The National Academies of
SCIENCES · ENGINEERING · MEDICINE

TRANSPORTATION RESEARCH BOARD

Practical Design Principles for Affordable Roundabouts: Case Studies

Wednesday, February 27, 2019
1:00-3:00 PM ET

The Transportation Research Board has met the standards and requirements of the Registered Continuing Education Providers Program. Credit earned on completion of this program will be reported to RCEP. A certificate of completion will be issued to participants that have registered and attended the entire session. As such, it does not include content that may be deemed or construed to be an approval or endorsement by RCEP.

Purpose

Discuss how practical design principles can be used to help agencies afford roundabouts.

Learning Objectives

At the end of this webinar, you will be able to:

- Describe how freight and their vehicles are handled at smaller roundabouts
- Identify where curb details are essential
- Discuss how agencies can message the design being built and set expectations for users

Brian Morehead, P.E., City Engineer – City of Newark

Nick Shultz, P.E., Transportation Engineer – City of Newark

Aaron Call, P.E., Principal – OHM Advisors

Circles on the Square

Mini-Roundabouts in the Central Business District

TRB Webinar
February 27, 2019

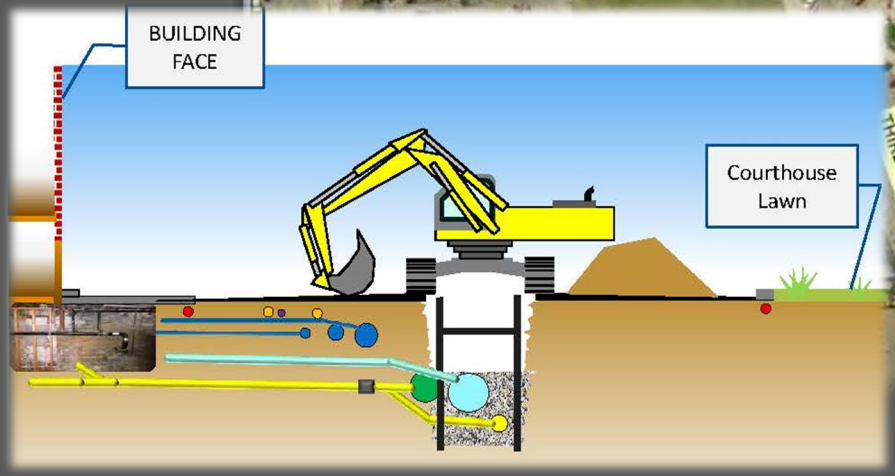
Part 1

Background

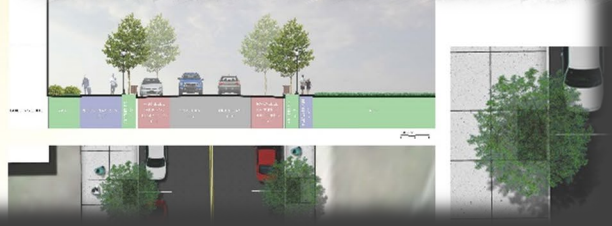
About Newark, Ohio

- County Seat of Licking County
- 40 Miles from Downtown Columbus
- Population = 47,573 (2010 Census)

SEWER SEPARATION SCOPE

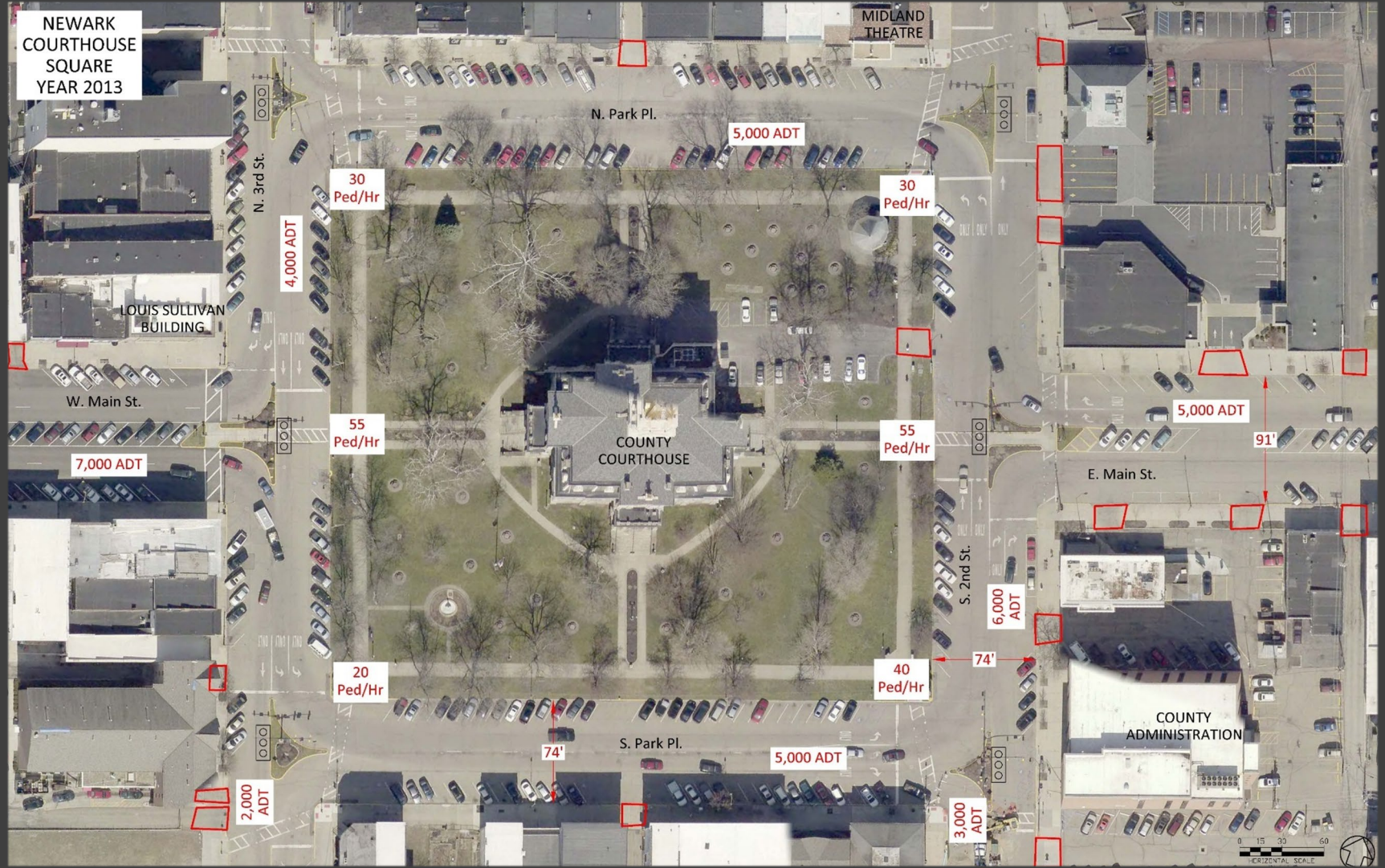


STREETSCAPE PLAN



Part 2

Existing Infrastructure


NEWARK COURTHOUSE SQUARE YEAR 2013
MIDLAND THEATRE
N. Park Pl.
5,000 ADT
30 Ped/Hr
30 Ped/Hr
N. 3rd St.
4,000 ADT
LOUIS SULLIVAN BUILDING
W. Main St.
55 Ped/Hr
55 Ped/Hr
7,000 ADT
COUNTY COURTHOUSE
5,000 ADT
91'
E. Main St.
S. 2nd St.
6,000 ADT
74'
20 Ped/Hr
40 Ped/Hr
COUNTY ADMINISTRATION
74'
S. Park Pl.
5,000 ADT
2,000 ADT
3,000 ADT
0 15 30 60
HORIZONTAL SCALE

