

Tracking the Deployment of the Integrated Metropolitan ITS Infrastructure in Houston, Galveston, Brazoria

FY99 Results

For additional information, please contact:

Joseph I. Peters, Ph.D.
ITS Program Assessment Coordinator
ITS Joint Program Office, Room 3416
400 Seventh St., S.W.
Washington, D.C. 20590
(202) 366-2202
FAX: (202) 493-2027
E-mail: joe.peters@fhwa.dot.gov

Table of Contents

Part 1 - Background and Purpose.....	1
Part 2 - Summary 1999 Survey Results	3
Part 3 - Detailed 1999 Survey Results	7
Freeway Management Component Indicators.....	9
Freeway Management Integration Indicators.....	11
Incident Management Component Indicators.....	13
Incident Management Integration Indicators	15
Arterial Management Component Indicators.....	17
Arterial Management Integration Indicators.....	19
Electronic Toll Collection Component Indicators	21
Electronic Toll Collection Integration Indicators.....	22
Transit Management Component Indicators.....	23
Transit Management Integration Indicators	24
Electronic Fare Payment Component Indicators.....	26
Electronic Fare Payment Integration Indicators.....	27
Highway-Rail Intersection Component Indicators.....	28
Highway-Rail Intersection Integration Indicators.....	29
Emergency Management Component Indicators	30
Emergency Management Integration Indicators.....	31
Regional Multimodal Traveler Information Component Indicators	32
Regional Multimodal Traveler Information Integration Indicators	33
Appendix A. Survey Coverage Area.....	A.1
Appendix B. Surveyed Agencies	B.1
Appendix C. Freeway Management Components.....	C.1
Appendix D. Freeway Management Integration.....	D.1
Appendix E. Freeway Management Information Collection and Dissemination.....	E.1
Appendix F. Arterial Management Components	F.1
Appendix G. Arterial Management Integration.....	G.1
Appendix H. Arterial Management Information Collection and Dissemination.....	H.1
Appendix I. Transit Management Components	I.1
Appendix J. Transit Management Integration.....	J.1
Appendix K. Transit Management Information Collection and Dissemination.....	K.1
Appendix L. Emergency Management.....	L.1

Part 1 - Background and Purpose

In January 1996, Secretary Peña set a goal of deploying the integrated metropolitan Intelligent Transportation System (ITS) infrastructure in 75¹ of the nation's largest metropolitan areas by 2006:

*"I'm setting a national goal: to build an intelligent transportation infrastructure across the United States to save time and lives, and improve the quality of life for Americans. I believe that what we do, we must measure . . . Let us set a very tangible target that will focus our attention . . . I want 75 of our largest metropolitan areas outfitted with a complete intelligent transportation infrastructure in 10 years."*²

-- Secretary Peña, 1996

In 1997, the U.S. Department of Transportation initiated an effort to track progress toward fulfillment of this goal by conducting a survey of deployment in the nation's largest metropolitan areas. Traditionally, the product of a transportation infrastructure investment consists of a fixed asset such as a highway, bridge, or public transportation vehicle developed, constructed, or purchased by a single agency. Tracking the level of deployment for such traditional fixed assets can be accomplished by simply counting the number of such assets deployed. Measuring the deployment of the metropolitan ITS infrastructure is more complex because it consists of a set of systems, often deployed by multiple agencies, and integrated through a combination of complex institutional and technical arrangements. In brief, it is often difficult to simply count the number of systems deployed without first devising a measurement approach that captures the essential features of such systems in a consistent fashion across many deployment environments.

In order to track progress toward fulfillment of the Secretary's goal for deployment, the U.S. Department of Transportation ITS Joint Program Office developed the metropolitan ITS deployment tracking methodology. This methodology tracks deployment of the nine components that make up the Metropolitan ITS infrastructure: Freeway Management; Incident Management; Arterial Management; Emergency Management; Transit Management; Electronic Toll Collection; Electronic Fare Payment; Highway-Rail Intersections; and Regional Multimodal Traveler Information. Through a set of indicators tied to the major functions of each component, the level of deployment is tracked for the nation's largest metropolitan areas. In addition, the integration links between agencies operating the infrastructure are also tracked. The details of

¹ Since Secretary Peña's speech, the number of metropolitan areas that DOT will measure has been increased from 75 to 78. However, to maintain reporting consistency across the 10-year goal period, this report considers only the original 75 metropolitan areas.

² Excerpt of a speech delivered by Secretary of Transportation Peña at the Transportation Research Board in Washington, DC on January 10, 1996.

the methodology are explained elsewhere.³

During the summer and fall of 1999, the U.S. DOT undertook a new data collection effort for the purpose of examining ITS deployment progress in the nation's largest metropolitan areas. The Houston, Galveston, Brazoria metropolitan area was among the areas surveyed in 1997 and again in 1999. This report presents the results of the 1999 survey efforts and compares the results of the 1997 survey against those observed in 1999. The overall response rate for the surveys administered in the Houston, Galveston, Brazoria region was 93% in 1997 and 61% in 1999.

Part 2 contains a summary of the 1999 survey results, and Part 3 provides a comparison of 1999 survey results and the 1997 survey results.

The report also contains a set of appendices containing a map of the survey area, the list of local contacts surveyed along with a status of their response to the survey and a summary of the data collected from the surveys.

Agencies are encouraged to review the data presented in this report for completeness and accuracy and to direct any comments or corrections to the data provided to the contacts listed below:

Steve Gordon
Oak Ridge National Laboratory
P.O. Box 2008, 4500N, MS-6207
Oak Ridge, TN 37831-6207
(865) 576-8416 (voice)
(865) 574-3895 (fax)
gordonsr@ornl.gov

Jeff Trombly
Science Applications International Corporation
301 Laboratory Road
Oak Ridge, TN 37831-2501
(865) 481-8563 (voice)
(865) 481-2941 (fax)
jeffrey.w.trombly@saic.com

³ Additional Resources: "Measuring ITS Deployment and Integration" (Electronic Document Number: 4372). U.S. Department of Transportation, Joint Program Office for Intelligent Transportation Systems, 400 Seventh St., SW (HVH-1), Washington, DC 20590, Phone: 202-366-9536, Fax: 202-366-3302, Web: <http://www.its.dot.gov>.

Part 2 - Summary 1999 Survey Results

Deployment indicators have been developed for two broad areas of interest: (1) the individual components, including their basic functions and characteristics and (2) integration of components, including how these components work together to provide coordinated regional service. As mentioned earlier, these indicators are expressed as percentages of the possible deployment opportunity and not necessarily what should be deployed based on local needs. Requirements for deployment and integration between each component will vary based on local conditions and cannot be assigned without extensive coordination with individual metropolitan areas.

The following two figures portray the surrogate indicators for each of the nine components in Houston, Galveston, Brazoria and the same indicators at the national level. These are judged to be the single best representative of a component and are being used as summary indicator for component. The summary indicators are expressed as a percentage; however, because deployment goals have yet to be established, these indicators should not be read as a comparison of what is deployed versus eventual deployment goals. Instead, they only reflect what is deployed compared to full market saturation (i.e., opportunity for deployment).

Each component indicator was selected to reflect a critical function of the individual components. For example, in the case of Freeway Management, three basic functions were defined: surveillance, traffic control, and information display. The three indicators developed to reflect these functions are: percentage of freeway centerline miles under electronic surveillance (surveillance function), percentage of freeway entrance ramps managed by ramp meters (traffic control function), and percentage of freeway centerline miles covered by permanent VMS, HAR, or in-vehicle signing (information display function). The indicators are surrogates that do not necessarily reflect the full breadth of metropolitan ITS deployment activity.

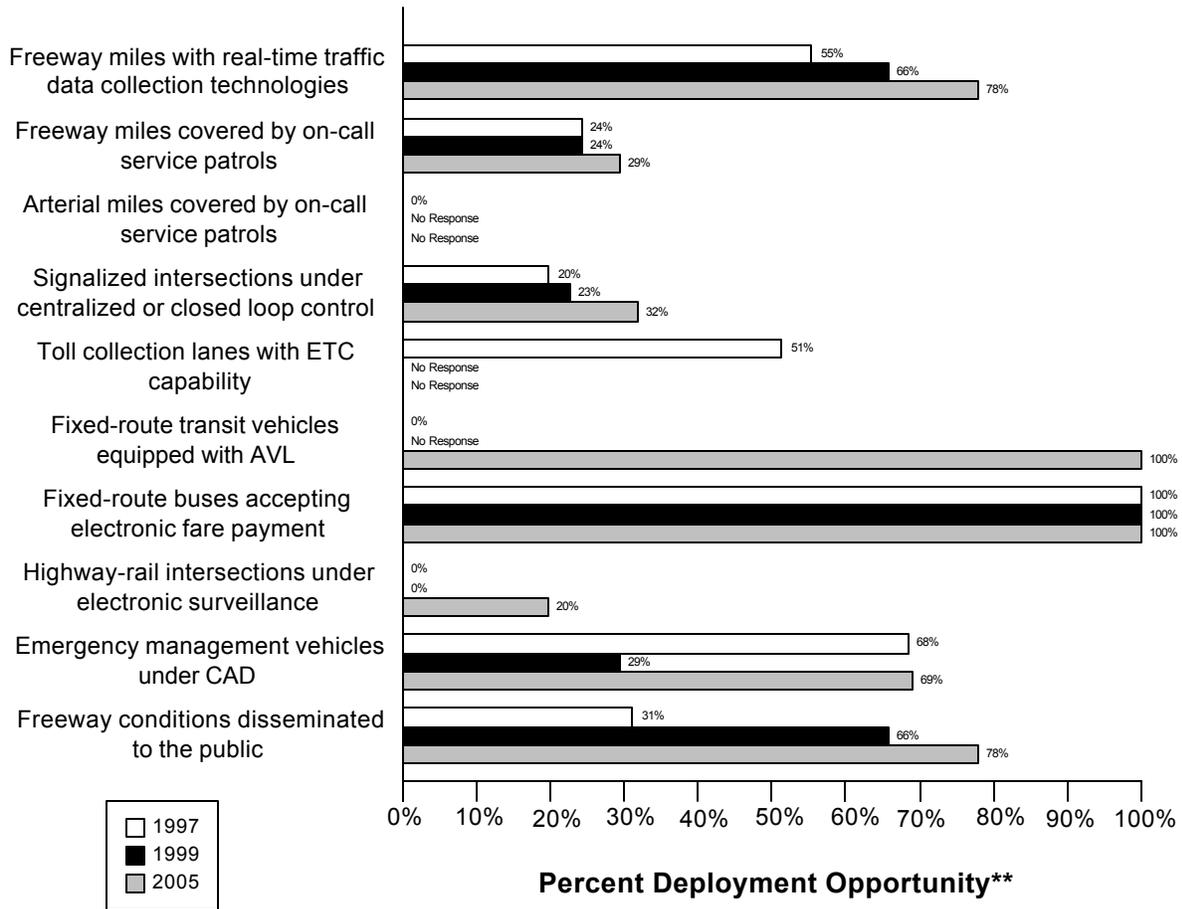
A critical aspect of ITS that provides much of its capability is the integration of individual components to form a unified regional traffic control system. Individual ITS components routinely collect information that is used for purposes internal to that component. For example, the Arterial Management component monitors arterial conditions to revise signal timing and to convey these conditions to travelers through such technologies as variable message signs and highway advisory radio. Other ITS components can make use of this information in formulating their control strategies. For example, Transit Management may alter routes and schedules based on real-time information on arterial traffic conditions, and Freeway Management may alter ramp metering or diversion recommendations based on the same information.

As with the component indicators, definitions for inter- and intra-component integration were developed for each component, and indicators, derived from these definitions, were produced for each component. A total of 34 individual integration indicators was specified and is portrayed in the third figure which follows. Each integration indicator has been assigned a number and an origin/destination path from one ITS infrastructure component to another. For example, the

integration of information from the Freeway Management component to the Regional Multimodal Traveler Information component is identified by the number “10.”

