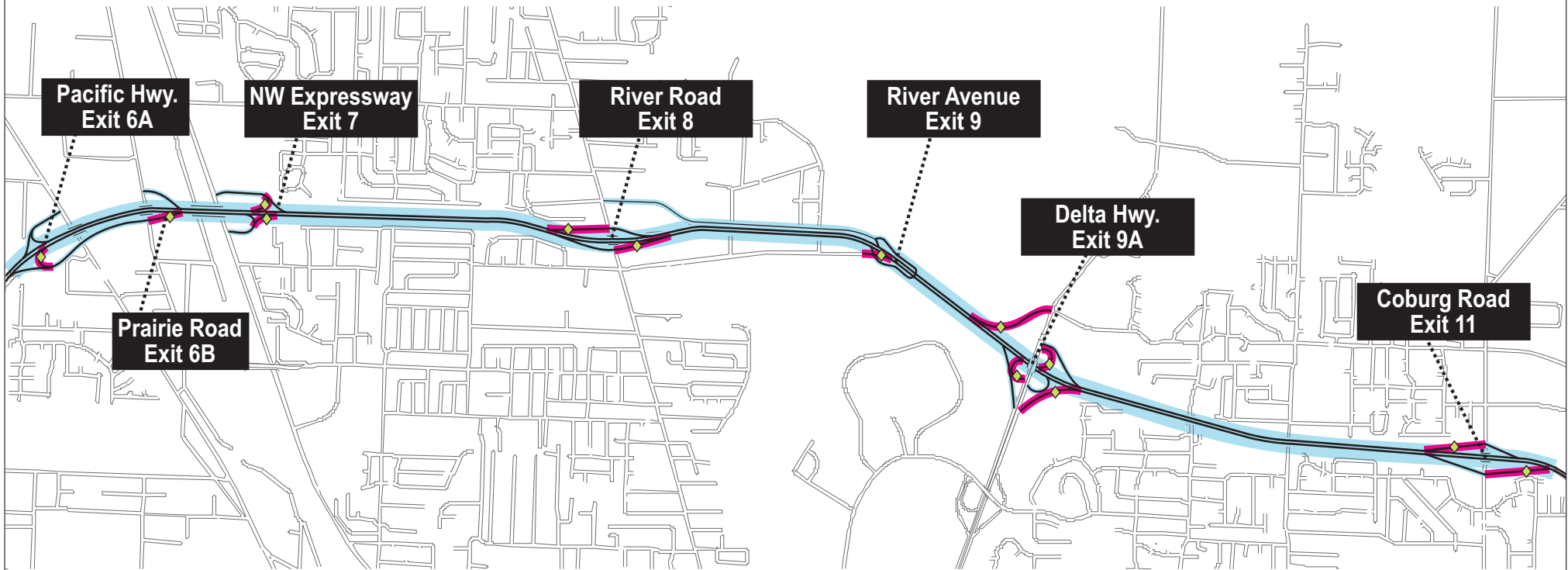
- Eastbound On-Ramp at Pacific Highway – Exit 6A
- Eastbound On-Ramp at Prairie Road – Exit 6B
- Westbound/Eastbound On-Ramps at Northwest Expressway – Exit 7
- Westbound/Eastbound On-Ramps at River Road – Exit 8
- Eastbound On-Ramp at River Avenue – Exit 9
- Westbound/Eastbound On-Ramps from Northbound Delta Highway – Exit 9A
- Westbound/Eastbound On-Ramps from Southbound Delta Highway – Exit 9A
- Westbound/Eastbound On-Ramps at Coburg Road – Exit 11



*Westbound On-Ramp at Coburg Rd*

**LEGEND**

-  - Ramp with Ramp Meter
-  - Study Sector



Not to Scale

**Figure 8-4**  
**STUDY SECTOR AND**  
**RAMP METER LOCATIONS**

As a reality check, an initial field review was conducted of the thirteen ramps in this analysis to identify any potential fatal flaws limiting the installation of ramp meters. The results of the initial field review indicate adequate storage and acceleration room could be provided on all ramps except eastbound River Avenue. A detailed engineering review should be performed prior to deploying ramp meters.

The ramp meter scenario was constructed by selecting the appropriate links in the regional transportation network where ramp meters are proposed as well as each highway link that will be affected by the ramp meters (IDAS recommends a continuous stretch of highway be selected). The IDAS software has several default impact values it uses when analyzing ITS options. Based on input from the IDAS Subcommittee, the default impact values for ramp metering were adjusted to values thought to better represent the Eugene-Springfield region. A table showing the IDAS default values and the values used for this analysis are included in Appendix R.