N PARK PL

N 2nd St

N PARK PL

West of N 2nd St

N 3RD ST

W Main St

S PARK PL

S 3rd St

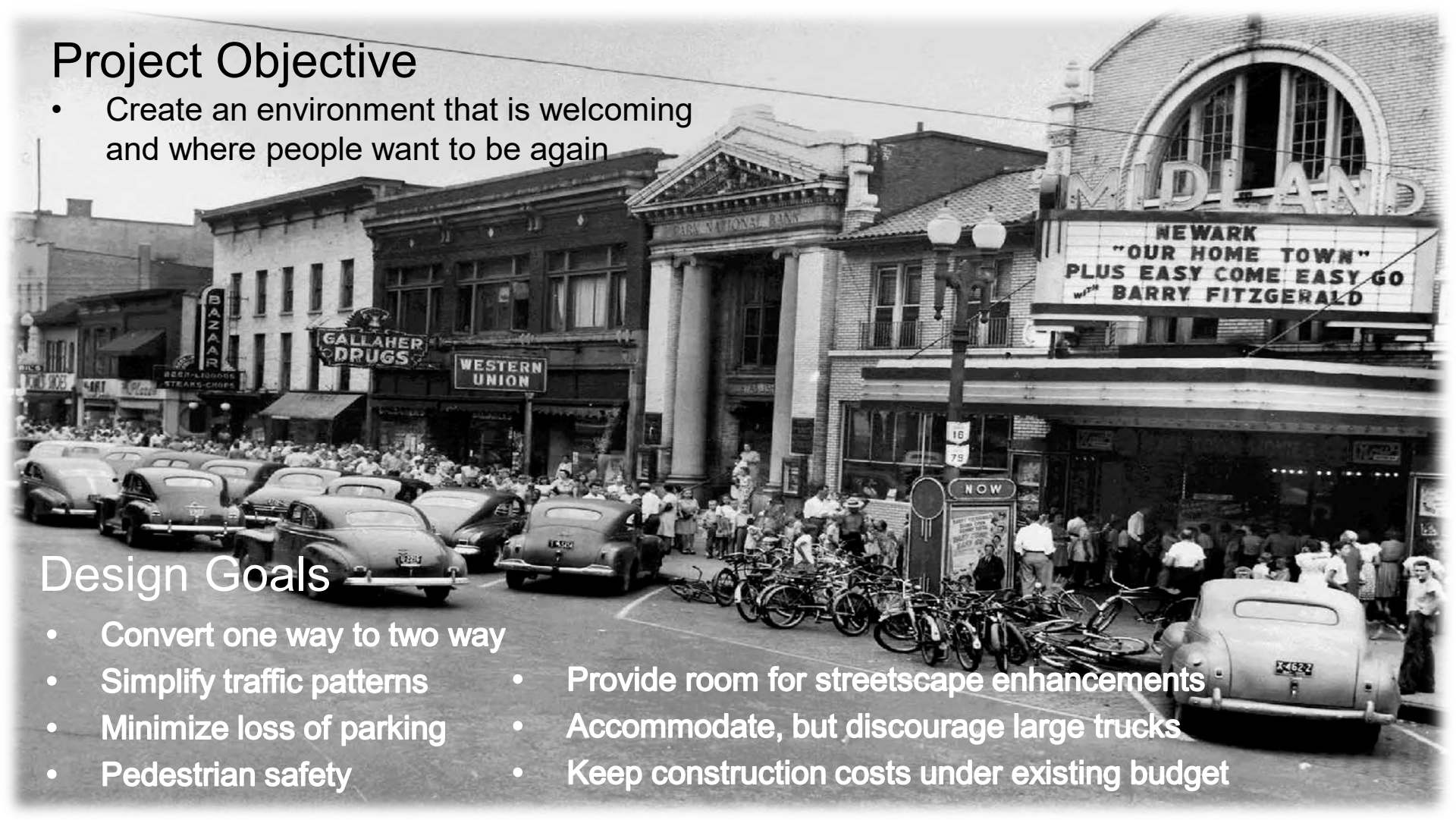
S 3rd St / S Park Pl

Part 3

Design

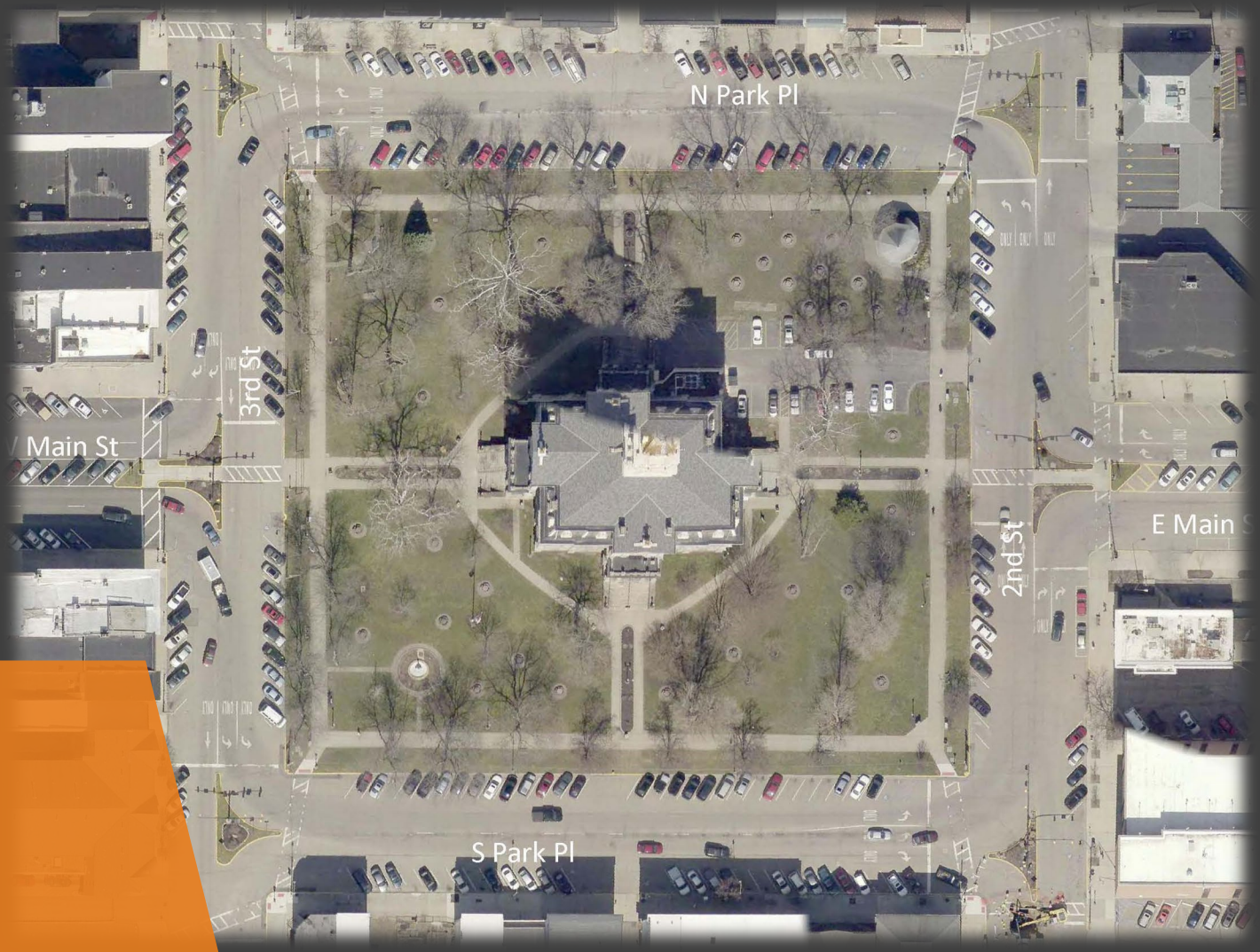
Project Objective

- Create an environment that is welcoming and where people want to be again