Data as of 5/1/00

Houston, Galveston, Brazoria Summary Indicators*

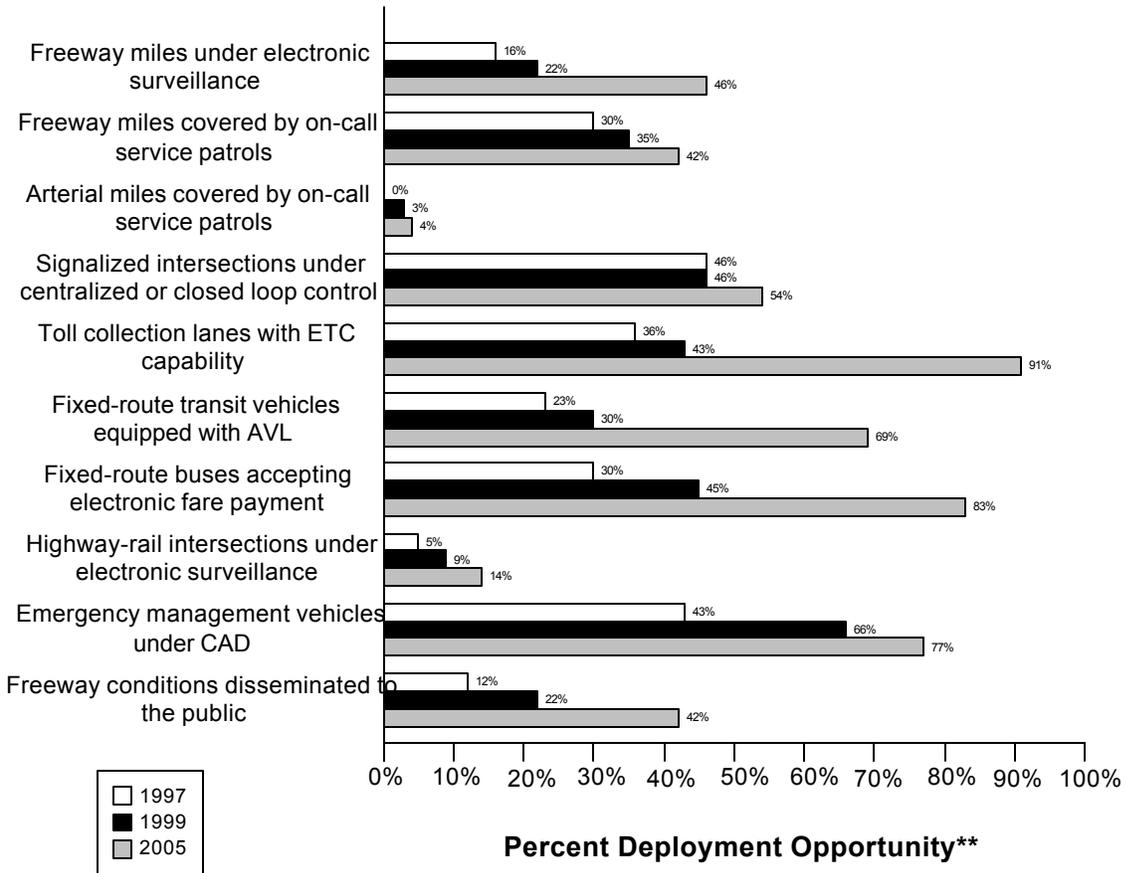


* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

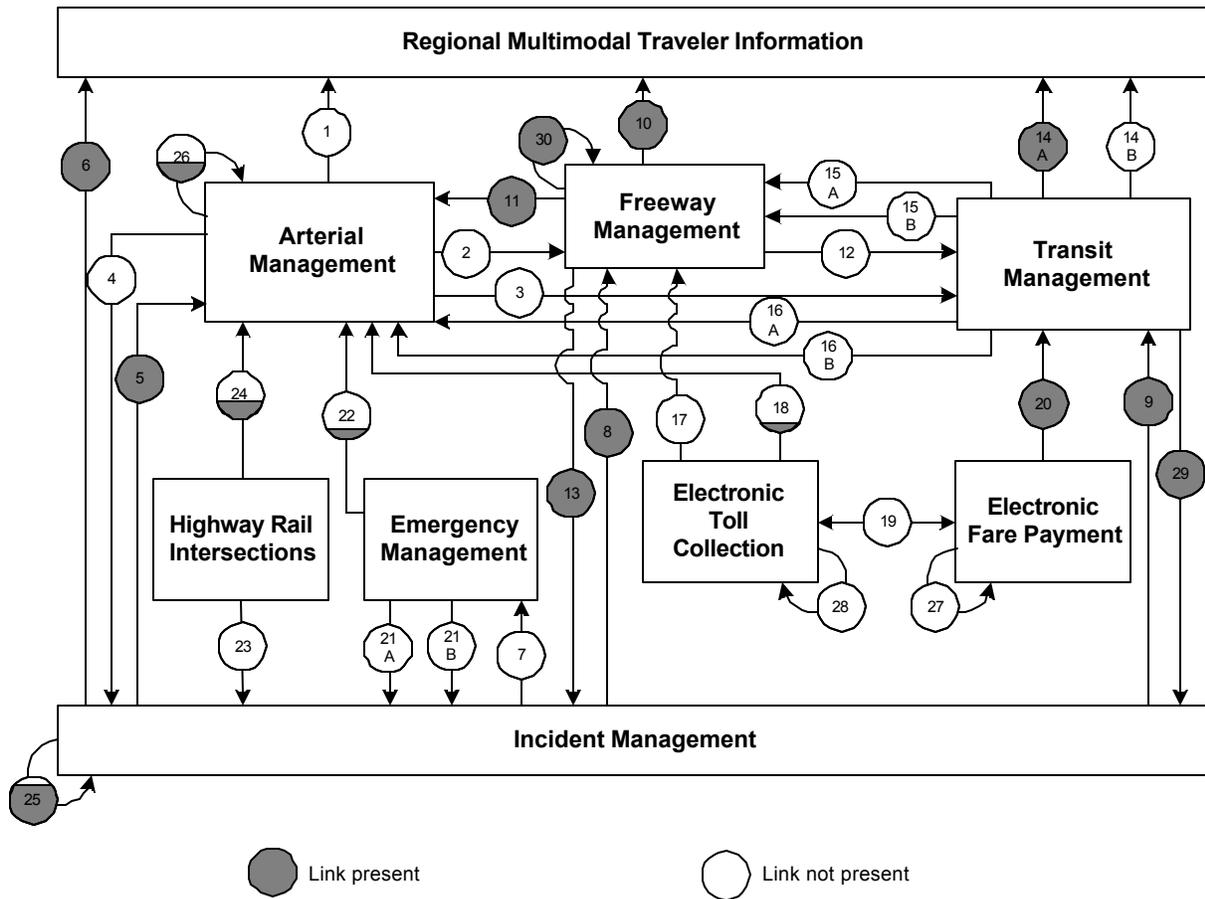
National Summary Indicators*

Data as of 5/1/00



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity
 ** Deployment opportunity reflects potential totals that do not necessarily reflect actual need

Houston, Galveston, Brazoria Integration Links



Note: Shading indicates the value of the link. For example a circle half shaded equals 50%

Link	Description	Link	Description
1	Arterial Management to Regional Multimodal Traveler Information	2	Arterial Management to Freeway Management
3	Arterial Management to Transit Management	4	Arterial Management to Incident Management
5	Incident Management to Arterial Management	6	Incident Management to Regional Multimodal Traveler Information
7	Incident Management to Emergency Management.	8	Incident Management to Freeway Management
9	Incident Management to Transit Management	10	Freeway Management to Regional Multimodal Traveler Information
11	Freeway Management to Arterial Management	12	Freeway Management to Transit Management

Link	Description	Link	Description
13	Freeway Management to Incident Management	14a	Transit Management to Regional Multimodal Traveler Information (static route information)
		14b	Transit Management to Regional Multimodal Traveler Information (schedule adherence information)
15a	Transit Management to Freeway Management	16a	Transit Management to Arterial Management
15b	Transit Management to Freeway Management (transit vehicle probes)	16b	Transit Management to Arterial Management (transit vehicle probes)
17	Electronic Toll Collection to Freeway Management (ETC equipped probes)	18	Electronic Toll Collection to Arterial Management (ETC equipped probes)
19	Electronic Fare Payment and Electronic Toll Collection	20	Electronic Fare Payment to Transit Management
21a	Emergency Management to Incident Management (incident notification)	22	Emergency Management to Arterial Management
21b	Emergency Management to Incident Management (incident clearance)		
23	Highway-rail intersections to Incident Management (crossing status)	24	Highway-rail intersections to Arterial Management (crossing status)
25	Incident Management intra component	26	Arterial Management intra component
27	Electronic Fare Payment intra component.	28	Electronic Toll Collection intra component
29	Transit Management to Incident Management (incident reporting)	30	Freeway Management intra component

Part 3 - Detailed 1999 Survey Results

The following figures and tables summarize the complete set of component and integration indicators developed for the Houston, Galveston, Brazoria metropolitan area. The figures summarizing the component indicators consist of a bar chart portraying the deployment levels for 1997, 1999, and 2005 accompanied by detailed tables of the data used to calculate each component indicator value (*Num* stands for numerator and *Den* stands for denominator; blank space indicates that no response was received.)

Example: Calculating Component Indicators for Freeway Management

Consider a metropolitan area with 100 miles of freeway and 25 freeway entrance ramps. The area has no ramp meters, 10 freeway miles for which traffic data are collected electronically, and 5 freeway miles, which are covered by highway advisory radio.

The component indicator for electronic surveillance is calculated as $(10/100)$ or 10%.

The component indicator for ramp meter control is calculated as $(0/25)$ or 0%.

The component indicator for HAR coverage is calculated as $(5/100)$ or 5%.

The summary indicator for the metropolitan area is calculated as $(10\%+0\%+5\%)/3 = 5\%$.

The figures summarizing the integration indicators consist of a diagram for each of the nine metropolitan ITS components portraying the integration level for 1999 (*italic*) and 2005 (**bold**), accompanied by tables providing an explanation of the data and calculations performed to develop each integration indicator value for 1999 and 2005. Each diagram portrays the proportion of agencies providing information to a component (e.g., the flow of incident information from Incident Management to Freeway Management) and the proportion of agencies providing information from one component to other components (e.g., the flow of freeway travel condition information from Freeway Management to Arterial Management).

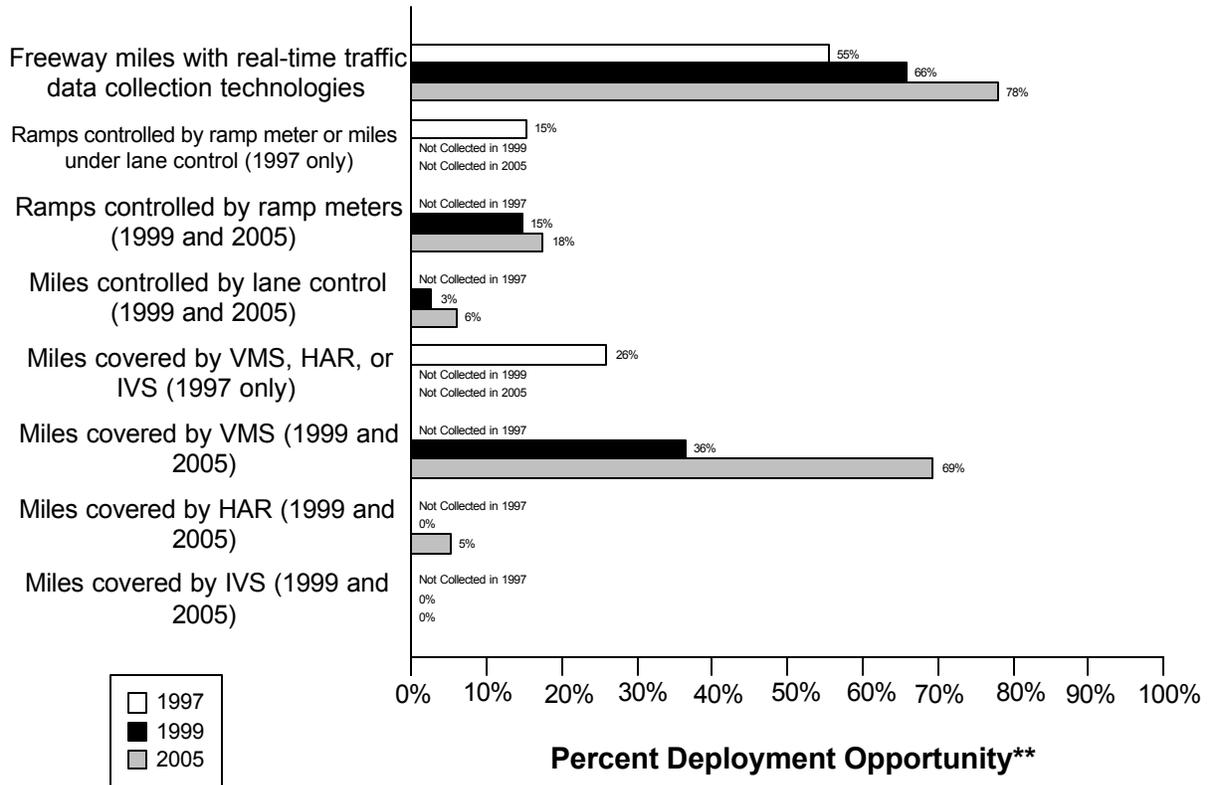
Example: Calculating Integration between Arterial Management and Regional Multimodal Traveler Information

Consider a metropolitan area with three arterial management agencies. One out of three provides information to the public using a Regional Multimodal Traveler Information Media (e.g., internet, kiosk, pager, etc...). The integration indicator is $1/3$ or 33%.

Freeway Management Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Freeway Management*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

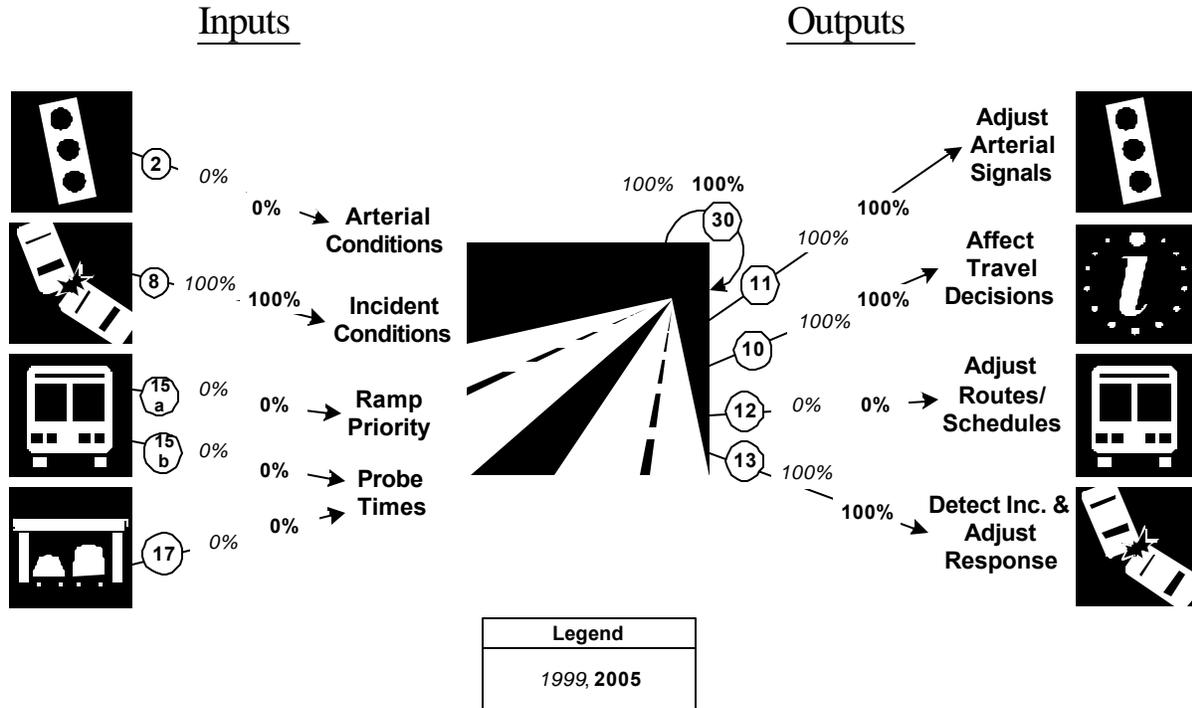
** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway centerline miles are under electronic surveillance for monitoring traffic flow	320	577	55%	380	577	66%	450	577	78%
Freeway entrance ramps are controlled by ramp meters or miles under lane control	100	656	15%						

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway entrance ramps are controlled by ramp meters				97	656	15%	115	656	18%
Freeway centerline miles will be controlled by lane control				16	577	3%	35	577	6%
Freeway miles are covered by VMS, HAR, or IVS	150	577	26%						
Freeway miles are covered by VMS				210	577	36%	400	577	69%
Freeway miles are covered by HAR				0	577	0%	30	577	5%
Freeway miles are covered by IVS				0	577	0%	0	577	0%

Freeway Management Integration Indicators

Houston, Galveston, Brazoria Freeway Management Integration*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

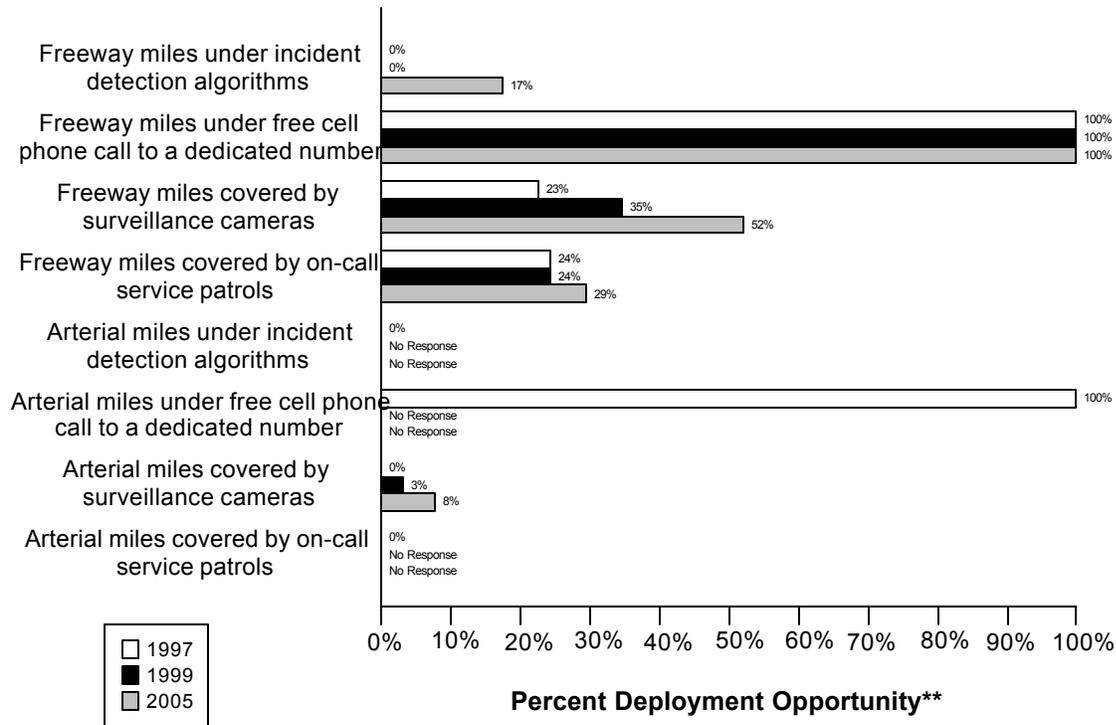
Link Description	1999	2005
2. Arterial Management agencies sending information to Freeway Management	(0 / 5) 0%	(0 / 5) 0%
8. Incident Management agencies sending information to Freeway Management	(1 / 1) 100%	(1 / 1) 100%
15a. Transit management agencies with vehicles equipped with ramp meter priority	(0 / 1) 0%	(0 / 1) 0%
15b. Transit Management agencies with vehicles equipped as probes	(0 / 1) 0%	(0 / 1) 0%
17. Freeway Management agencies receiving freeway conditions from vehicle probes	(0 / 1) 0%	(0 / 1) 0%
30. Freeway Management agencies sending information to another Freeway Management agency	(1 / 1) 100%	(1 / 1) 100%
11. Freeway Management agencies sending information to Arterial Management	(1 / 1) 100%	(1 / 1) 100%