#### 8.4.1.1 Ramp Meter Benefits Analysis Results

The IDAS software provides details on the following performance measures as compared to the base model:

- Vehicle miles traveled (VMT), vehicle hours traveled (VHT), average speed, and the number of vehicular trips
- Number of accidents, including fatalities, injuries, and property damage only (PDO)<sup>11</sup>
- Emissions (HC/ROG, NO<sub>x</sub>, CO, PM<sub>10</sub>, CO<sub>2</sub>)
- Fuel consumption
- Noise
- Travel time reliability

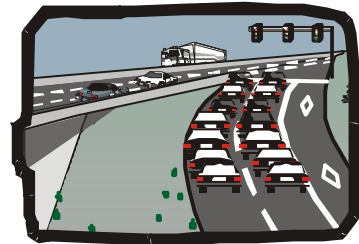


Table 8-1 below shows the expected benefits in the traditional categories (travel time, average speed and fuel consumption) for the forecast year 2015. Benefits are daily for the forecast year.

**Table 8-1. Traditional Benefits From Ramp Meters on Beltline Highway**

Performance Measure	Benefit/Day
Travel Time (Hours)	55 hours saved
Fuel Consumption (gallons)	55 gallons additional consumed
Number of Accidents	7 percent fewer accidents

The benefit-to-cost output for the analysis year as estimated by IDAS is shown in Table 8-2. The benefits results for ramp metering on Beltline Highway suggest that the primary benefits from ramp metering are associated with the cost savings resulting from the

<sup>11</sup> IDAS calculates accident benefits based on the risk of accidents and not actual occurrences.

reduced potential for accidents and from improved user mobility<sup>12</sup>. Detailed benefits output from IDAS for ramp meters on Beltline Highway are provided in Appendix T.

**Table 8-2. Benefit-to-Cost Summary for Ramp Meters on Beltline Highway (Coburg Road to Pacific Highway)**

Performance Measure	Annual Benefit
User Mobility	\$685,000
Fuel Consumption	(\$6,000) <sup>13</sup>
Accidents	\$520,000
Emissions	(\$1,000)
<b>Total Annual Benefits</b>	<b>\$1,200,000</b>
<b>Total Annual Costs</b>	<b>\$230,000</b>
<b>Benefit/Cost Comparison</b>	<b>5:1</b>

IDAS also provides a benefits assessment by facility type (freeway, arterial, collector and ramp). While the analysis of ramp meters on Beltline Highway shows an overall improvement in mobility, and a reduction in hours of delay and number of accidents, the delay on the freeway ramps and regional arterials shows a slight increase. The results of the analysis show no change in the number of accidents on arterial roadways.

#### **8.4.2 Proposed Traffic Responsive Signal Timing on Gateway Street**

The purpose for traffic responsive signal timing on Gateway Street is to improve travel time for traffic and transit. Traffic responsive signal timing will provide the capability for the traffic signals to automatically change coordinated signal timing plans based on existing vehicle volumes. This corridor is a desirable location for traffic responsive signal timing because of the seasonal and daily fluctuations in traffic due to the proximity of the Gateway Mall. For this analysis, traffic responsive signal timing was deployed along Gateway Street at the signalized intersections listed below:

- Gateway Street at Harlow Road
- Gateway Street at South Driveway
- Gateway Street at Oakdale Street
- Gateway Street at North Driveway
- Gateway Street at Gateway Loop
- Gateway Street at Beltline Road
- Gateway Street at Game Farm Road
- Gateway Street at International Way

For this assessment, no upgrade to the existing central signal system software or local traffic signal software has been assumed since the existing signal system has the capability to operate traffic responsive signal timings. The default and revised impact values used for this analysis are provided in Appendix R.

<sup>12</sup> User mobility is advocated by FHWA in place of the more familiar travel time measure. User mobility is calculated using zone-to-zone travel times and the number of trips between zones.

<sup>13</sup> The increased fuel consumption and emissions are likely the result of additional delay (idling vehicles) on the arterials and freeway on-ramps.