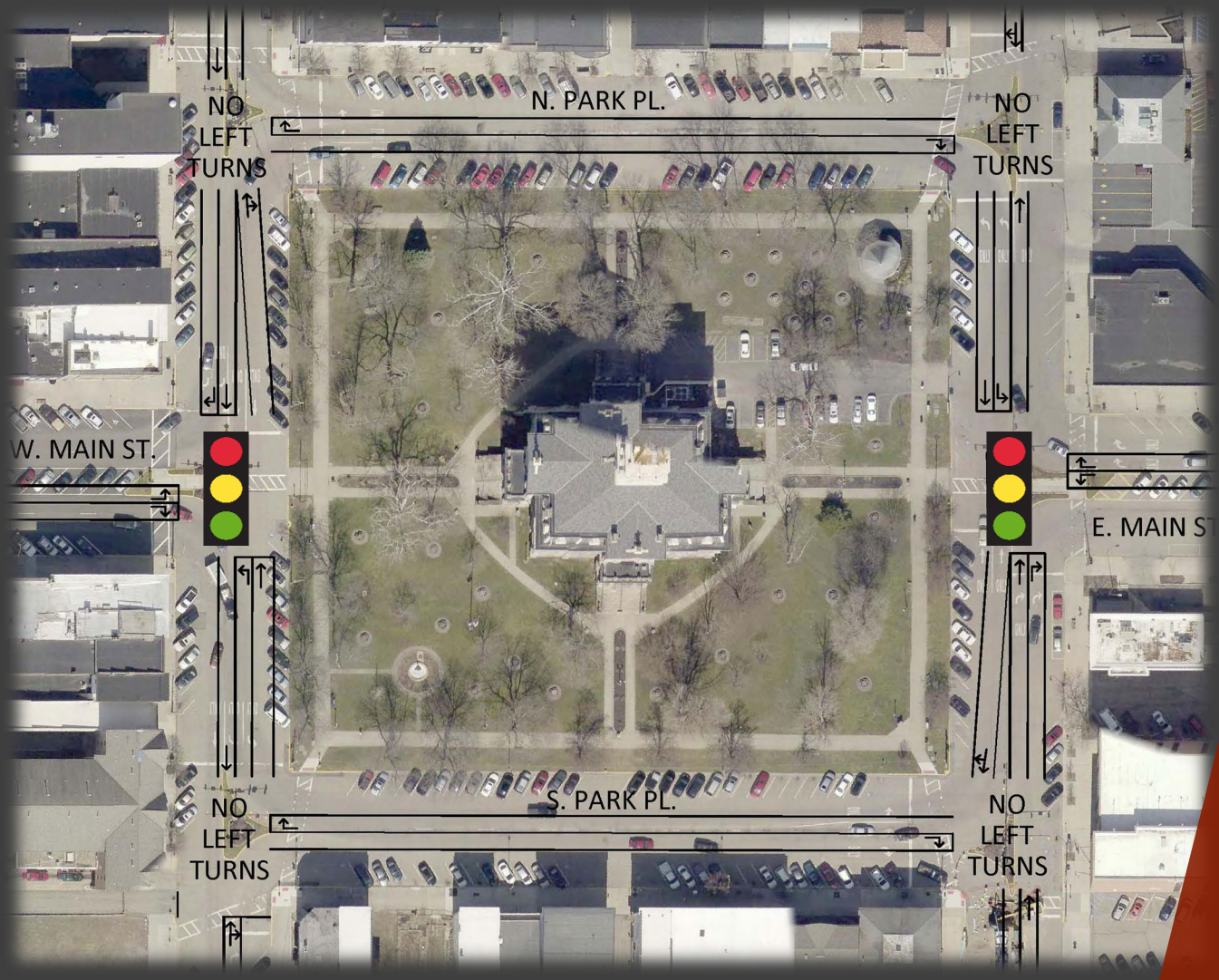


Design Goals

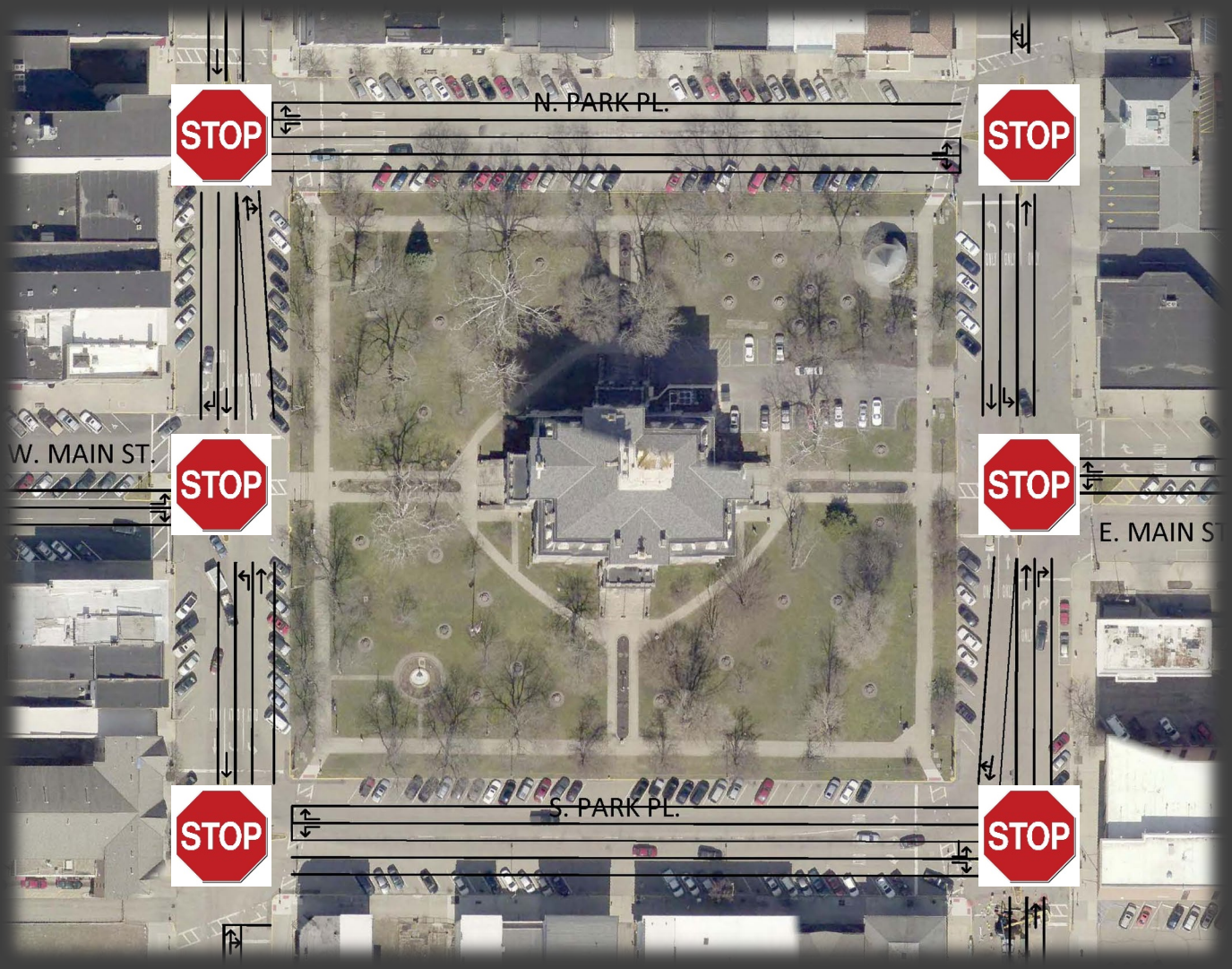
- Convert one way to two way
- Simplify traffic patterns
- Minimize loss of parking
- Pedestrian safety
- Provide room for streetscape enhancements
- Accommodate, but discourage large trucks
- Keep construction costs under existing budget



