

Innovations in Transportation
Interchange and Highway Design



MARK THOMAS

Rob Himes, PE

President

(949) 333-9690

rhimes@markthomas.com

www.markthomas.com

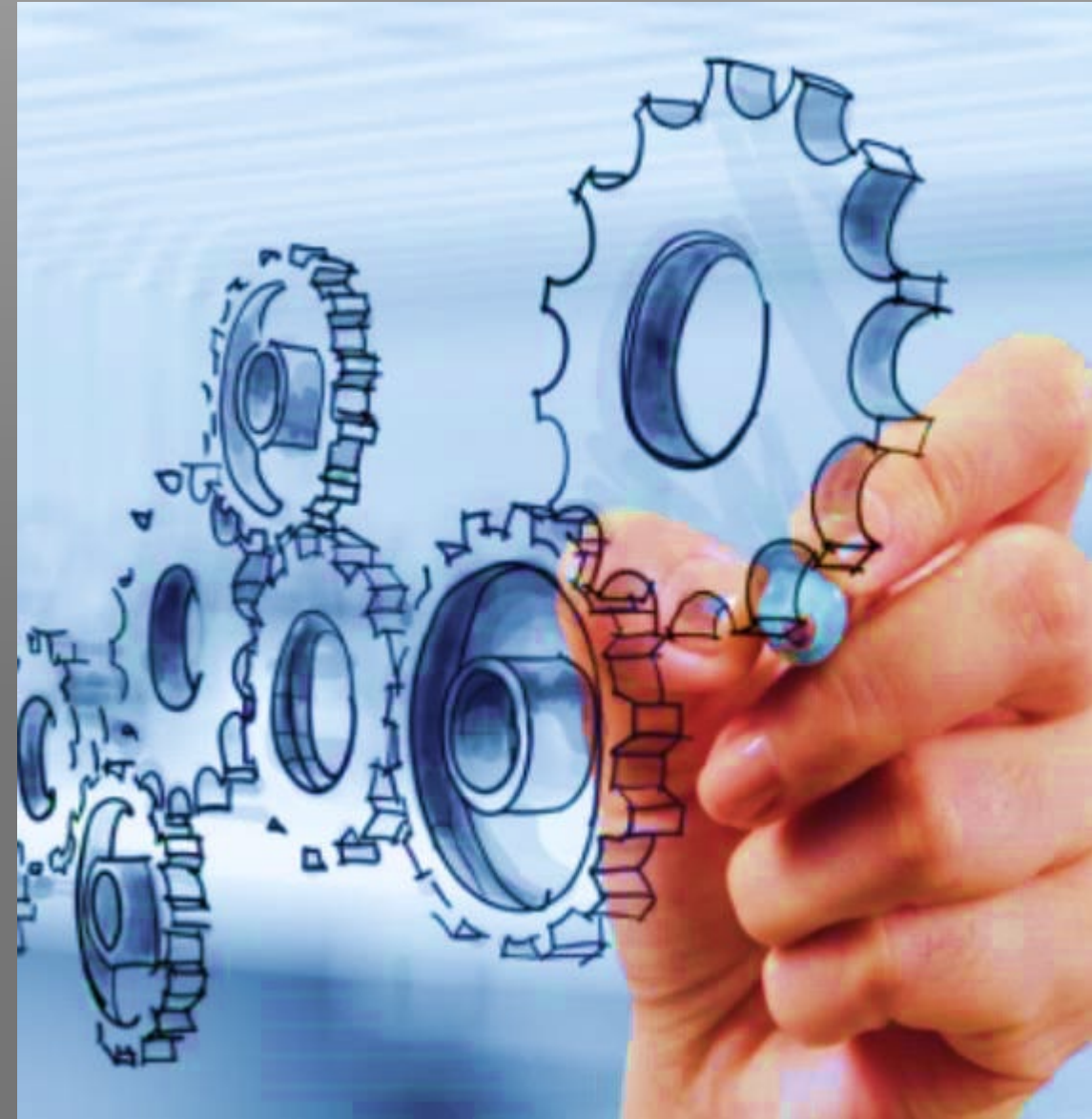
Who is Mark Thomas?

