

Table 1.3. ITS Data Relevant for Multiple (Nonreal-Time) Uses

Ref. No.			Features of the Data Source			Real-time uses	Possible multiple uses of ITS-generated data
	ITS data source	Primary data elements	Typical collection equipment	Spatial coverage	Temporal coverage		
FREEWAY AND TOLL COLLECTION							
1	Freeway traffic flow surveillance data	! volume ! speed ! occupancy	! loop detectors ! video imaging ! acoustic ! radar/ microwave	Usually spaced at <= 1 mile; by lane	Sensors report at 20-60 second intervals	! ramp meter timing ! incident detection ! congestion/queue identification	! Congestion monitoring ! Link speeds for TDF and air quality models ! AADT, K- and D-factors ! Saturation flow rates ! Pre-planned TMC operations
		! vehicle classification ! vehicle weight	! loop detectors ! WIM equipment ! video imaging ! acoustic	Usually 50-100 per state; by lane	Usually hourly	Pre-screening for weight enforcement	! Truck percents by time of day for TDF and air quality models ! Truck flow patterns ! Pavement loadings
2	Ramp meter and traffic signal preemptions	! time of preemption ! location	Field controllers	At traffic control devices only	Usually full-time	Priority to transit, HOV, and EMS vehicles	Network details for microscopic traffic simulation models (e.g., TRAF, TRANSIMS)
3	Ramp meter and traffic signal cycle lengths	! begin time ! end time ! location ! cycle length	Field controllers	At traffic control devices only	Usually full-time	Adapt traffic control response to actual traffic conditions	! Network details for microscopic traffic simulation models (e.g., TRAF, TRANSIMS) ! Pre-planned TMC operations
4	Visual and video surveillance data	! time ! location ! queue length ! vehicle trajectories ! vehicle classification ! vehicle occupancy	! CCTV ! aerial videos ! image processing technology	Selected locations	Usually full-time	! coordinate traffic control response ! congestion/queue identification ! incident verification	! Congestion monitoring ! Car-following and traffic flow theory
5	Vehicle counts from electronic toll collection	! time ! location ! vehicle counts	Electronic toll collections equipment	At instrumented toll lanes	Usually full-time	Automatic toll collection	Traffic counts by time of day
6	TMC generated traffic flow metrics (forecasted or transformed data)	! link congestion indices ! stops/delay estimates	TMC software	Selected roadway segments	Hours of TMC operation	! incident detection ! traveler information ! preemptive control strategies	! congestion monitoring ! effectiveness of prediction methods
ARTERIAL AND PARKING MANAGEMENT							
7	Arterial traffic flow surveillance data	! volume ! speed ! occupancy	! loop detectors ! video imaging ! acoustic ! radar/ microwave	Usually midblock at selected locations only ("system detectors")	Sensors report at 20-60 second intervals	! progression setting ! congestion/queue identification	! congestion monitoring ! link speeds for travel forecasting models (free flow only) ! AADT, K- and D-factors

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8	Traffic signal phasing and offsets	! begin time ! end time ! location ! up/down-stream offsets	Field controllers	At traffic control devices only	Usually full-time	Adapt traffic control response to actual traffic conditions	Network details for microscopic traffic simulation models (e.g., TRAF, TRANSIMS)
9	Parking management	! time ! lot location ! available spaces	Field controllers	Selected parking facilities	Usually day time or special events	Real-time information to travelers on parking availability	Parking utilization and needs studies
TRANSIT AND RIDESHARING							
10	Transit usage	! vehicle boardings (by time and location) ! station origin and destination (O/D) ! paratransit O/D	Electronic fare payment systems	Transit routes	Usually full-time	Used for electronic payment of transit fares	! route planning/run-cutting ! ridership reporting (e.g., Section 15)
11	Transit route deviations and advisories	! route number ! time of advisory ! route segments taken	TMC software	Transit routes	Usually full-time	Transit route revisions	Transit route and schedule planning
12	Rideshare requests	! time of day ! O/D	CAD	Usually areawide	Day time, usually peak periods	Dynamic rideshare matching	! travel demand estimation ! transit route and service planning
INCIDENT MANAGEMENT AND SAFETY							
13	Incident logs	! location ! begin, notification, dispatch, arrive, clear, depart times ! type ! extent (blockage) ! HazMat ! Police accident rpt. reference ! cause	! CAD ! computer-driven logs	Extent of Incident Management Program	Extent of Incident Management Program	Incident response and clearance	! incident response evaluations (program effectiveness) ! congestion monitoring (e.g., % recurring vs nonrecurring) ! safety reviews (change in incident rates)
14	Train arrivals at Highway Rail Intersections	! location ! begin time ! end time	Field controllers	At instrumented HRIs	Usually full-time	! coordination with nearby traffic signals ! notification to travelers	Grade crossing safety and operational studies
15	Emergency vehicle dispatch records	! time ! O/D ! route ! notification, arrive, scene, leave times	CAD	Usually areawide	Usually full-time	Coordination of Emergency Management response	! Emergency management labor and patrol studies ! Emergency management route planning

