Traffic Operations
Solutions to Traffic Congestion
and Future Trends

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1. Traffic operations and why we have congestion
2. Solutions to traffic congestion
3. Future Trends

Major parts of traffic operations

- Freeway operations and FMS
- Arterial / urban operations and UTC
- Incident and accident management
- Intelligent transport systems, ITS
- Agencies, institutions, cooperation

Why do we have congestion?

Reality Check . . .

Large (500,000+) Urbanized Areas with the Most and Least per Capita Travel in 2001

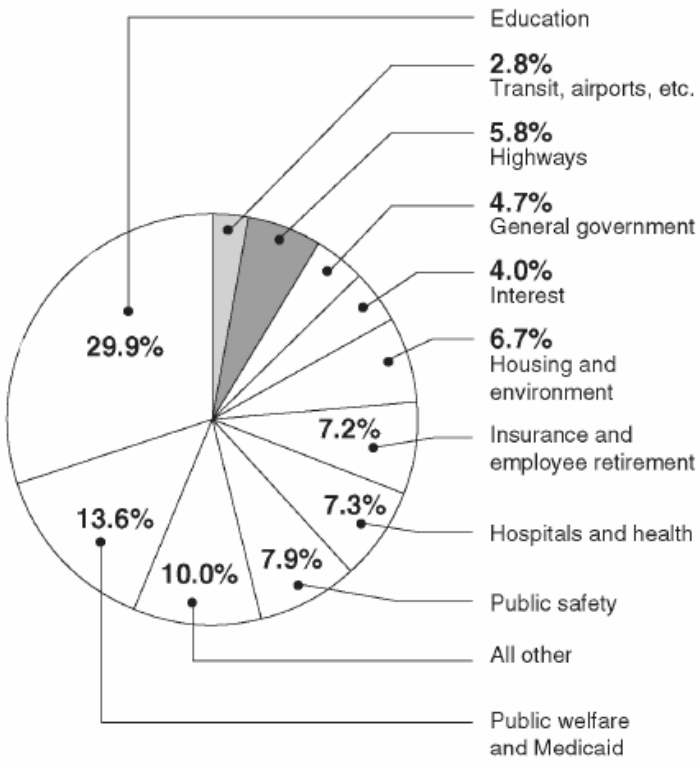
RANK	URBANIZED AREA NAME	STATE LOCATION	MILES OF ROADWAY PER 1,000 PERSONS	TOTAL DVMT PER CAPITA	AVERAGE DAILY TRAFFIC/ FREEWAY LANE
1	Houston	TX	6.1	37.6	18,174
2	Atlanta	GA	4.7	35.6	19,031
3	Birmingham	AL	6.9	34.8	12,847
4	Nashville	TN	4.4	34.3	13,763
5	Indianapolis	IN	4.7	33.6	16,911
6	Austin	TX	5.2	32.9	16,424
46	**Los Angeles**	**CA**	**2.1**	**22.2**	**23,123**
65	Philadelphia	PA	3.1	18.4	14,656
66	**Honolulu**	**HI**	**1.5**	**16.8**	**14,014**
67	New York-Northeastern NJ	NY	2.2	15.7	15,329
68	New Orleans	LA	3.1	14.4	13,478
69	San Juan	PR	2.2	13.4	15,557

Source: Highway Statistics, 2002

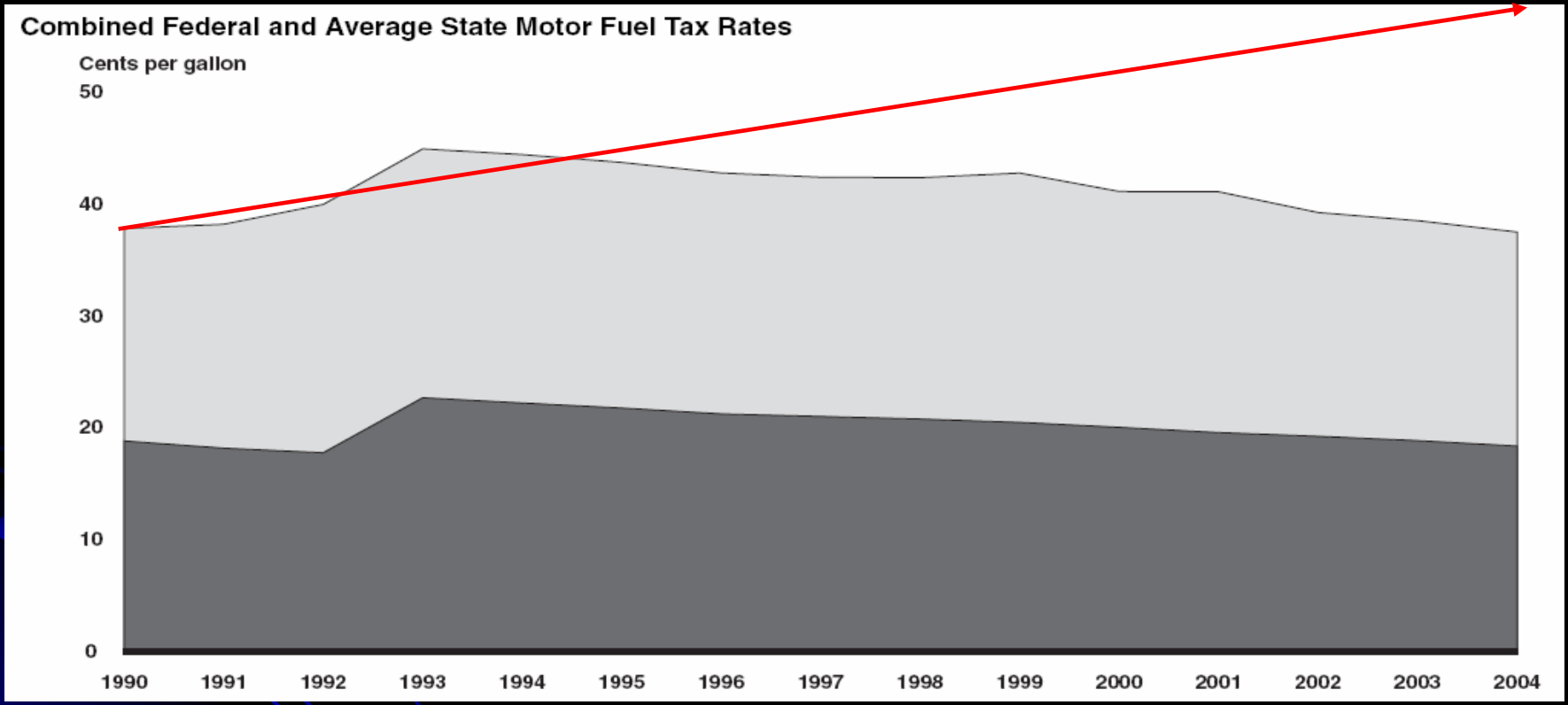
2003 GAO report: 25 states spend fewer than **$3.76** per $1,000 of Gross State Product in transportation. Hawaii is one of them.