Link Description	1999	2005
10. Freeway Management agencies disseminating freeway conditions to the public	(1/ 1) 100%	(1/ 1) 100%
12. Freeway Management agencies sending freeway conditions to Transit Management	(0/ 1) 0%	(0/ 1) 0%
13. Freeway Management agencies sending freeway conditions to Incident Management	(1/ 1) 100%	(1/ 1) 100%

Incident Management Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Freeway and Arterial Incident Management*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
 ** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

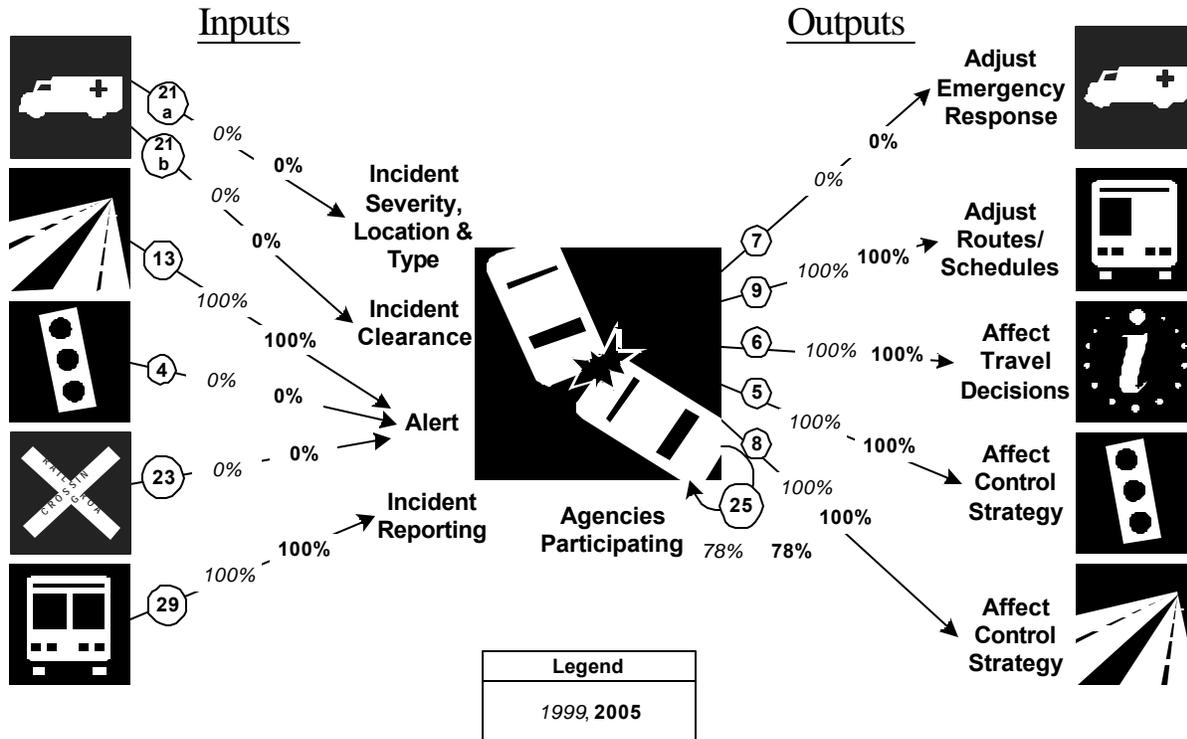
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway miles are covered by incident detection algorithms	0	577	0%	0	577	0%	100	577	17%
Freeway miles are covered by free cellular phone calls to a dedicated number	577	577	100%	577	577	100%	577	577	100%
Freeway miles are covered by surveillance cameras.	130	577	23%	200	577	35%	300	577	52%

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway miles are covered by on-call publicly-sponsored service patrol or towing services.	140	577	24%	140	577	24%	170	577	29%
Arterial miles are covered by incident detection algorithms	0	3288	0%		3288			3288	
Arterial miles are covered by free cellular phone calls to a dedicated number	3288	3288	100%		3288			3288	
Arterial miles are covered by surveillance cameras	0	3288	0%	100	3288	3%	250	3288	8%
Arterial miles are covered by on-call publicly-sponsored service patrol or towing services	0	3288	0%		3288			3288	

Incident Management Integration Indicators

Houston, Galveston, Brazoria

Incident Management Integration*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

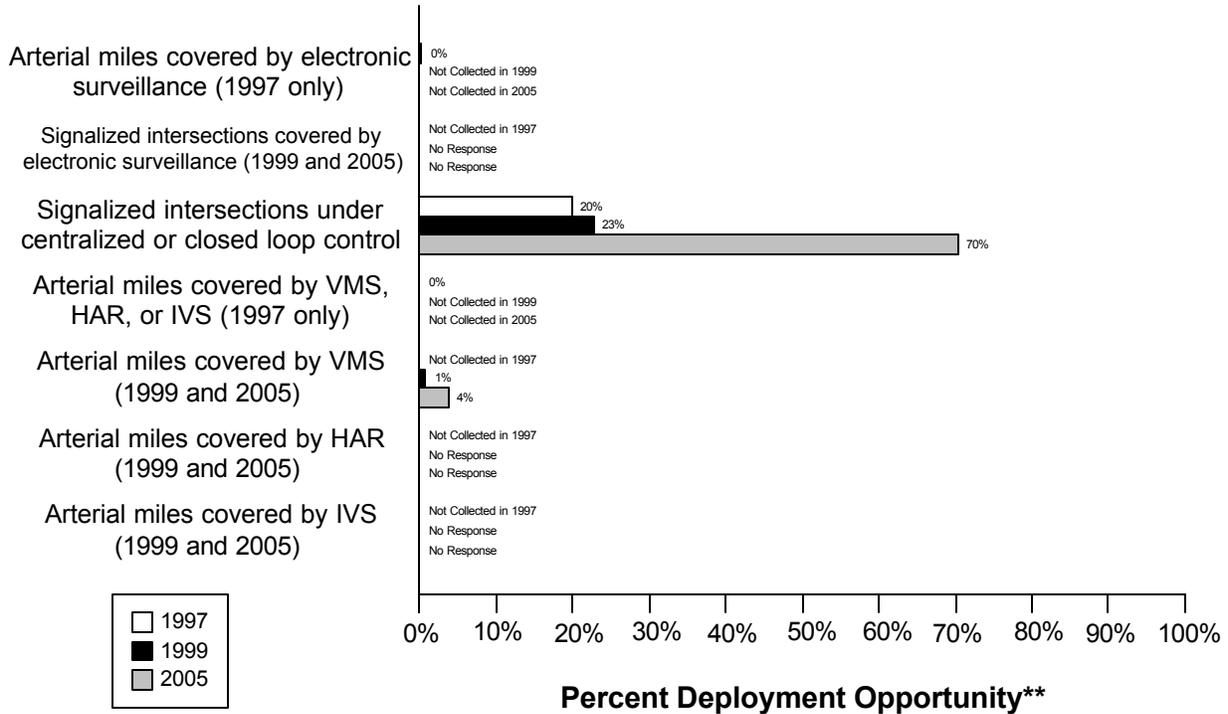
Link Description	1999	2005
21a. Incident management agencies receiving incident severity from Emergency Management	(0 / 1) 0%	(0 / 1) 0%
21b. Incident management agencies receiving incident clearance activities from Emergency Management	(0 / 1) 0%	(0 / 1) 0%
13. Freeway Management agencies sending freeway conditions to Incident Management	(1 / 1) 100%	(1 / 1) 100%
4. Arterial Management agencies sending arterial conditions to Incident Management	(0 / 5) 0%	(0 / 5) 0%
23. Arterial Management agencies receive information on highway-rail intersection crossing blockages for the purpose of managing incident response	(0 / 5) 0%	(0 / 5) 0%
29. Transit Management agencies report traffic incidents as part of an organized regional incident management program	(1 / 1) 100%	(1 / 1) 100%

Link Description	1999	2005
7. Incident management agencies transfer information describing incident severity, location, and type to Emergency Management agencies	(0/ 1) 0%	(0/ 1) 0%
9. Incident Management agencies transfer information describing incident severity, location, and type to Transit Management agencies	(1/ 1) 100%	(1/ 1) 100%
6. Incident Management agencies disseminate information describing incident severity, location, and type to the public	(1/ 1) 100%	(1/ 1) 100%
5. Incident Management agencies transfer information describing incident severity, location, and type to Arterial Management agencies	(1/ 1) 100%	(1/ 1) 100%
8. Incident Management agencies transfer information describing incident severity, location, and type to Freeway Management agencies	(1/ 1) 100%	(1/ 1) 100%
25. Police, fire, and EMS agencies participating in a formal incident management plan/team	(14/ 18) 78%	(14/ 18) 78%

Arterial Management Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Arterial Management*



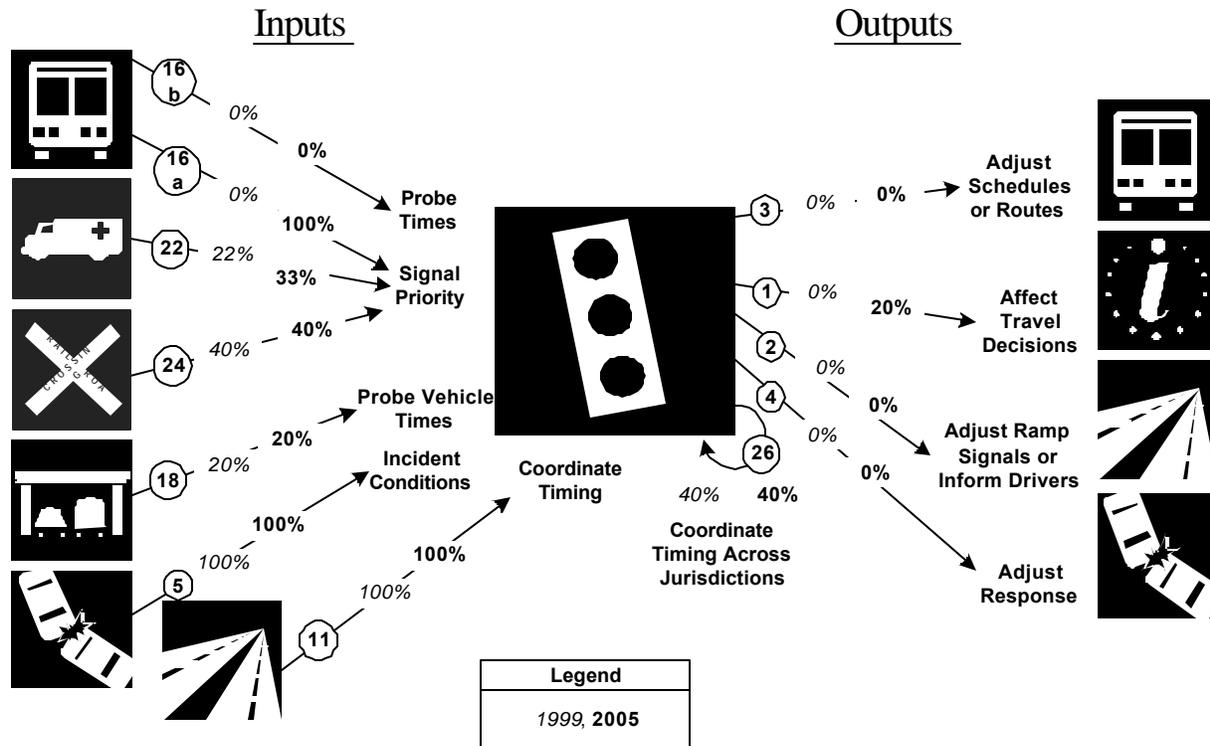
* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
 ** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Arterial miles covered by electronic surveillance	10	3288	0%						
Signalized intersections are covered by electronic surveillance for monitoring traffic flow					3072			1160	
Signalized intersections are under centralized or closed loop control	725	3654	20%	698	3072	23%	817	1160	70%

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Arterial miles are covered by VMS, HAR, or IVS	2	3288	0%						
Arterial miles are covered by VMS				25	3288	1%	125	3288	4%
Arterial miles are covered by HAR					3288			3288	
Arterial miles are covered by IVS					3288			3288	

Arterial Management Integration Indicators

Houston, Galveston, Brazoria Arterial Management Integration*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

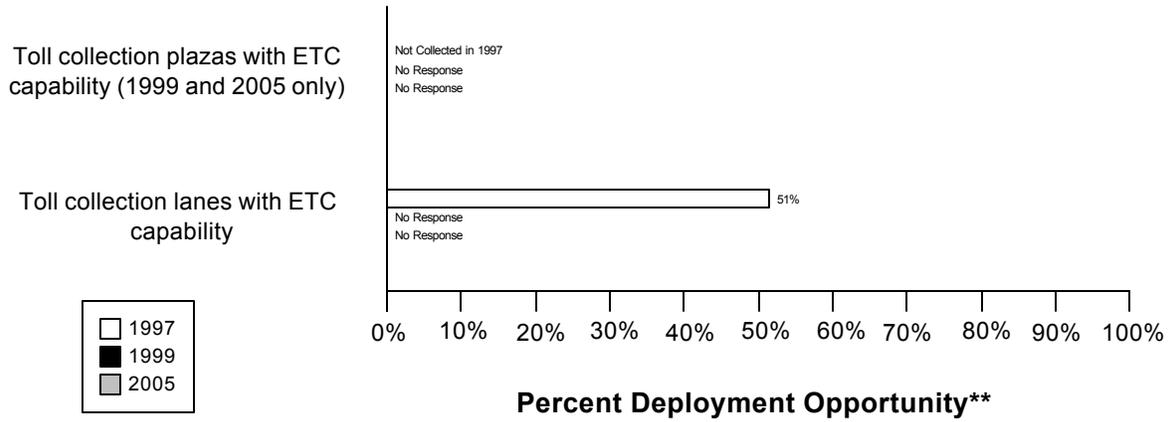
Link Description	1999	2005
16a. Transit management agencies with vehicles equipped with traffic signal priority	(0 / 1) 0%	(1 / 1) 100%
16b. Transit Management agencies have vehicles equipped as probes on arterials	(0 / 1) 0%	(0 / 1) 0%
22. Emergency Management agencies have vehicles equipped with traffic signal preemption capability	(4 / 18) 22%	(6 / 18) 33%
24. Arterial Management agencies have traffic signals within 200 feet of a highway rail intersection with the capability of having their signal timing adjusted in response to a train crossing	(2 / 5) 40%	(2 / 5) 40%
18. Number of Arterial Management agencies receiving information from vehicle probes	(1 / 5) 20%	(1 / 5) 20%
5. Incident Management agencies transfer information describing incident severity, location, and type to Arterial Management	(1 / 1) 100%	(1 / 1) 100%

Link Description	1999	2005
11. Freeway Management agencies transfer freeway travel times, speeds, and conditions to Arterial Management agencies	(1/ 1) 100%	(1/ 1) 100%
3. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Transit Management	(0/ 5) 0%	(0/ 5) 0%
1. Arterial Management agencies disseminate arterial travel times, speeds, and conditions to the public	(0/ 5) 0%	(1/ 5) 20%
2. Arterial Management agencies send traffic condition information to Freeway Management	(0/ 5) 0%	(0/ 5) 0%
4. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Incident Management	(0/ 5) 0%	(0/ 5) 0%
26. Arterial Management agencies under cooperative agreement to share traffic signal timing for coordinated response	(2/ 5) 40%	(2/ 5) 40%

Electronic Toll Collection Component Indicators

Data as of 5/1/00

**Houston, Galveston, Brazoria
Electronic Toll Collection***



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

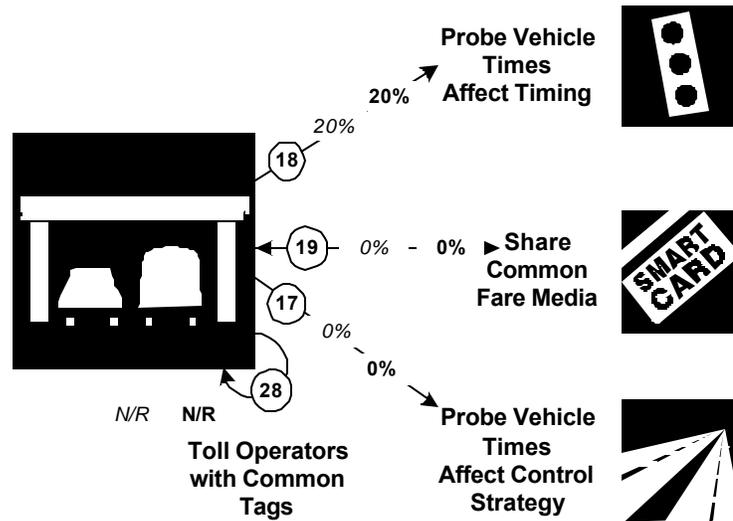
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Toll collection plazas with ETC capability									
Toll collection lanes with ETC capability	114	222	51%						