- 92 Years in business
- 12 offices/250 staff
- Working with Caltrans Since 1987





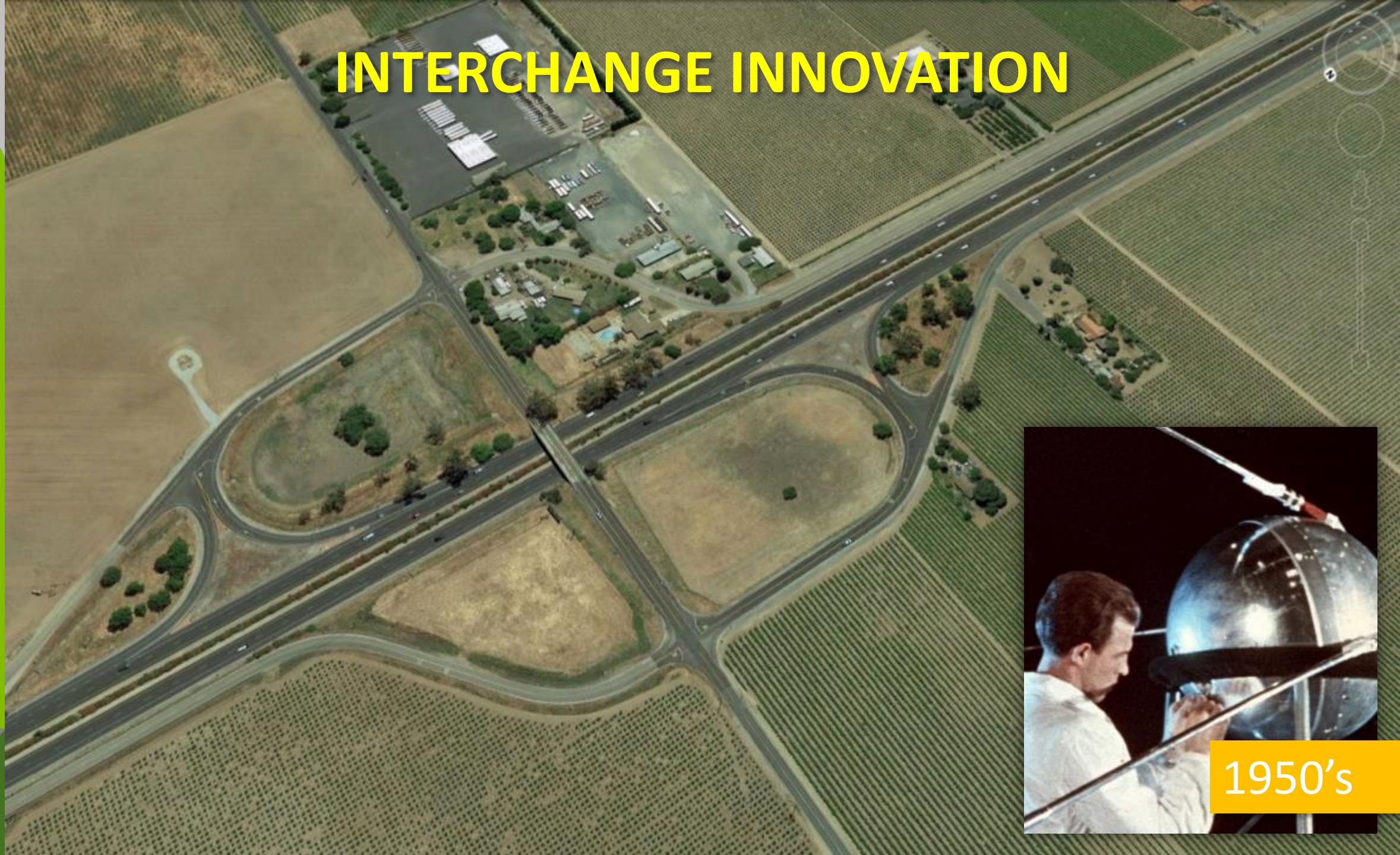
CREATIVITY



INNOVATION



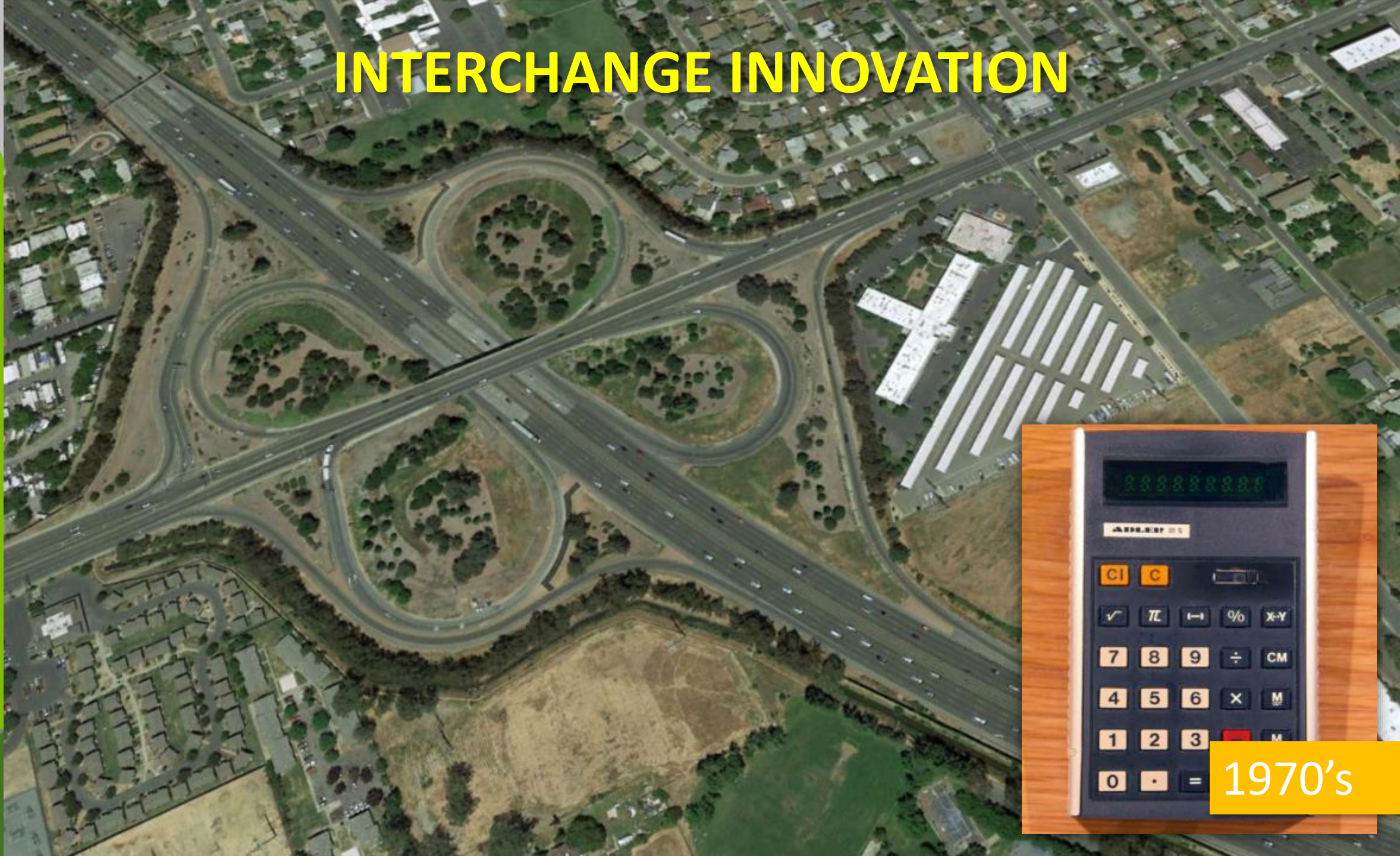
INTERCHANGE INNOVATION



1950's



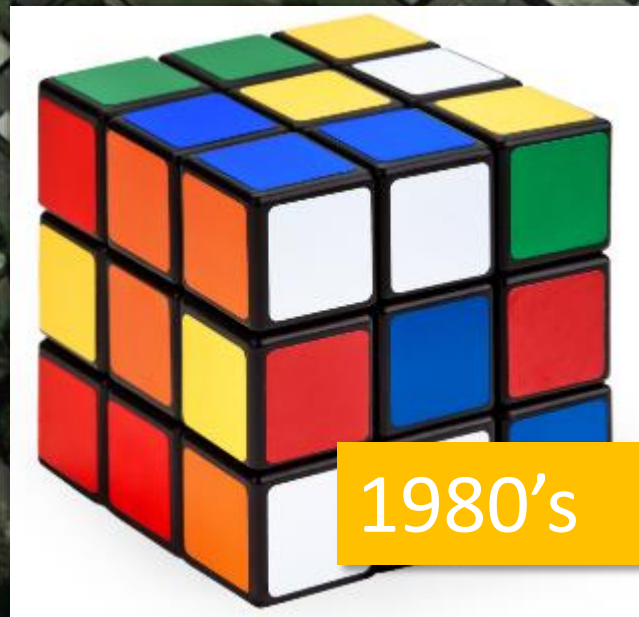
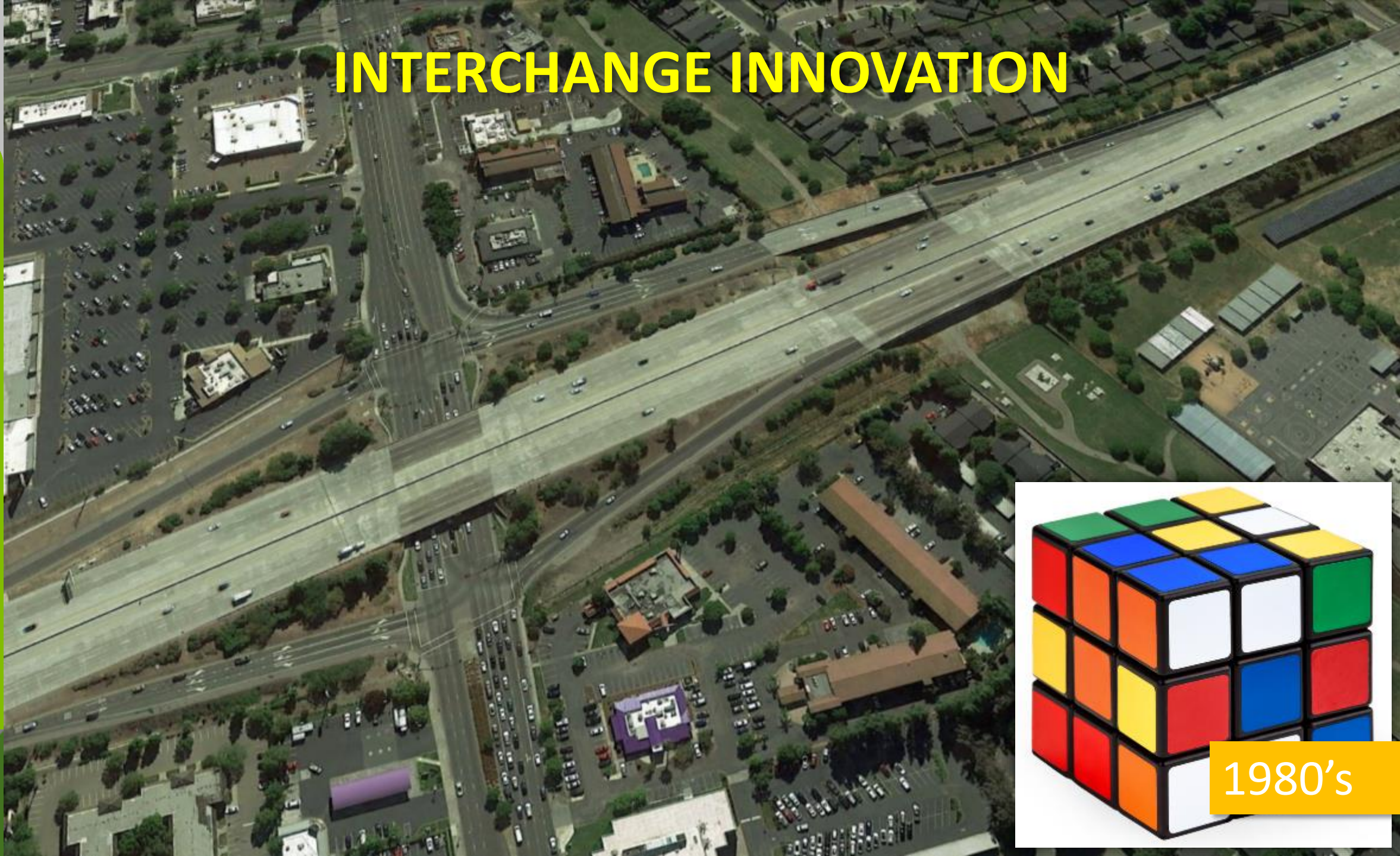
INTERCHANGE INNOVATION



