MOVE ILLINOIS

The Illinois Tollway

DRIVING THE FUTURE

Special Interchange Design

National Perception vs. Urban Reality

Traffic Engineering and Safety Conference

October 14, 2015

Presentation Purpose

- **System interchanges – interstate-to-interstate**
  - Myth vs. reality
  - Future maintenance
  - Context is important

Move Illinois Program

TAKE CARE OF EXISTING SYSTEM NEEDS

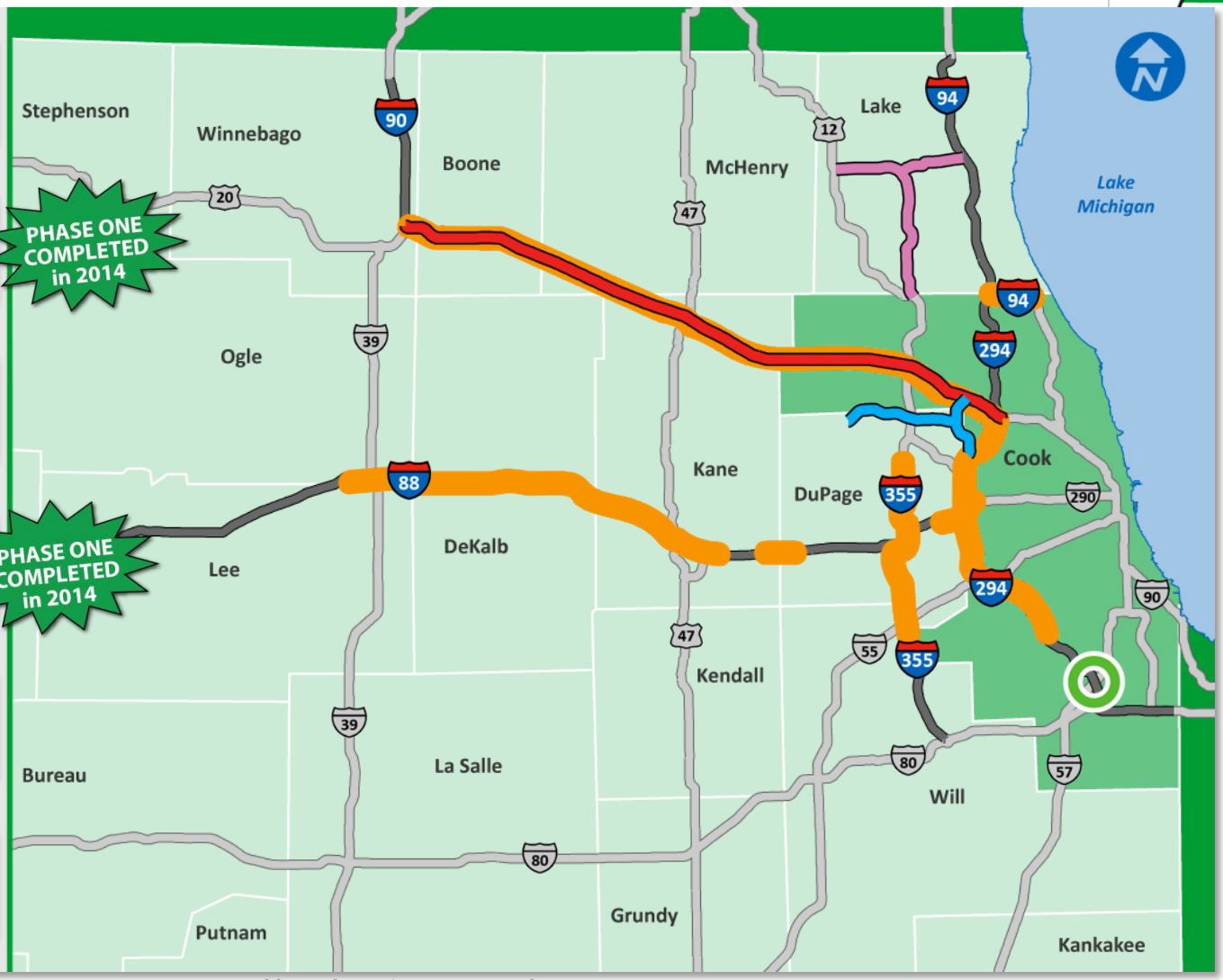
JANE ADDAMS MEMORIAL TOLLWAY
$2.5 billion
PHASE ONE COMPLETED in 2014

ELGIN O'HARE WESTERN ACCESS
$3.4 billion

I-294/I-57 INTERCHANGE
$719 million
PHASE ONE COMPLETED in 2014

ILLINOIS ROUTE 53/120 PROJECT

OTHER EMERGING PROJECTS



Major System Interchange Projects

- **Tri-State Tollway (I-294) at I-57**
  - Simplified maintenance for flyover
- **I-290 at Illinois Route 390**
  - Broken-back curve for flyover
- **Tri-State Tollway (I-294) at I-190**
  - Left-hand ramp for flyover