Electronic Toll Collection Integration Indicators

Houston, Galveston, Brazoria Electronic Toll Collection Integration*

Inputs

Outputs



Legend
1999, 2005

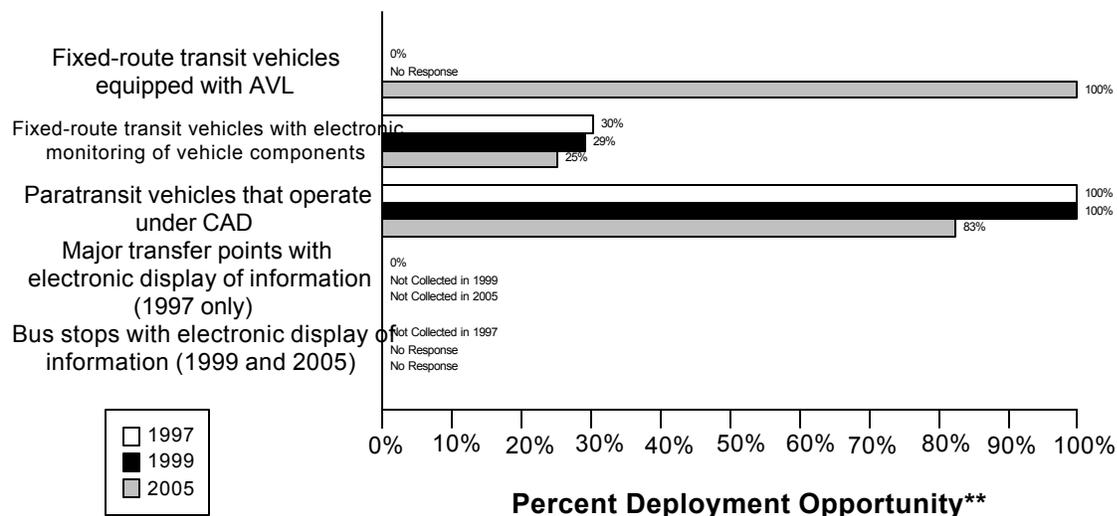
* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
18. Number of Arterial Management agencies receiving information from vehicle probes	(1 / 5) 20%	(1 / 5) 20%
19. Transit agencies that accept electronic payment through the use of electronic toll collection media	(0 / 1) 0%	(0 / 1) 0%
17. Freeway Management agencies receiving information from vehicle probes	(0 / 1) 0%	(0 / 1) 0%
28. Toll operators using common toll tag technology	(0 /)	(0 /)

Transit Management Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Transit Management*

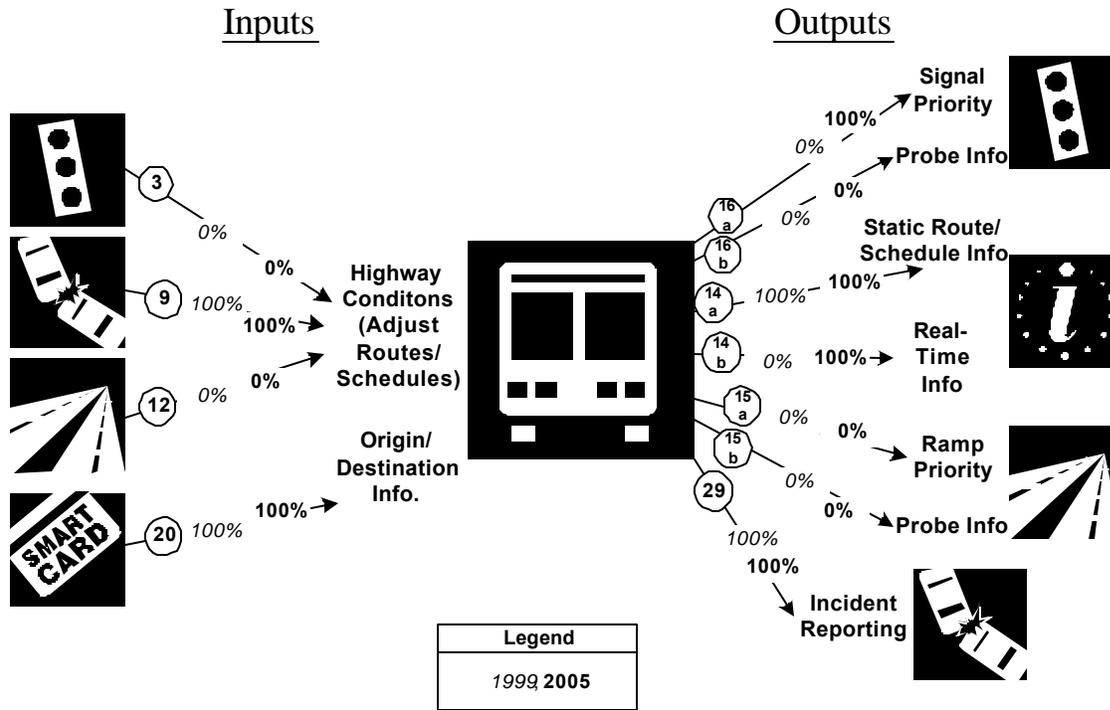


* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.
 ** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Fixed-route transit vehicles are equipped with AVL	0	1326	0%		1380		1600	1600	100%
Fixed-route transit vehicles are equipped with electronic monitoring of vehicle component	400	1326	30%	400	1380	29%	400	1600	25%
Paratransit vehicles operate under computer-aided dispatch	165	165	100%	165	165	100%	165	200	82%
Percent fixed-route transfer locations with electronic display of information	0	14	0%						
Bus stops display information to the public									

Transit Management Integration Indicators

Houston, Galveston, Brazoria Transit Management Integration*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
3. Arterial Management agencies transfer arterial travel times, speeds, and conditions to Transit Management	(0 / 5) 0%	(0 / 5) 0%
9. Incident management agencies transfer information describing incident severity, location, and type to Transit Management	(1 / 1) 100%	(1 / 1) 100%
12. Freeway Management agencies transfer freeway travel times, speeds, and conditions to Transit Management	(0 / 1) 0%	(0 / 1) 0%
20. Transit Management agencies using Electronic Fare Payment data in transit service planning	(1 / 1) 100%	(1 / 1) 100%
16a. Transit Management agencies have vehicles equipped with traffic signal priority capability	(0 / 1) 0%	(1 / 1) 100%
16b. Transit Management agencies have vehicles equipped as probes on arterials	(0 / 1) 0%	(0 / 1) 0%
14a. Transit Management agencies disseminate information describing transit routes, schedules, and fares to travelers	(1 / 1) 100%	(1 / 1) 100%
14b. Transit Management agencies disseminate information describing schedule/route adherence to travelers	(0 / 1) 0%	(1 / 1) 100%

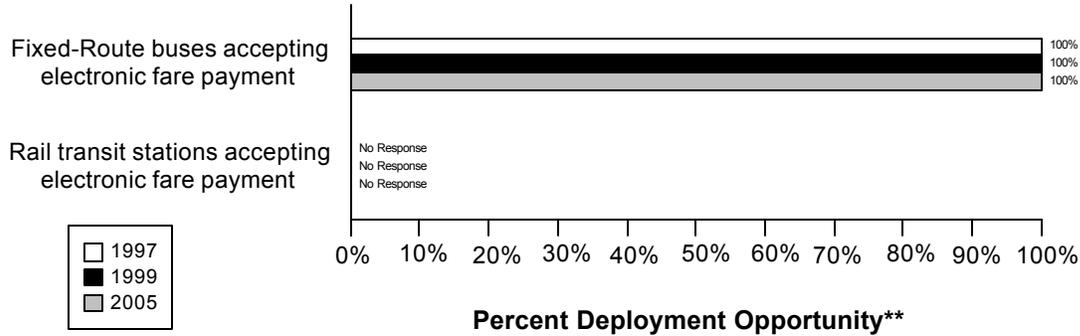
Link Description	1999	2005
15a. Transit Management agencies have vehicles equipped with ramp meter priority capability	(0/ 1) 0%	(0/ 1) 0%
15b. Transit Management agencies have vehicles equipped as probes on freeways	(0/ 1) 0%	(0/ 1) 0%
29. Transit Management agencies that report traffic incidents as part of an organized regional Incident Management program	(1/ 1) 100%	(1/ 1) 100%

Electronic Fare Payment Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria

Electronic Fare Payment*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

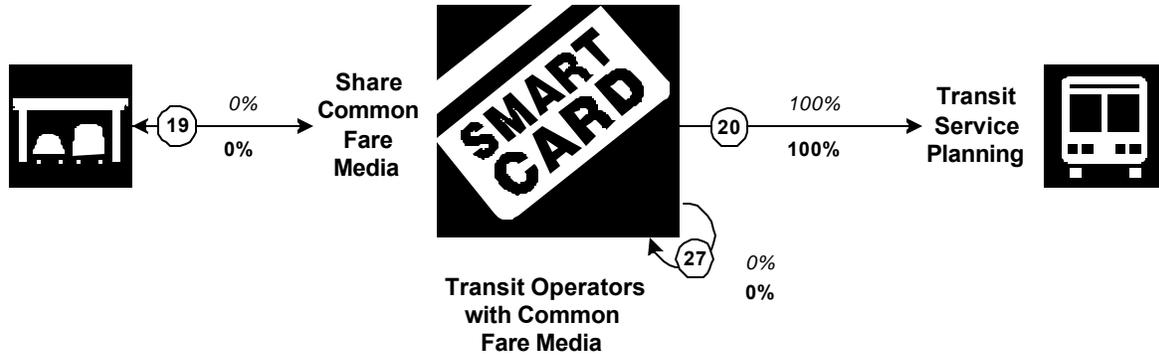
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Fixed-route transit vehicles that accept electronic payment	1326	1326	100%	1380	1380	100%	1600	1600	100%
Rail transit stations that accept electronic payment	0	0							

Electronic Fare Payment Integration Indicators

**Houston, Galveston, Brazoria
Electronic Fare Payment Integration***

Inputs

Outputs



Legend
1999
2005

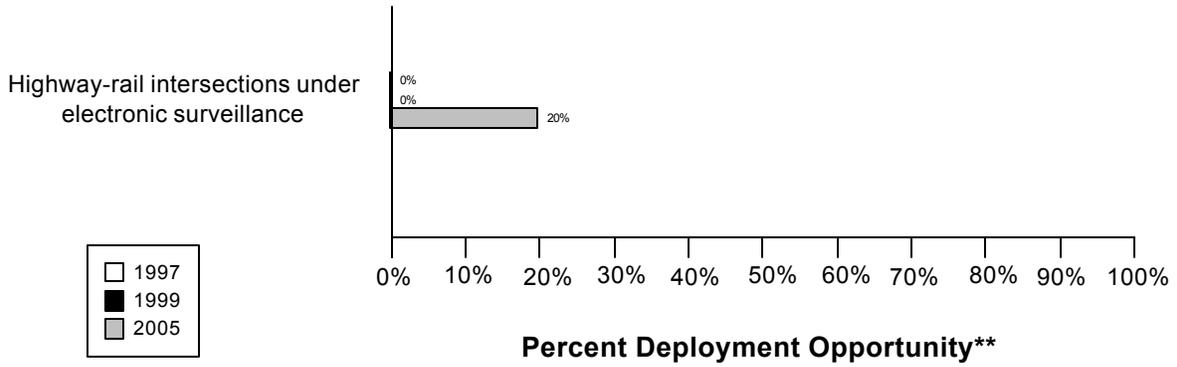
* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
19. Transit agencies that accept electronic payment through the use of electronic toll collection media	(0/ 1) 0%	(0/ 1) 0%
20. Transit Management agencies use Electronic Fare Payment data in transit service planning	(1/ 1) 100%	(1/ 1) 100%
27. Transit Management agencies that use the same electronic payment system	(0/ 1) 0%	(0/ 1) 0%

Highway Rail Intersection Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Highway-Rail Intersections*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

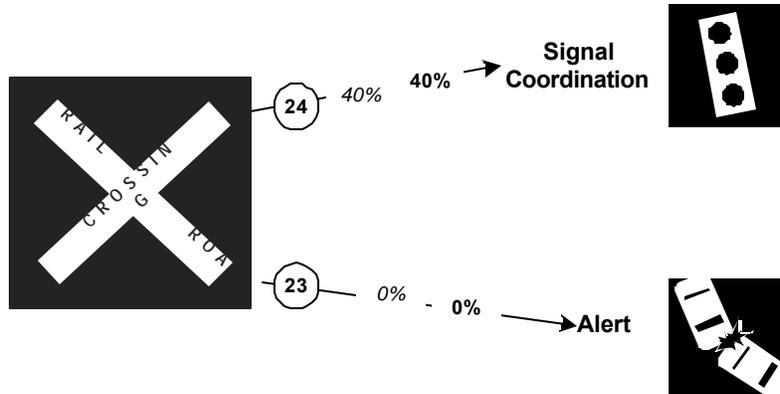
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Highway-rail intersections are under electronic surveillance	1	2004	0%	0	101	0%	20	101	20%

Highway Rail Intersection Integration Indicators

Houston, Galveston, Brazoria Highway Rail Intersections Integration*

Inputs

Outputs



Legend
1999, 2005

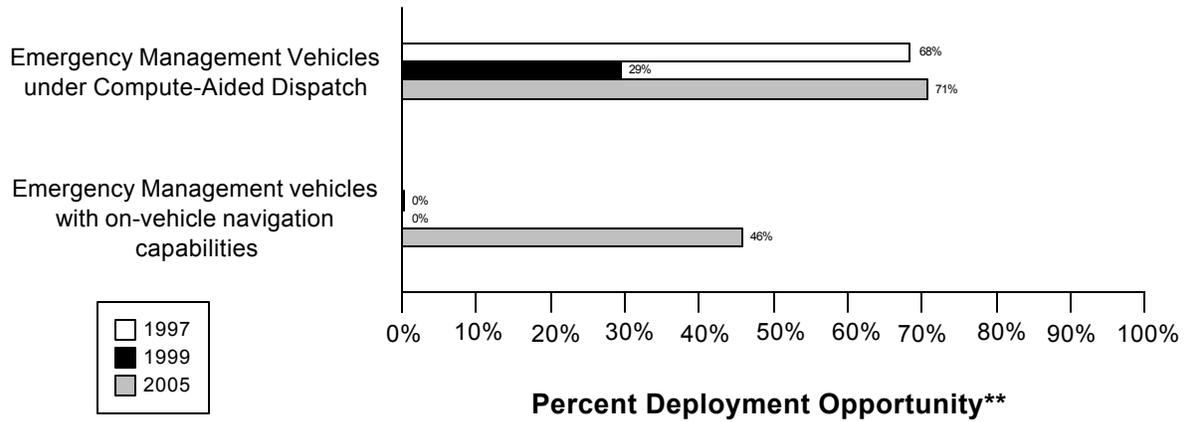
* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
24. Arterial Management agencies with traffic signals within 200 feet of a highway rail intersection with the capability of having their signal timing adjusted in response to a train crossing	(2/ 5) 40%	(2/ 5) 40%
23. Arterial Management agencies receive information on highway-rail intersection crossing blockages for the purpose of managing incident response	(0/ 5) 0%	(0/ 5) 0%

Emergency Management Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Emergency Management*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