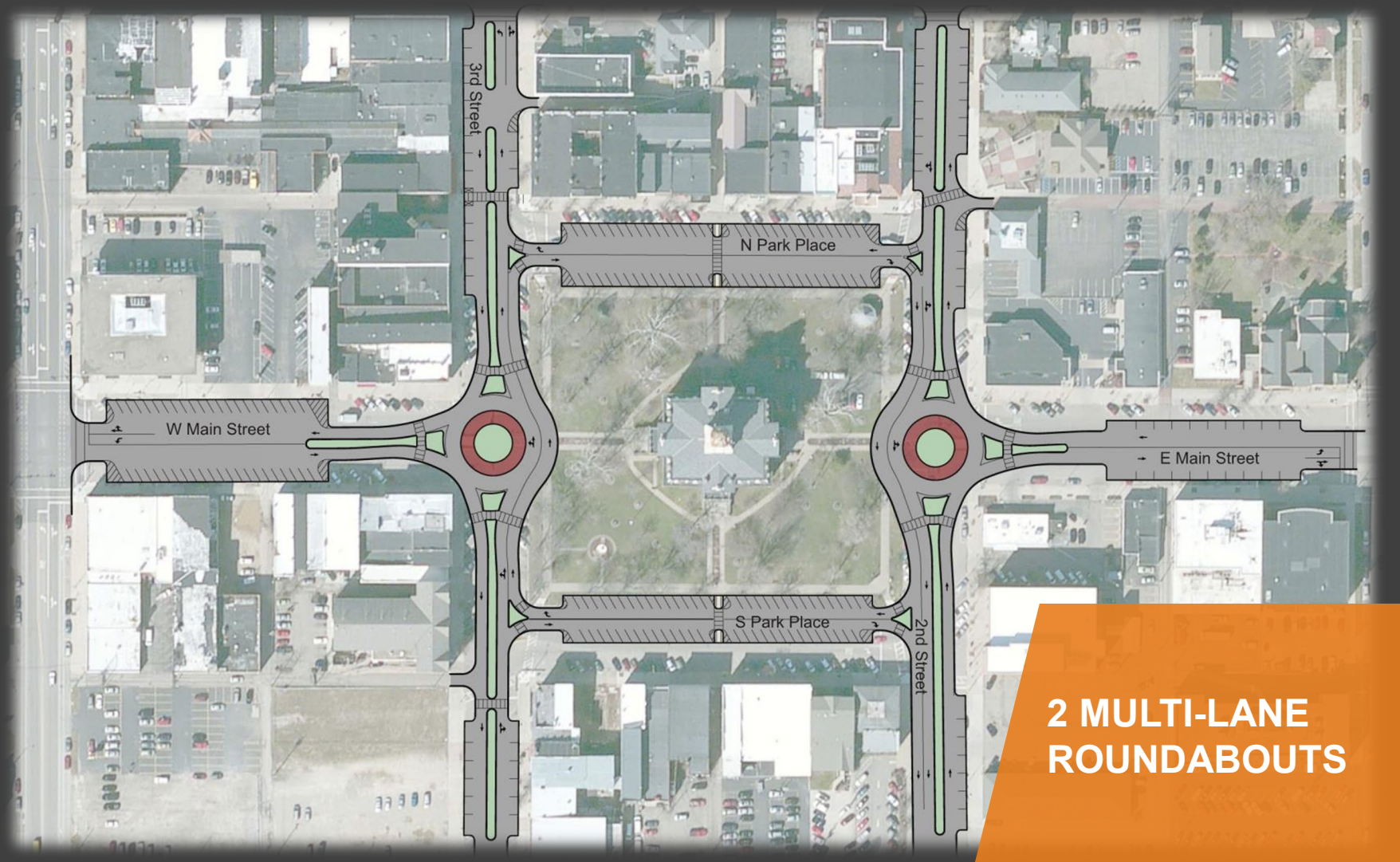
EXISTING



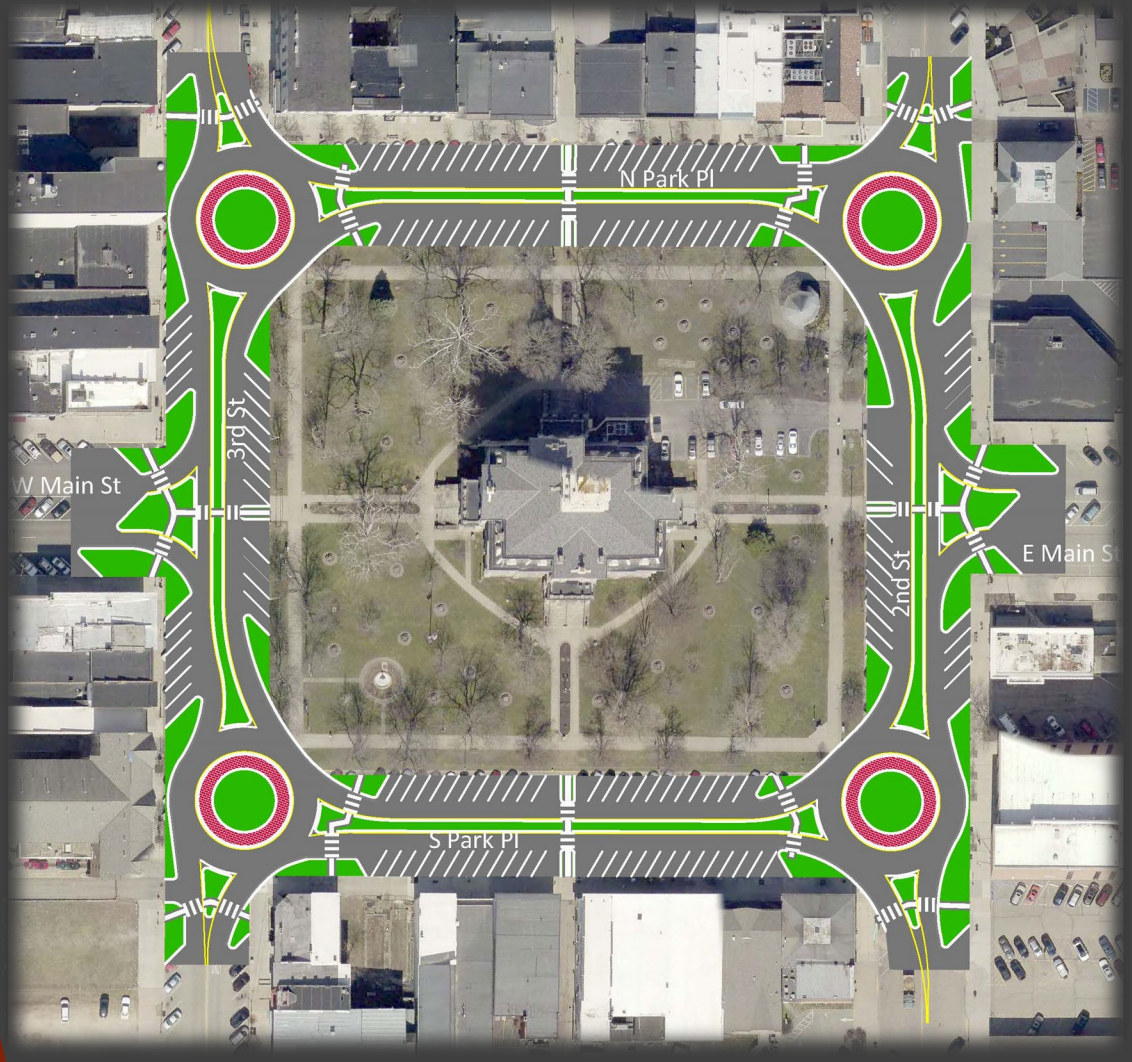
SIMPLIFIED SIGNALIZATION



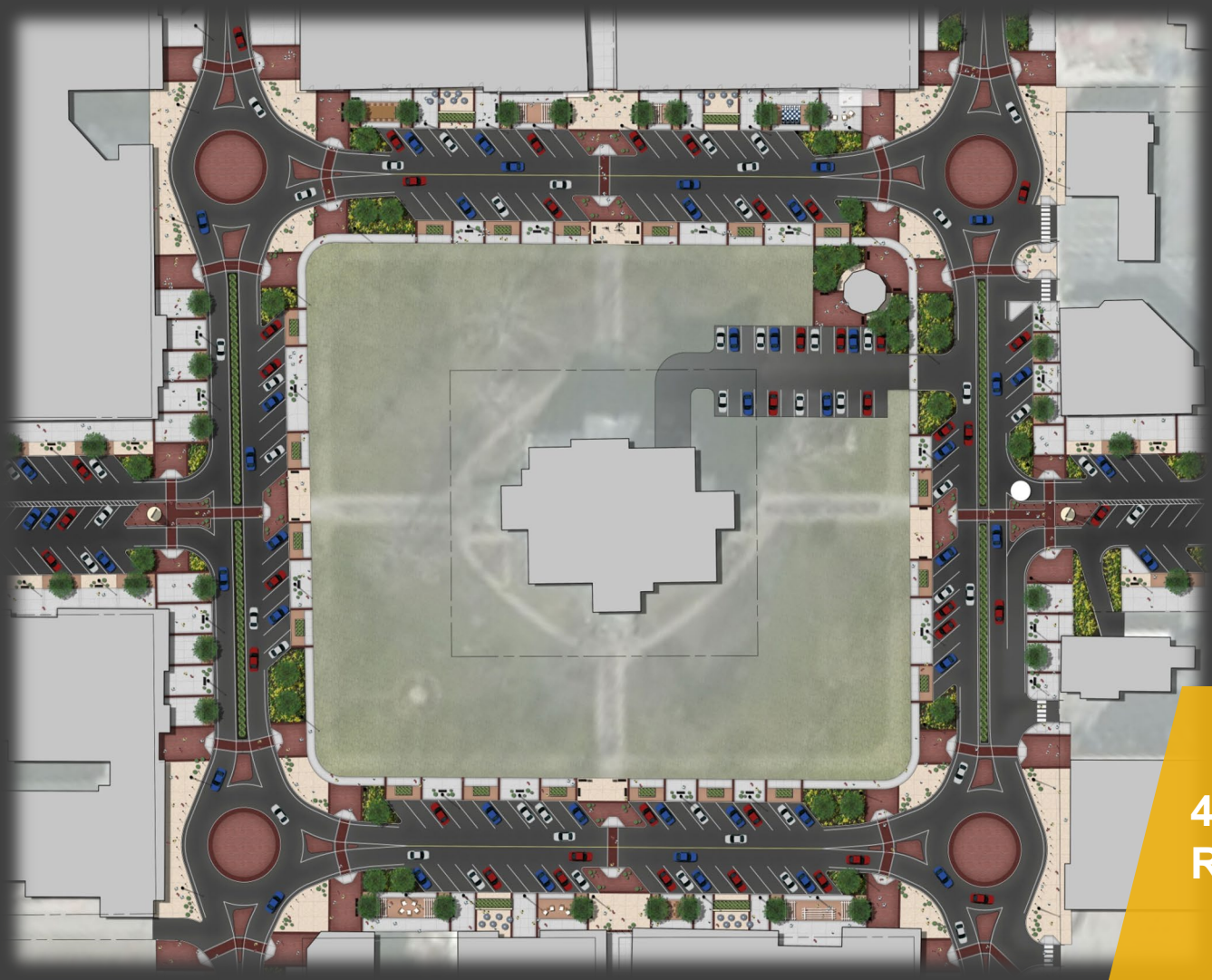
STOP CONTROLLED



2 MULTI-LANE ROUNDABOUTS



4 SINGLE-LANE ROUNDABOUTS

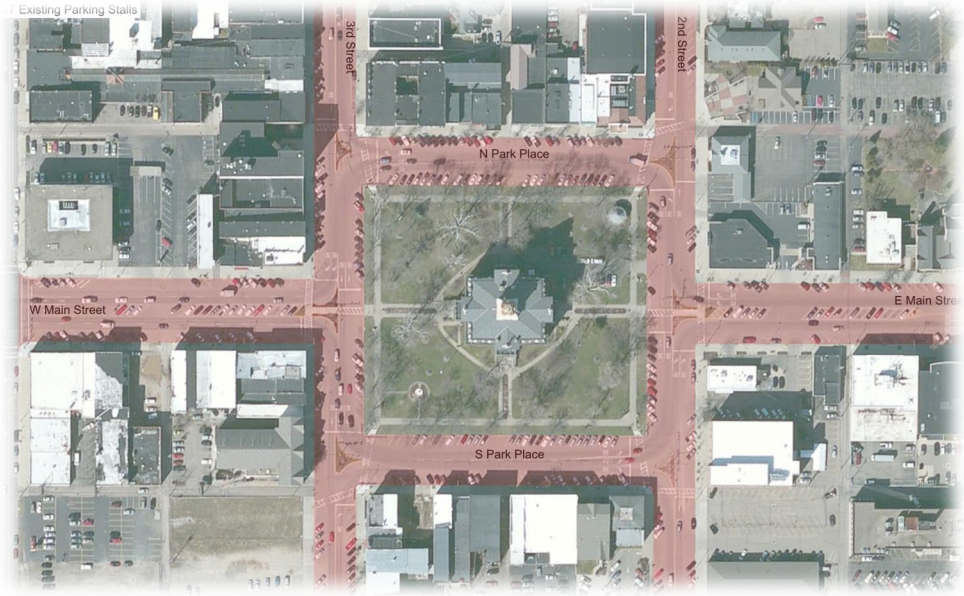


4 MINI ROUNDABOUTS

PUBLIC INVOLVEMENT

Design Challenges

- Parking design and availability
- Grading to existing structures / ADA compliance
- Incorporating into sewer separation plans
- MOT / Construction Phasing
- Maintaining / limiting access
- Design Schedule
- BMP Design / Green Infrastructure Loan