1970's



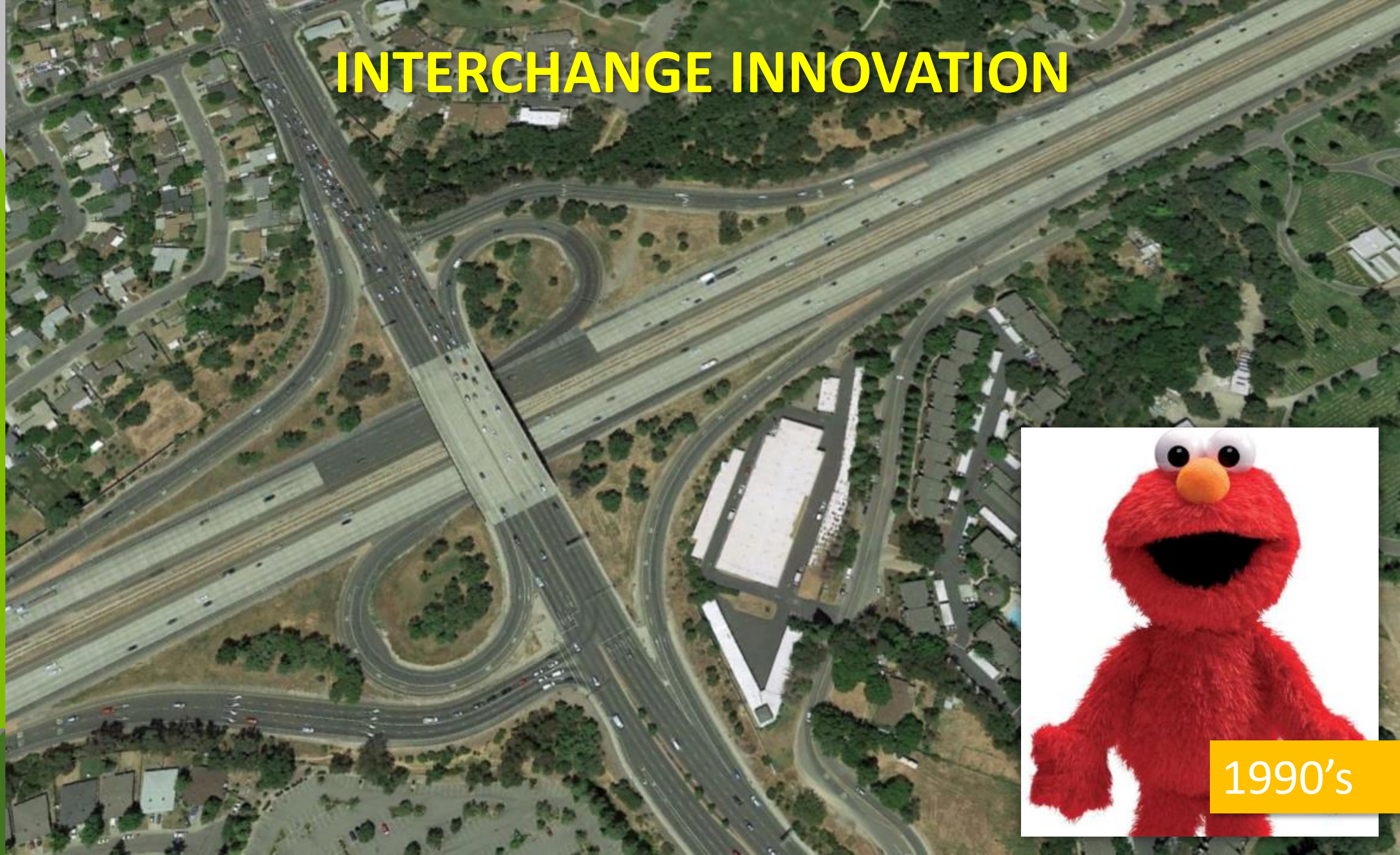
INTERCHANGE INNOVATION



1980's



INTERCHANGE INNOVATION



1990's



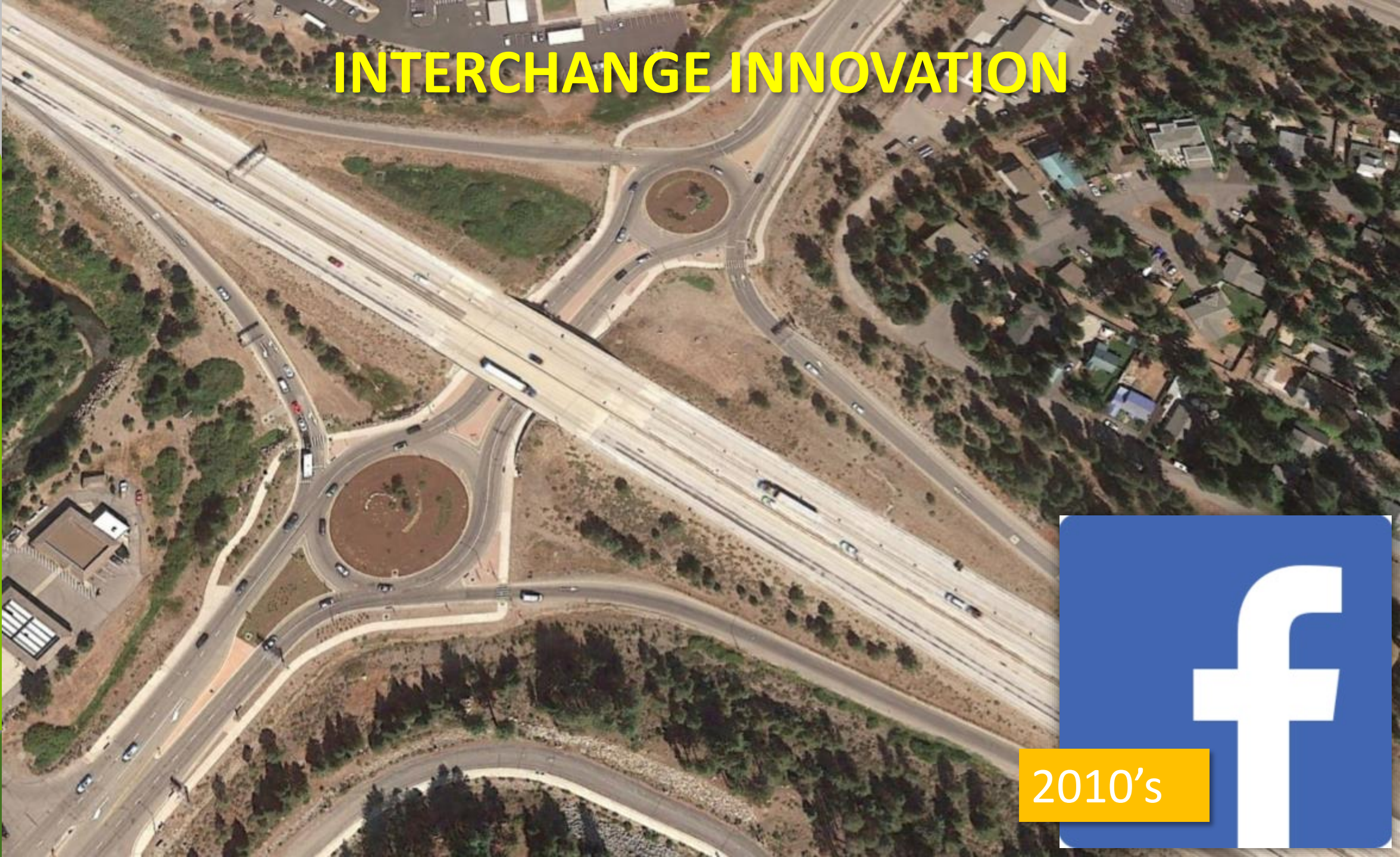
INTERCHANGE INNOVATION



2000's



INTERCHANGE INNOVATION

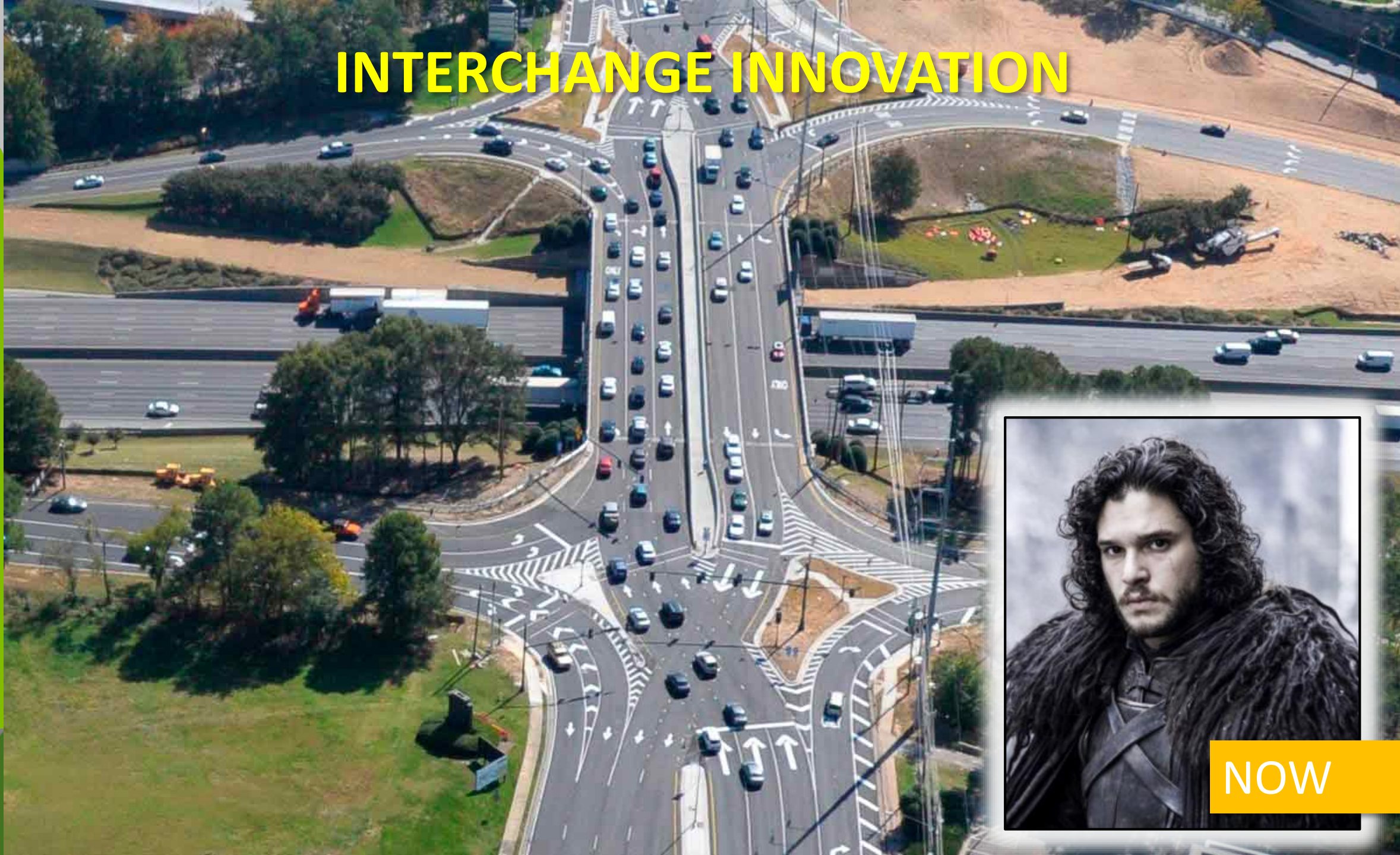


2010's





INTERCHANGE INNOVATION

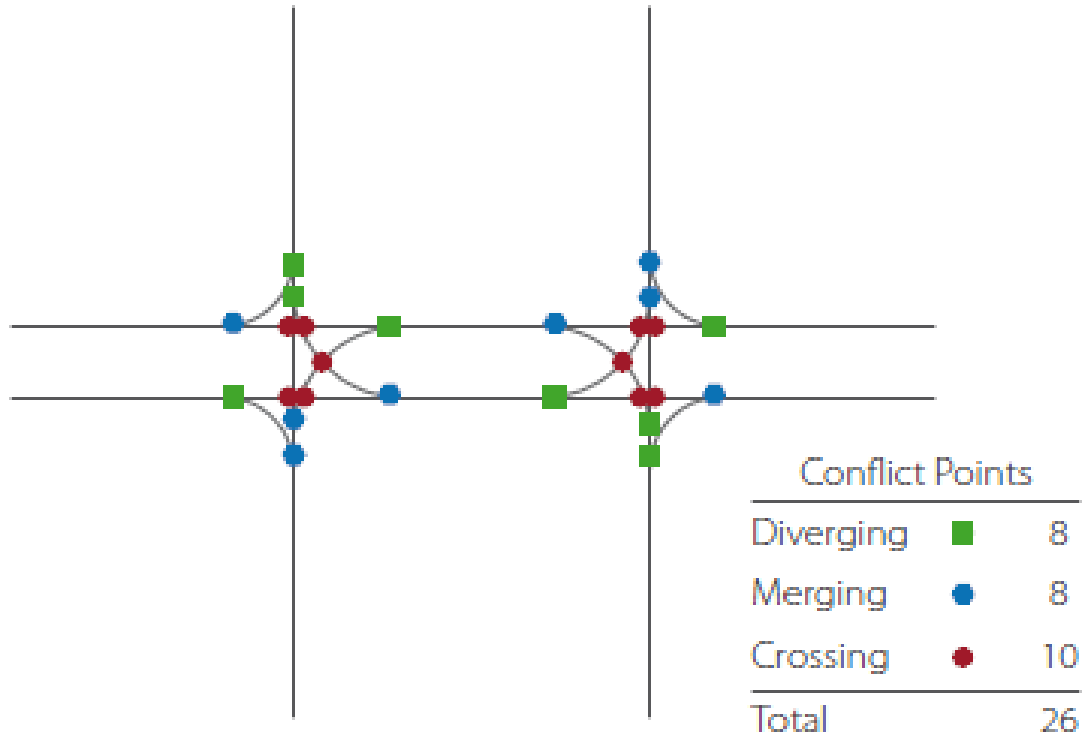


NOW

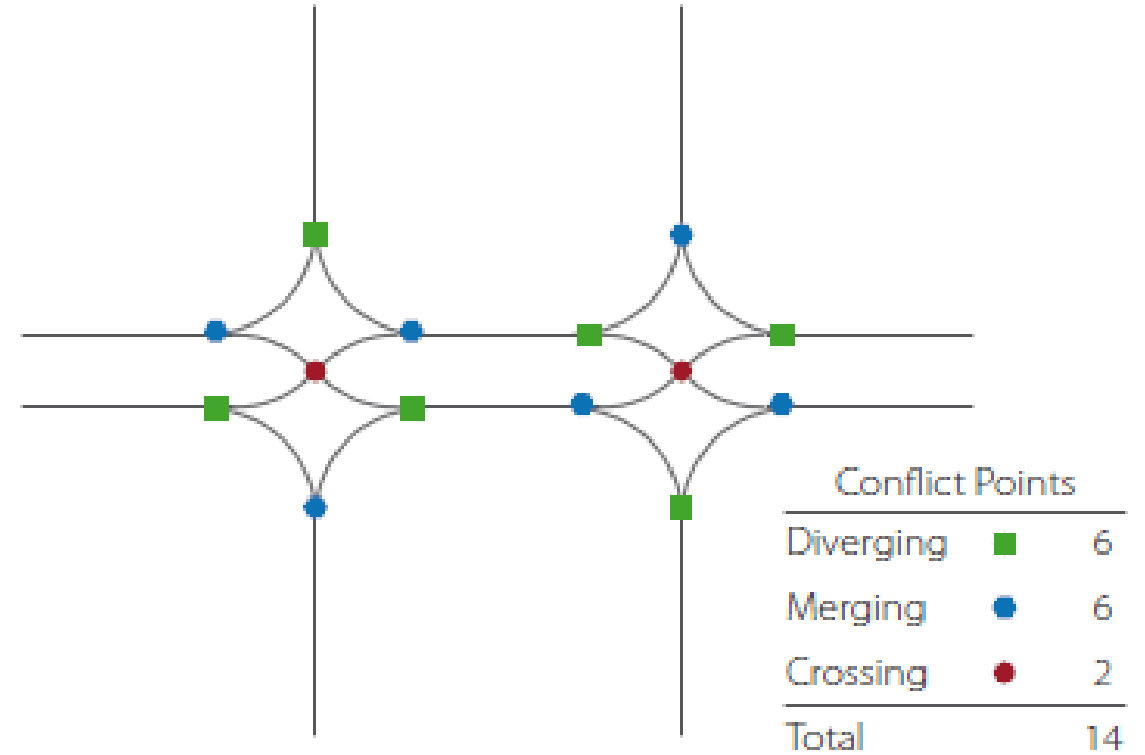
TRAFFIC MOVEMENTS



Diamond interchange



DDI interchange





DIVERGING DIAMOND





DIVERGING DIAMOND INTERCHANGE

Informational Guide

FHWA SA-14-067

August 2014

DESIGN INFORMATION BULLETIN NUMBER 90

Department of Transportation
 Division of Design
 Office of Standards and Procedures

DIVERGING DIAMOND INTERCHANGE

APPROVED BY:

TIMOTHY L. CRAGGS
 DIVISION CHIEF
 DIVISION OF DESIGN

THOMAS P. HALLENBECK
 DIVISION CHIEF
 DIVISION OF TRAFFIC OPERATIONS

Month XX, 2016

DIB 90
 2016

March 25,

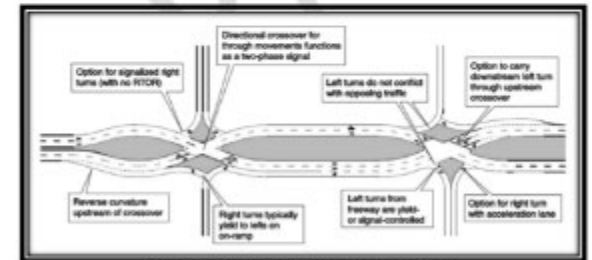
1.0 INTRODUCTION

California Department of Transportation (Caltrans) values innovations and seeks creative solutions. The diverging diamond interchange (DDI) also known as a double crossover diamond (DCD) is proving to be an efficient interchange configuration. The DDI is a viable alternative to the conventional diamond interchange and other service interchange forms such as partial cloverleaf. The primary difference between a DDI and a conventional diamond interchange is the design of directional crossovers on either side of the interchange.

The DDI design has been shown to improve the operations of turning movements to and from the freeway facility and significantly reduces the number of vehicle-to-vehicle, vehicle-to-pedestrian, and vehicle-to-bike conflict points compared to a conventional diamond interchange. The primary difference between the DDI and a conventional diamond interchange is the design of directional crossovers on either side of the interchange. Figure 1.0 shows the key characteristics of the diverging diamond interchange.

By moving through traffic to the left side of the street between the crossovers, left-turn movements are removed from the crossover signal phasing. Traffic signals at DDI's operate with two phase intervals compared to three at conventional diamond interchanges. This reduction in phase intervals improves overall throughput on the minor road and left-turning traffic to and from the freeway. The DDI operates efficiently for cross streets with high through movements or heavy left-turns on or off the freeway ramps.