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16	Emergency vehicle locations	! vehicle type ! time ! location ! response type	Automatic Vehicle Identification (AVI) or GPS equipment	Usually areawide	Usually full-time	! tracking vehicle progress ! green wave and signal preemption initiation	! Emergency management route planning ! Emergency management response time studies
17	Construction and work zone identification	! location ! date ! time ! lanes/shoulders blocked	TMC software			Traveler information	Congestion monitoring
COMMERCIAL VEHICLE OPERATIONS							
18	HazMat cargo identifiers	! type ! container/package ! route ! time	CVO systems	At reader and sensor locations	Usually full-time	! Identifying HazMat in specific incidents ! routes for specific shipments	! HazMat flows ! HazMat incident studies
19	Fleet Activity Reports	! carrier ! citations ! accidents ! inspection results	CVO inspections	N/A	Usually summarized annually	May overlap with SAFETYNET functions	
20	Cargo identification	! cargo type ! O/D	CVO systems	At reader and sensor locations	Usually full-time	Clearance activities	Freight movement patterns
21	Border crossings	! counts by vehicle type ! cargo type ! O/D	CVO systems	At reader and sensor locations	Usually full-time	Enforcement	Freight movement patterns
22	On-board safety data	! vehicle type ! cumulative mileage ! driver log (hrs. of service) ! subsystem status (e.g., brakes)	CVO systems	At reader and sensor locations	Usually full-time	Enforcement and inspection	Special safety studies (e.g., driver fatigue, vehicle components)
ENVIRONMENTAL AND WEATHER							
23	Emissions Management System	! time ! location ! pollutant concentrations ! wind conditions	Specialized sensors	Sensor locations	Usually full-time	Identification of hotspots and subsequent control strategies	! trends in emissions ! special Air Quality studies
24	Weather data	! location ! time ! precipitation ! temperature ! wind conditions	Environmental sensors	At sensor locations	Usually full-time	Traveler information	! congestion monitoring (capacity reductions) ! freeze/thaw cycles for pavement models
VEHICLE AND PASSENGER INFORMATION							

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25	Location referencing data	Special case; pertains to all location references in ITS and planning					Need conversion from lat/long to highway distance and location (e.g., milepost references for queue lengths)
26	Probe data	! vehicle ID ! segment location ! travel time	! probe readers and vehicle tags ! GPS on vehicles	GPS is areawide; readers restricted to highway locations	Usually full-time	! coordinate traffic control response ! congestion/queue identification ! incident detection ! real-time transit vehicle schedule adherence ! electronic toll collection	! congestion monitoring ! link speeds for travel forecasting models ! historic transit schedule adherence ! traveler response to incidents or traveler information ! O/D patterns
27	VMS messages	! VMS location ! time of msg ! msg content	TMC software	VMS locations	Hours of TMC operation	Traveler information	Effects of VMS message content on traveler response
28	Vehicle trajectories	! location (route) ! time ! speed ! acceleration ! headway	! AVI or GPS equipment ! advanced video image processing	AVI restricted to reader locations; GPS is areawide	1-10 second intervals	Collected as part of surveillance function	! Traffic simulation model calibration for local conditions (driver type distributions) ! Modal emission model calibration ! Traffic flow research
29	TMC and Information Service Provider generated route guidance	! time/date ! O/D ! route segments ! estimated travel time	TMC/Information Service Provider software	Usually areawide	Hours of TMC operation	Traveler information	! O/Ds for travel demand forecasting model inputs ! Interzonal travel times for travel demand forecasting model calibration
30	Parking and roadway (congestion) pricing changes	! time/date ! rte. segment/lot ID ! new price	TMC software	Facilities subject to variable pricing	Hours of TMC operation	Demand management	! Special studies of traveler response to pricing ! Establishment of pricing policies