

Michael Baker

INTERNATIONAL

We Make a Difference



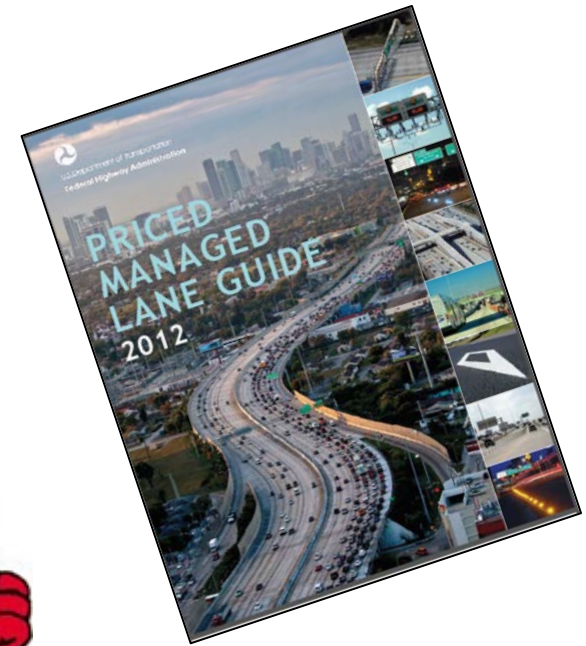
15th International Managed Lane
Conference, Miami, FL
May 4, 2016 to May 6, 2016



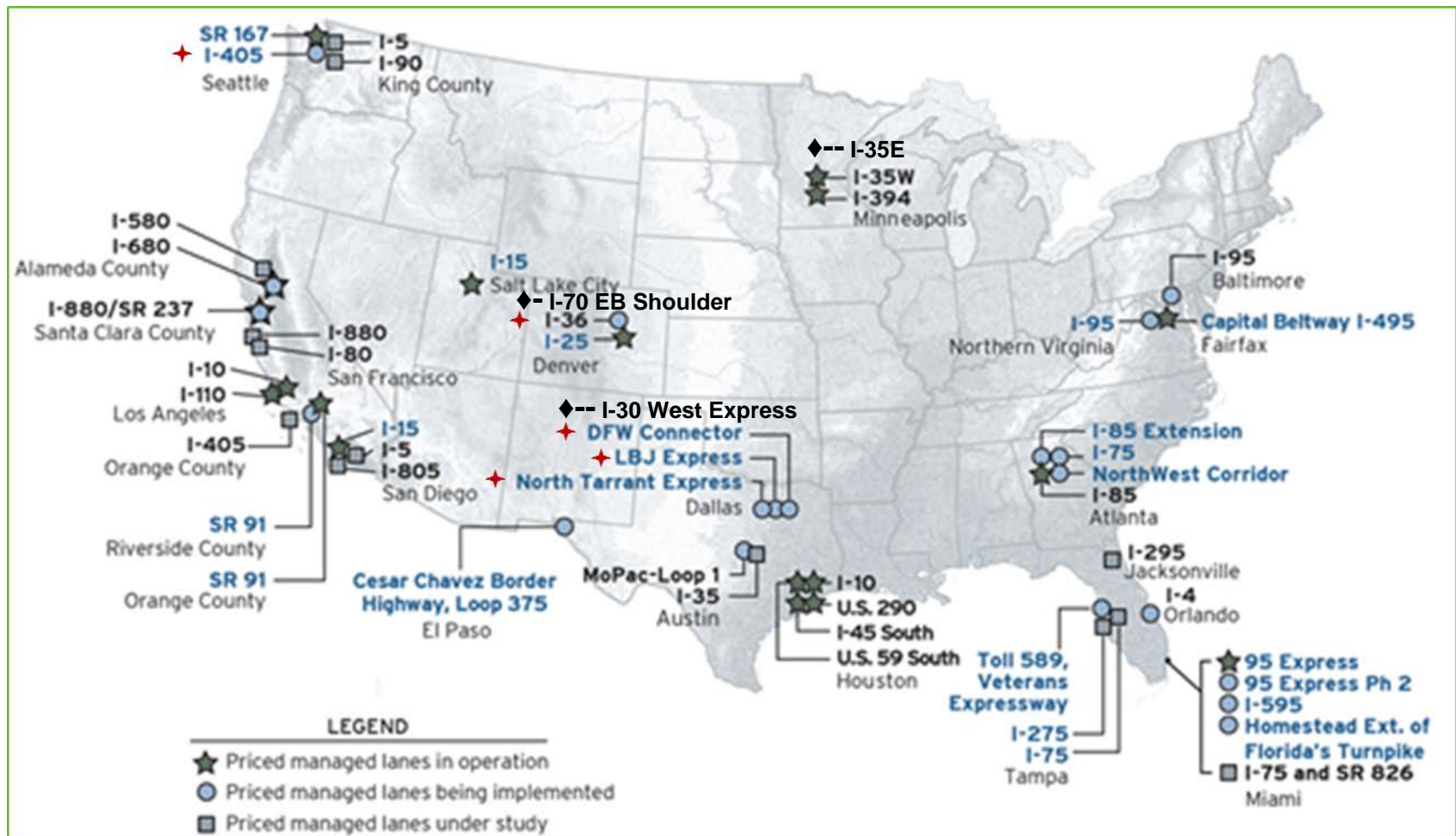
Flexibility Must be Built into All Facets of the Managed Lane Facility Life Cycle