*Eastbound Beltline Road at Gateway Street*

### 8.4.2.1 Traffic Responsive Signal Timing Benefits Analysis Results

The benefit to cost output for the analysis year as estimated by IDAS is shown in Table 8-3. Benefits results suggest an improvement in user mobility as the primary benefit of the traffic responsive signal timing. Detailed benefits output from IDAS are provided in Appendix T.

**Table 8-3. Benefit-to-Cost Summary for Gateway Traffic Responsive Signal Timing**

Performance Measure	Annual Benefit
User Mobility	\$135,000
Fuel Consumption	\$1,000
Emissions	\$10,000
<b>Total Annual Benefits</b>	<b>\$146,000</b>
<b>Total Annual Costs</b>	<b>\$27,500</b>
<b>Benefit/Cost Comparison</b>	<b>5:1</b>

### 8.4.3 Proposed Ten-Year (2015) ITS Deployment Plan

The ten-year deployment plan was chosen for analysis because it most closely matches the analysis year of the Eugene-Springfield travel demand model. In fact, it is not possible to enter an ITS project in IDAS past the travel demand model analysis year. The full ten-year plan could not be completely captured in this analysis because a significant percentage of the proposed projects have no associated ITS element within the IDAS software. For example, weather stations are not a current ITS element available for analysis in IDAS. Figure 8-5 shows graphically the ITS devices and projects deployed in the Eugene-Springfield metropolitan area for the ten-year deployment plan. The following sections describe the scope of the ten-year deployment projects deployed for the benefits analysis. The default and revised impact values used for this analysis are provided in Appendix R. The equipment deployed for each project is listed in Appendix S.