Standard System Interchange

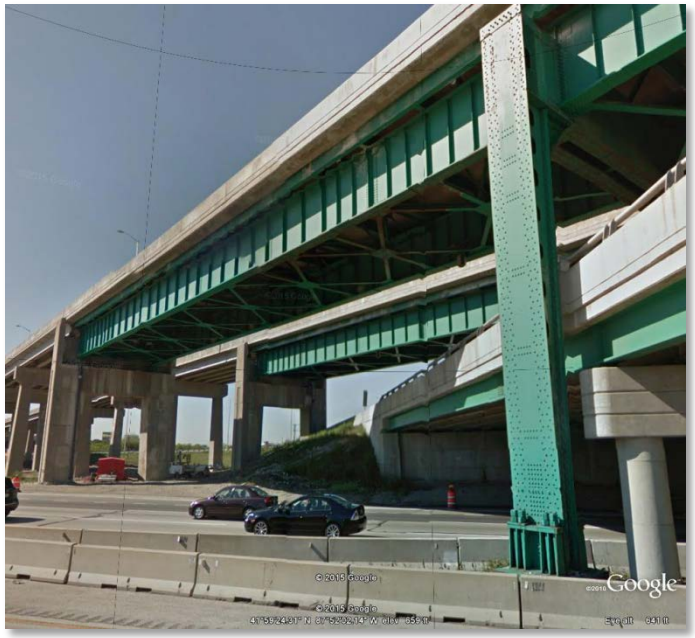
- **“Texas-style” four-level directional interchange**
  - U.S. unofficial high-end standard
  - Generally good traffic operations

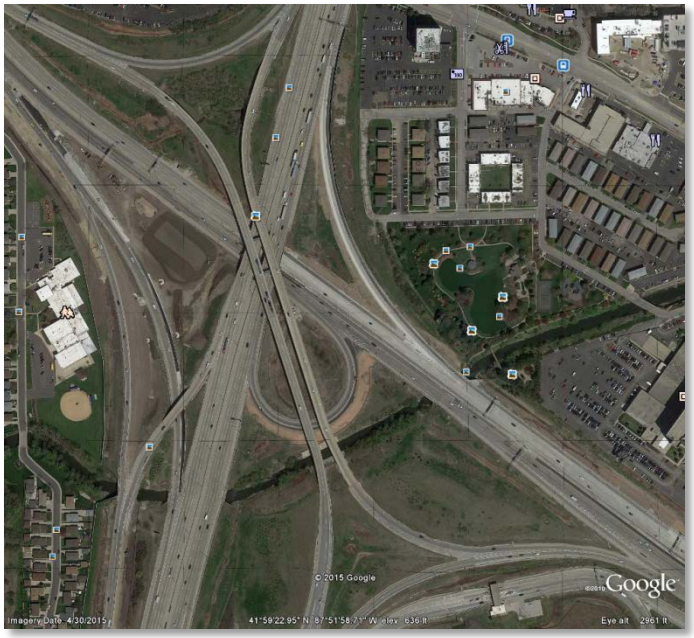
Texas-Style System Interchange

- **Negatives?**
  - Large footprint
  - Long third-, fourth- and even fifth-level bridge structures
  - Difficult to maintain and (eventually) rebuild

Existing Example

- **Jane Addams Memorial Tollway (I-90) at the Tri-State Tollway (I-294)**
  - Directional interchange built in 1958, when larger footprint was available
  - Includes third-level directional flyover ramps



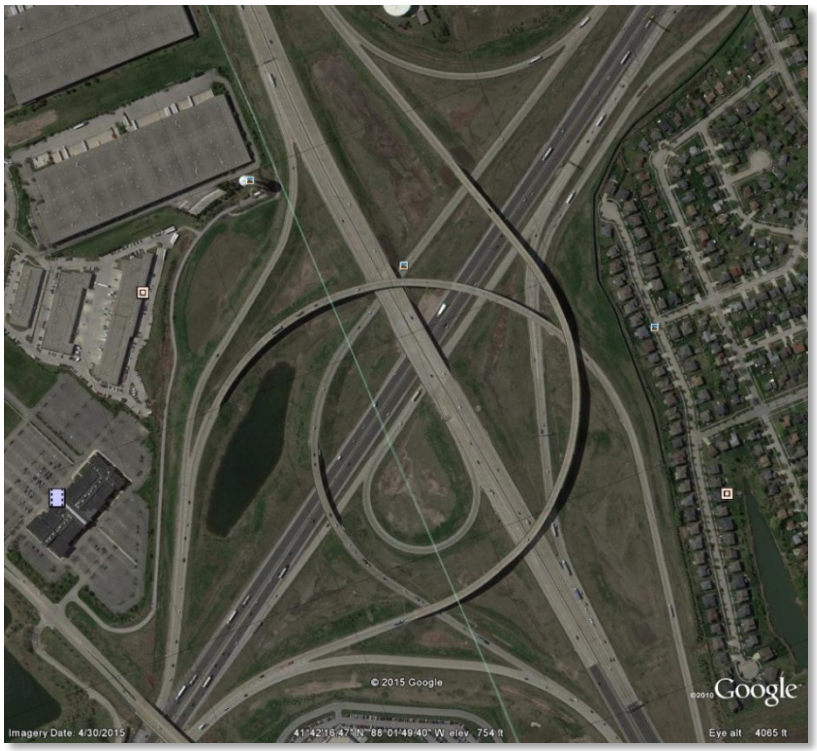


Long-Term Issues

- **Tri-State Tollway (I-294) over the Jane Addams Memorial Tollway (I-90) bridge**
- **Restricts ability to expand either route**
- **Hinders ability to maintain and eventually rebuild interchange**
  - Must close active lanes