Matthew E. MacGregor (MBI) & Patrick Vu (STC)

- First and foremost...



... We like the Kool-Aid
Managed lanes are great !!!



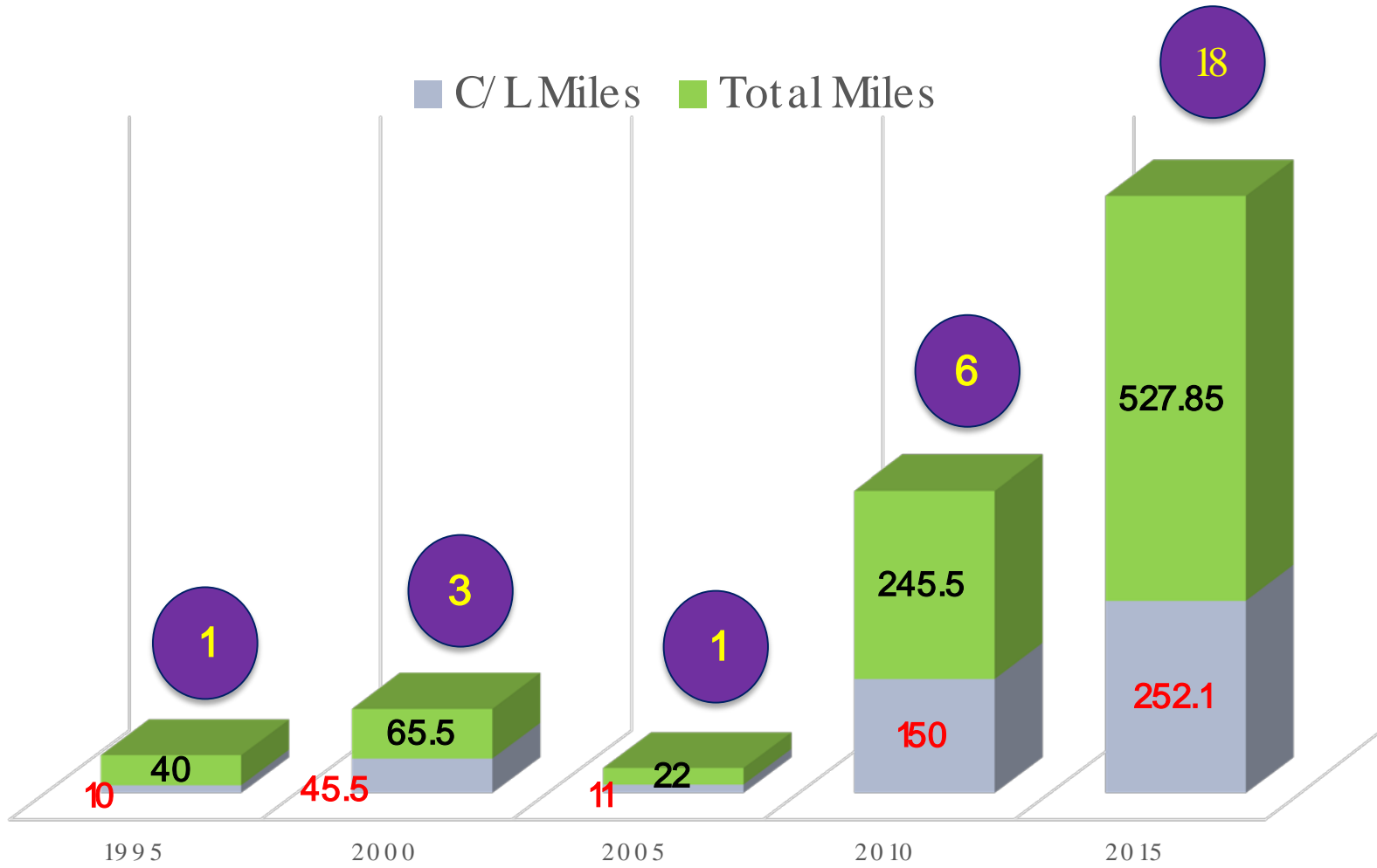
- ★ Now in operation
- ◆-- Recently Opened or will be soon