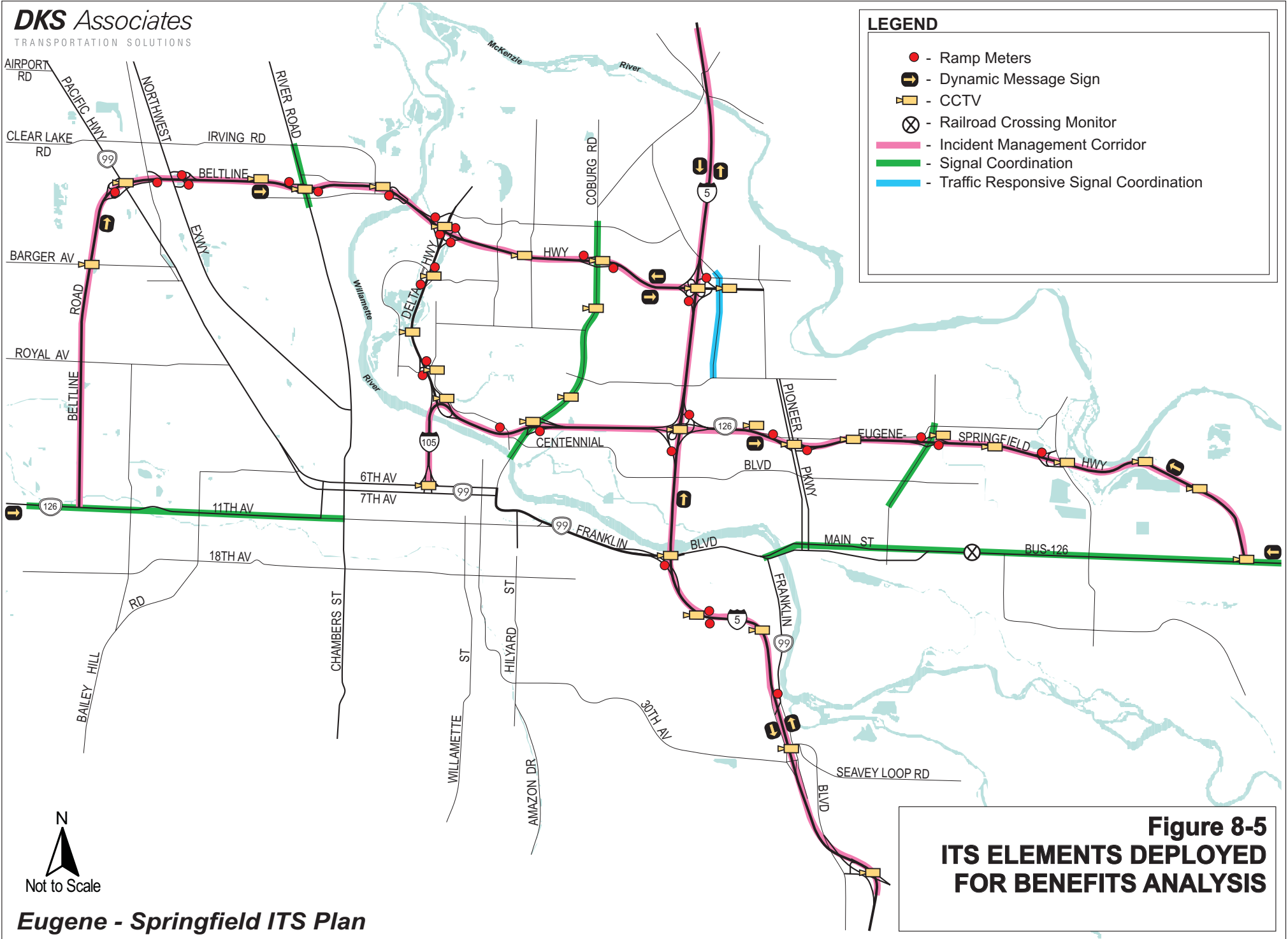
#### 8.4.3.1 Ramp Meters

Ramp meters were deployed at on-ramps along the following freeways/highways:

- Beltline Highway (ORE 99 to Interstate 5)
- I-5 (30<sup>th</sup> Avenue to Beltline Highway)
- ORE 126 (42<sup>nd</sup> Street to Interstate 5)
- Delta Highway (Valley River Drive to Beltline Highway)
- I-105 (Delta Highway to Interstate 5)



*EB ORE 126 On-Ramp at Mohawk Blvd*



**Figure 8-5  
ITS ELEMENTS DEPLOYED  
FOR BENEFITS ANALYSIS**

N  
Not to Scale

#### 8.4.3.2 Railroad Crossing Monitors

Railroad crossing monitors were placed at the existing railroad crossing on BUS 126 between 28<sup>th</sup> and 31<sup>st</sup> Street in Springfield. IDAS requires the user to select the links (both directions) that represent the location of the crossing. This project would include an automatic detection system to detect vehicles on the tracks in advance of an active train crossing. In addition, the project would include train detection to provide advanced information to motorists of an approaching train.

#### 8.4.3.3 Permanent Dynamic Message Signs

Permanent dynamic message signs were deployed in the Eugene-Springfield regional network along the following freeways/highways.



- Beltline Highway (DMS-15, 16, 17, 18, 19 and 20)
- I-5 (DMS-01, 02, 03, 04, 05, and 06)
- ORE 126 (DMS-10, 11, 12 and 14)
- W 11<sup>th</sup> Avenue (DMS-07)
- I-105 (DMS-08 and 09)
- Pacific Highway/ORE 99 (DMS-21)
- Franklin Boulevard (DMS-13)

For the proposed location of the dynamic message sign numbers identified above see Appendix P.

#### 8.4.3.4 Transit Signal Priority

Transit signal priority was deployed in the network on Main Street, Pioneer Parkway and Coburg Road; however, the software never completed the calculations without crashing with transit priority in the network. Therefore, this assessment does not include potential benefits associated with transit signal priority.

#### 8.4.3.5 Signal Coordination

Signal coordination was deployed along the following corridors:

- River Road (River Avenue to Irving Road)
- Coburg Road (Centennial Boulevard to Crescent Avenue)
- Main/A Street (Mill Street to 58<sup>th</sup> Street)
- W 11<sup>th</sup> Avenue (Danebo Avenue to Chambers Street)
- Mohawk Boulevard (Centennial Boulevard to Marcola Road)



*Westbound Main Street at Pioneer Parkway East*

#### 8.4.3.6 Traffic Responsive Signal Coordination

Traffic responsive signal coordination was deployed along the following corridor:

- Gateway Street (Harlow Road to International Way)

#### 8.4.3.7 Incident Detection/Verification/Response/Management Combined

IDAS offers three incident management systems that can be deployed. They are incident detection combined with verification, incident response combined with management, or a combination of these two. The combination of all was selected for deployment in Eugene-Springfield. The incident management systems were deployed on the following corridors:

- Beltline Highway (ORE 126 to Interstate 5)
- ORE 126 (Interstate 5 to Main Street)
- I-105 (6<sup>th</sup>-7<sup>th</sup> Avenue to Interstate 5)
- Interstate 5 (Goshen to Coburg)

This deployment in IDAS requires the user to select the proper links in the regional network that will have these components installed.