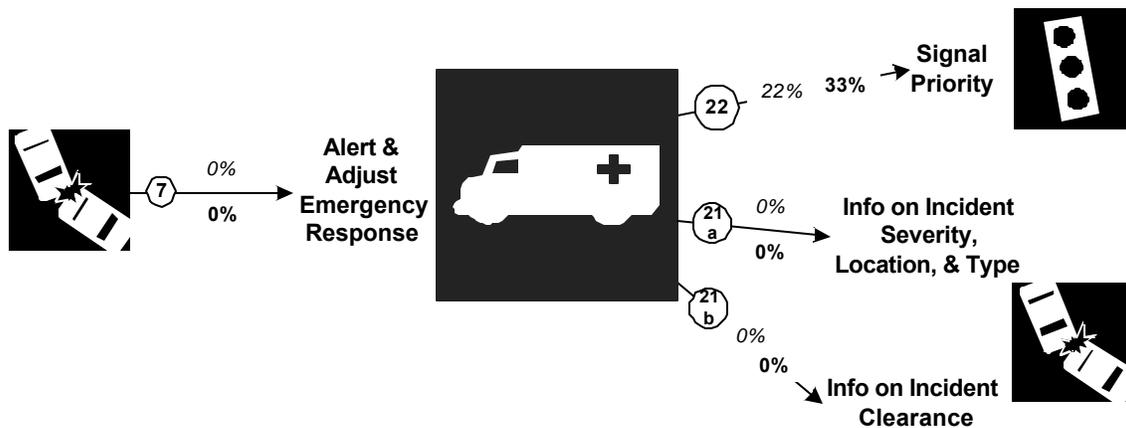
Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Public sector emergency vehicles that operate under computer-aided dispatch	2144	3134	68%	537	1830	29%	1637	2319	71%
Public sector emergency vehicles that have in-vehicle route guidance capability	5	3134	0%	1	1830	0%	1063	2319	46%

Emergency Management Integration Indicators

Houston, Galveston, Brazoria Emergency Management Integration*

Inputs

Outputs



Legend
1999, 2005

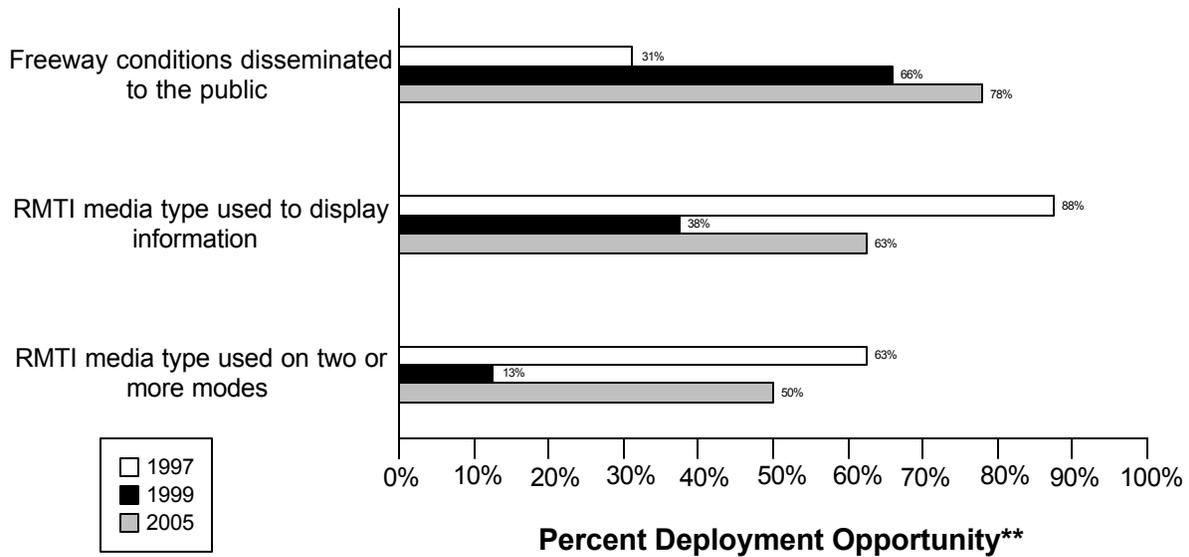
* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
7. Freeway Management agencies transfer information describing incident severity, location, and type to Emergency Management agencies	(0/ 1) 0%	(0/ 1) 0%
22. Emergency Management agencies have vehicles equipped with traffic signal preemption capability	(4/ 18) 22%	(6/ 18) 33%
21a. Freeway Management agencies receive incident severity, location, and type data from Emergency Management agencies	(0/ 1) 0%	(0/ 1) 0%
21b. Freeway Management agencies receive incident clearance activities information from Emergency Management agencies	(0/ 1) 0%	(0/ 1) 0%

Regional Multimodal Traveler Information Component Indicators

Data as of 5/1/00

Houston, Galveston, Brazoria Regional Multimodal Traveler Information*



* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity.

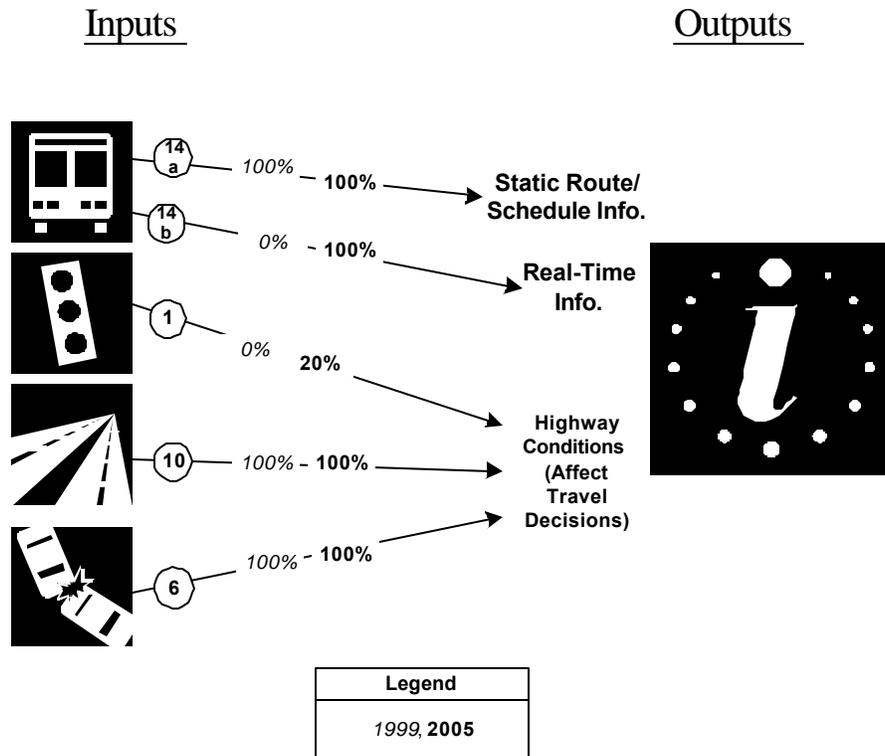
** Deployment opportunity reflects potential totals that do not necessarily reflect actual need.

Description	1997			1999			2005		
	Num	Den	%	Num	Den	%	Num	Den	%
Freeway conditions disseminated to travelers	180	577	31%	380	577	66%	450	577	78%
Possible RMTI media types are used to display information to travelers	7	8	88%	3	8	38%	5	8	63%
Possible RMTI media are used to display information on <i>two or more modes</i> to travelers	5	8	63%	1	8	13%	4	8	50%

Regional Multimodal Traveler Information Integration Indicators

Houston, Galveston, Brazoria

Regional Multimodal Traveler Information Integration*

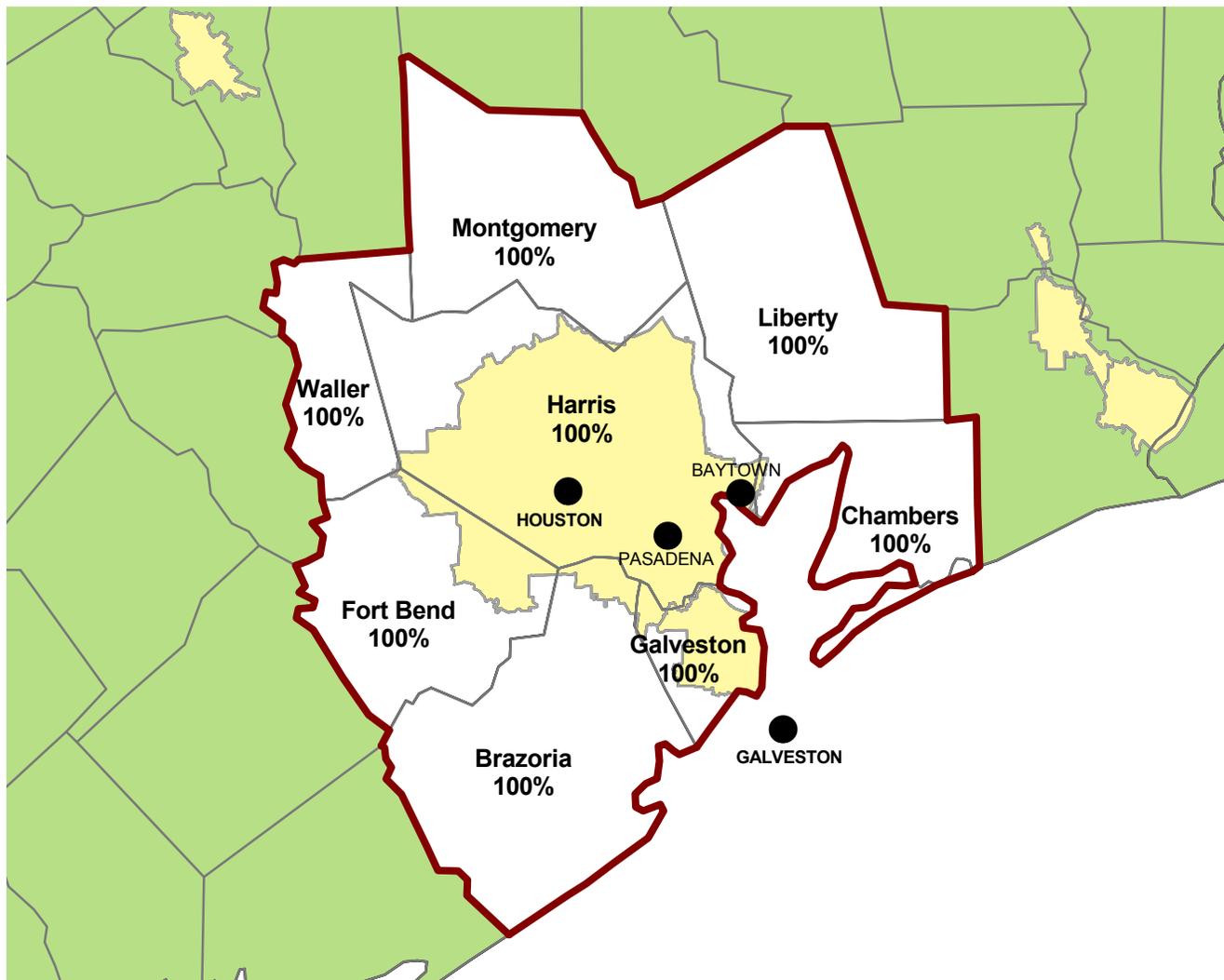


* Indicators are single surrogates that do not necessarily reflect the full breadth of ITS deployment activity

Link Description	1999	2005
14a. Transit Management agencies that disseminate information describing transit routes, schedules, and fares to travelers	(1 / 1) 100%	(1 / 1) 100%
14b. Transit Management agencies that disseminate information describing schedule/route adherence to travelers	(0 / 1) 0%	(1 / 1) 100%
1. Arterial Management agencies that disseminate arterial travel times, speeds, and conditions to the public	(0 / 5) 0%	(1 / 5) 20%
10. Freeway Management agencies that disseminate freeway travel times, speeds, and conditions to travelers	(1 / 1) 100%	(1 / 1) 100%
6. Incident Management agencies that disseminate information describing incident severity, location, and type to the public	(1 / 1) 100%	(1 / 1) 100%

Appendix A
Survey Coverage Area

HOUSTON-GALVESTON AREA COUNCIL, TX



- City Included in Surveys
 - ⚡ Metropolitan Planning Area Boundary
 - ⚡ County Boundary
 - Urbanized Area
 - Outside Survey Area
- Percentage on the Map Represents Percentage of County Population Included within MPO Boundary

Appendix B
Surveyed Agencies

Surveyed Agencies

Agency Name	Phone	Fax	1999		1997	
			Out	In	Out	In
HOUSTON, GALVESTON, BRAZORIA						
Arterial Management						
Houston City	(713) 881-3190	(713) 881-3171	8/5/1999	10/12/1999	8/15/1997	8/14/1998
Pasadena City	(713) 475-7861	(713) 475-1153	8/5/1999	9/16/1999	8/15/1997	10/6/1997
Fort Bend County	(281) 342-3039	(281) 342-7366	8/5/1999	10/15/1999	8/15/1997	10/10/1997
Galveston City	(409) 766-3386	(409) 766-2146	8/5/1999		8/15/1997	
Harris County	(713) 881-3189	(713) 881-3171	8/5/1999		8/1/1998	8/18/1998
Baytown City	(281) 420-5313	(281) 420-5322	8/5/1999		8/15/1997	
Texas Department of Transportation-Houston	(713) 802-5661	(713) 802-5900	8/5/1999	12/1/1999	8/15/1997	6/26/1998
Montgomery County	(409) 539-7833	(409) 539-7802	8/5/1999	12/29/1999	8/15/1997	8/26/1997
Electronic Toll Collection						
Harris County/San Louis-Vacek Bridge	281-875-1400	281-875-6941	6/30/1999		8/15/1997	11/7/1997
Harris County/Sam Houston Ship Channel	281-875-1400	281-875-6941	6/30/1999		8/15/1997	11/7/1997
Emergency Management						
Fort Bend Ambulance	(281) 238-4740	(281) 238-9650	6/4/1999	9/7/1999	8/15/1997	5/19/1998
Pasadena City Police Department	(713) 477-1221	(713) 477-8124	6/4/1999	9/8/1999	8/15/1997	9/2/1997
Waller County Paramedic Service	(409) 826-8282	(409) 826-7667	6/4/1999			
Galveston County Police Department	(409) 766-2197	(409) 766-2185	6/17/1999	9/2/1999	8/15/1997	5/19/1998
Constable Office Precint 1	(409) 826-8282	(409) 826-7667	6/4/1999			
Waller County Sheriffs Department	(409) 826-8282	(409) 826-7667	6/17/1999		8/15/1997	8/26/1997
Liberty County Sheriff's Department	(409) 336-4530	(409) 336-4536	6/3/1999	6/7/1999	8/15/1997	5/15/1998
Waller Fire Department Volunteer Waller County	(409) 826-8282	(409) 826-7667	6/4/1999			
Baytown City Fire & Rescue	281-420-5328	281-420-5367	6/3/1999	6/7/1999	7/1/1998	7/1/1998
Pasadena City Fire Department	713-475-5554	713-000-0000	6/4/1999	9/8/1999	8/15/1997	9/2/1997
Galveston City Police Department	409-766-2174	409-766-3381	9/22/1999		8/15/1997	5/15/1998
Monaville Volunteer Fire Department (Waller	(409) 826-8282	(409) 826-7667	6/4/1999			
Galveston County Sheriff's Department	(409) 770-5193	(409) 770-5296	6/3/1999	6/9/1999	8/15/1997	5/19/1998
Baytown City Emergency Management	281-422-0044	281-420-5844	6/4/1999	9/7/1999	8/15/1997	8/26/1997
Fort Bend County Sheriffs Department	(281) 238-4740	(281) 238-9650	6/4/1999	9/7/1999	8/15/1997	5/19/1998
Chambers County Sheriff's Department	(409) 267-8326	(409) 267-6736	6/7/1999	8/10/1999	8/15/1997	7/1/1998
Galveston County Fire Department	(409) 766-3303	(409) 765-6349	6/4/1999	6/9/1999		
Houston City Police Department	(713) 247-8917	(713) 227-8629	6/7/1999	6/11/1999	7/1/1998	7/1/1998
Harris County Sheriff's Department	(713) 881-3082	(713) 881-3077	6/3/1999	6/9/1999	8/15/1997	6/30/1998
Houston City Fire Department	(713) 865-4266	(713) 865-4264	6/7/1999	6/30/1999	8/15/1997	8/29/1997