Existing Example

- **Veterans Memorial Tollway (I-355) at I-55**
  - Interchange spread out over larger footprint
  - Only two relatively short third-level points
  - Simple road spans
  - Includes a loop ramp

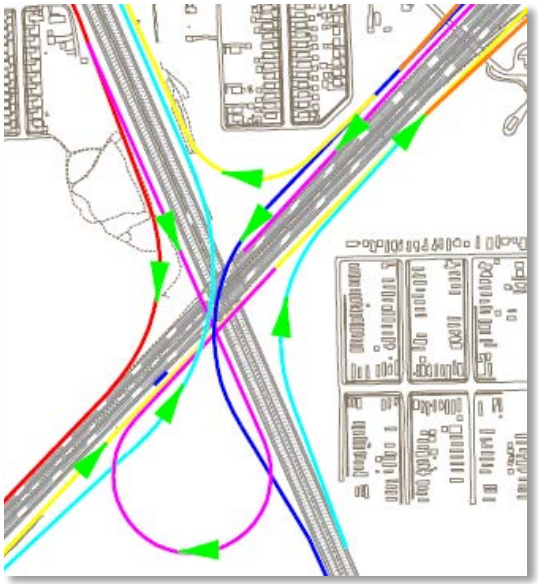


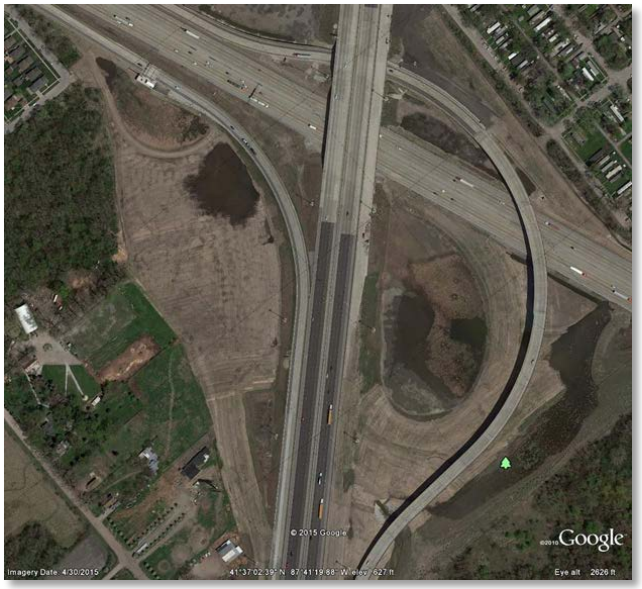
Tri-State Tollway (I-294)/I-57 Interchange Flyover Ramps

- **Cloverleaf envisioned in 1960s never built**
- **Year 2000 design similar to the Jane Addams Memorial Tollway (I-90) at the Tri-State Tollway (I-294)**
  - Implementation issues
  - Future maintenance issues
    - Different jurisdictions (I-57 is an IDOT roadway)
  - Expensive third-level structures not only over roads, but also impacts adjacent residents

Horizontal Update – Northbound I-57 to Northbound Tri-State Tollway (I-294)

- **Similar to flyover ramps at Veterans Memorial Tollway (I-355) and I-55**
  - Shorter spans of mainlines
  - Bridges moved outside of mainline
  - Simplified future maintenance





Vertical Update – Northbound I-57 to Northbound Tri-State Tollway (I-294)

- **Ramp redesigned to span the Tri-State Tollway (I-294) and then go under I-57**
  - Never higher than second level (I-57)
  - Reduced flyover length
  - Simpler spans
  - Reduced residences impacts

Positives and Negatives

- **Reduced construction impacts to interstates**
- **Bridge lengthened to span drainage area**
  - Still less expensive than original bridge structure
- **Reduced approach and departure grades**
  - Important in winter weather regions

Present Value Cost Savings

- **Reduced limits on the North Tri-State Tollway (I-294)**
  - Reduced property acquisition (half)
- **Massive reduction in fill requirements**
- **More than 10 percent initial construction bid savings**
  - Simplicity savings not included
  - Long-term maintenance
  - Plus right-of-way (ROW) and social savings

43 residences and 3 businesses require relocation.	23 residences and 3 businesses require relocation.
Approximately 34 acres of land will be required for ROW.	Approximately 27 acres of land will be required for ROW.

Tolling?