#### 8.4.3.8 Highway Advisory Radio

Highway advisory radio is intended to provide travelers transportation condition information as they enter the metropolitan area. It transmits low power AM radio signals so the driver can tune to a station and receive traveler information. The transmitters were placed along freeways entering the Eugene-Springfield metropolitan area at the locations listed below.



Source: NY State DOT

- ORE 126 Westbound Just East of ORE126/Main Street
- Beltline Highway at ORE 99
- I-5 southbound at Coburg
- I-5 northbound at ORE 58
- ORE 126 eastbound west of Beltline Road

#### 8.4.3.9 Closed Circuit Television (CCTV) Cameras

The closed circuit television cameras identified in the ten-year deployment plan as shown on the deployment plan map were placed in the network for analysis. Cameras were placed along the following freeways:

- |                    |                              |
|--------------------|------------------------------|
| ■ I-5              | ■ Delta Highway              |
| ■ Beltline Highway | ■ Eugene-Springfield Highway |
| ■ Pacific Highway  | ■ I-105                      |
| ■ BUS 126          | ■ Coburg Road                |
| ■ ORE 126          |                              |



IDAS requires the user to simply select the links where CCTV cameras are to be installed. There are no impact values associated with this particular deployment other than how many cameras are to be deployed per link selection.

### 8.5 TEN-YEAR (2015) ITS DEPLOYMENT PLAN BENEFITS ANALYSIS RESULTS

Based on the detailed benefits analysis, the potential benefits associated with the proposed ten-year deployment plan are significant. Table 8-4 summarizes the expected benefits for the forecast year 2015 as they relate to our project goals established at the beginning of the project.

**Table 8-4. Benefits From 10-Year ITS Deployment Plan**

Project Goal	Projected Benefit/Day
Improve and Maintain a Safe Transportation System	✓ 9 Percent Reduction in Crashes
Improve the Efficiency of the Transportation System	✓ 100 Hours Saved Daily by Travelers
	✓ 24,000 Gallons Fuel Saved
	✓ 10 Percent Reduction in Emissions
	✓ Travel Time Reliability Improved 67 Percent
Deploy Functional and Cost Efficient ITS Infrastructure	✓ 10 to 1 Benefit-to-Cost Ratio

The benefit to cost output for the analysis year as estimated by IDAS is shown in Table 8-5. Detailed benefits output from IDAS for the 10-year ITS deployment plan are provided in Appendix T.

**Table 8-5. Benefit-to-Cost Summary for 10-Year (2015) ITS Deployment Plan**

Performance Measure	Annual Benefit
User Mobility	\$4,275,000
Fuel Consumption	\$10,800,000
Accidents	\$7,750,000
Emissions	\$2,400,000
<b>Total Annual Benefits</b>	<b>\$25,225,000</b>
<b>Total Annual Costs</b>	<b>\$2,400,000</b>
<b>Benefit/Cost Comparison</b>	<b>10.5:1</b>

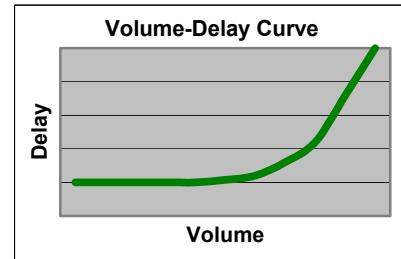
## 8.6 LESSONS LEARNED

The ITS Deployment Analysis System (IDAS) software was used to assess the potential benefits from two proposed ITS projects and the proposed 10-year ITS deployment plan for the Eugene-Springfield metropolitan area. Overall, IDAS provided a useful tool and benefits that appeared reasonable assessment for the Eugene-Springfield ITS Plan. Numerous lessons were learned during preparation of the assessment. This section provides a summary of the lessons learned from using IDAS to assess the benefits of the proposed 10-Year ITS Plan for the Eugene-Springfield metropolitan area.

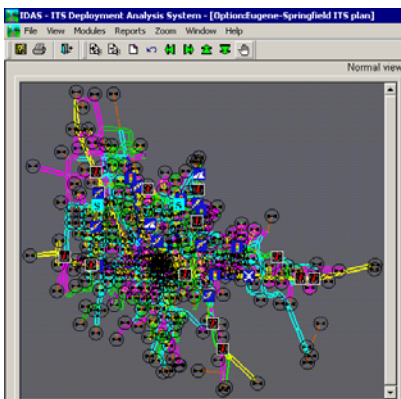
- **IDAS does not produce a precise calibrated regional transportation model.** Since IDAS is designed to work with several different types of travel demand models, the outputs vary between the outputs of the IDAS model and the transportation demand model. To calibrate the IDAS model, it is important to compare the baseline results (VMT, VHT and average speed) computed in IDAS to the travel demand model.