Figure 1.0
 Key Characteristics of a DDI



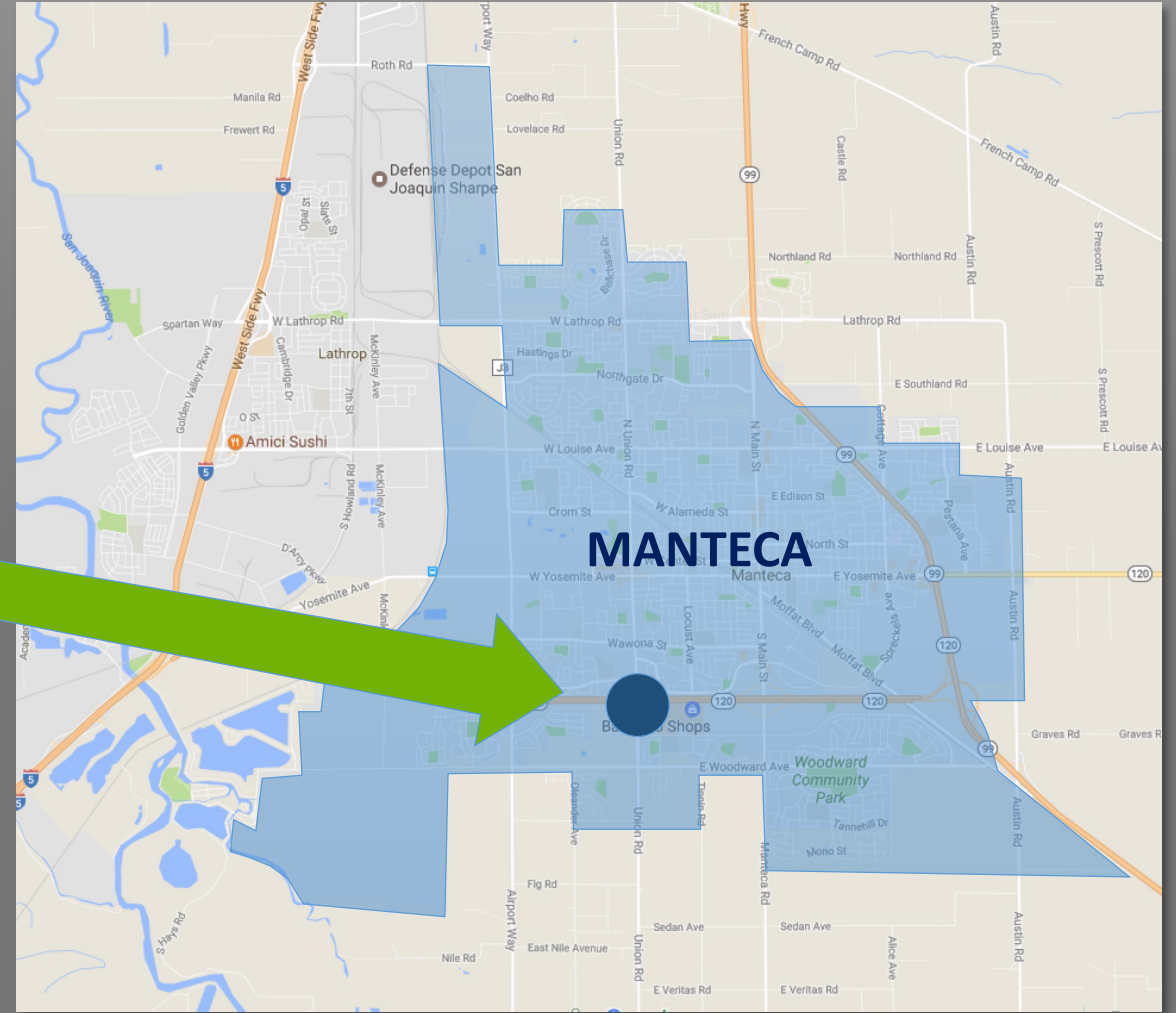
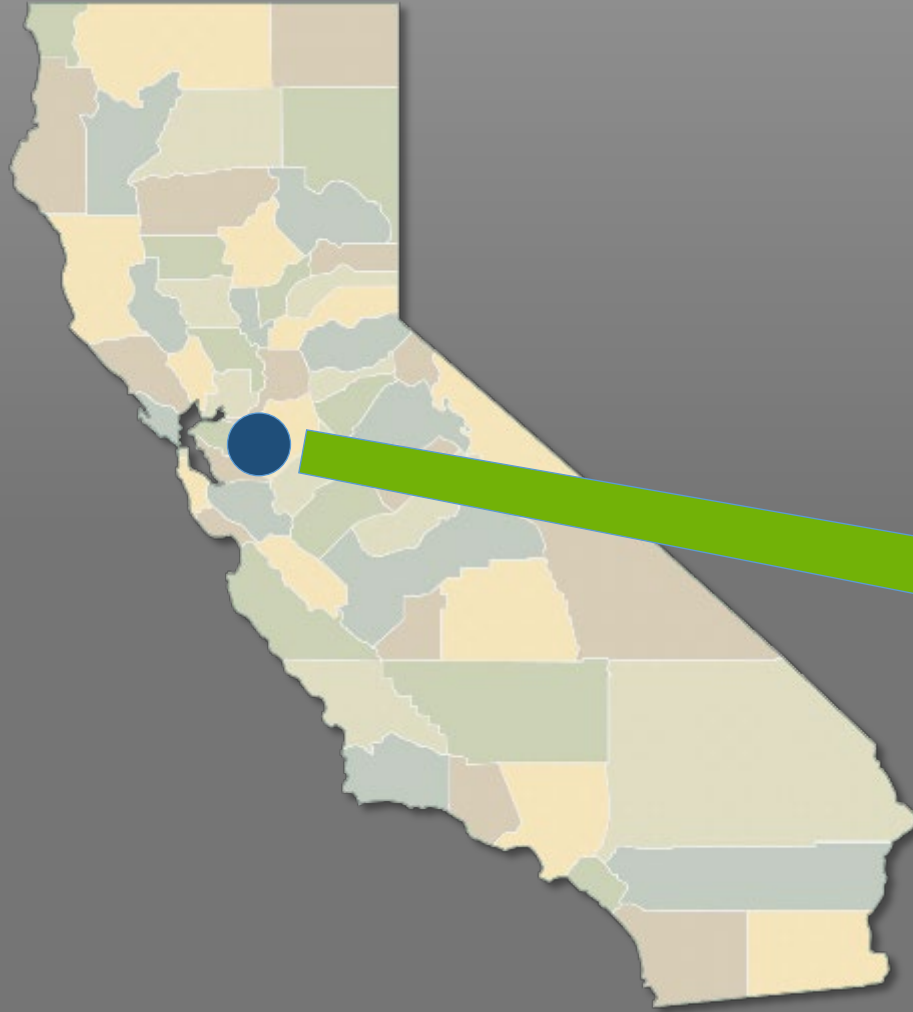
Source: FHWA-SA-14-067_DDI_Informational Guide

By shifting cross street traffic to the left side of the street between the signalized crossover intersections, vehicles on the crossroad making a left-turn on or off of freeway ramps do not