- **Original toll plaza north of 147th Street**
- **Tolls require acceleration and deceleration from cash lanes**
- **Design updated to I-PASS or Pay Online Tolling**
  - Cash customers can pay online in seven days
  - Allows for free-flowing design parameters
  - Further reduced the Tri-State Tollway (I-294) footprint

Conclusion

- Opened in November 2014
- Higher-than-expected initial usage
- Positive user feedback

I-290 Interchange at Illinois Route 390

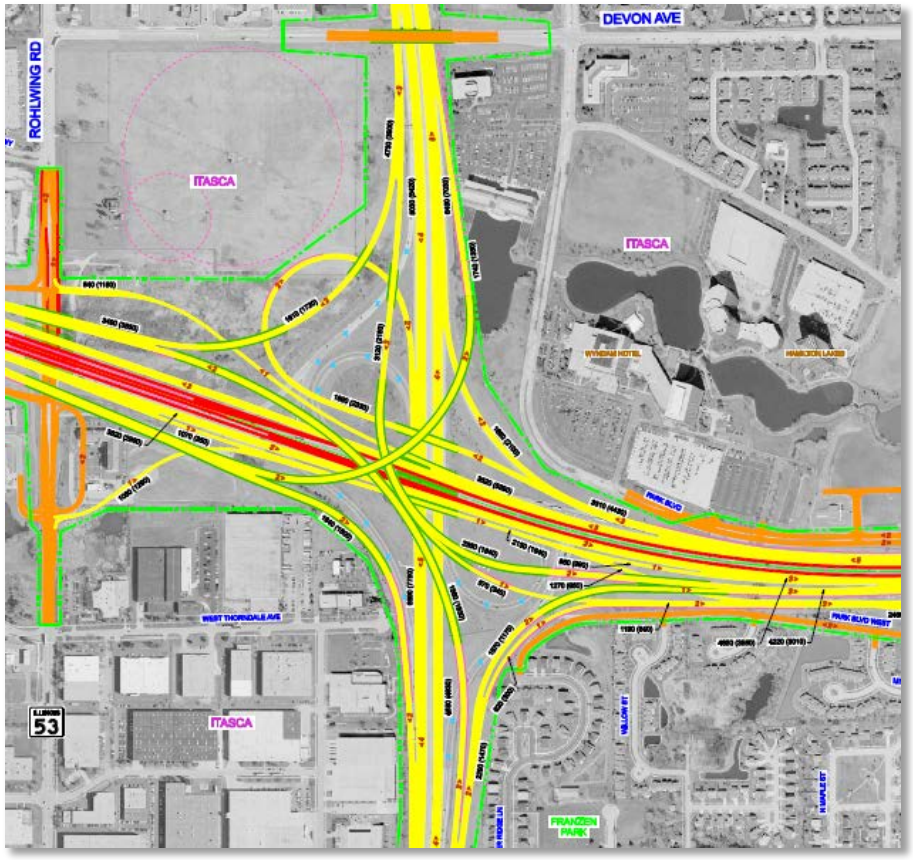
- **Existing interchange with Thorndale Avenue includes signalized I-290 exit ramps**
  - Heavy Illinois Route 390 truck demand
  - Queuing on I-290 exit ramps
- **All movements to remain open during construction, complicating alternatives**

Broken-Back Curves

- **Two successive horizontal curves in the same direction with a short tangent between them**
- **Per AASHTO – DON'T CONSTRUCT THEM!**
  - "The 'broken-back' arrangement of curves should be avoided except where very unusual topographical or ROW conditions make other alternatives impractical… most drivers do not expect successive curves to be in the same direction… are not pleasing in appearance… compound curve alignment preferable."
  - All right if "the connecting tangent is of considerable length. Even in this case, the alignment may be unpleasant in appearance when both curves are clearly visible for some distance ahead."

Early EIS Design

- **Three flyovers, including fourth-level flyover ramp for eastbound Illinois Route 390 to northbound I-290**



Tolling?

- **Illinois Department of Transportation (IDOT) originally analyzed as free road**
- **Adding tolls on Illinois Route 390 reduced 2040 traffic**
  - Tolling generally removes short-distance trips
  - Removes some weaving between ramps
  - Reduced need for directional ramps