- **IDAS requires the data imported from the travel demand model to be in ASCII format.** For the Eugene-Springfield analysis, the output from the travel demand model had to be modified to be imported into IDAS. For example, IDAS requires that each link in the regional network have a defined speed, lane capacity, number of lanes, travel mode, beginning and ending node, facility type, area type, distance, and district ID. To convert the Emme/2 output to the necessary format, a Portland State University graduate student spent two days creating a program to convert the link data to the proper format.

- **Matching the volume delay curves in IDAS to the travel demand model volume delay curves is critical to calibrating the model.** The curves were adjusted using the Heinz Spiess conical delay function that is used in the Eugene-Springfield travel demand model.



- **ITS options with different opening years must be inserted as separate ITS deployments.** For example, if ten dynamic message signs are proposed, each one being deployed a different year, then IDAS requires each sign be deployed separately. It would be easier to deploy the dynamic message sign option with numerous signs and have the ability to adjust the opening year for each individual sign. This would reduce the number of locations where impact values would need to be adjusted and would simplify management of changes to impact values following initial runs.



*Eugene-Springfield Network in IDAS*

- **IDAS relies on the user to import the travel demand model that most closely reflects the time period an ITS option would be active.** For example, if ramp meters are proposed and are only expected to be on during the PM peak period, then the user should use the PM peak model as the base. However, if the user intends to evaluate an ITS option that would be functional throughout the day, then the user should use the daily travel demand model as the base. The program does not allow the user to specify time periods an ITS option would be active.

## 8.7 OTHER BENEFITS DATA

The ability to measure the benefits of ITS technologies is important to making decisions regarding their implementation. Intelligent Transportation Systems are intended to benefit the traveling public by:

- Reducing travel delay
- Reducing collisions
- Reducing fuel consumption
- Improving air quality
- Improving safety

Examples of the benefits of ITS from actual deployments in the State of Oregon and around the Country are described in this section.

### 8.7.1 Ramp Metering in Portland Metropolitan Area



Ramp meters are used to regulate the flow of traffic onto a freeway. The purpose of a ramp meter is to smooth the flow of traffic on the freeway and to reduce accidents resulting from merging conflicts.

- 61 percent reduction in travel time on Interstate 5
- 43 percent reduction in accidents on Interstate 5<sup>14</sup>

### 8.7.2 ODOT Incident Response Program

Since 1995, the Oregon Department of Transportation in association with the Oregon State Police has operated an incident management program to assist disabled vehicles in the Eugene-Springfield metropolitan area. The incident management program includes incident response vehicles that patrol the freeway and highway corridors to assist motorists and reduce the duration of incidents and reduce the resulting traffic congestion. The incident response vehicles are equipped with electronic message boards, temporary traffic control devices, flat tire repair gear, gasoline, jumper cables, water, and other essentials for rescuing disabled vehicles and getting them on the move again. A recent evaluation<sup>15</sup> of the IR program identified the following benefits on Interstate 5.

- 15 percent reduction in incident duration
- 35 percent reduction in incident related delay



ODOT Region 2 Incident Response (Source: ODOT)

### 8.7.3 Coordinated Signal Timings



State-of-the-art traffic signal systems, with communication to a central computer and coordinated signal timing plans have proven to produce substantial benefits to the public. Recent implementation of coordinated signal timings in Multnomah County, Oregon have produced the following benefits<sup>16</sup>:

- Up to 85 percent reduction in stops
- Up to 33 percent reduction in travel time
- Over 85,000 gallons of fuel saved per year

<sup>14</sup> *I-5 North Ramp Metering Portland, Oregon*, Oregon Department of Transportation, June 1982.

<sup>15</sup> Bertini, Robert L., Tantiyanugulchai, Sutti, Anderson, Edward, Lindgren, Roger, and Leal, Monica.

*Evaluation of Region 2 Incident Response Program Using Archived Data*, Research Report PSU-CE-TRG-01-01, June 30, 2001.

<sup>16</sup> *Phase 2B Traffic Signal System and Optimization*, DKS Associates, March 2003.