GAO
Accountability * Integrity * Reliability

Total State and Local Expenditures by Program Category - 2000



There is not enough $$$ in state, fed hwy. funds



GAO-06-554 – 2004 constant prices

POOR CHOICES & BAD POLICIES (1/2)

2001 metro area trips in the U.S.: Auto = 96.4%
Public Transit = 3.2%

Freeway growth: 3,066 new miles in 1966
64 miles in 2004

1993→2003 increase in rail miles = 27%
increase in hwy miles = 3%

Today public transit gets 20% of all federal, state, regional and local surface transportation expenditures and serves 3% of the trips!

POOR CHOICES & BAD POLICIES (2/2)

86% of low income households (HH) own at least one auto

2000 U.S. Census:

- 38% of workers in HH without auto commute to work by auto!!! (carpool, borrowed car, temp. company car, etc.)
- Poor metropolitan workers choose auto 11:1 to PT

Auto is the best tool out of welfare. Bus a distant second.
Rail no good → access to too few jobs.

Historical trends in national highways

	Expenditures, billion 2001 $	Hwy. travel in billion vehicle-miles	Hwy. funds per 10 miles (one veh. trip)
1961	**52**	**700**	**$ 0.7**
1971	**75**	**1200**	**$ 0.6**
1981	**71**	**1600**	**$ 0.4**
1991	**90**	**2200**	**$ 0.4**
2001	**123**	**2800**	**$ 0.4**
2004	**128**	**3000**	**$ 0.4**

Source: FHWA

Historical trends in national transit

	Expenditures, billion 2001 $	Passenger trips, billion	Cost per trip
1961	**7.4**	**8.8**	**$ 0.8**
1971	**8.0**	**6.8**	**$ 1.2**
1981	**22.2**	**8.3**	**$ 2.7**
1991	**27.0**	**8.6**	**$ 3.1**
2001	**36.7**	**9.7**	**$ 3.8**
2003	**39.8**	**9.4**	**$ 4.2**

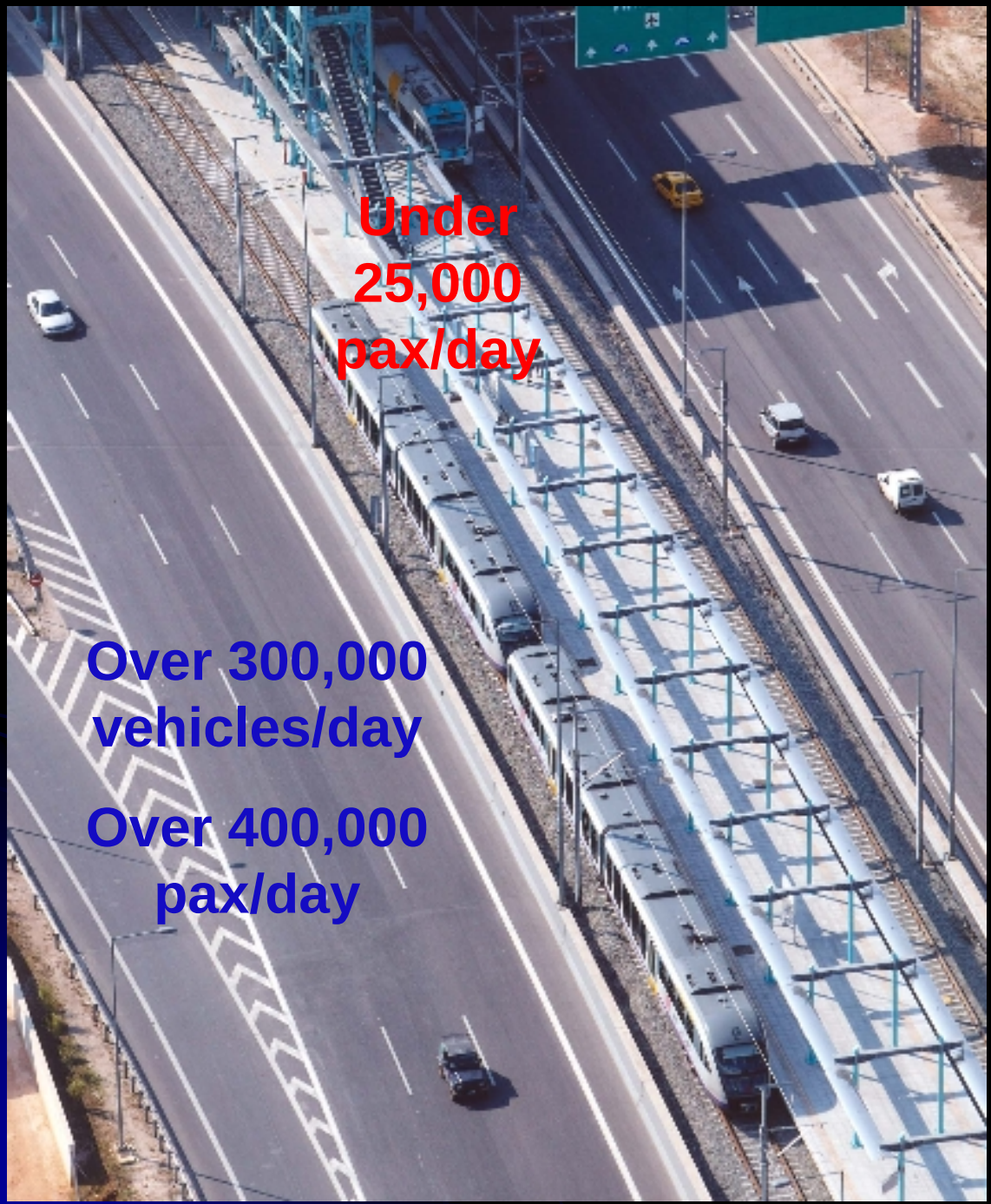
Source: APTA

"The national discrepancy in transportation investment."

(1) In over 40 years the U.S. doubled in population but transit trips remained the same. Funding for these trips grew 5.3 times!