Source of base map – Fellow Practitioners

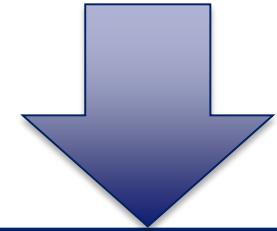
Operating Priced Managed Lanes in the U.S.

1. CA1 – SR 91 Express Lanes
2. CA2 – I-15 Express Lanes
3. CA3 – I-110 Express Lanes
4. CA4 – I-10 Express Lanes
5. CA5 – I-689 Express Lanes
6. CA6 – SR 237/ I-880
7. CO1 – I-25 Express Lanes
8. CO2 – SR 36
9. *CO3 – C407*
10. *CO4 – I-25 North Extension*
11. CO5 – I-70 EB Shoulder
12. FL1 – I-95 Express Lanes
13. FL2 – I-595 Express Lanes
14. GA1 – I-85 Express Toll Lanes
15. MD1 – I-95 Express Toll Lanes
16. MN1 – I-394 Managed Lanes
17. MN2 – I-35 W Managed Lanes
- 17 (a). MN3 – I-35 E Managed Lanes
18. TX1- I-10 Katy Freeway Managed Lanes
19. TX2 - I-45 North (North Fwy) HOT Lanes
20. TX3 - I-45 South (Gulf Fwy) HOT Lanes
21. TX4 - US 59 North (Eastex Fwy) HOT Lanes
22. TX5 - US 59 South (SW Fwy) HOT Lanes
23. TX6 – US 290 (Northwest Fwy) HOT Lanes
24. TX7 – LBJ TEXpress Lanes
25. TX8 - Loop 375 Toll Lanes
26. TX9 - DFW Connector TEXpress Lanes
27. TX10 – North Tarrant TEXpress Lanes
28. *TX11 – I-30 West TEXpress Lanes*
29. UT1 – I-15 Express Lanes
30. VA1 – I-495 Express Lanes
31. VA2 – I-95 Express Lanes
32. WA1 – SR 167 HOT Lanes
33. WA2 – I-405 HOT Lanes

From 1995 thru 2015



The First 10



No.	Facility	Where	Year	Type	Status
1	SR 91 Express Lanes	Orange Co.	1995	2-2	Extend - Access
2	I-15 Express Lanes	San Diego	1996	2-Rev	Replaced 2-2
3	I-10 Katy Freeway Managed Lanes	Houston	1998	1-Rev	Replaced 2-2
4	US-290 (Northwest Fwy) HOT Lanes	Houston	2000	1-Rev	Still Open
5	I-394 Managed Lanes	Minneapolis	2005	1-1	Still Open
6	I-25 Express Lanes	Denver	2006	2-Rev	Still Open
7	I-15 Express Lanes	Salt Lake City	2006	1-1	Extend
8	I-95 Express Lanes	Miami	2008	2-2	To be extended
9	SR 167 HOT Lanes	Seattle/Tacoma	2008	1-1	Operational Chg.
10	I-35W Managed Lanes	Minneapolis	2009	1-1	Still Open

