

## **E. Capital Costs**

Planning level conceptual cost estimates were developed for active traffic management techniques to better understand the overall capital cost investment required for implementation. The process of developing conceptual cost estimates included three primary steps:

1. Identify major elements required to make each concept technique functional
2. Collect individual costs of the major elements
3. Apply construction and design factors to create a complete cost for each technique

### *Major ATM Elements*

The scope identified six ATM concepts: speed harmonization; queue warning; junction control; hard shoulder running; traveler information; and dynamic re-routing. The major elements of each of these concepts were identified according to the FHWA ATM study (Active Traffic Management: The Next Step in Congestion Management, March 2007) and refined through WSDOT and consultant team dialogue. Within the concepts, multiple techniques were identified for a total of fifteen techniques at prototypical locations. The written and graphical presentations of these prototypical techniques (developed for the project) allowed more specific quantities to be identified in the conceptual cost estimates.

### *Individual Costs*

Individual costs for each concept's major elements were collected. These costs were informed by a variety of sources including FHWA's ITS Unit Costs Database, historical ITS estimate data from WSDOT Northwest Region, and product manufacturers and distributors including: Lighting Group Northwest (sign structures); Smart Stud Systems (in ground flashers); Skyline Electronics (variable and dynamic signs); and Daktronics (variable and dynamic signs). The costs cover two main categories: materials purchase and installation; and software purchasing and implementation.

### *Construction and Design Factors*

Construction and design factors were added to the estimates to create a complete cost for each prototypical technique. These factors include: traffic control; mobilization; construction contingency; construction engineering; sales tax; and preliminary (design) engineering.

Finally, a set of parallel capital costs were developed to determine the cost of implementing ATM techniques as part of an existing construction project, rather than a stand-alone project. Research into the idea of varying costs revealed that the primary savings lay in design (PS&E), yielding about 25% savings in design costs for existing construction projects over retrofit projects. This represents a 2 % savings for the total project. The costs provided in the report represent retrofit or stand-alone projects.

Unit costs used in the development of the conceptual cost estimates are presented on the following page.

<i>Item</i>	<i>Item Description</i>	<i>Unit</i>	<i>Unit Cost</i>
100	Data Loop (three lane set)	EA	\$6,000.00
101	Traffic Data Station	EA	\$19,000.00
102	Weather Data Station	EA	\$52,800.00
103	CCTV Camera, complete	EA	\$27,000.00
110	Corridor Communications	MI	\$212,000.00
111	Speed Harmonization Software at TMC	EA	\$1,500,000.00
112	Queue Warning Software at TMC	EA	\$250,000.00
113	Junction Control Software at TMC	EA	\$250,000.00
114	Hard Shoulder Running Software at TMC	EA	\$132,000.00
115	DR Software at TMC	EA	\$132,000.00
116	Traveler Info Software Implementation Only	EA	\$20,000.00
120	Mast Arm Signal	EA	\$30,000.00
121	Sign Bridge Gantry with Foundation	EA	\$182,500.00
122	Sign Cantilever Gantry with Foundation	EA	\$75,000.00
123	Sign Attachment to Existing Structure	EA	\$7,500.00
124	Sign Monotube Pole	EA	\$60,000.00
125	Sign Shoulder Mount	EA	\$15,000.00
130	VMS (Character)	SF	\$1,500.00
131	DMS (Full Matrix)	SF	\$3,000.00
132	Variable Speed Limit Sign (Shoulder)	EA	\$12,000.00
133	Large Format Signs	SF	\$45.00
134	Conventional Signs	SF	\$37.50
135	Advance or Shoulder Flasher	EA	\$2,000.00
140	Crushed Surface Base Course	TON	\$25.00
141	HMA Asphalt	TON	\$85.00
142	Pavement Removal	SY	\$5.00
150	Striping	LF	\$2.00
151	In Ground Flashers, complete	EA	\$300.00
156	Subtotal		
159	Traffic Control	LS	10% of Subtotal
160	Mobilization	LS	10% of Subtotal
161	<b>Construction Subtotal</b>		
163	Construction Contingency	LS	10% of Subtotal
164	Construction Engineering	LS	10% of Subtotal
166	<b>Construction Subtotal</b>		
169	<b>Subtotal</b>		
170	Sales Tax @ 8.9%	LS	8.9% of Subtotal
172	<b>Subtotal</b>		
173	Construction Engineering	LS	10% of Subtotal
174	Construction Contingencies	LS	10% of Subtotal
175	Preliminary Engineering	LS	10% of Subtotal
176	<b>CONSTRUCTION TOTAL</b>		