(2) At the same time, highway use increased 4.2 times, but funding grew only 2.5 times!

(3) Average trip by transit costs 10 times more!



***Suburban Railway*, or Europe's most expensive limousine service.**

300 seats per train occupied by 30 or fewer passengers, if there are any passengers in the train!

The City says its goal is to provide "mobility" so let's see why we're "mobile" during a day …

	Trips by Rail?
❖ Commutes (workers and students)	under 10%
❖ Personal (errands, entertainment)	under 1%
❖ Household (groceries, rides to children, elders)	nil
❖ Cargo, freight and heavy goods	none
❖ Mail and package delivery	none
❖ Visitor travel to attractions	nil
❖ Access to airport	nil *
❖ Access to ports and harbors	none
❖ Service, repair and household deliveries	none
❖ Social services to people	nil
❖ Emergency services and evacuations	none

Under 1% overall!

This is why the FTA says that rail is not a solution to traffic congestion.

(*) Some use, mostly by some business travelers and airport staff.

Auto provides fast access to work, school, goods, services and entertainment.

Average Trip Length → Auto = 11.8 mi PT = 12.4 mi
Average Travel Time → Auto = 22.9 min PT = 56.0 min

The simple math of why rail fails to solve congestion and makes it worse:

Say, rail will be done in 10 years, and that between now and then, there will be 30,000 new commuters on Oahu.

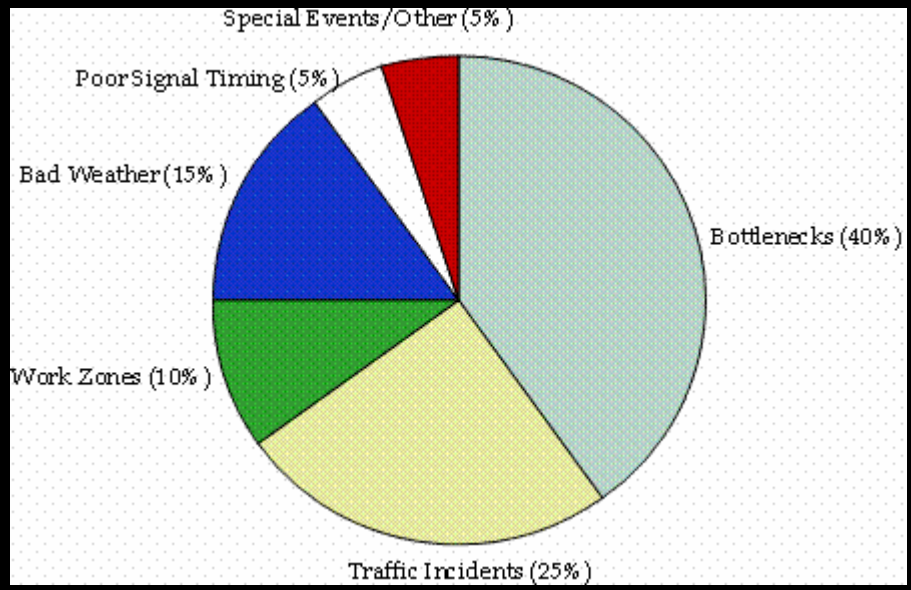
At the very best, 10% of them will use rail. So we will gave 3,000 new rail riders and 27,000 new motorists.

The bottom line is:

- **Nationally rail is a costly underachiever**
- **Up to know we were using nearly 90% of the transportation funds for highway projects and maintenance**
- **Come 2007, 60% of Oahu transport funds will be sunk into rail to serve less than 10% of passengers and none of the freight**
- **Rail won't reduce congestion**
- **Let's see what will …**

Small and large solutions to traffic congestion

Fundamental Causes of Congestion



Need to:

* relieve bottlenecks

** improve traffic signals

*** expedite incident clearance

**** better control for special events

Near-Term Solutions: Improvements to H-1 freeway

Objective: Remove bottlenecks
Result: 30% reduction in travel time

- Add a lane to the Kalihi St. “choker” on both directions
- ✓ Add lane between Liliha St. on ramp and Pali Hwy. off-ramp
- ✓ Lunalilo St. on-ramp rerouting
- 4-lane viaduct past Vineyard and Ward on-ramps
- Selective ramp metering
- ✓ Waimalu widening
- PM zipper lane (Aloha Stadium to Mililani)

Near-Term Solutions: Other Actions (1 of 3)

Contraflow along Dillingham Blvd. – Traffic simulation in 1991 estimated a capacity gain from the existing level of 1,440 vehicles per hour to 2,160 vph

Improve traffic signal timings and coordination – Los Angeles uses a computerized signal control system. It manages 1,170 intersections and 4,509 detectors (*FHWA*):

- 13% ↓ in fuel consumption
- 14% ↓ in emissions
- 41% ↓ in vehicle stops
- 18% ↓ in travel time
- 16% ↑ in average speed
- 44% ↓ in delay

Near-Term Solutions: Other Actions (2 of 3)