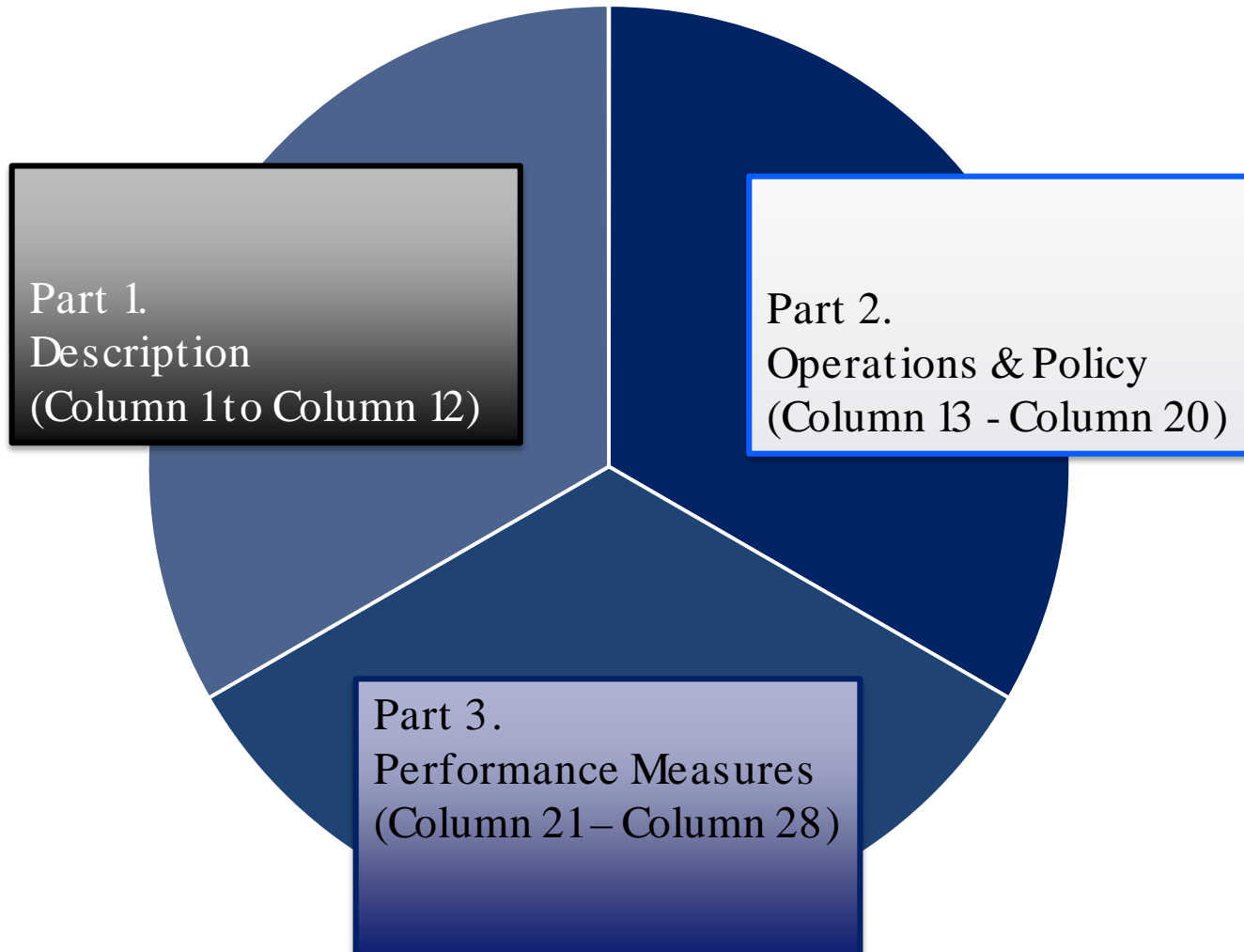
What is the Life Cycle of a Traditional Project?