PROJECT LOCATION

DIVERGING DIAMOND





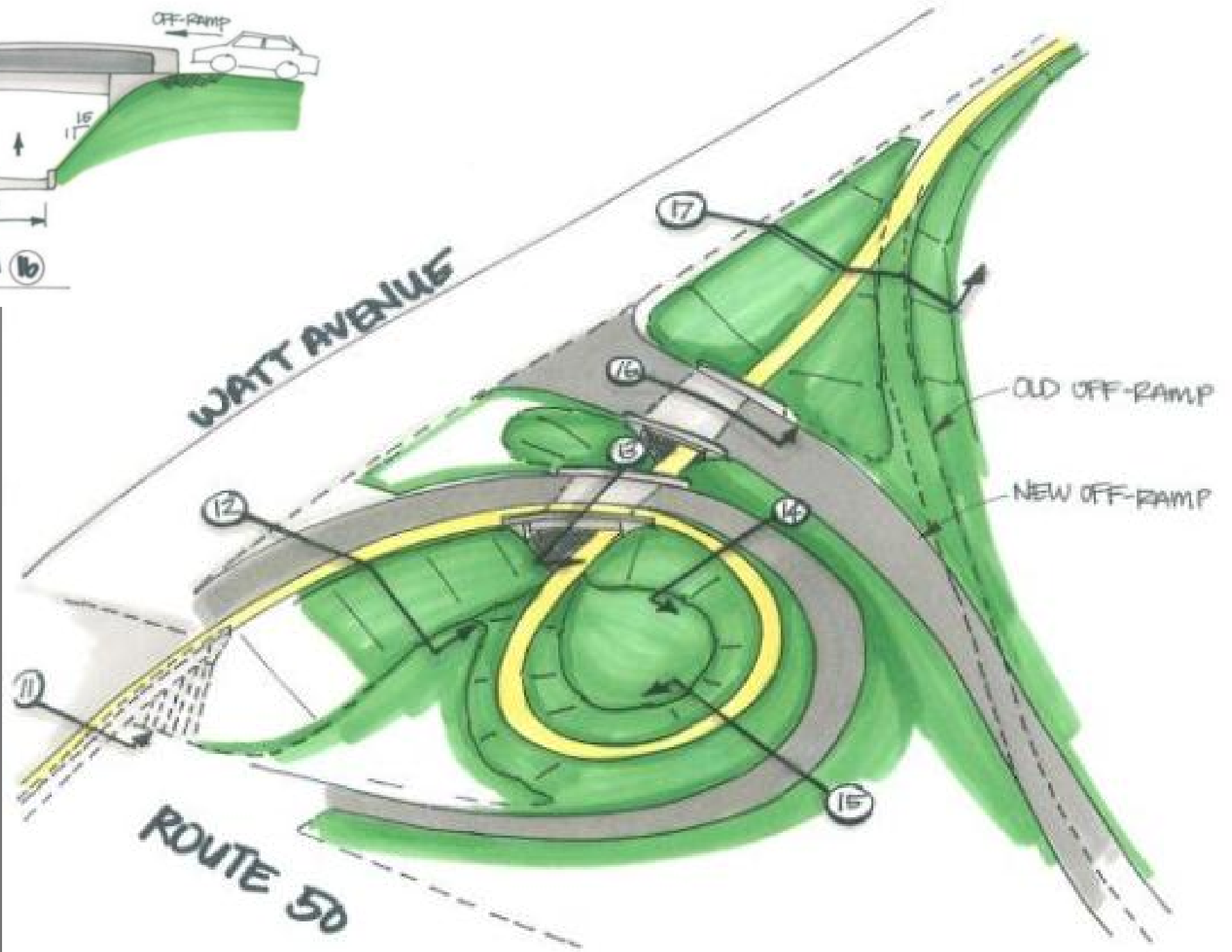
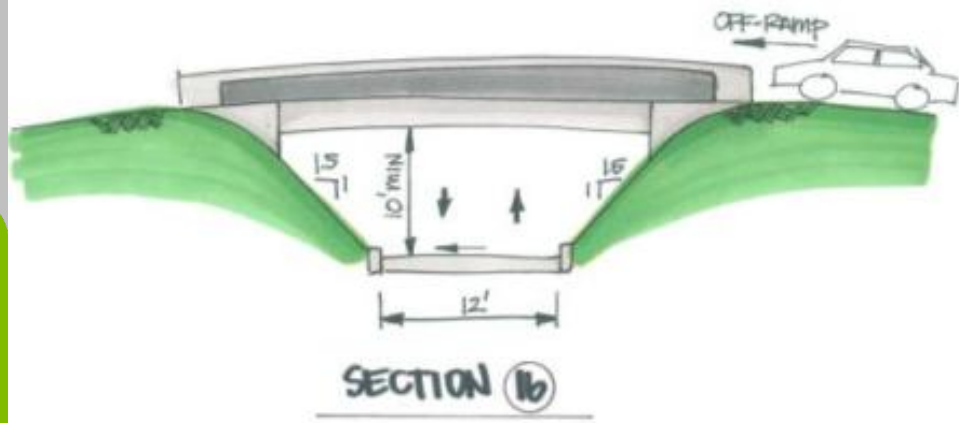
SR-120/Union Rd DDI Manteca, Ca





US 50/Watt Avenue







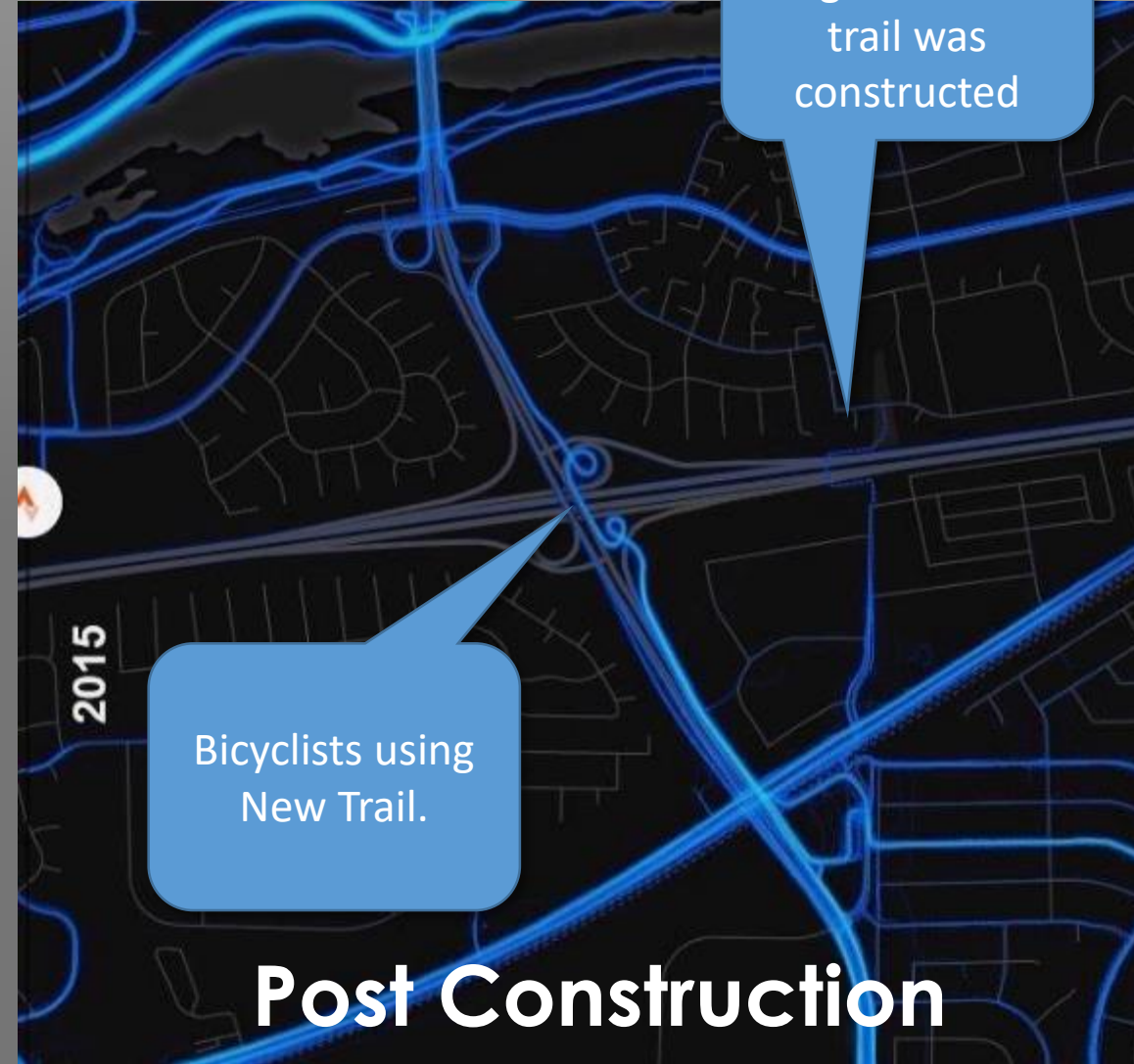
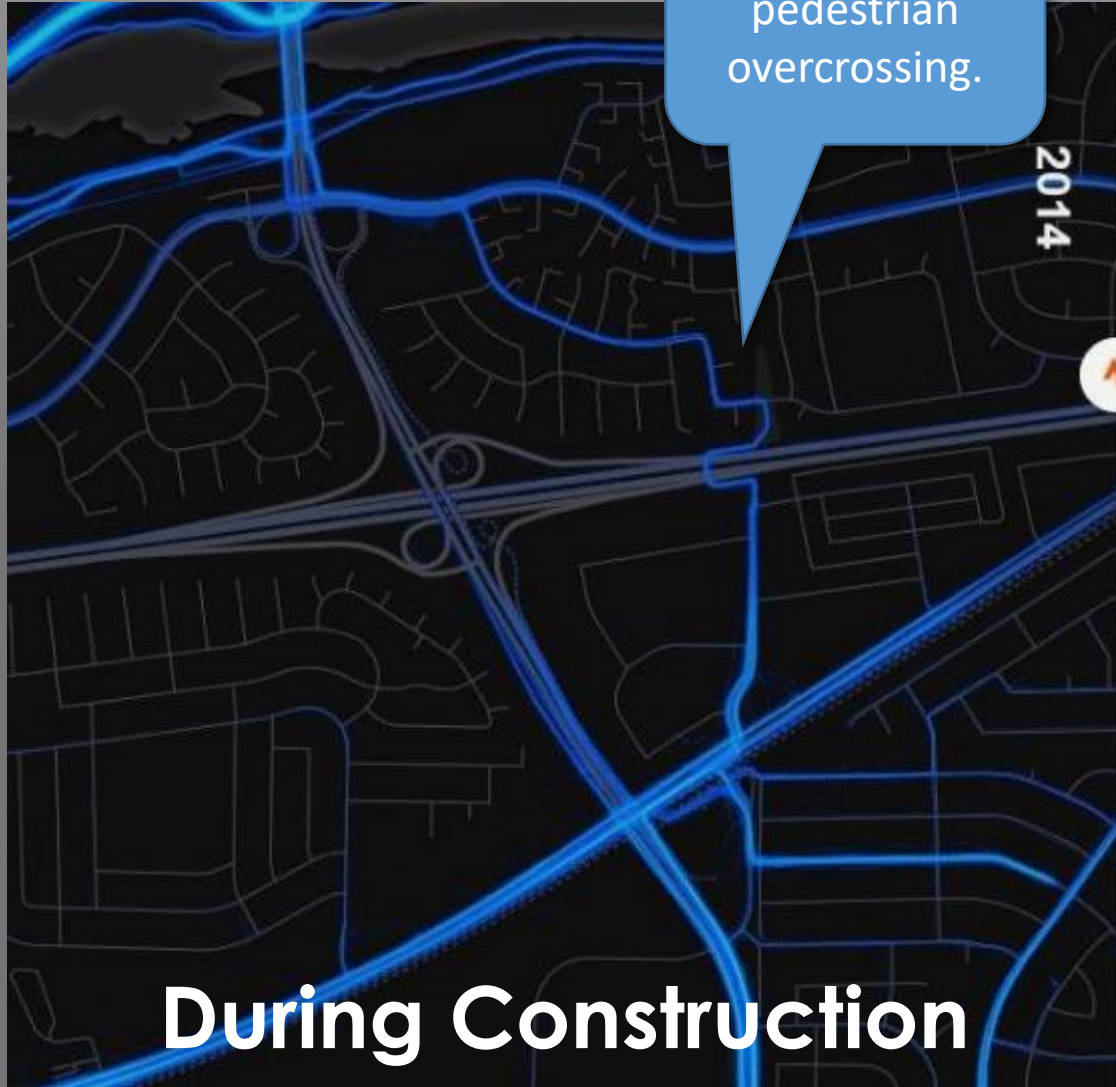
RIBBON PATH