Part 4

Finished Product

DOWNTOWN
NEWARK TODAY

N PARK PL

N 2nd St

BEFORE

N PARK PL

N 2nd St

AFTER

N 3RD ST
W Main St

BEFORE

N 3RD ST
W Main St

AFTER

S PARK PL

S 3rd St

BEFORE

S PARK PL

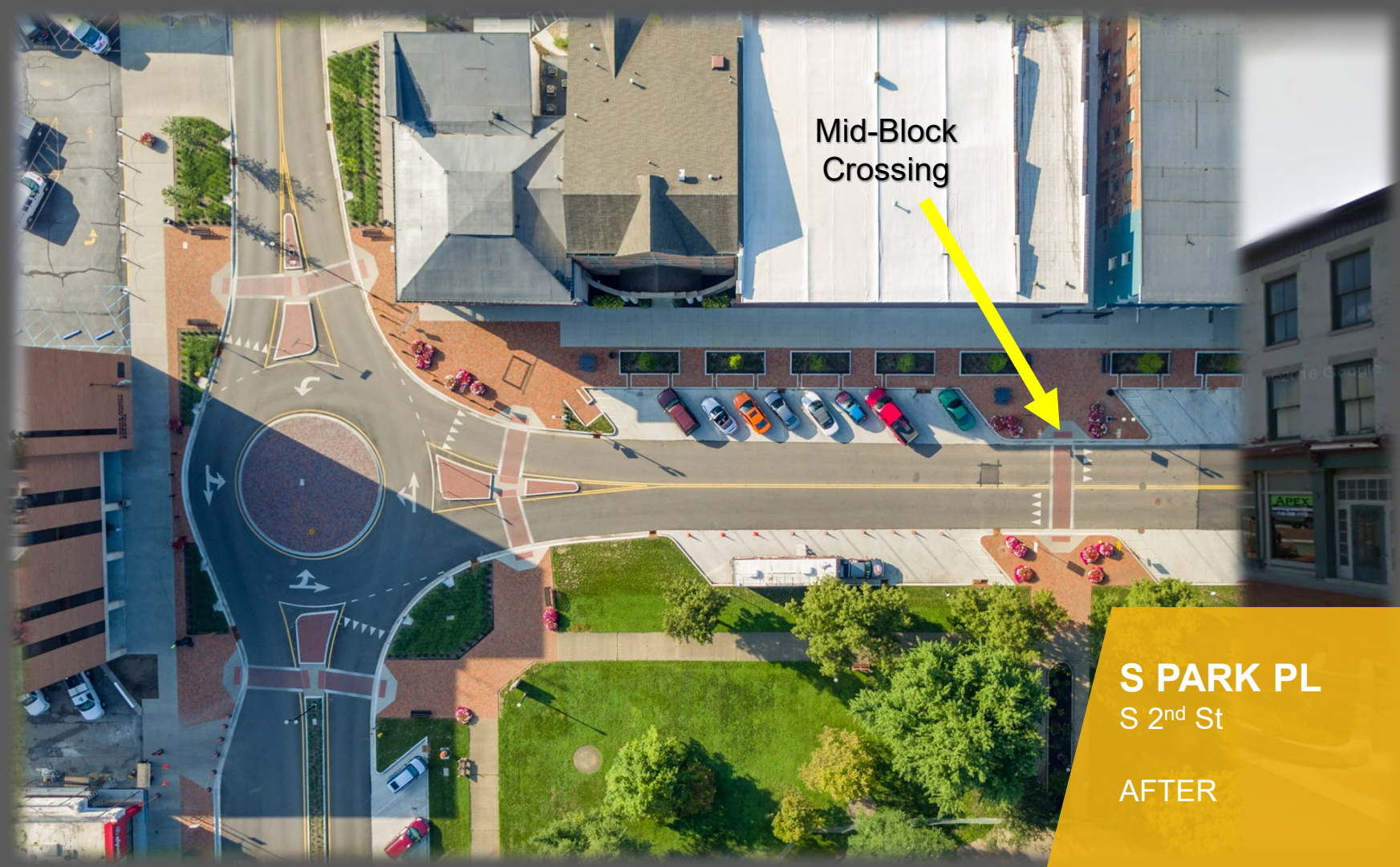
S 3rd St

AFTER

S PARK PL

S 2nd St

BEFORE



S PARK PL

S 2nd St

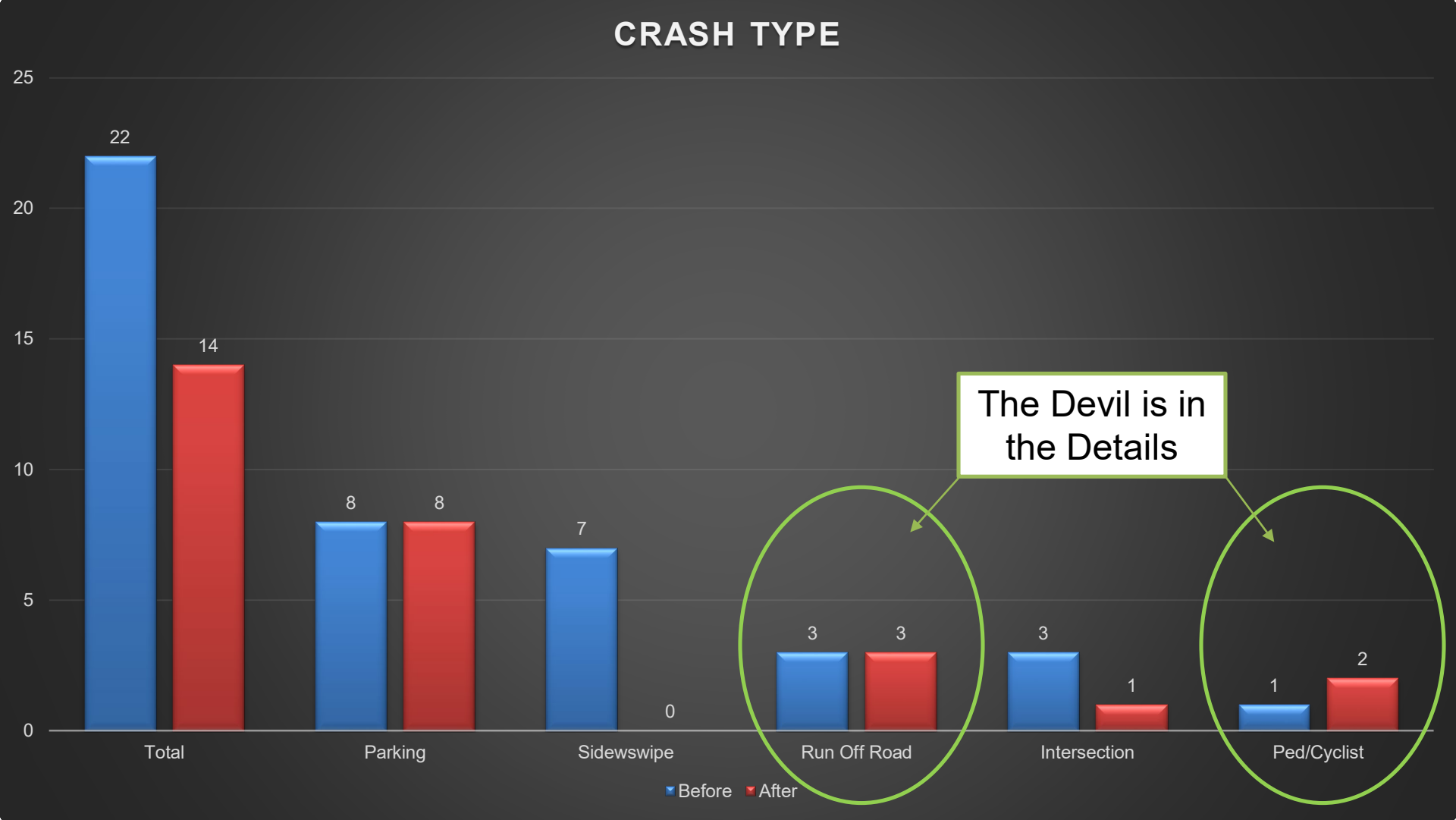
AFTER

Part 5

Results/Lessons Learned

S 2nd St / S Park Pl

S 2nd St / S Park Pl


CRASH TYPE
25
20
15
10
5
0
22
14
8
8
7
0
3
3
3
1
1
2
The Devil is in the Details
Total
Parking
Sidewswipe
Run Off Road
Intersection
Ped/Cyclist
Before
After

ISSUES:

- WB-50 Design Vehicle

SOLUTIONS:

- Move Signs
- Truck Restriction Signage
- Compact Cars Only Parking Space

W MAIN ST

S 3rd St

ISSUES:
- Left of Center

SOLUTIONS:
- Enforcement
- Education

S PARK PL
S 2nd St

ISSUES:

- Parking on Center Island

SOLUTIONS:

- Enforcement
- Education
- Wayfinding

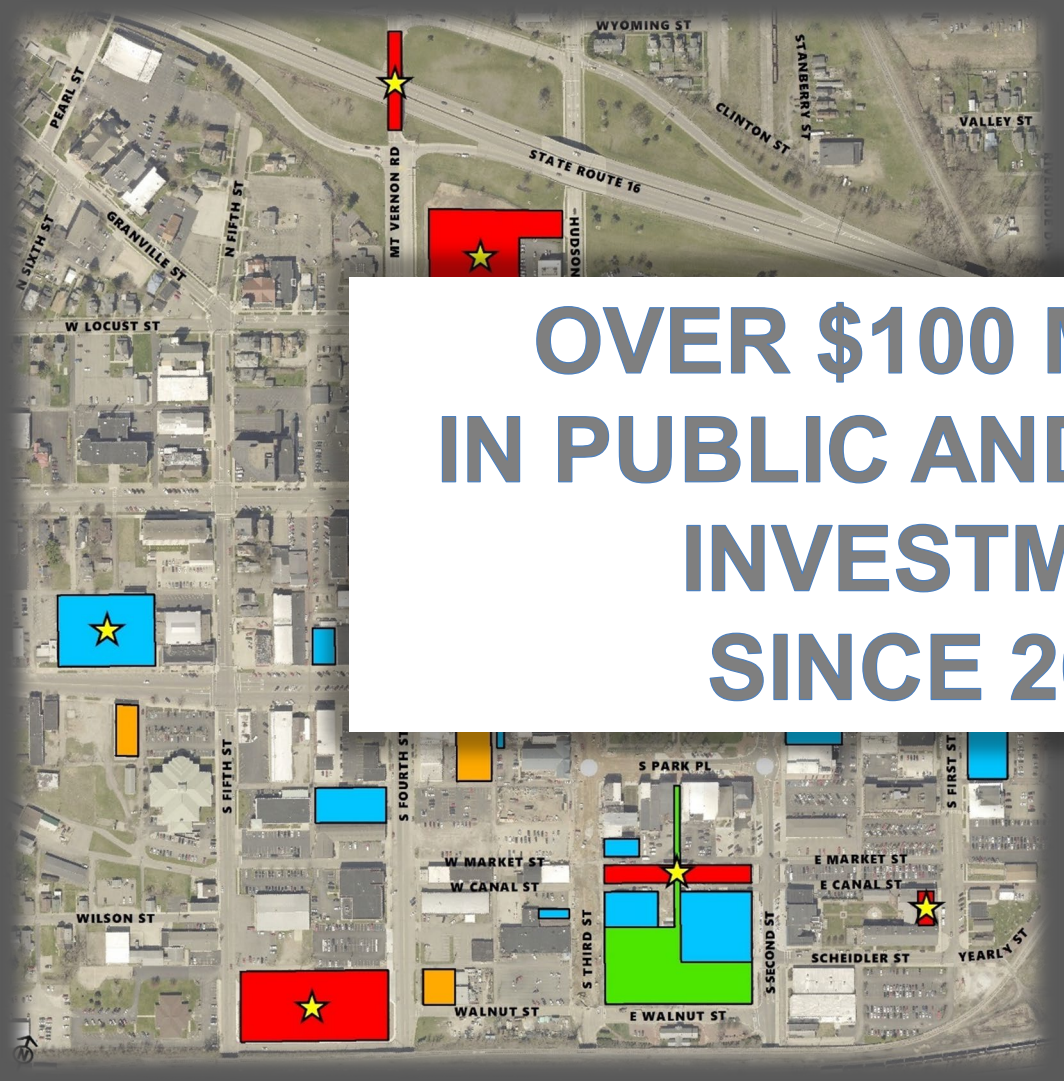
S PARK PL

S 2nd St

Part 6

Economic Impact

PUBLIC & PRIVATE INVESTMENT



- Beautification (1)
- New Building Construction (6)
- Demo Building (7)
- Renovate Building (23)

OVER $100 MILLION IN PUBLIC AND PRIVATE INVESTMENT SINCE 2014!

on

& Offices)
nies)
Venue and Event Space
w Apartments

ilding

h 3rd Tower)
otel

ECONOMIC DEVELOPMENT

Brian Morehead, P.E., City Engineer – City of Newark
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Aaron.Call@ohm-advisors.com

Thank you!
Questions?

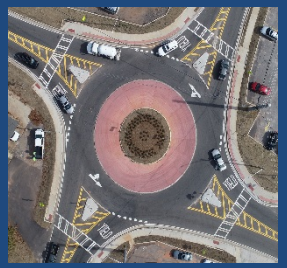
TRB Webinar
February 27, 2019

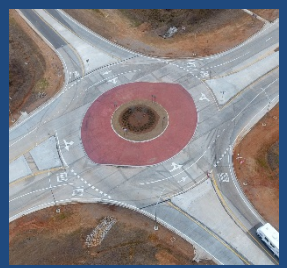
Affording Roundabouts:
Practical Design Principals for Affordable Roundabouts

Georgia Case Studies

Scott Zehngraff, P.E., PTOE

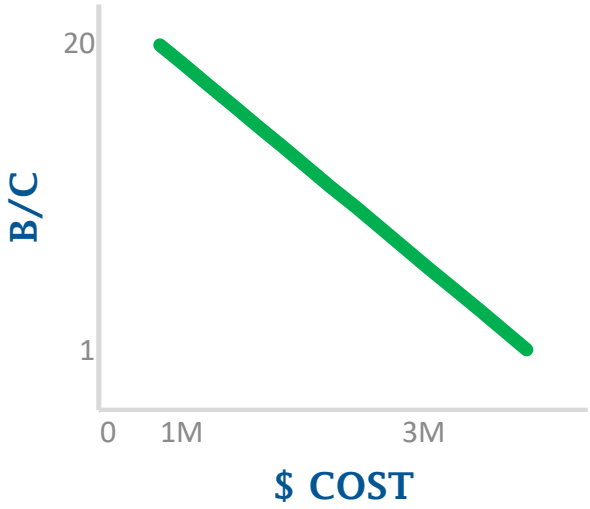
Assistant State Traffic Engineer
Georgia Department of Transportation
Office of Traffic Operations





Overview

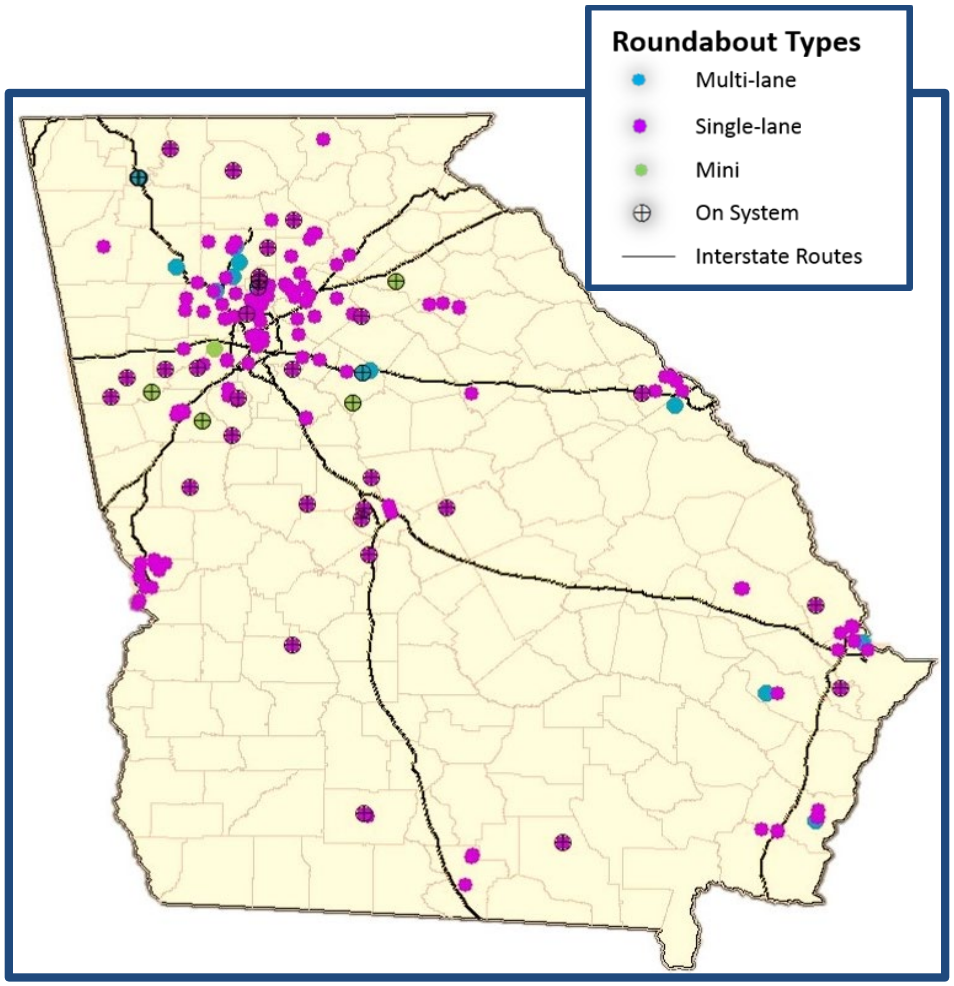
- Responsible for delivering lump sum safety & operational projects
  - Benefit/Cost driven
  - Variables:
    - Benefit – can't adjust
    - Cost – can adjust
- Case studies
  - Low cost – increases B/C
  - Alternative delivery methods
  - Identify lessons learned to be applied on conventional projects