- **Program** – Dependent on demographics & funding
- **Planning** - Schematic, Environmental, PI, NEPA
- **Design** – Right-of-Way, Utilities, Drainage, Horizontal, Vertical, Sequence of Work, Intersections, Access
- **Construction** - Earthwork, Phasing, Detours, Paving, Bridges, Walls, Night Work, Noise, SW3P, Conduit
- **Operations** – Signing, Striping, Signals, Lighting
- **Maintenance** – Routine, Major, Emergency
- **Customer Service** – Incident Management, Courtesy Patrol, Litter Pick Up
- **Change** – Widen, Replace, Extend

What is the Life Cycle of a Managed Lane?

- **Idea** – Scan Tours, Policy, Public Relations. Legal
- **Planning** - Schematic, Environmental, PI, NEPA
- **Design** – ITS, Signing, Barrier, Pavement, Concept of Operations, Integration (Projects and Systems)
- **Construction** - Civil, Toll Systems, Advance PR
- **Operations** - Pilot Test, Pricing Test, Open
- **Maintenance** – Physical (Routine, Major, Systems)
- **Customer Service** – Usage, Billing, Systems
- **Change** – Policy, Usage, Physical (Expand, Extend, Add Access)

National Express Lanes - Managed Lanes Database



B	C	D	E	F	G	H	I	J	K	L	M	N	O
Entered data should be verified by an agency rep familiar with those States facilities													
Part 1 – Facility Description, Hours, Access and Occupancy													
Sponsor	(1) ID	(2) State ID (YearOpen)	(3) Facility	(4) Length (C/L) (Lane)	(5) Type	(6) Hours of Operation	(7) Separation Treatment (Type) (Lanes)	(8) Separation Treatment (Detail) (Width)	(9) Access Control (No.) (Dir) (Type)	(10) Hours of Operation Policy	(11) Occupancy Rules (Initial)	(12) Occupancy Rules (Current)	(13) Discounts for No-Yes Type

Part 1 – Facility Description, Hours, Access and Occupancy

(1) ID - Chronological table number of an operating or near operating managed lane in State alphabetical order

(2) State ID (Year Open) – State abbreviation and Chronological within the State and the year the managed lane opened

(3) Facility – Identifying numerical designation – SR (State Road), I (Interstate), C (Colorado), US (United State Highway), Loop, Named Facility

(4) Length (C/L) (Lane) – Center Line miles (C/L) and total lane miles

(5) Type of original facility – HOV Conv (HOV Conversion to priced HOT or Express), New (New Construction for priced HOT or Express), Bus Conv (Busway conversion to priced HOT or Express), Conv New (Combination of both an HOV Conversion and New construction to priced HOT or Express). HOT – Generally a managed lane where HOV goes for free. Express – All regular customers pay full price or a discounted price.

(6) Hours of Operation – Peak Hours AM & PM, 24/7, Directional Hours, Scheduled Hours – All as noted

(7) Separation Treatment (Type) – Paint, Pylon, Barrier – Lanes to indicate directionality, number, reversible – 1-1, 1R, 1D, 2R, 2-2, 3R, 3-3, Etc.

(8) Separation Treatment (Detail) (Width) – Elements that comprise the separation - Paint, Buffer, Paint (PBP), Paint, Pylon, Pylon (PPP), Paint, Offset/Shldr, Barrier, Offset/Shldr, Paint (POBOP) or (PSBSP) – Total width of separation in ft-in (5-4), Offset or Shldr could be listed

(9) Access Control (No.) (Type) – A couple of variations exist – Ends Only (End) by slip ramps or grade separations, Limited Access (Limited) by slip ramp, Adjacent Lane, or grade separations, or Continuous Access (Continue), Number of total access points (No.) as 2,3 or 4; No. per directionality - as 3EB, 3WB, 4NB, 5SB etc.; Slip Ramp (S), Grade Separation (G), Adjacent Lane (A), Multiple types if they exist (S-G, G-A, S-G-A)

(10) Hours of Operation Policy – General basis for being established - “formal” – means a written adopted policy, “implicit” means that the underlying reasons for how the hours were set are understood. For example, consistency is often the reason cited for how the hours were set.