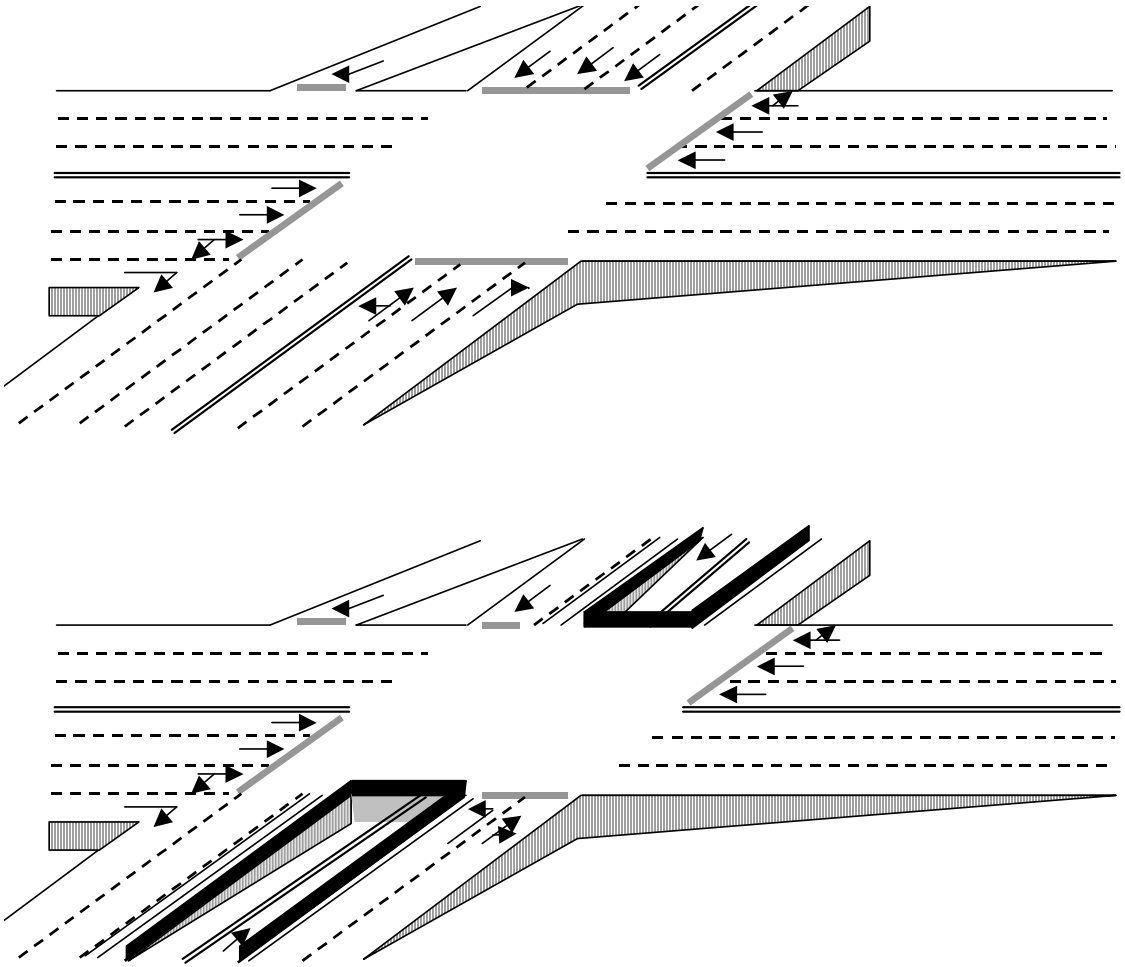
- Encourage 4x10 work shifts for a 5% to 10% reduction in peak hour traffic
- Shift start time of some large schools to reduce peak traffic: All high schools and UH-Manoa: 9 am
- Clear accidents faster, and manage major disruptions to traffic flow

Near-Term Solutions: Other Actions (3 of 3)

- Nimitz Viaduct (2 or 3 reversible lanes)

EA approved, $$$ on hand → mothballed due to the "rail proposal"

- Grade separation at "maxed out" intersections



- Kapiolani and Kalakaua intersection
- Expected cost: $5 million
- Expected benefits: $2 million/year in AM and PM savings alone for 250 days per year (value of time = $7.8/hr and fuel price=$1.5/gln in 2001)
- Key difficulties: traffic during construction and utilities

Ramp Metering

FREEWAY MANAGEMENT SYSTEMS

Freeway management systems employ traffic detectors, surveillance cameras, and other means of monitoring traffic flow on freeways to support the implementation of traffic management strategies such as ramp meters, lane closures, and variable speed limits

Benefits

A study of the six-week shutdown of the ramp meters in Minneapolis-St. Paul, Minnesota, found that ramp meters were responsible for:

- 21% crash reduction
- 10% increase in the volume of traffic accommodated by freeways
- 22% decrease in travel times

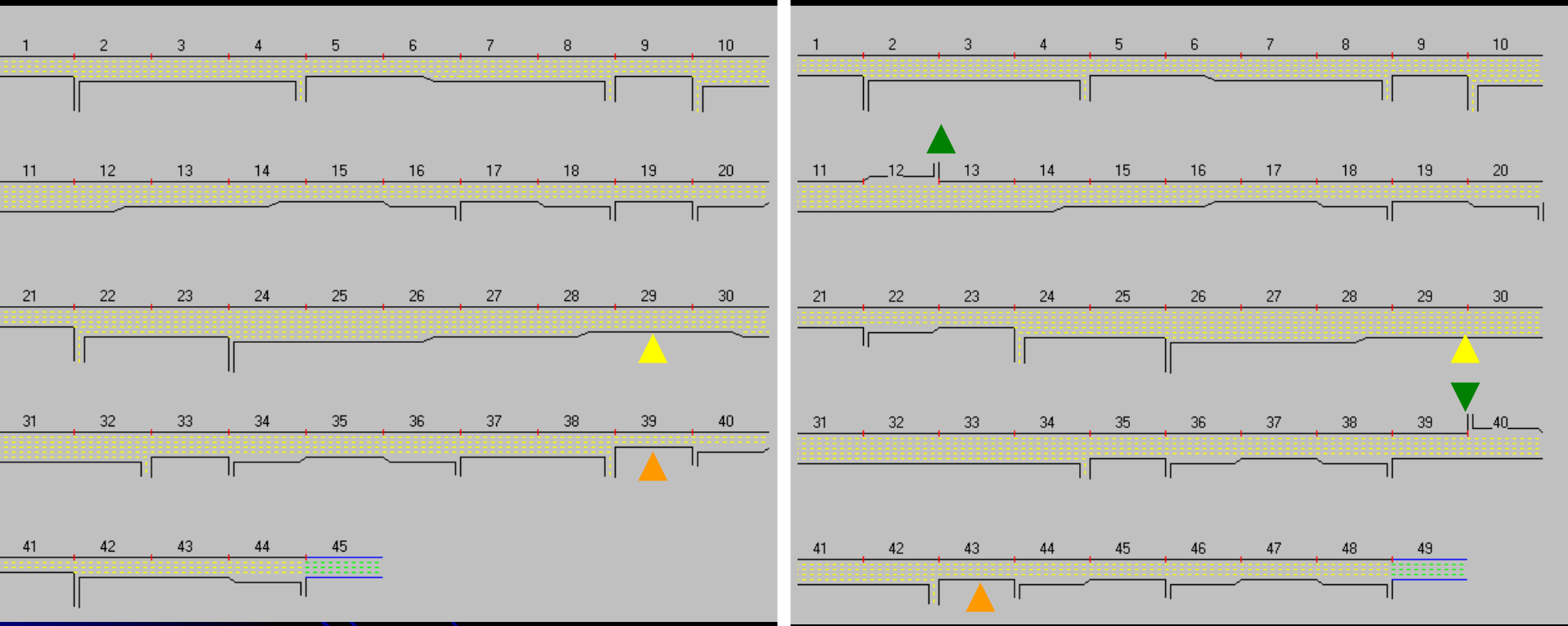
Costs

Colorado DOT (CDOT) has implemented ramp metering to regulate the flow of traffic onto freeways as part of the T-REX each site installed (Transportation Expansion) project.