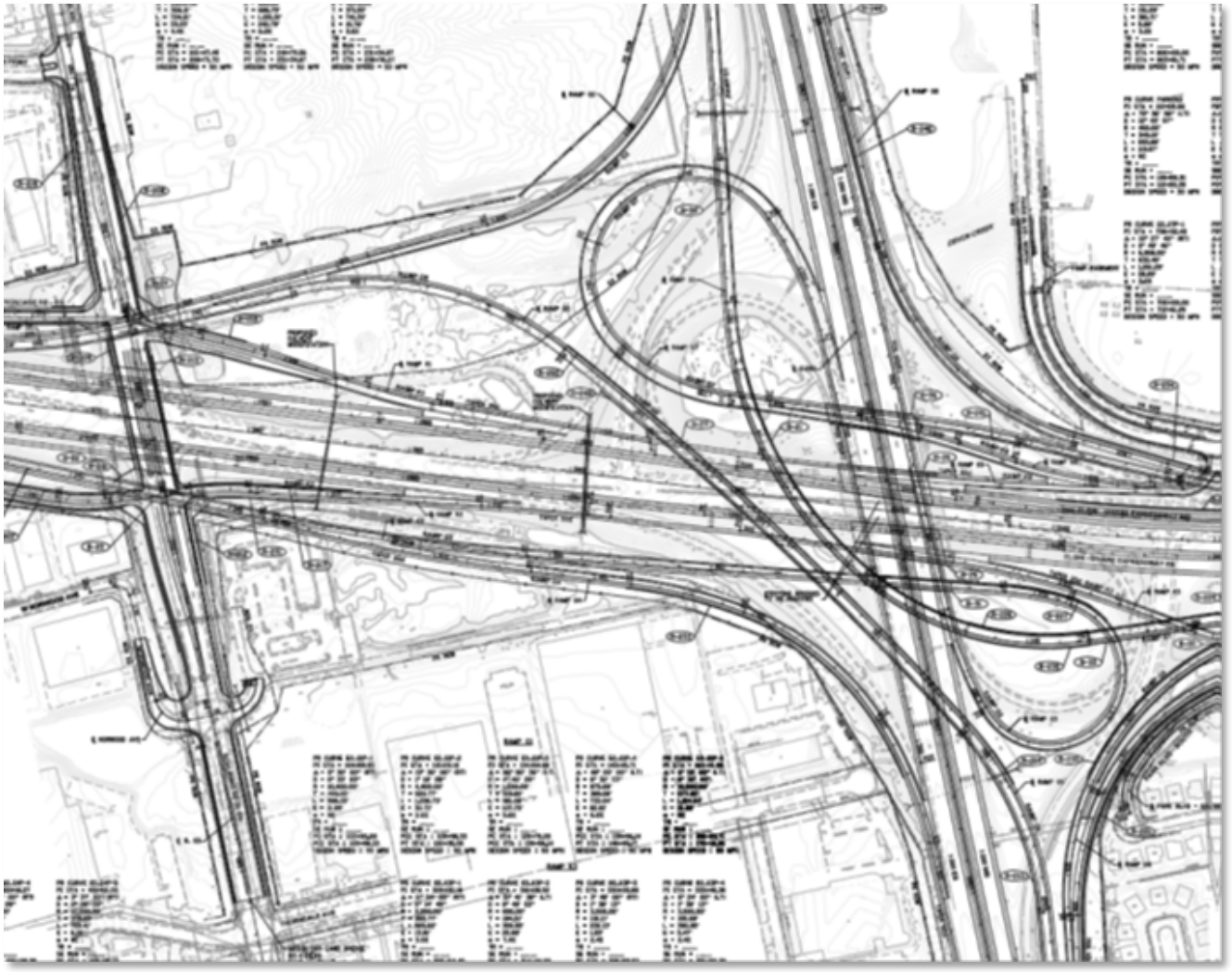
Updated Tollway Design

- **Illinois Route 53 updated to span Illinois Route 390**
  - Reduced fill for mainline
  - Simplified mainline construction
- **Eastbound Illinois Route 390 to northbound I-290 updated as loop ramp**
  - Existing movement is loop ramp
  - New collector-distributer road allows for proper deceleration
  - New toll road connecting the Jane Addams Memorial Tollway (I-90) and the Tri-State Tollway (I-294) on the west side of O'Hare, reducing traffic

I-290 to Illinois Route 390 Flyover Ramps

- **Flyovers from I-290 to Illinois Route 390 remain**
- **Westbound I-290 to westbound Illinois Route 390 has highest traffic**
- **Lessons learned from the Tri-State Tollway (I-294)/I-57 Interchange Project**
  - Avoid building a flyover over other bridges
  - Reduce span lengths over mainlines
  - Build as much of the ramp outside of existing facilities as possible for ease of construction

Current Flyover Design



Westbound I-290 to Westbound Illinois Route 390 Ramp

- **Existing residences on the southeast quadrant**
- **Additional room available on the northwest quadrant**
- **Only third-level structures required**
  - Able to avoid fourth-level structure
- **Reduce span length over I-290**
  - Span length impacts bridge type and cost
  - Increases beam height, impacting ramp profile

Details

- **Shifted entire ramp farther west**
  - More room for southbound flyover ramp west of I-290
  - Piers located outside of existing Thorndale Avenue
  - Requires additional same-direction curve
- **Consistent cross slope to west – no rotation**
- **Aesthetics?**
  - (I think its beautiful)

Conclusion

- **Opened in July 2015**
- **Positive driver feedback**
  - Avoiding delays at signal is main feedback
  - No one notices a “broken-back” curve, since there is ample distance between curves

Westbound I-190 to Southbound Tri-State Tollway (I-294)

- Existing left-hand ramp that spans the CTA and eastbound I-190
- Complicated approach to airport with less-than-standard interchange spacing
- Should left side ramp remain when reconstructed?

Left-Hand Ramps – Guidance

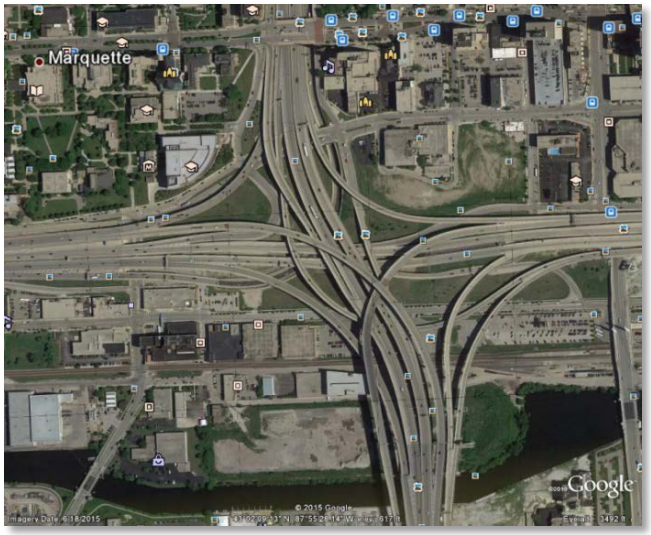
- **Per AASHTO – DON'T CONSTRUCT THEM!**
  - Left-hand ramps are contrary to the concept of driver expectancy when intermixed with right-hand ramps… avoid left-hand exits in the design of interchanges
  - Left-side ramp terminals break up the uniformity of interchange patterns and generally create uncertain operation on through roadways
  - Left-hand ramps are considered satisfactory for collector-distributor roads… use on high-speed, free-flow ramps is not recommended
  - Special attention should be given to signing and decision distance to alert the driver that an unusual situation exists

Right Reasons?