(11) Occupancy Rules (Initial) – A general initial position statement – 2+ free, 3+ free, HOV Discount, All Pay, Other

(12) Occupancy Rules (Current) – The current position statement – Same, 3+ free, HOV Discount, All Pay, Other

Jx	M	N	O	P	Q	R	S	T	U	V
1										
2	<i>Part 2 – Discounts, Exemptions, Violations and Pricing Approach</i>									
3	(11) Occupancy Rules (Initial)	(12) Occupancy Rules (Current)	(13) Discounts for HOV's No-Yes Type	(14) Types of Exempt Vehicles M-T-V-LEV-O	(15) Method Of Exemption/ Discount V-T-ST-R-A	(16) Types of Enforce- ment M-L-A	(17) Penalty for Violation Use / Toll	(18) Level of Violation L-O-T	(19) Pricing Approach F-P-S-D (If D – Min)	(20) Toll Cap (Y/N) (S/H)
16										
17	Part 2 – Discounts, Exemptions, Violations and Pricing Approach									
18	<i>(13) Discounts for HOV's – No, Yes 2+ 50% all day, Yes 2+ 50% Peak Only, Yes 3+ 50% all day, Yes 3+ 50% Peak, Etc.</i>									
19	<i>(14) Types of Exempt Vehicles – Motorcycles (M), Transit Bus (T), Van Pool (V), Low Emitting Vehicle (LEV), Police (P), Other (O)</i>									
20	<i>(15) Method of Exemption or Discount – Visual (V), Transponder (T), Switchable Tag (ST), Registration (R), Application (A)</i>									
21	<i>(16) Types of Enforcement – Manual Observed (M), Light Indicator Assisted (L), Automated in some form (A)</i>									
22	<i>(17) Penalty for Violation – Usage fee charged (Use), Toll Fee Charged (Toll) – Use, Toll, Use & Toll</i>									
23	<i>(18) Level of Violation – Lane and Operational (L), Occupancy Requirement (O), Toll Charged or Payment due date (T)</i>									
24	<i>(19) Pricing Approach – Fixed one price (F), Peak Period for two prices (P), Scheduled Variable more than two prices (S), and Dynamic Pricing multiple (D), If Dynamic indicate the frequency at which the price can change in minutes (6 min, 5 min 10 min etc.)</i>									
25		HOV 2+	Yes; 2+ free	M-T-V-P	V	M	Use & Toll	L, O, T	S	Y/H
26		HOV 2+	Yes; 2+ free	M-T-V-P	V	M	Use & Toll	L, O, T	S	Y/H
27		HOV 2+ (HOV 3+ from 6:30 - 8:00 a.m.)	Yes; HOV 3+ free from 6:30 - 8:00 a.m.; HOV 2+ other times	M-T-V-P	V	M	Use & Toll	L, O, T	S	Y/H
28	2+ HOV 50% discount peak periods; trucks allowed	2+ HOV 50% discount peak periods; trucks allowed	Yes; 50% off during pperiods	T P O	V T R A	L	Ticket issued by police for HOV violation	O	D - 5 min	Yes. Soft. \$0.84/mi (2016) indexed to inflation
							Ticket issued by police			

	V	W	X	Y	Z	AA	AB	AC	AD	AE
<i>Part 3 – Volume, Usage, Price, Revenue and Performance</i>										
ch	(20) Toll Cap (Y/N) (S/H)	(21) Max (Toll \$) Min (Toll \$)	(22) ADT Volume & Speed (MPH)	(23) AM Peak Volume & Speed (MPH)	(24) PM Peak Volume & Speed (MPH)	(25) Lane Reliability (%)	(26) Occupancy Utilization (%)	(27) Gross Revenue (\$)	(28) O & M Enforce- ment (\$)	Location

Part 3 – Volume, Usage, Price, Revenue and Performance

(21) Max (Toll \$), Min (Toll \$) – Maximum toll charged, (\$ 0.00 per mile), Minimum toll charged (\$ 0.00)

(22) ADT Volume & Speed (MPH) -

(23) AM Peak Volume & Speed -

(24) PM Peak Volume & Speed -

(25) Lane Reliability % - A % that ties the volume and speed performance to a target value of XX mph

(26) Occupancy Utilization –A % that is tied to the total people moved per vehicle volume over

(27) Gross Revenue (\$) – Gross anticipated revenue for all priced vehicles (Not net paid revenue)

(28) O & M Enforcement (\$) – Total cost to operate, maintain and enforce the facility that is available

NOTE: Depending on the level of performance data available the adjacent general purpose lane data could be provided. This might add an additional part 4 to be added to Table 1, or an adjustment to the columns presented.