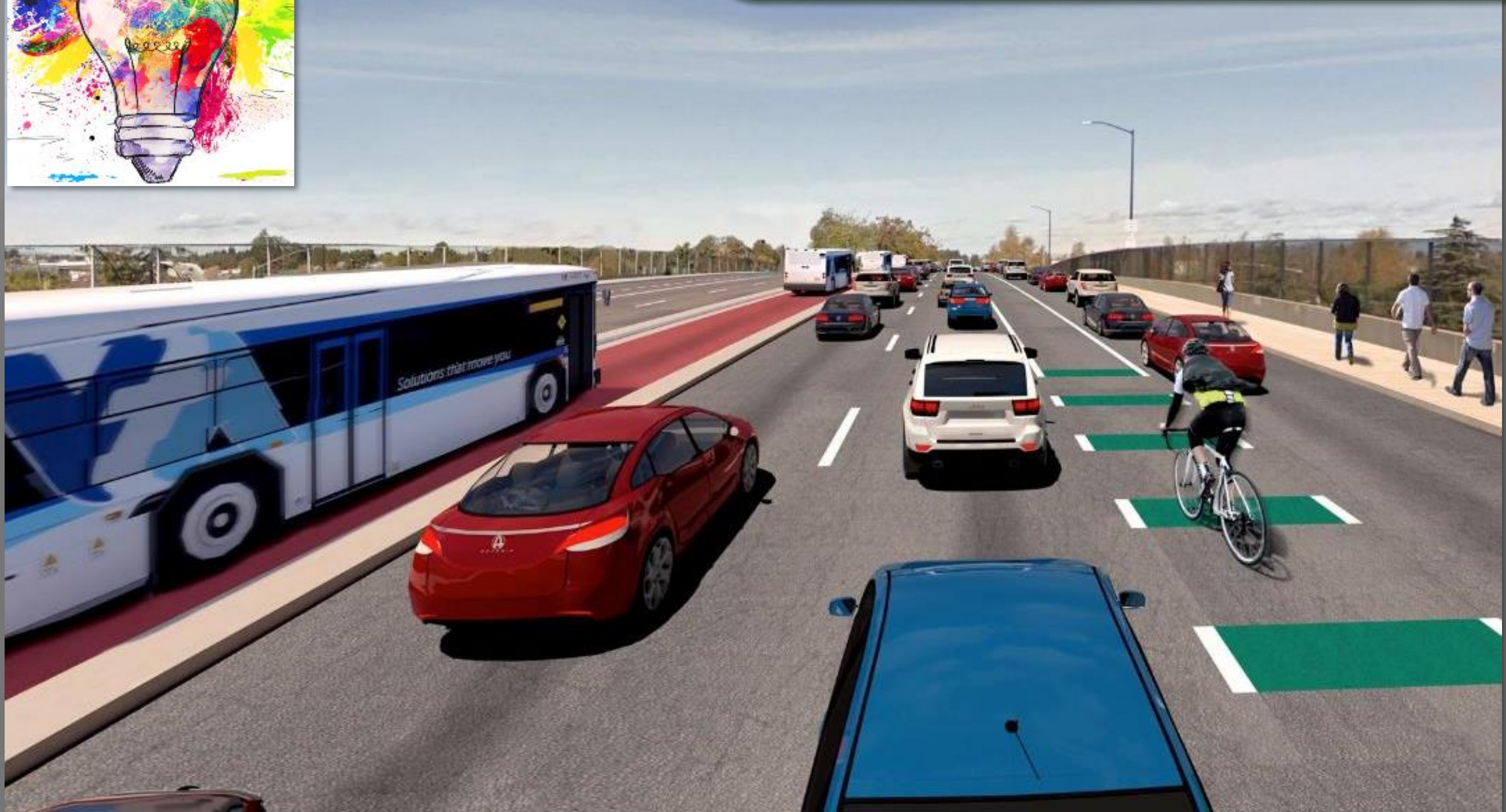
RIBBON PATH





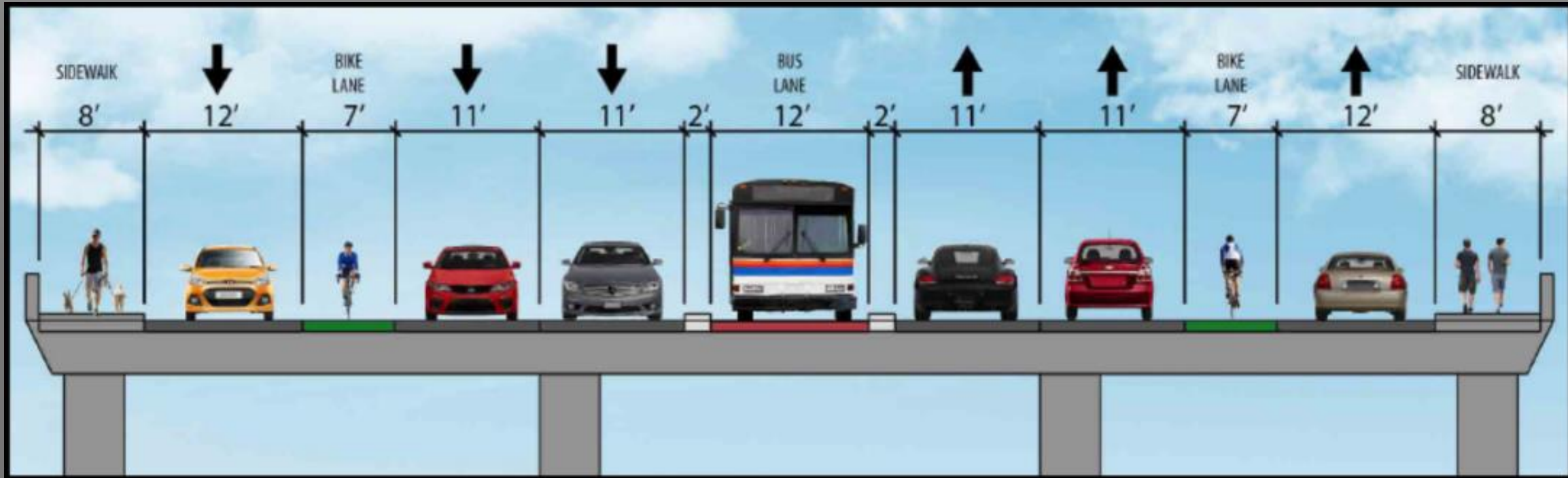


US 101/Shoreline Blvd





BUS RAPID TRANSIT LANE



Section View



BUS RAPID TRANSIT LANE



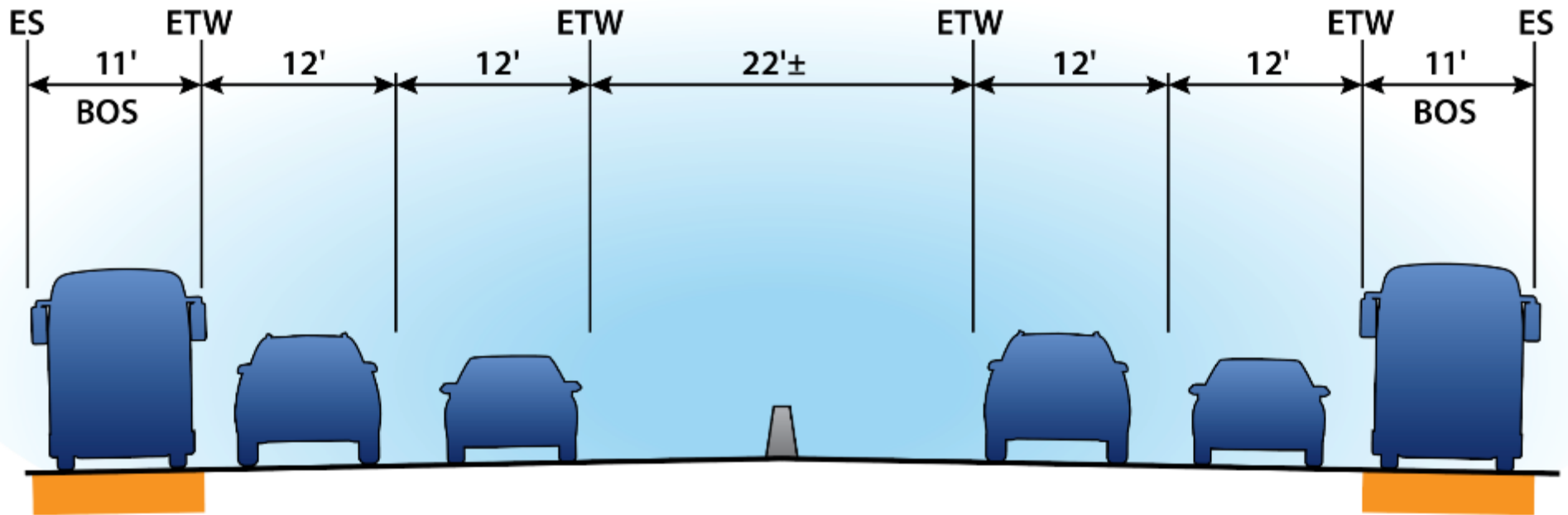
260 ft

Google earth



Highway 1 - SCCRTC

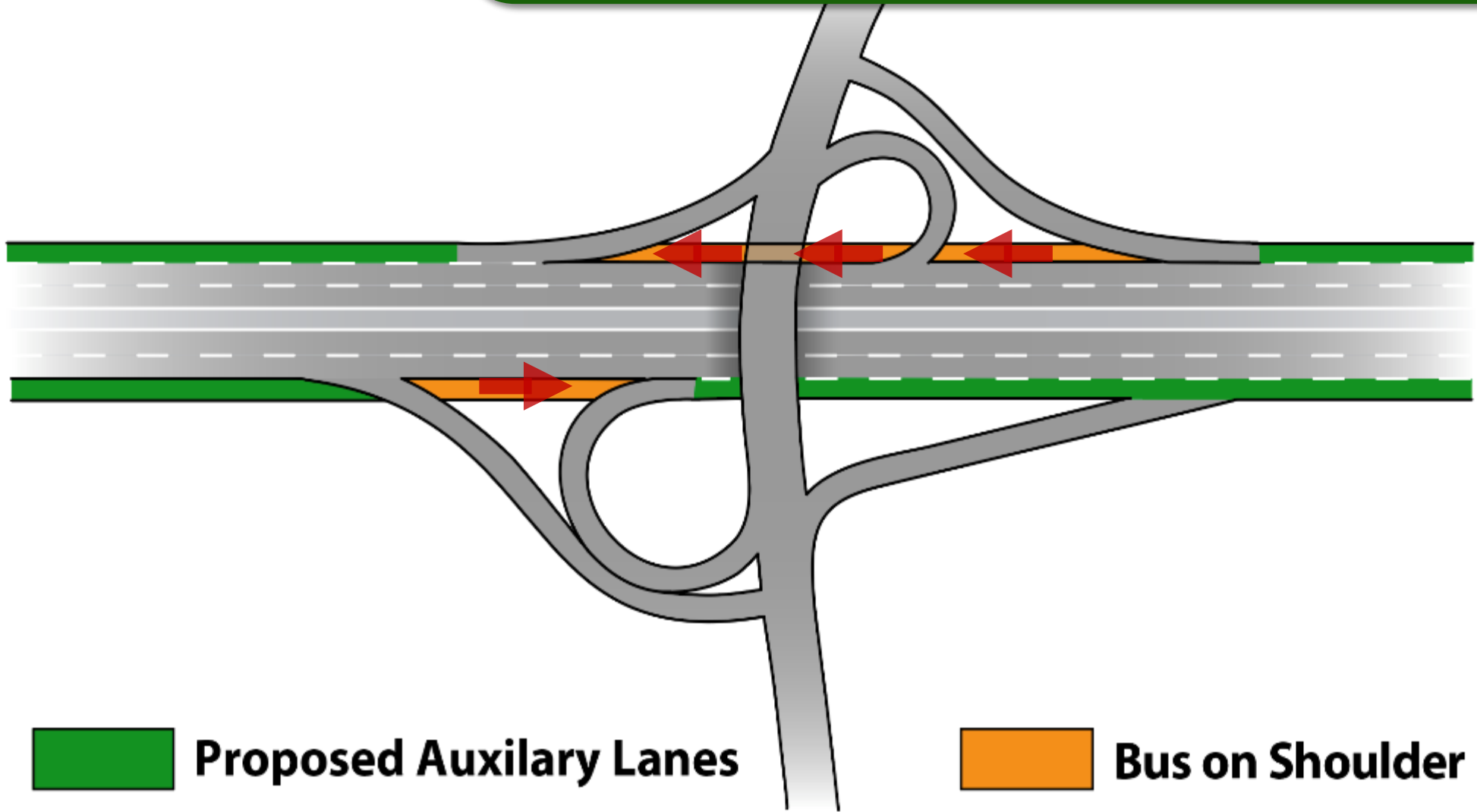