Cost: **$50,000** for each site installed with controller (2001)

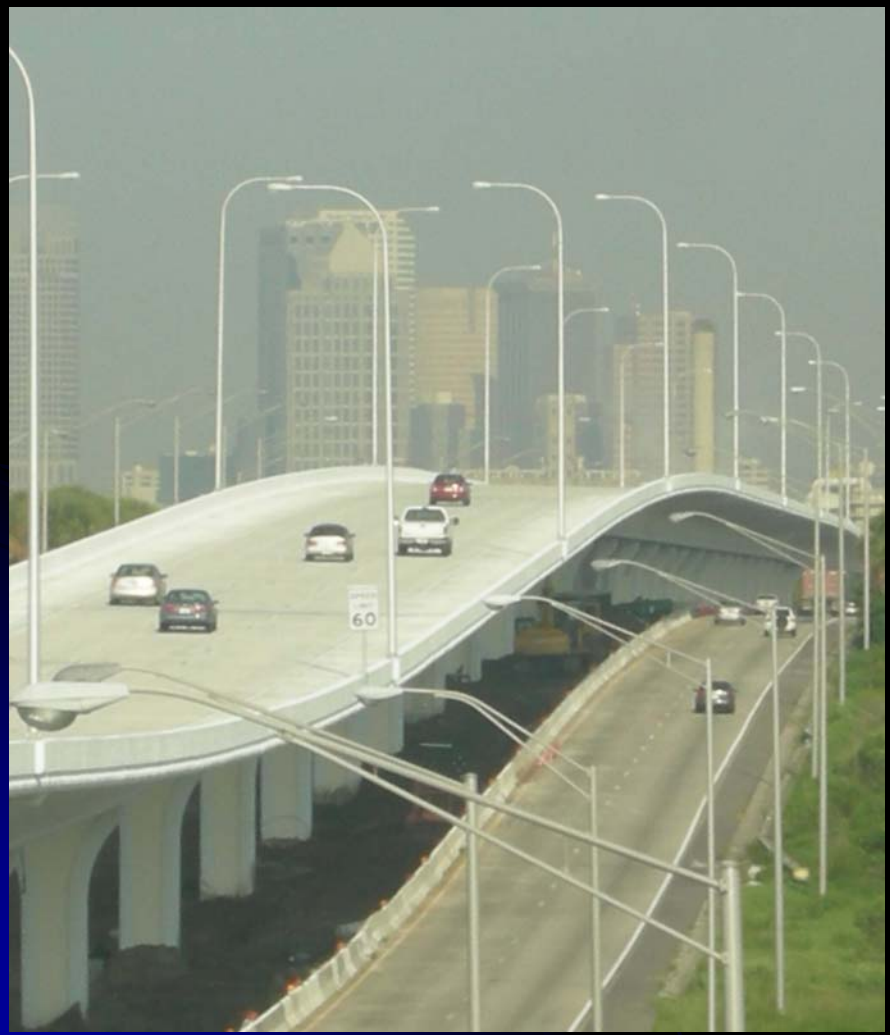
H-1 to Leeward Oahu

WW + W4 + Z_{PM} = -31%



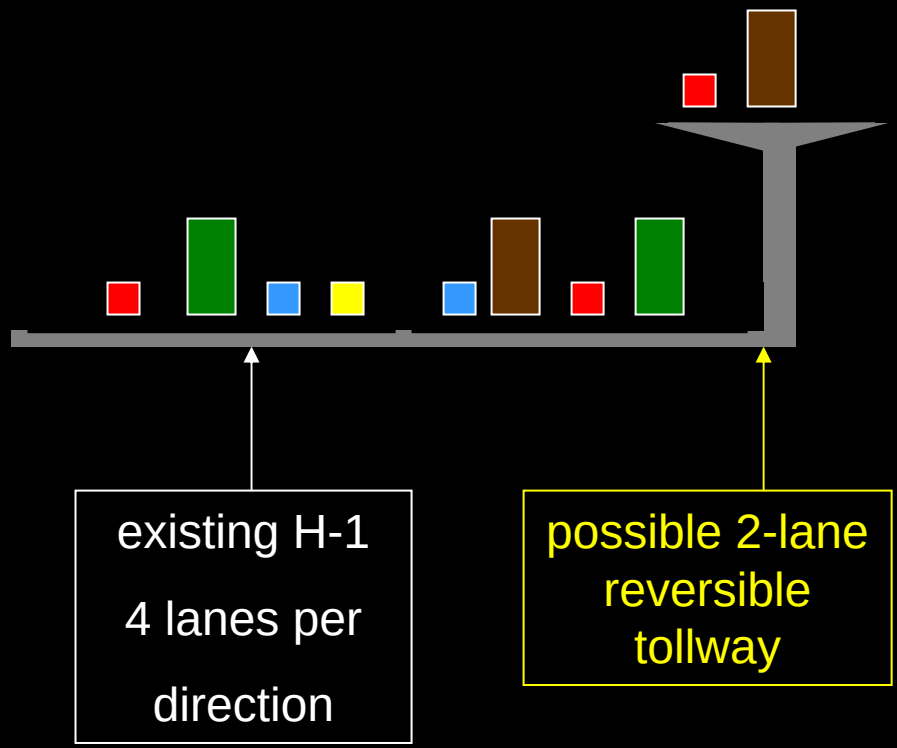
Tampa, FL Reversible Tollway

"6 lanes in 6 feet"