Agency Name	Phone	Fax	1999		1997	
			Out	In	Out	In
Tri-County Volunteer Fire Department (Waller	(409) 826-8282	(409) 826-7667	6/4/1999			
Brazoria County Sheriff's Department	(281) 331-9000	(409) 848-8003	6/4/1999	8/11/1999	8/15/1997	5/15/1998
Montgomery County Sheriff's Department	(409) 760-5872	(409) 538-7797	6/7/1999	9/7/1999	8/15/1997	8/22/1997
Baytown City Police Department	281-4206644	281-427-5037	6/3/1999	6/7/1999	8/15/1997	8/26/1997
Waller County Volunteer Emergency Medical	(409) 826-8282	(409) 826-7667	6/4/1999			
Liberty Fire Department	(409) 336-3922	(409) 336-5417	6/3/1999	8/11/1999		
Prairie View Volunteer Fire Department (Waller	(409) 826-8282	(409) 826-7667	6/4/1999			
Hempstead Volunteer Fire Department (Waller	(409) 826-8282	(409) 826-7667	6/4/1999			
Freeway Management						
Texas Department of Transportation-Houston	(713) 881-3285	(713) 881-3028	7/29/1999	11/1/1999	8/1/1998	8/21/1998
MPO						
Houston Galveston Area Council	(713) 627-3200	(713) 993-4508	7/15/1999	10/4/1999		
Transit Management						
Metro Transit Authority	(713) 881-3030	(713) 881-3028	8/9/1999	8/26/1999	7/17/1997	7/17/1997

Appendix C
Freeway Management Components

Freeway Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Texas Department of Transportation-Houston District	
	1999	2005
Agency Returned Survey?	Yes	
FREEWAY MANAGEMENT SECTION		
Number of freeway centerline miles that agency owns or maintains	562	
Number of freeway centerline miles that is used for planning	562	
Number of freeway entrance ramps that agency owns, operates or maintains	564	
Number of freeway entrance ramps that is used for planning	564	
Type of facilities used to conduct freeway/incident management activities		
Activities housed in a free-standing dedicated building?	Yes	
Activities housed in a building shared with other activities?	No	
Activities conducted in a dedicated control room?	Yes	
Control room contains operator console(s)?	Yes	
Control room contains electronic wall map?	No	
Control room contains CCTV display(s)?	Yes	
Activities conducted in a room containing workstations or PCs that manage traffic?	No	
Facilities are electronically linked to other transportation mgt facilities?	No	
Staffing and hours of operation of freeway/incident management activities		
Number of full-time agency staff members	NR	
Number of full time contractor staff members	NR	
Number of part-time agency staff members	NR	
Number of part-time contractor staff members	NR	
Staffed 24 hours day by agency staff or by others	agency	
Staffed during peak hours only by agency staff or by others	NR	
Staffed by others during off-peak hours	Yes	
Agency staff perform transportation management as an ancillary duty	No	
Agency staff dedicated to transportation management duty	Yes	
Types of operations conducted for freeway/incident management		
Incident detection and management?	Yes	
This metropolitan area?	Yes	
Other metropolitan area?	Yes	
Statewide?	No	
Monitoring and troubleshooting status of system components?	Yes	
Manual override of ramp metering rates at freeway on-ramps?	Yes	
Operating transportation management roadside devices?	Yes	
Radio communications with other agencies?	No	
Exchange of electronic data with other agencies such as computer aided dispatch?	Yes	
Real-Time Traffic Data Collection Technologies		
Total number of miles under surveillance with real-time data collection tech.	380	450

Freeway Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Texas Department of Transportation-Houston District	
	1999	2005
<i>Number of Stations with data collection technologies</i>		
Loop detectors	150	200
Video imaging detectors	0	0
Probe readers (elec. toll tags, transit vehicles, other technology)	187	300
Microwave radar	0	0
Other (e.g., acoustic detectors)	0	0
<i>Number of Miles covered with data collection technologies</i>		
Loop detectors	30	40
Video imaging detectors	0	0
Probe readers (elec. toll tags, transit vehicles, other technology)	170	225
Microwave radar	0	0
Other (e.g., acoustic detectors)	0	0
Variable Message Signs (VMS) on Freeways		
Candidate locations for deployment of VMS where VMS has been deployed	84	160
Candidate locations for deployment of VMS	NR	NR
Roadside Technologies used to Distribute Traveler Information		
Total number of miles where information is distributed	0	30
<i>Number deployed</i>		
Highway advisory radio	0	10
In-vehicle signing	0	0
Portable variable message signs	3	3
Other	0	0
<i>Miles covered</i>		
Highway advisory radio	0	30
In-vehicle signing	0	0
Portable variable message signs	NR	NR
Other	0	0
Ramp Meters on Freeways		
Number of entrance ramp meters operated under isolated control	0	0
Number of entrance ramp meters operated under central control	97	115
Number of entrance ramp meters that provide preemption for emergency vehicles	0	0
Number of entrance ramp meters that provide priority for transit vehicles	0	0
Total number of metered ramps	97	115
Freeway centerline miles under lane control	16	35
Communication Links		
<i>Freeway centerline miles covered by the following type of communication</i>		
Twisted pair cable	0	0
Coaxial cable	0	0
Fiber-optic cable	220	300
Microwave radio	0	0
Other	0	0
ITS Standards Used Related to Freeway Management		

Freeway Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Texas Department of Transportation-Houston District	
	1999	2005
ATMS Data Dictionary Sections 1 and 2 (ITE TM 1.01)	Yes	
ATMS Data Dictionary Sections 3 and 4 (ITE TM 1.02)	No	
Message Set for External TMC Communication (ITE-9604-1)	No	
NTCIP Class B Profile (AASHTO TS 3.3)	Yes	
NTCIP Data Collection and Monitoring Devices (AASHTO TS 3.DCM)	No	
NTCIP Object Definitions for Environmental Sensor Stations (AASHTO TS 3.7)	No	
NTICP Object Definitions for Dynamic Message Signs (AASHTO TS 3.6)	Yes	
NTICP Object Definitions for Highway Advisory Radio (AASHTO TS 3.HAR)	No	
NTICP Object Definitions for Ramp Meter Control (AASHTO TS 3.RMC)	Yes	
NTICP Object Definitions for Transportation Sensor Systems (AASHTO TS 3.TSS)	No	
NTICP Object Definitions for Video Camera Control (AASHTO TS 3.VCC)	No	
Would agency be willing to participate in testing of ITS Standards?	Yes	
Have agreements in place with other agencies to use similar hardware and software to aid maintenance and interoperability?	No	
INCIDENT MANAGEMENT SECTION		
Use of Service Patrols to Assist in Detection and Response to Incidents		
Publicly operated service patrol vehicles	Yes	
Privately operated service patrol vehicles operated under public contract	No	
Total number of freeway miles patrolled by these services	140	170
Miles Covered by Methods to Detect and Verify Incidents		
Free cellular phone call to a dedicated phone number other than 911	562	562
Police patrols	NR	NR
Computer algorithms linked to traffic surveillance equipment	0	100
CCTV	200	300
Private sector sources (e.g., Shadow Traffic, SmartRoutes)	NR	NR
Other (e.g., free cell phone call to an area radio system, etc.)	NR	NR
Procedures in place for Freeway Incident Response?		
Working agreement(s)/arrangement(s) with other agencies	Yes	
Inter-agency incident management admin. team that meets regularly	No	
Major incident response team that responds to major incidents	No	
Set of goals/objectives for incident mgt that has been adopted by agencies in region	Yes	
Central focal point for facilitating the two-way flow of information among agencies responding to an incident?		
The central focal point is a Freeway or Traffic Management Center	Yes	
The central focal point is a Police, Fire or joint dispatch center	No	
The central focal point is another center	No	
Methods of Communication Used On-Site at an Incident		
<u>Police</u>		
Two-way radio	Yes	
800 MHz trunked radio	No	
Cellular telephone	Yes	

Freeway Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Texas Department of Transportation-Houston District	
	1999	2005
Hand-held (i.e., walkie-talkie)	Yes	
Automated data systems (i.e., CAD)	Yes	
<u>Fire</u>		
Two-way radio	Yes	
800 MHz trunked radio	Yes	
Cellular telephone	No	
Hand-held (i.e., walkie-talkie)	No	
Automated data systems (i.e., CAD)	No	
<u>DOT</u>		
Two-way radio	Yes	
800 MHz trunked radio	Yes	
Cellular telephone	No	
Hand-held (i.e., walkie-talkie)	No	
Automated data systems (i.e., CAD)	No	
<u>Towing</u>		
Two-way radio	Yes	
800 MHz trunked radio	No	
Cellular telephone	No	
Hand-held (i.e., walkie-talkie)	No	
Automated data systems (i.e., CAD)	No	
Which police agencies typically respond to incidents on freeways?		
State Police	Yes	
County Police or Sheriff	Yes	
City Police	Yes	
Who provides on-site emergency medical response?		
Fire	No	
Emergency Management Service Agency	Yes	
Private hospital	No	
Has a multi-agency contact list been developed in area containing the names, phone numbers, etc. for the appropriate response personnel?	Yes	
Is the Incident Command System used to manage incident scenes?	No	
Is there a legal specification by state law or formal agreement as to who is "in charge" at the incident scene?		
Specified by state law?	No	
Formal agreement?	Yes	
Not specified or don't know?	No	
On-scene command post used to manage activities of responding agencies?	Yes	
Are there communication linkages to a communications traffic/freeway mgt center?	Yes	
Plan developed and adopted by responding agencies for staging and parking response vehicles and equip. at incident site that minimizes lane blockage and facilitates the re-opening of lanes?	No	
Respondents protected through law or court opinion for liability claims		

Freeway Management
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Texas Department of Transportation-Houston District	
	1999	2005
for damages to vehicles or cargoes during clearance activities?	Yes	
Are overturned tank trucks, which are intact and not leaking, uprighted without first off-loading?	Yes	
Does your state or local jurisdiction have a law that requires drivers involved in property-damage-only accidents to move the vehicles from travel lanes to a safe location to exchange info and wait for police?	Yes	
Have laws or policies regarding the removal of stalled/abandoned vehicles from freeway shoulders?	Yes	
Hours abandoned vehicles are allowed to remain on a freeway shoulder?	>36	
Have policies or procedures for quick removal of vehicles?	No	
Is Total Station equipment used to investigate major incidents?	No	
Handling of Towing Responses to Incidents		
Formal contract based on qualifications?	No	
Rotation with companies under contract?	Yes	
Separate lists kept for light and heavy response and for specialty recovery?	Yes	
Rotation list with minimal qualifications?	No	
In towing qualifications, do you require towers to be certified under the Towing and Recovery Ass. of America's National Drivers Cert. Program?	DK	
DK: Don't know		
NR: No Response		
Leg: Legislation or action being planned		

Appendix D
Freeway Management Integration

Freeway Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Texas Department of Transportation-Houston District	
	1999	2005
Agency Returned Survey?	Yes	
Freeway Management Section		
Agencies your agency provides freeway travel times, speeds, and conditions information, share infrastructure or coordinates operation		
<i>Freeway Management Agencies</i>		
Provide Information	Texas Department of Transportation-Houston District	None listed
Share Infrastructure	Texas Department of Transportation-Houston District	None listed
Coordinate Operation	Texas Department of Transportation-Houston District	None listed
<i>Incident Management Agencies</i>		
Provide Information	Texas Department of Transportation-Houston District	None listed
Share Infrastructure	Texas Department of Transportation-Houston District	None listed
Coordinate Operation	Texas Department of Transportation-Houston District	None listed
<i>Arterial Management Agencies</i>		
Provide Information	Baytown City, Fort Bend County, Galveston City, Houston City, Harris County, Montgomery County, Pasadena City, Texas Department of Transportation-Houston District	None listed
Share Infrastructure	Baytown City, Galveston City, Houston City, Harris County, Pasadena City, Texas Department of Transportation-Houston District	None listed
Coordinate Operation	Houston City, Harris County, Texas Department of Transportation-Houston District	None listed
<i>Public Transit Operators</i>		
Provide Information	None listed	None listed
Share Infrastructure	None listed	None listed
Coordinate Operation	None listed	None listed
<u>Receiving real-time information via electronic means from others</u>		
<i>Incident Management agencies from which your agency receives incident severity, location, and type information</i>	None listed	None listed
<i>Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions</i>	None listed	None listed
<i>Public Transit operators from which your agency receives freeway travel times derived from vehicle probes</i>	None listed	None listed
<i>Toll Collection agencies from which your agency receives freeway travel times derived from vehicles probes</i>	None listed	None listed
Freeway Incident Management Section		
Agencies your agency provides incident severity, location, and type info. and/or shares infrastructure and/or coordinates operation		

Freeway Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Texas Department of Transportation-Houston District	
	1999	2005
Arterial Management Agencies		
Provide Information	Texas Department of Transportation-Houston District	None listed
Share Infrastructure	None listed	None listed
Coordinate Operation	None listed	None listed
Emergency Management Agencies		
Provide Information	None listed	None listed
Share Infrastructure	Houston City Police Department, Harris County Sheriffs Department, Metro Police Department, Metro Bus Dispatch	None listed
Coordinate Operation	Houston City Police Department, Harris County Sheriffs Department, Metro Police Department, Metro Bus Dispatch	None listed
Freeway Management Agencies		
Provide Information	Texas Department of Transportation-Houston District	None listed
Share Infrastructure	Texas Department of Transportation-Houston District	None listed
Coordinate Operation	Texas Department of Transportation-Houston District	None listed
Public Transit Operators		
Provide Information	Metro Transit Authority	None listed
Share Infrastructure	Metro Transit Authority	None listed
Coordinate Operation	Metro Transit Authority	None listed
Receiving real-time information via electronic means from others		
Emergency Management agencies from which your agency receives incident clearance and/or incident severity and type		
Receive Arterial Incident Clearance Information	None listed	None listed
Receive Arterial Incident Severity Information	None listed	None listed
Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions		
	None listed	None listed
Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions		
	Texas Department of Transportation-Houston District	None listed

*short survey: Agency responded using a short survey. The survey did not include names of individual agencies, but only identified whether integration exists.

Appendix E
Freeway Management Information Collection and Dissemination

Data Collection and Dissemination: Freeway Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Texas Department of Transportation-Houston District	
	1999	2005
Agency Returned Survey?	Yes	
Freeway Management Section		
Data collected, archived, and/or transferred to another agency		
Collected by your agency	Traffic volumes, Traffic speeds, Lane occupancy, Probe vehicles, Incidents, Current work zones, Scheduled work zones	Vehicle classification, Ramp meter preemption's, Weather conditions
Archived by your agency	Traffic volumes, Traffic speeds, Lane occupancy, Incidents	Vehicle classification, Probe vehicles, Weather conditions
Transferred to another agency by your agency	Incidents	NR
Importance of making information available to the public		
Ranked High	Traffic speeds, Probe vehicles, Incidents, Current work zones, Scheduled work zones, Emergency/evacuation routes and procedures	
Ranked Medium	Road conditions, Route designations (snow emergency, etc.), Weather conditions, Intermodal (air, rail, water) connections	
Ranked Low	Traffic volumes, Lane occupancy, Vehicle classification, Ramp queues, Ramp meter preemption's, Metering rate, Highway operations coordination information	
Groups that make requests for the data	Universities, State DOT personnel, Media (I.e., TV stations, radio stations), MPOs, Consultants, Advanced Traveler Information Systems (ATIS) provi, Traffic Services	
What is the data used for?	Traffic analysis, Planning, Incident detection algorithm development, Accident prediction models, Dissemination to the public	
Methods used to disseminate freeway information to the public		
Technologies your agency uses to disseminate:	Internet Web sites	Dedicated cable TV, Pagers or personal data assistants, E-mail or other direct PC communication
Technologies your agency (through another agency or org.) uses to disseminate:	Pagers or personal data assistants	Kiosks
Internet web site reporting freeway conditions	www.traffic.tamu.edu	
Telephone system for reporting freeway information to the public	NR	
Organizations your agency sends information for dissemination to the public	metro traffic network shadow traffic network	
Freeway Incident Management Section		
Methods used to distribute incident location and severity information to the public		
Technologies your agency uses to disseminate:	Internet Web sites, Pagers or personal data assistants	Dedicated cable TV, E-mail or other direct PC communication
Technologies your agency (through another agency or org.) uses to disseminate:	NR	Kiosks
Internet web site reporting incident information	www.traffic.tamu.edu	
Telephone system for reporting incident information to the public	NR	
Organizations your agency sends information for dissemination to the public	Metro Traffic Network Shadow Traffic Network	