- **Driver expectancy** – drivers have been taught that access is on the right side
- **Weaving** – exiting traffic would have to weave through mainline lanes
- **High-speed left lane** – slower traffic should stay right adjacent to access ramps
- **Future widening** – rural interstates are typically widened to center
- **Safety** – HSM approximately 50 percent reduction stat

HSM Data?

- **The Marquette Interchange removed left-hand ramps and reduced crashes by approximately 50 percent**
  - Is this the basis of the HSM stat?
  - Marquette Interchange was a $700+ million project that also added lanes, reconstructed pavement and consolidated access
  - Is the entire reduction in crashes attributed to removing the left-hand ramps?



Are Left-Hand Ramps an Option?

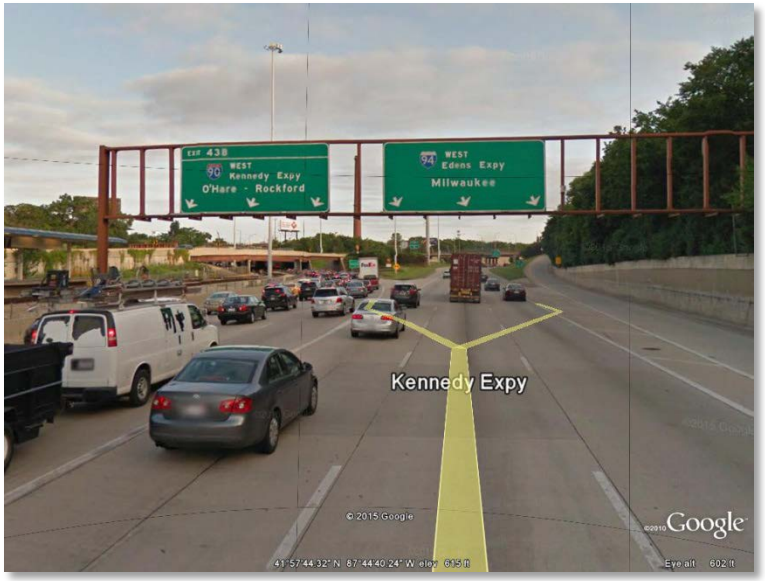
- Exiting mainline instead of entering?
- If approach speed is lower?
- If car-only facility?
- Ample decision distance and signage?
- In-car technology improvements?
- If right-side exit has inferior operations?

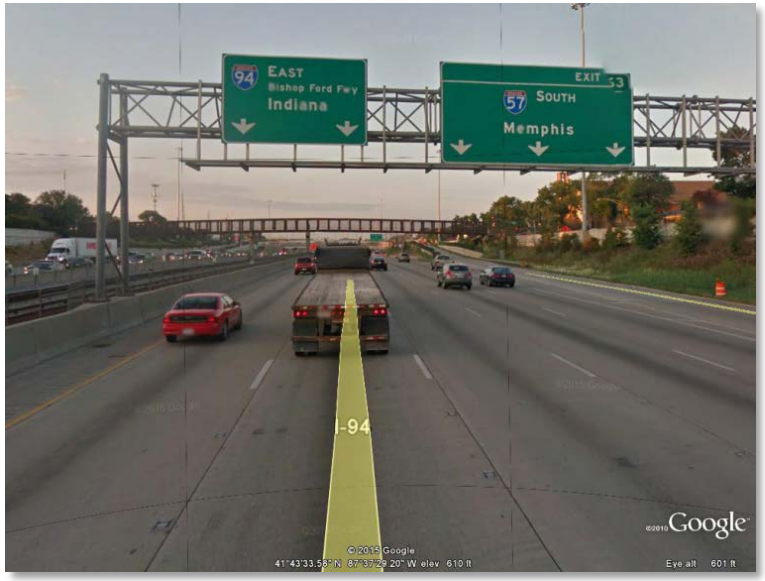
Positives of Left-Hand Exit Ramps

- Cost savings of reducing structure lengths
- Avoids overloading of right side of interstate
- Can reduce weaving on mainline