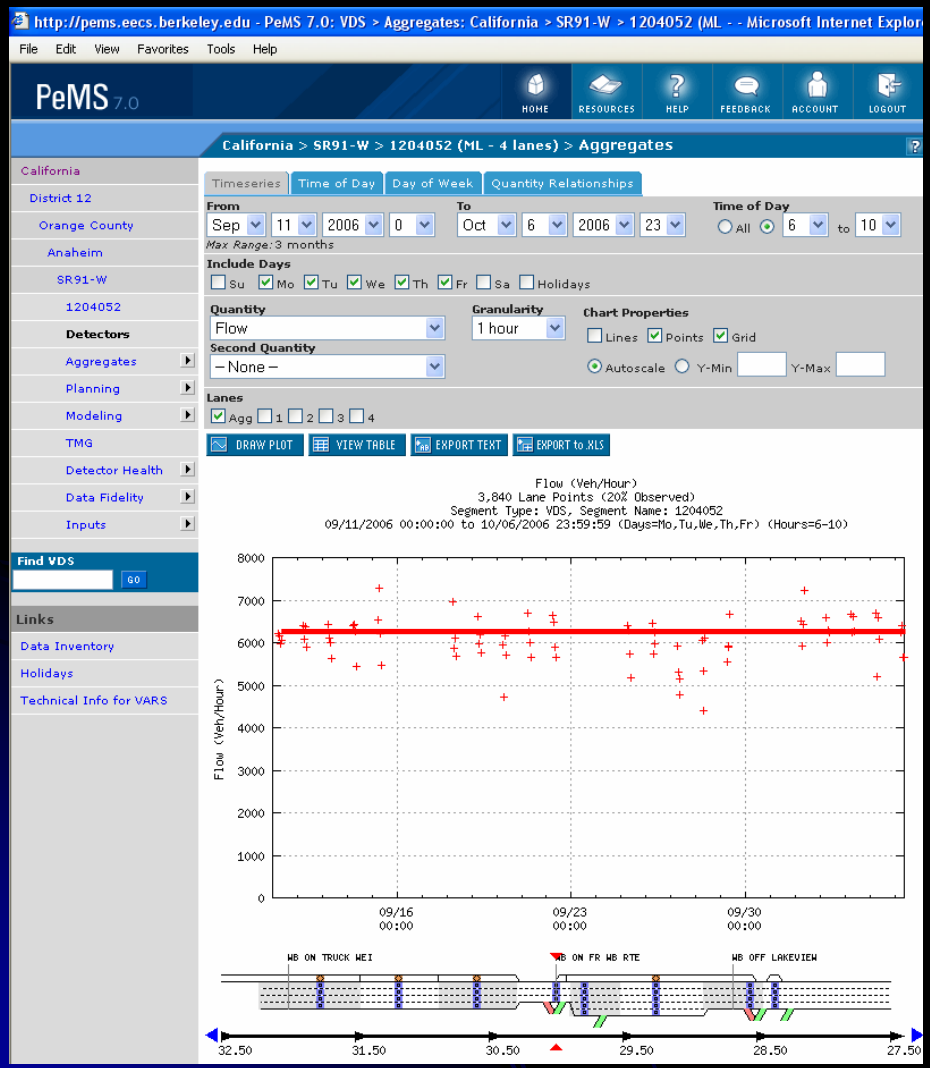


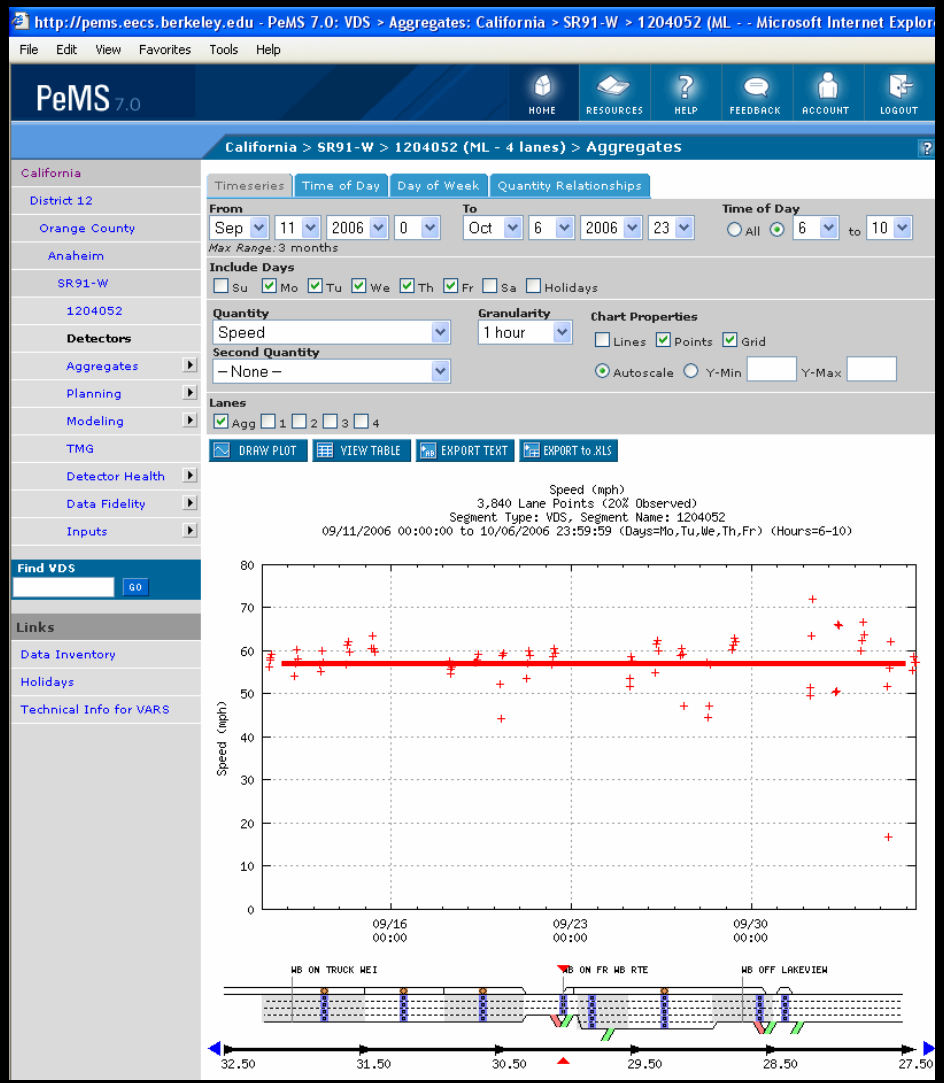
I-495 Capital Beltway

ASCE: **"Virginia DOT may have found a solution to the congestion on I-495."** Under the state's Public-Private Transportation Act, they will add two HOT lanes per direction



Toll Expressways consistently deliver 2,000 cars per hour per lane at 55 mph → SR-91W (Sept-Oct, 2006)