Appendix F
Arterial Management Components

Arterial Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Agency Returned Survey?	Yes		Yes		Yes		Yes		Yes		5	
ARTERIAL MANAGEMENT SECTION												
Number of arterial miles that agency owns or maintains	104		NR		NR		NR		NR		104	
Number of arterial miles that is used for planning	0		NR		NR		NR		NR		0	
Number of highway-rail intersections that agency maintains	47		54		NR		NR		NR		101	
Number of highway-rail intersections that is used for planning	0		NR		NR		NR		NR		0	
Type of facilities used to conduct arterial management activities												
Activities housed in a free-standing dedicated building?	No		No		No		No		No		0	
Activities housed in a building shared with other activities?	No		No		No		No		No		0	
Activities conducted in a dedicated control room?	No		No		No		No		No		0	
Control room contains operator console(s)?	No		No		No		No		No		0	
Control room contains electronic wall map?	No		No		No		No		No		0	
Control room contains CCTV display(s)?	No		No		No		No		No		0	
Activities conducted in a room containing workstations or PCs that manage traffic?	No		No		No		No		No		0	
Facilities are electronically linked to other transportation mgt facilities?	No		No		No		No		No		0	
Staffing and hours of operation of arterial management activities												
Number of full-time agency staff members	NR		NR		NR		NR		NR		0	
Number of full time contractor staff members	NR		NR		NR		NR		NR		0	
Number of part-time agency staff members	NR		NR		NR		NR		NR		0	
Number of part-time contractor staff members	NR		NR		NR		NR		NR		0	
Staffed 24 hours day by agency staff or by others	NR		NR		NR		NR		NR		0	
Staffed during peak hours only by agency staff or by others	NR		NR		NR		NR		NR		0	
Staffed by others during off-peak hours	No		No		No		No		No		0	
Agency staff perform transportation management as an ancillary duty	No		No		No		No		No		0	
Agency staff dedicated to transportation management duty	No		No		No		No		No		0	
Types of operations conducted for arterial management												
Incident detection and management?	No		No		No		No		No		0	
This metropolitan area?	No		No		No		No		No		0	
Other metropolitan area?	No		No		No		No		No		0	
Monitoring and troubleshooting status of system components?	No		No		No		No		No		0	
Radio communications with other agencies?	No		No		No		No		No		0	
Exchange of electronic data with other agencies such as computer aided dispatch?	No		No		No		No		No		0	
Manual override of traffic signal timing plans	No		No		No		No		No		0	
Operating transportation mgt roadside devices (e.g., VMS, CCTV, etc.)	No		No		No		No		No		0	

Arterial Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Describe agency's role in traffic signal control	Do not operate		NR		NR		All roads in incorporated area		NR			
Traffic Signals Operated by Agency												
Number of signalized intersections operated and owned by agency	0	NR	NR	NR	NR	NR	126	NR	NR	NR	126	0
Number of signalized intersections operated by agency but owned by another	0	NR	NR	NR	NR	NR	0	NR	NR	NR	0	0
Total number of signalized intersections operated by agency	0	NR	2,001	NR	25	30	126	NR	920	1,130	3072	1160
<i>Characteristics of signalized intersections that agency operates</i>												
Under closed loop or central system control	0	NR	163	NR	0	17	65	NR	470	800	698	817
Under real-time traffic adaptive control using advanced software	0	NR	0	NR	0	0	NR	NR	0	0	0	0
Using SCOOT	No		No		No		No		No		0	
Using SCATS	No		No		No		No		No		0	
Name of software	NR		NR		NR		NR		NR			
Allow signal preemption for emergency vehicles	0	NR	295	NR	0	0	NR	NR	90	130	385	130
Allow signal priority for transit vehicles	0	NR	0	1,350	0	0	NR	NR	0	15	0	1365
Within 200 feet of a highway-rail intersection	0	NR	100	100	0	0	NR	NR	98	105	198	205
Within 200 feet of a highway-rail intersection that adjust signal timing	0	NR	50	100	0	0	NR	NR	98	105	148	205
Software used to control the signals agency operates												
Date of last upgrade to traffic signal control system software?	NR		NR		NR		Naztec		NR			
How often do you update signal timing?	NR		NR		NR		2 years		NR			
Software used and number of signalized intersections under control (1999, 2005)	NR		NR		NR		Naztec 682, 900, 848 & Kentron 4000, NR, NR		NR			
Controllers used to control signals												
NEMA	0	0	0	0	0	0	123	NR	0	0	123	0
170/179	0	0	0	0	0	0	0	0	0	0	0	0
2070 controller	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Technologies Associated with Highway-Rail Intersections												
Total number of highway-rail intersections under electronic surveillance	NR	NR	0	20	NR	NR	NR	NR	NR	NR	0	20
<i>Highway-Rail intersection capabilities</i>												
Video surveillance	0	0	0	0	0	0	0	0	0	0	0	0
Electronic surveillance other than video	0	0	0	0	0	0	0	0	0	0	0	0
Ability to predict train arrival electronically	0	0	0	0	0	0	0	0	0	0	0	0
Equipped with electronic traffic violator devices	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0

Arterial Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Real-Time Electronic Traffic Data Collection Technologies												
Total number of signalized intersections covered by electronic surveillance	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
<i>Number of signalized intersections with data collection technologies</i>												
Loop detectors	0	0	0	0	0	0	0	0	0	0	0	0
Video detection cameras	0	0	0	0	0	0	0	0	0	0	0	0
Probe readers reading toll tags	0	0	0	0	0	0	0	0	0	0	0	0
Probe readers reading license plates	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Roadside Technologies used to Distribute Traveler Information												
<i>Number deployed</i>												
Highway Advisory Radio	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
In-Vehicle Signing (IVS)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
VMS controlling parking access	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
<i>Miles covered</i>												
Highway Advisory Radio	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
In-Vehicle Signing (IVS)	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
Variable Message Signs (VMS) on Arterials												
Candidate locations for deployment of VMS where VMS has been deployed	NR	NR	10	50	NR	NR	NR	NR	NR	NR	10	50
Candidate locations for deployment of VMS	NR	NR	10	50	NR	NR	NR	NR	NR	NR	10	50
Communication Technologies												
<i>Signalized intersections communicated with by each type of communication</i>												
Twisted pair cable	0	0	0	0	0	0	4	NR	0	0	4	0
Coaxial cable	0	0	0	0	0	0	0	0	0	0	0	0
Fiber-optic cable	0	0	0	0	0	0	0	0	0	0	0	0
Other (e.g., wireless, dial-up modems, leased lines, etc.)	0	0	0	0	0	0	6	0	0	0	6	0
Does agency convey information on highway-rail intersection crossing status to travelers via roadside media such as VMS or HAR?												
	No		No		No		No		No		0	
ITS Standards Used Related to Traffic Signal Control												
Advanced Transportation Controller (ATC) Software Application Interface (ITE 9603-1)	No		No		No		No		No		0	
ATC Physical Cabinet Functional Design (ITE-9603-2)	No		No		No		No		No		0	
ATC Functionality and Interface Definitions (ITE-9603-3)	No		No		No		No		No		0	
Natl. Trans. Communications for ITS Protocol (NTCIP) Class B Profile (AASHTO TS 3.3)	No		No		No		No		No		0	
NTCIP Data Collection and Monitoring Devices (AASHTO TS 3.DCM)	No		No		No		No		No		0	
NTCIP Object Definitions for Video Camera Control (AASHTO TS 3.VCC)	No		No		No		No		No		0	
NTCIP Object Definitions for Actuated Traffic Signal Controller Units (AASHTO TS 3.5)	No		No		No		No		No		0	
Would agency be willing to participate in testing of ITS Standards?	Yes		NR		NR		Yes		NR		2	
Have agreements in place with other agencies to use similar hardware and software to aid maintenance and interoperability?												
	No		NR		NR		No		NR		0	
INCIDENT MANAGEMENT ON ARTERIAL STREETS												
Receive information on highway-rail intersection crossing blockages for the purpose of managing incident response?												
	No		No		No		No		No		0	

Arterial Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Use of Service Patrols to Assist in Detection and Response to Incidents												
Publicly operated service patrol vehicles	No		No		No		No		No		0	
Privately operated service patrol vehicles operated under public contract	No		No		No		No		No		0	
Total number of arterial miles patrolled by these services	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	0	0
Miles Covered by Methods to Detect and Verify Incidents												
Free cellular phone call to a dedicated phone number other than 911	0	0	0	0	0	0	0	0	0	0	0	0
Free cellular phone call to an area radio station	0	0	0	0	0	0	0	0	0	0	0	0
Police patrols	0	0	0	0	0	0	0	0	0	0	0	0
Computer algorithms linked to traffic surveillance equipment	0	0	0	0	0	0	0	0	0	0	0	0
CCTV	0	0	100	250	0	0	0	0	0	0	100	250
Private sector sources (e.g., Shadow Traffic, Smart Routes)	0	0	0	0	0	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0	0	0	0
Procedures in place for Arterial Incident Response?												
Working agreement(s)/arrangement(s) with other agencies	No		No		No		No		No		0	
Inter-agency incident management admin. team that meets regularly	No		No		No		No		No		0	
Major incident response team that responds to major incidents	No		No		No		No		No		0	
Set of goals/objectives for incident mgt that has been adopted by agencies in region	No		No		No		No		No		0	
Methods of Communication Used On-Site at an Incident												
<u>Police</u>												
Two-way radio	No		No		No		Yes		No		1	
800 MHz trunked radio	No		No		No		No		No		0	
Cellular telephone	No		No		No		No		No		0	
Hand-held (i.e., walkie-talkie)	No		No		No		No		No		0	
Automated data systems (i.e., CAD)	No		No		No		No		No		0	
Other	No		No		No		No		No		0	
<u>Fire</u>												
Two-way radio	No		No		No		Yes		No		1	
800 MHz trunked radio	No		No		No		No		No		0	
Cellular telephone	No		No		No		No		No		0	
Hand-held (i.e., walkie-talkie)	No		No		No		No		No		0	
Automated data systems (i.e., CAD)	No		No		No		No		No		0	
Other	No		No		No		No		No		0	
<u>DOT</u>												
Two-way radio	No		No		No		No		No		0	
800 MHz trunked radio	No		No		No		No		No		0	
Cellular telephone	No		No		No		No		No		0	
Hand-held (i.e., walkie-talkie)	No		No		No		No		No		0	
Automated data systems (i.e., CAD)	No		No		No		No		No		0	
Other	No		No		No		No		No		0	

Arterial Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
<u>Towing</u>												
Two-way radio	No		No		No		Yes		No		1	
800 MHz trunked radio	No		No		No		No		No		0	
Cellular telephone	No		No		No		No		No		0	
Hand-held (i.e., walkie-talkie)	No		No		No		Yes		No		1	
Automated data systems (i.e., CAD)	No		No		No		No		No		0	
Other	No		No		No		No		No		0	
Which police agencies typically respond to incidents on arterials?												
State Police	No		No		No		No		No		0	
County Police or Sheriff	No		No		No		No		No		0	
City Police	No		No		No		Yes		No		1	
Who provides on-site emergency medical response?												
Fire	No		No		No		Yes		No		1	
Emergency Management Service Agency	No		No		No		No		No		0	
Private hospital	No		No		No		No		No		0	
Has a multi-agency contact list been developed in area containing the names, phone numbers, etc. for the appropriate response personnel?	NR		NR		NR		Yes		NR		1	
Is the Incident Command System used to manage incident scenes?	NR		NR		NR		DK		NR		0	
Is there a legal specification by state law or formal agreement as to who is "in charge" at the incident scene?												
Specified by state law?	No		No		No		No		No		0	
Formal agreement?	No		No		No		No		No		0	
Not specified or don't know?	No		No		No		Yes		No		1	
On-scene command post used to manage activities of responding agencies?	NR		NR		NR		Yes		NR		1	
Are there communication linkages to a communications traffic/freeway mgt center?	NR		NR		NR		Yes		NR		1	
Plan developed and adopted by responding agencies for staging and parking response vehicles and equip. at incident site that minimizes lane blockage and facilitates the re-opening of lanes?	NR		NR		NR		Yes		NR		1	
Respondents protected through law or court opinion for liability claims for damages to vehicles or cargoes during clearance activities?	NR		NR		NR		Yes		NR		1	
Are overturned tank trucks, which are intact and not leaking, uprighted without first off-loading?	NR		NR		NR		NR		NR		0	
Does your state or local jurisdiction have a law that requires drivers involved in property-damage-only accidents to move the vehicles from travel lanes to a safe location to exchange info and wait for police?	NR		NR		NR		No		NR		0	
Have laws or policies regarding the removal of stalled/abandoned vehicles from freeway shoulders?	NR		NR		NR		Yes		NR		1	
Hours abandoned vehicles are allowed to remain on a freeway shoulder?	NR		NR		NR		NR		NR		0	
Have policies or procedures for quick removal of vehicles?	NR		NR		NR		No		NR		0	
Is Total Station equipment used to investigate major incidents?	NR		NR		NR		DK		NR		0	
Handling of Towing Responses to Incidents												

Arterial Management
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District		Totals	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Formal contract based on qualifications?	No		No		No		No		No		0	
Rotation with companies under contract?	No		No		No		Yes		No		1	
Separate lists kept for light and heavy response and for specialty recovery?	NR		NR		NR		Yes		NR		1	
Rotation list with minimal qualifications?	No		No		No		No		No		0	
In towing qualifications, do you require towers to be certified under the Towing and Recovery Ass. of America's National Drivers Cert. Program?	NR		NR		NR		Yes		NR		1	
DK: Don't know												
NR: No Response												
Leg: Legislation or action being planned												

Appendix G
Arterial Management Integration

Arterial Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Fort Bend County		Houston City		Montgomery County	
	1999	2005	1999	2005	1999	2005
Agency Returned Survey?	Yes		Yes		Yes	
Arterial Management Section						
<u>Arterial Mgt. agencies in metropolitan area with which you share info.</u>						
Share Timing Plans Information	None listed	None listed	short survey	None listed	None listed	None listed
Coordinate Changes to Timing Plans	None listed	None listed	short survey	None listed	None listed	None listed
Turn over Control of Signals	None listed	None listed	short survey	None listed	None listed	None listed
<u>Agencies your agency provides arterial travel times, speeds, and conditions information, share infrastructure or coordinates operation</u>						
<i>Freeway Management Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<i>Incident Management Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<i>Public Transit Operators Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<i>Arterial Management Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<u>Receiving real-time information via electronic means from others</u>						
<i>Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions</i>						
freeway travel times, speeds, and conditions	None listed	None listed	short survey	None listed	None listed	None listed
<i>Public Transit operators from which your agency receives arterial travel times derived from vehicle probes</i>						
arterial travel times derived from vehicle probes	None listed	None listed	None listed	None listed	None listed	None listed
<i>Incident Management agencies from which your agency receives incident clearance and/or incident severity, location, and type information</i>						
Receive information on Incident Clearance	None listed	None listed	None listed	None listed	None listed	None listed
Receive information on Incident Severity, Location, and Type	None listed	None listed	None listed	None listed	None listed	None listed
<i>Toll Collection agencies from which your agency receives arterial travel times derived from vehicles probes</i>						
times derived from vehicles probes	None listed	None listed	short survey	None listed	None listed	None listed
Arterial Incident Management Section						
<u>Agencies your agency provides incident severity, location, and type info. and/or shares infrastructure and/or coordinates operation</u>						

Arterial Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Fort Bend County		Houston City		Montgomery County	
	1999	2005	1999	2005	1999	2005
<i>Emergency Management Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<i>Freeway Management Agencies</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<i>Public Transit Operators</i>						
Provide Information	None listed	None listed	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed	None listed	None listed
<u>Receiving real-time information via electronic means from others</u>						
<i>Emergency Management agencies from which your agency receives arterial incident clearance and/or arterial incident severity</i>						
Receive Arterial Incident Clearance Information	None listed	None listed	short survey	None listed	None listed	None listed
Receive Arterial Incident Severity Information	None listed	None listed	short survey	None listed	None listed	None listed
<i>Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions</i>						
Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions	None listed	None listed	None listed	None listed	None listed	None listed

*short survey: Agency responded using a short survey. The survey did not include names of individual agencies, but only identified whether integration exists.