Major System Divergences

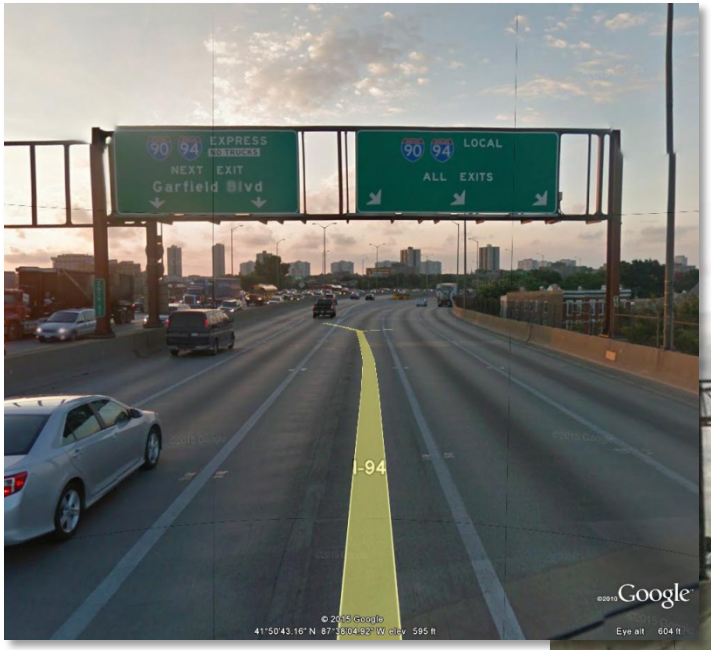
- Two-sided major divergence includes a “left-hand” movement for one of the mainlines
- With proper signage and decision distance, major route can be left or right

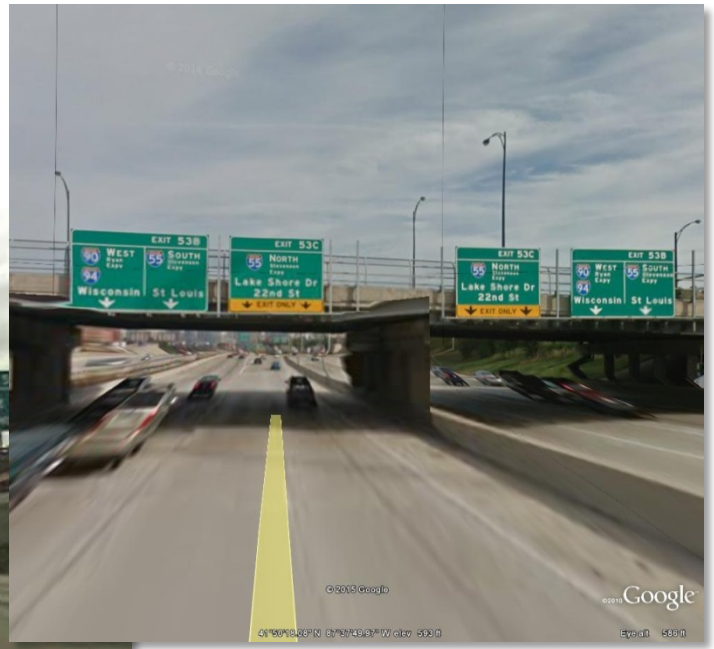




Dan Ryan Expressway Express and Local Lanes

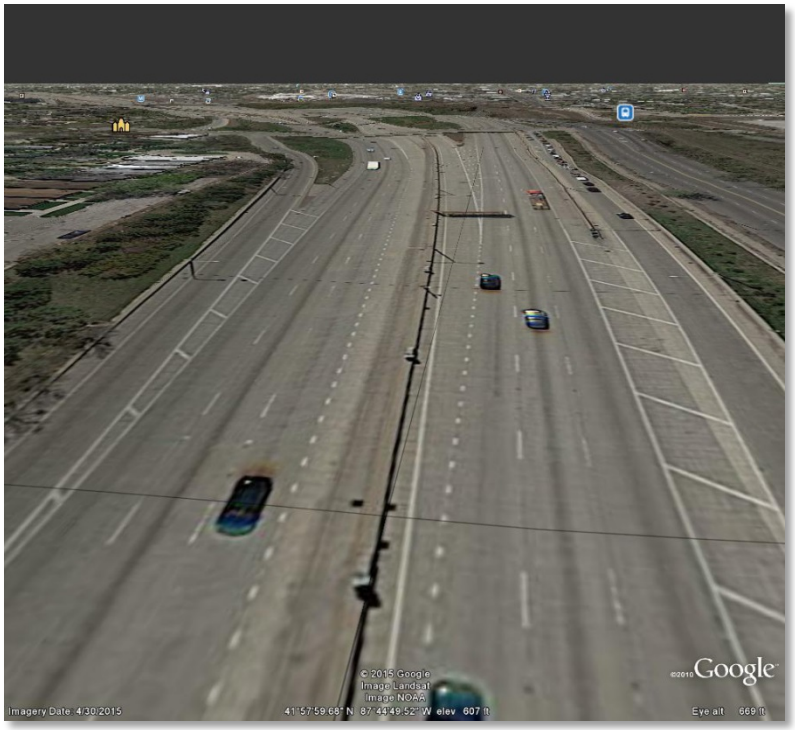
- Separate express lanes on left for cars only
- Half of the movements via left ramps





Kennedy Expressway Reversible Lanes

- Barrier separated car-only express within interstate
- Changes direction by the time of day
- Majority of connections are on left side