	Yes. Soft. \$0.84/mi (2016) indexed to inflation	\$0.84/mi max; \$0.14/mi min; Maximum tolled length is 13.26 miles	24,400/day; 72 mph	5,100/day; 72 mph	6,100/day; 72 mph	100%		Q4 2015 = \$15.2 M; annual 2015 = \$51.8 M	4 2015 \$4.3M	
	Y/S		50 mph ave guarantee							

The screenshot displays a Google My Maps interface. On the left, a sidebar titled "National Express Lane Inventory" shows 3 views and a note that "All changes saved in Drive". It includes an "Add layer" button and a "Share" icon. A layer named "SCRAP National Express Lanes Pr..." is unchecked. The "Facilities" layer is checked, with a sub-option for "Uniform style" and a red pin icon indicating "All items (11)". A "Base map" option is also visible. The main map area shows the United States with state boundaries and names. Three red pins are placed on the map: one in California (near Los Angeles/San Diego), one in Texas (near Dallas), and one in Houston. The map includes navigation controls at the top left, a search bar at the top center, and a grid icon at the top right. The Google My Maps logo is at the bottom center, and map data is attributed to 2016 Google, INEGI, and ORF.

National Express Lane Inventory
3 views
All changes saved in Drive

Add layer Share
 SCRAP National Express Lanes Pr...
 Facilities
 Uniform style
 All items (11)
 Base map

SR 91 Express Lanes

Sponsor	Steven Yoshizumi
(1) ID	1
(2) State ID (YearOpen)	CA1
(4) Length (C/L) (Lane)	10 40
(5) Type	New
(6) Hours of Operation	24/7
(7) Separation Treatme...	Pylon (2-2)
(8) Separation Treatme...	PPP 4-0
(9) Access Control (No.)...	2 EB/1 WB; Ends
(10) Hours of Operation...	Formal

33.862, -117.77463

The screenshot displays a web interface for managing facilities. A table lists various facilities, with the third entry, 'I-10 Katy Freeway Managed Lanes', selected. A detailed view for this facility is shown on the right, listing various attributes such as sponsor, ID, state, length, type, and hours of operation.

	Sponsor	(1) ID	(2) State ID (YearOpen)	(3) Facility	(4) Length (C/L)
1	Steven Yoshizumi	1	CA1	SR 91 Express Lanes	10 40
2	Steven Yoshizumi	2	CA2	I-15 Express Lanes	20 80
3	Nick Wood	18	TX1	I-10 Katy Freeway Managed Lanes	12 (48)
4	Nick Wood	19	TX2	I-45 North (North Freeway) HOT Lanes	19.9 (19.9)
5	Nick Wood	20	TX3	I-45 South (Gulf Freeway) HOT Lanes	15.5 (15.5)
6	Nick Wood	21	TX4	US-59 North (Eastex Freeway) HOT Lanes	20.2 (20.2)

I-10 Katy Freeway Managed Lanes	
Sponsor	Nick Wood
(1) ID	18
(2) State ID (YearOpen)	TX1
(4) Length (C/L) (Lane)	12 (48)
(5) Type	New
(6) Hours of Operation	24/7 HOV 5-11 AM HOV 2-8 PM
(7) Separation Treatme...	Pylons (2-2)
(8) Separation Treatme...	No value
(9) Access Control (No.)...	Limited
(10) Hours of Operation...	Formal
(11) Occupancy Rules (L...	No value

- Performance metrics are **important**, but



... there must be an apples to apples approach

Change is to be Expected

- Capturing facility information and archiving in a database provides glimpse into types of adjustments made to facilities through time
- Insight on lesson learned:
 - Some operators have made significant changes to facilities after go-live
 - Performance monitoring pre/ after enables operators to justify data driven changes
 - Performance monitoring needs to be sustainable
 - Note some facilities have not changed, but subsequent facilities in their network build out are different