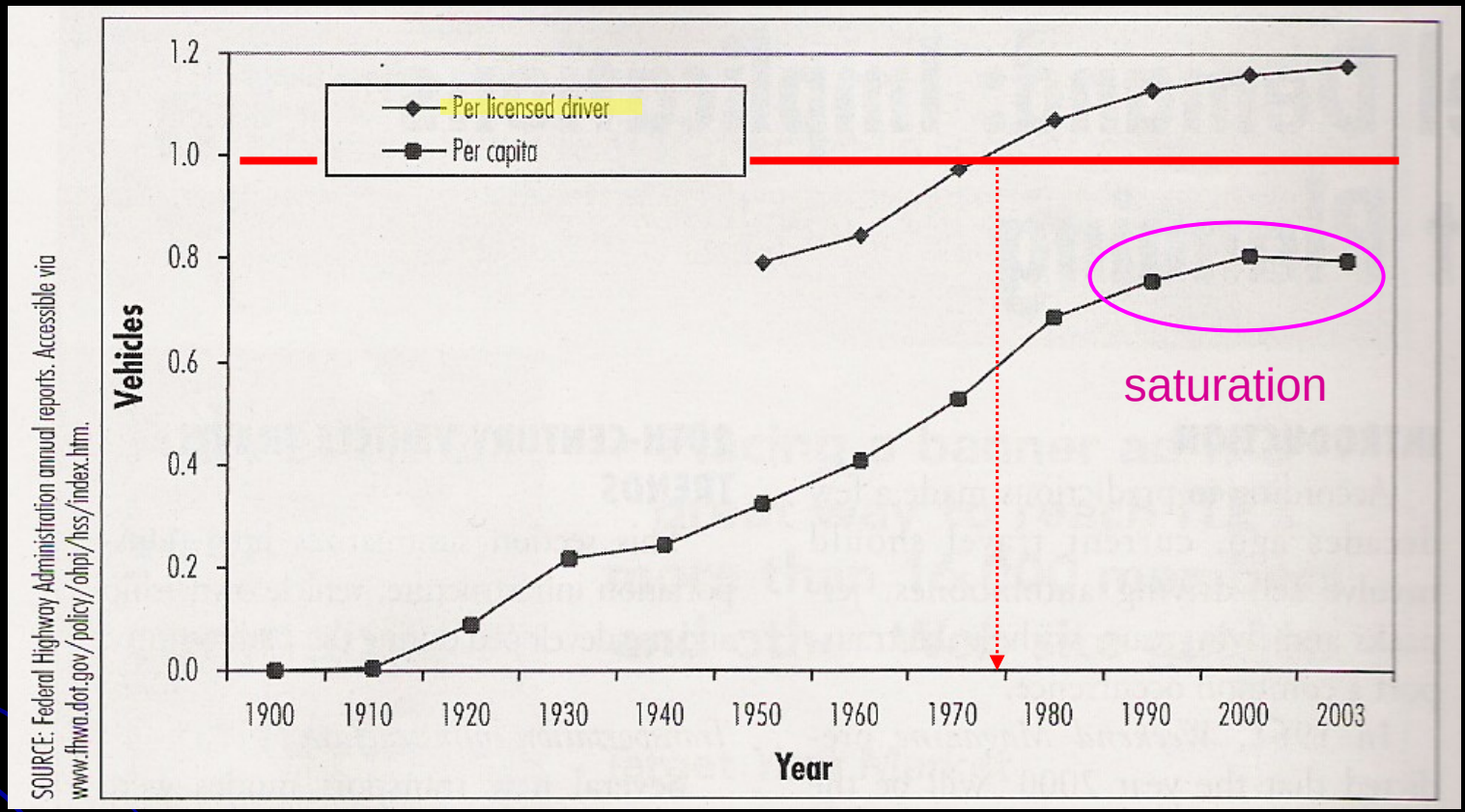




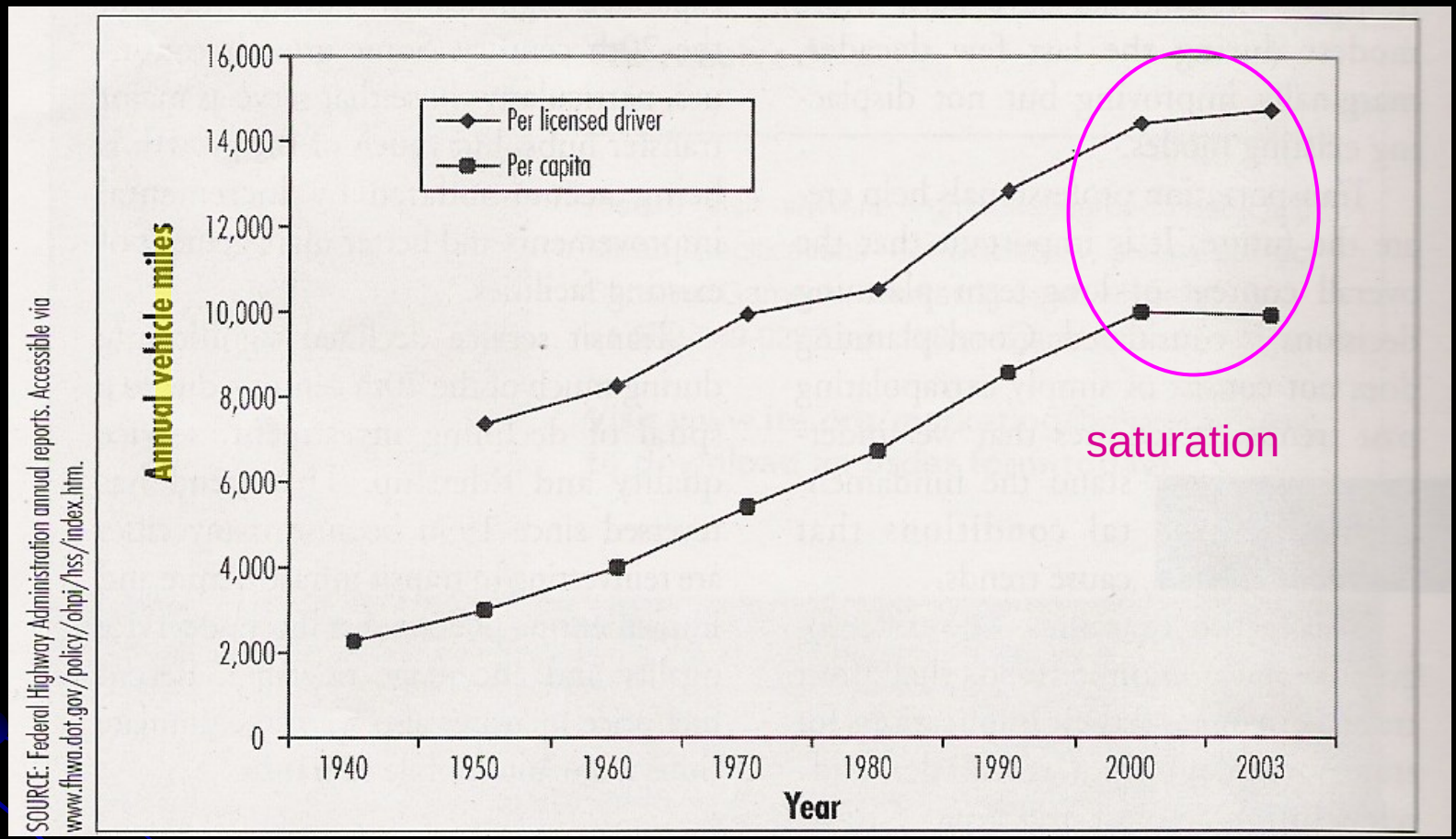
Future Trends

Sample Trends Related to Congestion

- Cars per driver, and car usage have reached saturation
- Aging of the nation will naturally reduce VMT, or at least peak period VMT
- Technology has many effective ways to deal with energy issues