Arterial Management Integration
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Pasadena City		Texas Department of Transportation-Houston District	
	1999	2005	1999	2005
Agency Returned Survey?	Yes		Yes	
Arterial Management Section				
<u>Arterial Mgt. agencies in metropolitan area with which you share info.</u>				
Share Timing Plans Information	None listed	None listed	short survey	None listed
Coordinate Changes to Timing Plans	None listed	None listed	short survey	None listed
Turn over Control of Signals	None listed	None listed	short survey	None listed
<u>Agencies your agency provides arterial travel times, speeds, and conditions information, share infrastructure or coordinates operation</u>				
<i>Freeway Management Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<i>Incident Management Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<i>Public Transit Operators Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<i>Arterial Management Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<u>Receiving real-time information via electronic means from others</u>				
<i>Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions</i>				
<i>Public Transit operators from which your agency receives arterial travel times derived from vehicle probes</i>				
<i>Incident Management agencies from which your agency receives incident clearance and/or incident severity, location, and type information</i>				
Receive information on Incident Clearance	None listed	None listed	None listed	None listed
Receive information on Incident Severity, Location, and Type	None listed	None listed	None listed	None listed
<i>Toll Collection agencies from which your agency receives arterial travel times derived from vehicles probes</i>				
<i>Arterial Incident Management Section</i>				
<u>Agencies your agency provides incident severity, location, and type info. and/or shares infrastructure and/or coordinates operation</u>				

Arterial Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Pasadena City		Texas Department of Transportation-Houston District	
	1999	2005	1999	2005
<i>Emergency Management Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<i>Freeway Management Agencies</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<i>Public Transit Operators</i>				
Provide Information	None listed	None listed	None listed	None listed
Share Infrastructure	None listed	None listed	None listed	None listed
Coordinate Operation	None listed	None listed	None listed	None listed
<u>Receiving real-time information via electronic means from others</u>				
<i>Emergency Management agencies from which your agency receives arterial incident clearance and/or arterial incident severity</i>				
Receive Arterial Incident Clearance Information	None listed	None listed	None listed	None listed
Receive Arterial Incident Severity Information	None listed	None listed	None listed	None listed
<i>Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions</i>				
Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions	None listed	None listed	None listed	None listed

*short survey: Agency responded using a short survey. The survey did not include names of individual agencies, but only identified whether integration exists.

Appendix H
Arterial Management Information Collection and Dissemination

Data Collection and Dissemination: Arterial Management
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Agency Returned Survey?	Yes		Yes		Yes		Yes		Yes	
Arterial Management Section										
Data collected, archived, and/or transferred to another agency										
Collected by your agency	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Archived by your agency	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Transferred to another agency by your agency	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Importance of making information available to the public										
Ranked High							Traffic volumes, Road conditions, Scheduled work zones, Emergency/evacuation routes and procedures			NR
Ranked Medium							Traffic speeds, Vehicle classification, Turning movements, Phasing/cycle lengths			NR
Ranked Low							Lane occupancy			NR
Groups that make requests for the data							Consultants			NR
What is the data used for?							Traffic analysis, Construction impact determination, Planning, Dissemination to the public			NR
Methods used to disseminate arterial information to the public										
Technologies your agency uses to disseminate:	NR	NR	NR	Internet Web sites	NR	NR	NR	NR	NR	NR
Technologies your agency (through another agency or org.) uses to disseminate:	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Internet web site reporting arterial conditions			NR		NR		NR		NR	
Telephone system for reporting arterial information to the public			NR		NR		NR		NR	
Organizations your agency sends information for dissemination to the public			NR		NR		NR		NR	
Arterial Incident Management Section										
Methods used to distribute incident location and severity information to the public										

Data Collection and Dissemination: Arterial Management
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Fort Bend County		Houston City		Montgomery County		Pasadena City		Texas Department of Transportation-Houston District	
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005
Technologies your agency uses to disseminate:	NR	NR	Internet Web sites	Internet Web sites	NR	NR	High Power Vocie & Siren System	NR	NR	NR
Technologies your agency (through another agency or org.) uses to disseminate:	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Internet web site reporting incident information	NR		NR		NR		NR		NR	
Telephone system for reporting incident information to the public	NR		NR		NR		NR		NR	
Organizations your agency sends information for dissemination to the public	NR		NR		NR		NR		NR	

Appendix I
Transit Management Components

Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
Agency Returned Survey?	Yes	
Number of vehicles used in revenue service		
Fixed Route Bus	1,380	1,600
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	165	200
Commuter Rail	NR	NR
Ferry Boat	NR	NR
Have of plan to have an Automated Vehicle Location System?	Yes	
Primary and Secondary Location Technologies Used		
<u>Primary Technologies</u>		
GPS	No	No
Sign/Odometer	No	No
Dead-Reckoning	No	Yes
LORAN C	No	No
Other	No	No
<u>Backup Technologies</u>		
GPS	No	No
Sign/Odometer	No	No
Dead-Reckoning	No	No
LORAN C	No	No
Other	No	Yes
Number of Vehicles Equipped with AVL		
Fixed Route Bus	NR	1,600
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	165	200
Commuter Rail	NR	NR
Ferry Boat	NR	NR
Motor Buses Operated as Vehicle Probes		
Number of Motor Buses equipped as probes on freeways?	NR	
Number of Motor Buses equipped as probes on arterials?	NR	
Have Organized Regional Incident Management Program?	Yes	
Have Automated Traveler Information System?	Yes	
<u>Services Automated Traveler Info. System Applies:</u>		

Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
Fixed Route	Yes	
Heavy Rail	No	
Light Rail	No	
Demand Responsive	No	
Commuter Rail	No	
Ferry	No	
Locations where traveler information is displayed to public		
Number of bus stops on fixed transit routes	NR	NR
Bus stops on fixed transit routes that display traveler info to the public	NR	NR
Number of rail stations	NR	NR
Number of rail stations that display traveler information	NR	NR
Number of other locations that display traveler information to public	NR	NR
Number of vehicles the traveler information system has available		
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
Deployment of Communications Technology		
<i>Attributes of Radio System:</i>		
Digital?	No	
Analog?	Yes	
Trunked?	Yes	
Regular?	No	
Services that use a Digital or Trunked Radio System		
<i>Digital Only</i>		
Fixed Route Bus	No	No
Heavy or Rapid Rail	No	No
Light Rail	No	No
Demand Responsive	No	No
Commuter Rail	No	No
Ferry Boat	No	No
<i>Trunked Only</i>		
Fixed Route Bus	No	No
Heavy or Rapid Rail	No	No
Light Rail	No	No
Demand Responsive	No	No

Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
Commuter Rail	No	No
Ferry Boat	No	No
Have of plan to have Automatic Passenger Counters (APCs)?	Yes	
Methods used to count passengers		
Treadle Mats	No	
Infrared Beams	Yes	
Primary and Secondary Location Technologies Used		
<i>Primary Technologies</i>		
GPS	No	No
Differential GPS	No	No
Signpost/Odometer	No	No
Dead_Reckoning	No	Yes
LORAN C	No	No
Other	No	No
<i>Backup Technologies</i>		
GPS	No	No
Differential GPS	No	Yes
Signpost/Odometer	No	No
Dead_Reckoning	No	No
LORAN C	No	No
Other	No	No
Number of Vehicles with APCs		
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
Remote Real-Time Monitoring and Computer Assisted Dispatching		
<i>Remote Real-Time Monitoring</i>		
Fixed Route Bus	400	400
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
<i>Automated Dispatching or Control Software</i>		
Fixed Route Bus	1,380	1,600

Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	165	165
Commuter Rail	NR	NR
Ferry Boat	NR	NR
Coordinate or plan to coordinate travel request and vehicle dispatching for multiple agencies?	NR	
Is there or will there be a Transportation Management Center (TMC) in the region that controls transit and highway modes?	Yes	
Modes that TMC currently controls:		
Highways	Yes	No
Fixed Route Bus	Yes	No
Heavy or Rapid Rail	No	No
Light Rail	No	Yes
Demand Responsive	Yes	No
Commuter Rail	No	No
Ferry Boat	No	No
Other	No	No
Priority at Traffic Signals and Ramp Meter Priority		
<u>Priority at Traffic Signals</u>		
Fixed Route Bus	NR	1,600
Light Rail	NR	NR
Demand Responsive	NR	NR
<u>Ramp Meter Priority</u>		
Fixed Route Bus	NR	NR
Demand Responsive	NR	NR
Number of Vehicles Equipped with Navigation Aids		
Fixed Route Bus	NR	NR
Heavy or Rapid Rail	NR	NR
Light Rail	NR	NR
Demand Responsive	NR	NR
Commuter Rail	NR	NR
Ferry Boat	NR	NR
ITS Standards Used Related to Transit Management		
TCIP On Board Objects (TCIP-OB)	Yes	
TCIP Traffic Management Objects (TCIP-TM)	No	
TCIP Common Public Transportation Objects (TCIP-CPT)	No	

Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
TCIP Passenger Information Objects (TCIP-PI)	No	
TCIP Incident Management Objects (TCIP-IM)	No	
TCIP Fare Collection Objects (TCIP-FC)	No	
TCIP Spatial Representation Objects (TCIP-SP)	No	
TCIP Control Center Objects (TCIP-CC)	No	
TCIP Scheduling/Runcutting Objects (TCIP-SCH)	No	
Send data communication between micro computer and heavy duty vehicle applications (SAE J1708)	No	
Would agency be willing to participate in testing of ITS Standards?	Yes	
Have agreements in place with other agencies to use similar hardware and software to aid maintenance and interoperability?	Yes	
Electronic Fare Payment		
Have full operational Electronic Fare Payment System?	Yes	
<u>Methods of Fare Payment</u>		
<u>Stored value card with fare deducted for each trip</u>		
Magnetic Stripe	Yes	
Smart Card	No	
Debit Card	No	
<u>Billed by the month for trips taken</u>		
Magnetic Stripe	No	
Smart Card	No	
Credit Card	No	
<u>Monthly Pass</u>		
Magnetic Stripe	No	
Smart Card	No	
Vehicles/Stations Equipped with Automated Payment Mechanism		
<u>Magnetic Stripe Readers</u>		
Fixed Route Bus Vehicles	1,380	1,600
Heavy or Rapid Rail Stations	NR	NR
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<u>Smart Card Readers</u>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	NR	NR
Light Rail Stations	NR	NR

Transit Management
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

	Metro Transit Authority	
	1999	2005
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<i>Credit Card</i>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	NR	NR
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
<i>Debit Card</i>		
Fixed Route Bus Vehicles	NR	NR
Heavy or Rapid Rail Stations	NR	NR
Light Rail Stations	NR	NR
Demand Responsive Vehicles	NR	NR
Commuter Rail Stations	NR	NR
Ferry Boat Landings	NR	NR
NR: No Response		

Appendix J
Transit Management Integration

Transit Management Integration
 Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Metro Transit Authority	
	1999	2005
Agency Returned Survey?	Yes	
<u>Transit operators in the region that use the same electronic payment system</u>	None listed	
<u>Toll operators from whom you accept electronic payment of transit fare through the use of ETC media</u>	None listed	
<u>Receiving real-time information via electronic means from others</u>		
<i>Freeway Management agencies from which your agency receives freeway travel times, speeds, and conditions</i>		
<i>Receive Information</i>	Texas Department of Transportation-Houston District	None listed
<i>Share Infrastructure</i>	Texas Department of Transportation-Houston District	None listed
<i>Arterial Management agencies from which your agency receives arterial travel times, speeds, and conditions</i>		
<i>Receive Information</i>	Harris County, Houston City, Texas Department of Transportation-Houston District	Baytown City, Fort Bend County, Galveston City, Montgomery County, Pasadena City
<i>Share Infrastructure</i>	Harris County, Houston City, Texas Department of Transportation-Houston District	Baytown City, Fort Bend County, Galveston City
<i>Incident Management agencies from which your agency receives incident severity, location, and type</i>		
<i>Receive Information</i>	Texas Department of Transportation-Houston District	None listed
<i>Share Infrastructure</i>	Texas Department of Transportation-Houston District	None listed

Appendix K
Transit Management Information Collection and Dissemination

Data Collection and Dissemination: Transit Management
Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Metro Transit Authority	
	1999	2005
Agency Returned Survey?	Yes	
Methods used to disseminate transit information to the public		
Technologies your agency uses to disseminate:		
Transit routes, schedules and fares	Telephone System	E-mail or other direct PC communication, Kiosks, Internet Web Sites
Real-time transit schedule adherence or arrival and departure times	NR	Kiosks
Technologies employed by other organization receiving your data		
Transit routes, schedules and fares	NR	NR
Real-time transit schedule adherence or arrival and departure times	NR	NR
Internet web site reporting transit routes, schedules and fare, etc.	www.hov-metro.harris.tx.us	
Telephone system for reporting transit information to the public	713-635-5000	
Organizations your agency sends information for dissemination to the public	NR	
Data collected, archived, and/or transferred to another agency		
Collected by your agency	Incidents	Passenger information (e.g., surveys, O/D), Trip itinerary planning records, Passenger count, Vehicle time and location
Archived by your agency	Incidents	Passenger information (e.g., surveys, O/D), Trip itinerary planning records, Passenger count, Vehicle time and location
Transferred to another agency by your agency	Incidents	Passenger information (e.g., surveys, O/D), Trip itinerary planning records, Passenger count, Vehicle time and location
Importance of making information available to the public		
Ranked High	Incidents, Passenger information (e.g., surveys, O/D), Trip itinerary planning records, Passenger count, Vehicle time and location	
Ranked Medium	NR	
Ranked Low	NR	
Groups that make requests for the data	Federal DOT personnel, Universities	
What is the data used for?	Planning, Traffic analysis	

Appendix L
Emergency Management

Emergency Management Agencies for Metropolitan Area: Houston, Galveston, Brazoria

Agency Name	Total Vehicles		Navigation Capabilities		AVL		CAD		CAD Equipped with Mobile Data Terminal		Vehicles Equipped with Preemption		Participate in Formal Incident Mgt Program	Send Incident Info to other agencies	List of agencies receiving data
	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005	1999	2005			
Baytown City Emergency Management	3	4	0	0	0	0	3	4	0	4	3	4	No	Yes	Texas Department of Health, Austin, Texas
Baytown City Fire & Rescue	5	6	0	6	0	6	0	6	0	6	5	6	Yes	No	None listed
Baytown City Police Department	80	80	0	0	0	0	0	0	NR	NR	0	0	Yes	No	None listed
Brazoria County Sheriff's Department	23	NR	0	0	0	0	23	0	NR	NR	0	0	Yes	No	None listed
Chambers County Sheriff's Department	26	NR	0	NR	0	NR	0	NR	0	NR	0	NR	No	No	None listed
Fort Bend Ambulance	15	17	NR	NR	NR	NR	14	17	NR	NR	10	12	No	No	None listed
Fort Bend County Sheriffs Department	183	195	0	45	0	45	0	0	27	45	0	0	Yes	Yes	TCIC, TRAX, Email
Galveston County Fire Department	18	NR	0	NR	0	NR	0	NR	NR	NR	0	NR	Yes	No	None listed
Galveston County Police Department	53	NR	0	NR	0	NR	53	NR	NR	NR	0	NR	Yes	No	None listed
Galveston County Sheriff's Department	110	NR	0	NR	0	NR	0	NR	NR	NR	0	NR	Yes	Yes	None listed
Harris County Sheriff's Department	565	800	0	0	0	0	7	400	NR	NR	0	0	Yes	Yes	Greater Houston Incident Management Plan
Houston City Fire Department	277	NR	0	NR	148	NR	259	NR	NR	NR	130	NR	Yes	No	None listed
Houston City Police Department	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	Yes	Yes	None listed
Liberty County Sheriff's Department	31	42	1	12	0	0	0	35	NR	NR	0	4	Yes	Yes	Liberty County Emergency Management, Texas Department of Public Safety
Liberty Fire Department	13	NR	0	NR	0	NR	0	NR	0	NR	0	NR	Yes	No	None listed
Montgomery County Sheriff's Department	250	1,000	0	1,000	0	1,000	0	1,000	0	1,000	0	750	No	No	None listed
Pasadena City Fire Department	32	NR	0	NR	0	NR	32	NR	0	NR	0	NR	Yes	Yes	Harris County Report, TexasFIRS
Pasadena City Police Department	146	175	0	0	0	0	146	175	0	0	0	0	Yes	No	None listed