National Multi-Billion Dollar Projects

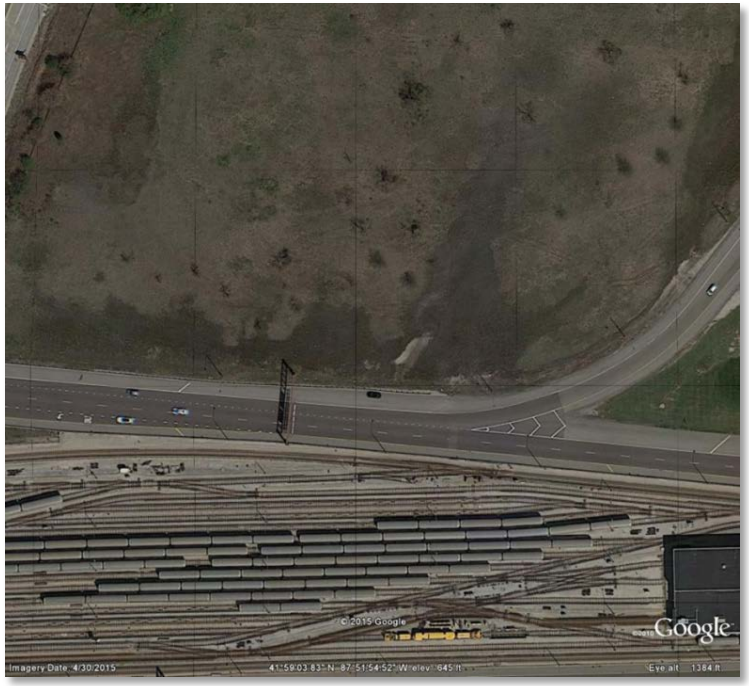
- **Nearly every major managed-lanes project includes left-side ramp connections**
  - Houston – Katy Freeway (~$3 billion)
  - DC – Capital Beltway (>$2 billion)
  - Atlanta – I-75 Reversibles (~$1 billion)
  - Orlando – I-4 (~$3 billion)
  - Dallas – North Tarrant Express (<$4 billion)
  - Miami – I-595 Reversibles (~$2 billion)
  - Also multiple new/recent projects near Seattle, San Francisco, Los Angeles, San Diego, Denver, Tampa Bay, Austin, San Antonio and North Carolina

Context for I-190 Interchange

- I-190 begins one mile east of the location
- Trucks already in I-190 left lane (I-90 Lane 3)

Approach to Ramp

- Northbound Tri-State Tollway (I-294) to westbound I-190 ramp to be restricted
- Right-side flyover ramp would require heavy weaving and additional lanes with this ramp

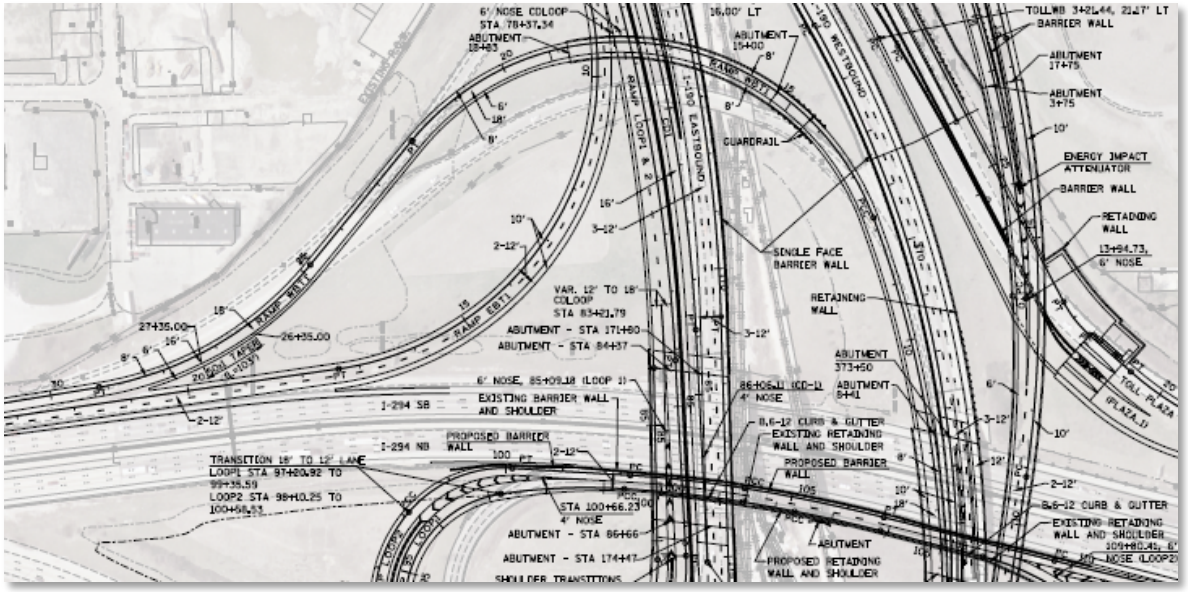


Actual Exit

- Includes left-side auxiliary lane prior to exit
- Simple span over CTA and eastbound I-190

Conclusion

- **Left-hand ramp is proposed**
  - Span length reduced by more than 50 percent
  - Additional approach signage provided
- **Downstream merge onto southbound the Tri-State Tollway (I-294) on the right**



Any Questions?

- **Happy 9th birthday, Addison!**