(*ITE Journal*, Sept. 2006)



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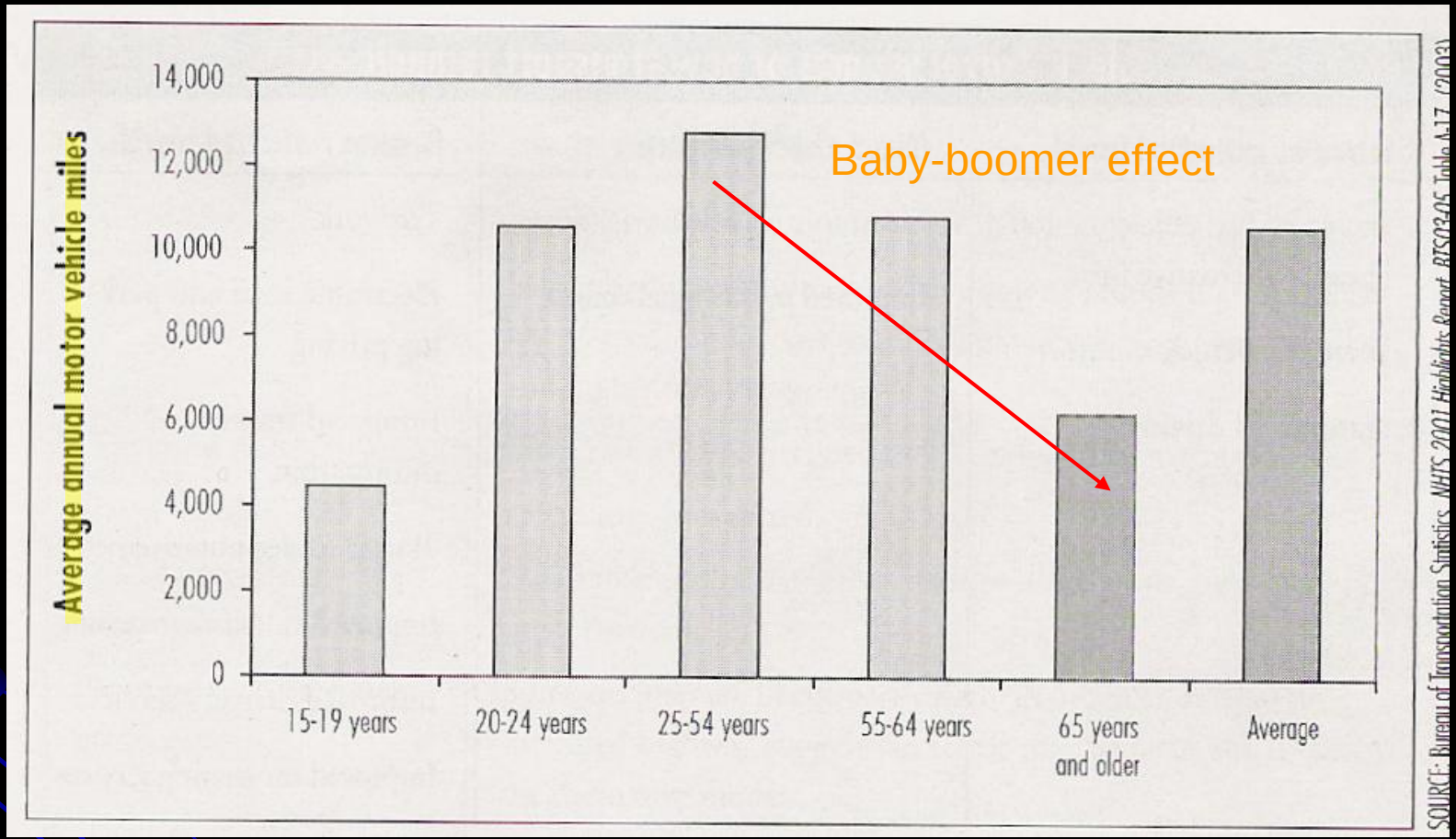

(*ITE Journal*, Sept. 2006)

Energy to transport one person one mile:

Auto = 3,593 BTU

Rail = 3,687 BTU

(U.C.-Berkeley)

HONDA ACCORD V6 HYBRID
10.3 gallons of regular gas at $2.599
34 mpg vs. EPA highway rating of 34 mpg

TOYOTA PRIUS
8.3 gallons of regular gas at $2.599
42 mpg vs. EPA highway rating of 51 mpg

VOLKSWAGEN JETTA TDI
7.0 gallons of B20 biodiesel at $2.749
50 mpg vs. EPA highway rating of 42 mpg

(*Autoweek*, Oct. 2006)

SUMMARY

1. Lots of little traffic fixes can yield big benefits → if we do enough of them quickly and correctly.

2. We must learn from the lessons of failing rail systems in the nation and the successful tollways, and HOT lanes in the US and abroad.

3. The project which will solve a big part of congestion on Oahu is a 3-lane reversible HOT expressway between Ewa and Keehi Lagoon coupled with the already approved Nimitz Hwy. viaduct.

HOT = ~~freeway~~ = high capacity transit

Epilogue

HOT = win^4 → transit, commuters, freight, taxpayers

RAIL = certifiable loser
= depends heavily on those who don't use it to pay for it!
= those who don't use it will pay the most!

Smart Growth = social engineering, or do politicians and planners know what's best for you?

TOD = subsidized housing for the upper middle class
= free money for developers (follow the money!)

Thanks!

University of **H**awaii at **M**anoa

Department of **C**ivil and **E**nvironmental **E**ngineering

Traffic and **T**ransportation **L**aboratory