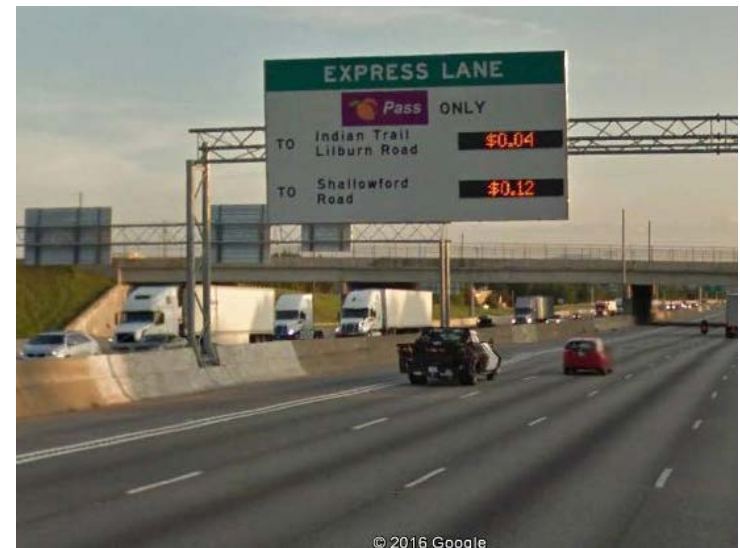
Limited Access Vs Continuous Access

- Examples of facilities that opened with limited access (defined ingress/ egress), to more continuous access
- WSDOT SR 167 Express Lanes, Seattle, WA
- VTA SR 237/ I-880 Express Lanes, San Jose, CA



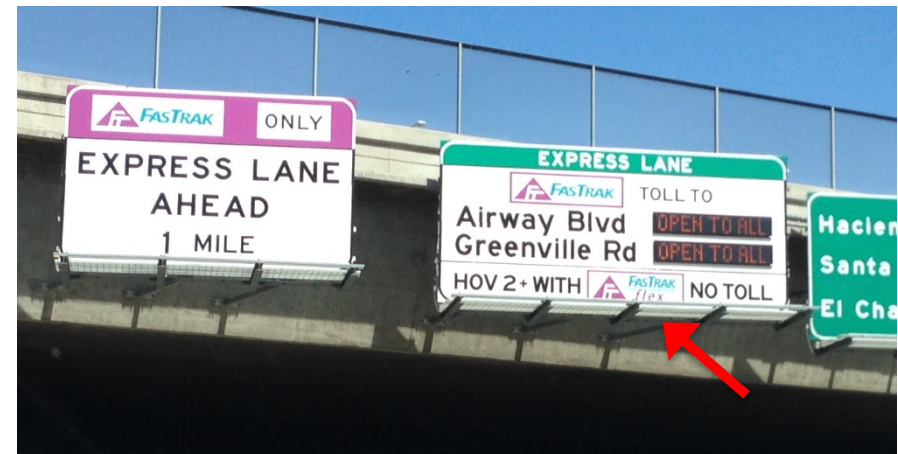
GA SRTA I-85 Express Lanes, Atlanta, GA

- Removed HOV access point, but after Go-Live installed temporary, then reinstall permanent access
- Changed toll rate policies to \$0.01/mile during non-peak hours



Alameda CTC I-680 & I-580, Bay Area, CA

- Since I-680SB launched in 2010, carpooler do not need FasTrak tag and toll system does not have Violation Enforcement System (VES)
- I-580 launched in March 2016, all vehicles are required to have FasTrak tag and photo enforcement is used



WSDOT I-405, Seattle, WA

- Changed access point configuration by lengthening and changing stripping
- Changed tolling hours from 24/7 to weekdays 5AM-7PM



Conclusions

- Database - Accurate, Current and Concise
- Include Links - To Additional Data and Resources
- Ambassadors - Take Ownership & Update Data
- Partner with DOT, Transit, Toll, MPO, Public
 - Connect performance metrics where possible
- Connected & Autonomous Vehicles - ???
- Look Back – Look Around – Look Forward
- Objective Analysis – Share Results and Data
- Spread the word

Michael Baker

INTERNATIONAL

We Make a Difference

TRB



Matthew E. MacGregor, P.E.
Michael Baker International (MBI)
469-801-8550
Matthew.macgregor@mbakerintl.com



Patrick Vu, PE
Silicon Transportation Consultants (STC)
617-448-8611
pvu@silicontc.com



It is Ok to Share, Yes?

Questions and data welcome anytime....