Section View



BOS On Shoulder Operation



BUS ON SHOULDER



**SO,
WHAT HAVE WE LEARNED?**



1950's



1970's



1980's



1990's



2000's



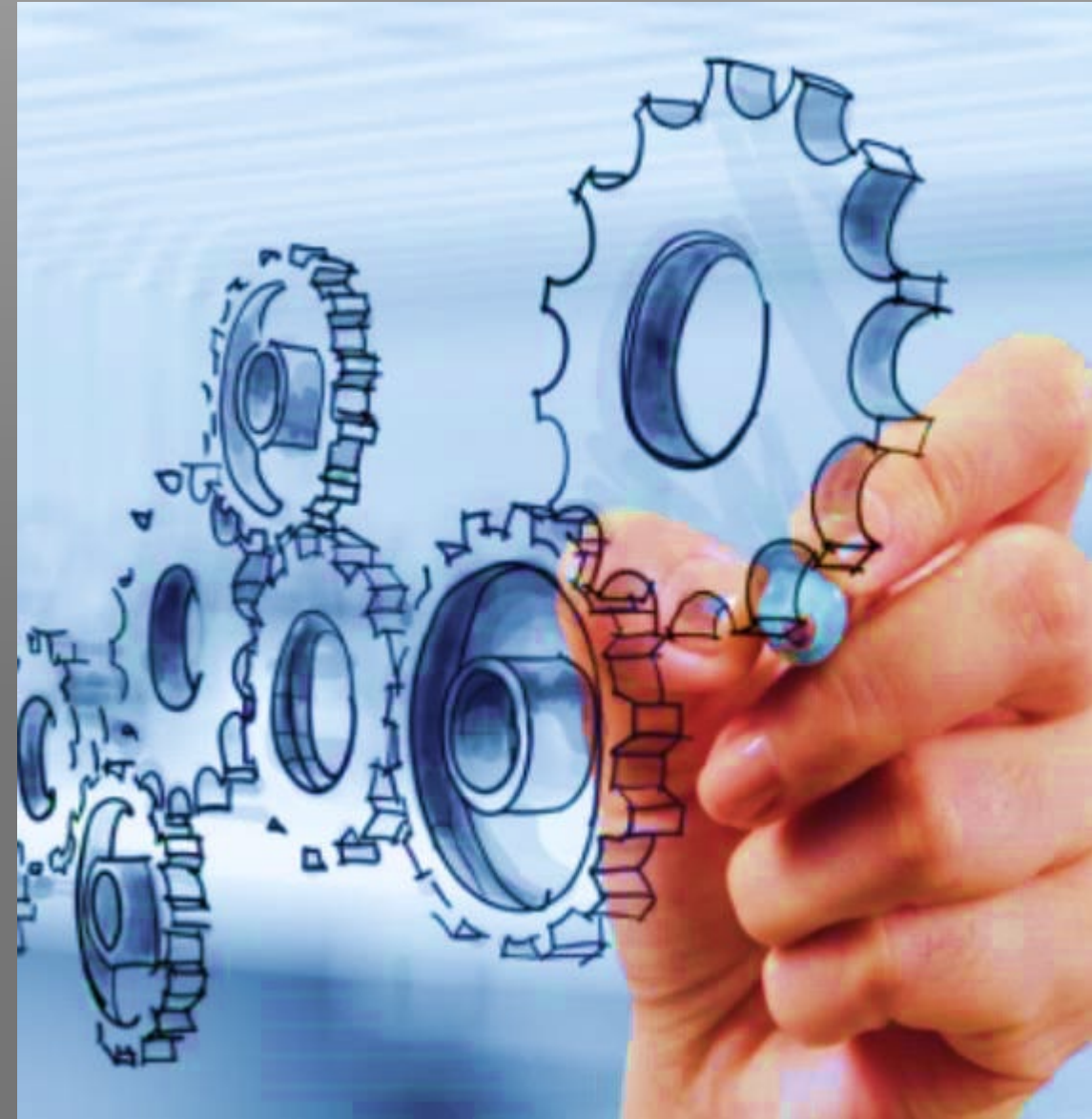
2010's



NOW



CREATIVITY



INNOVATION



MARK THOMAS

Rob Himes, PE

President

(949) 333-9690

rhimes@markthomas.com

www.markthomas.com