Roundabouts in Georgia

- **50+ On state routes/ built with GDOT $$**
  - 35+ single lane/compact
  - 5+ multi-lane/hybrid
  - 10+ mini
- 20+ under construction
- 65+ in design

- **165+ On local roads**
- 250+ Other circular intersections

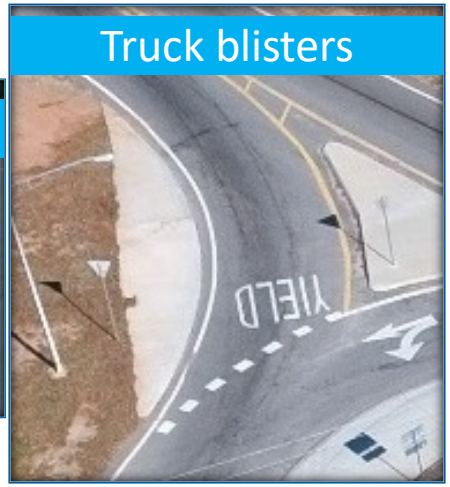


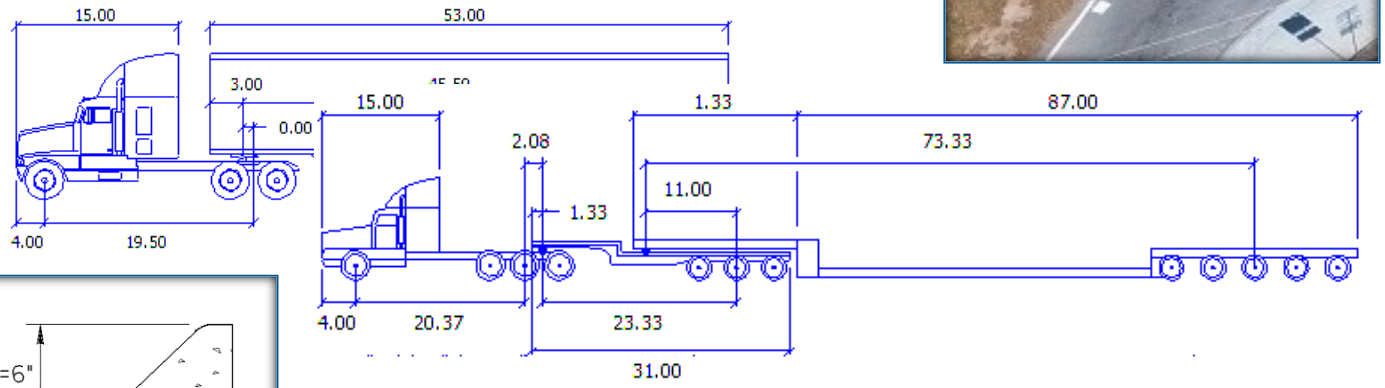
Things to look out for

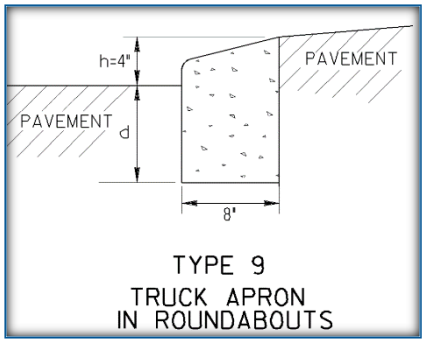
How do we accommodate trucks at smaller roundabouts?

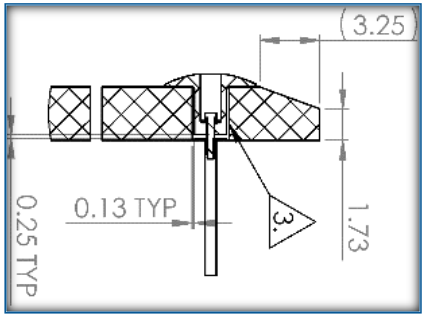
Mountable central islands

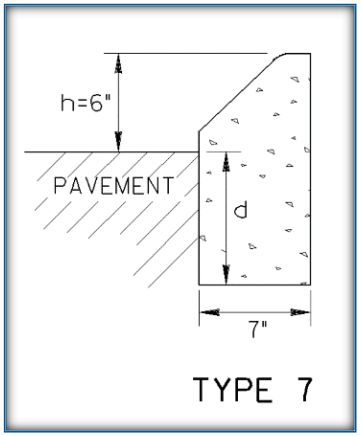
Truck blisters







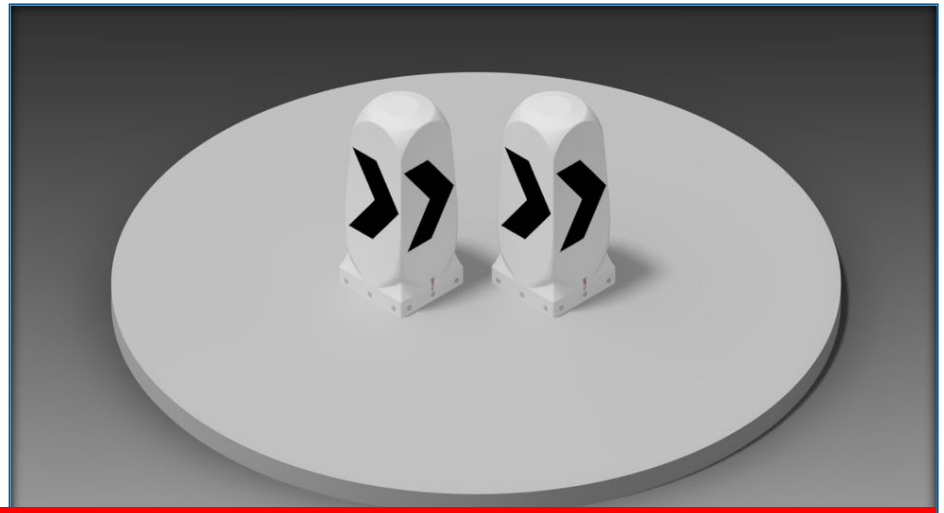




What curbing do we use?

How do we message design of low cost roundabouts?

Marking



Supplemental conspicuity

Case Studies in Georgia

SR 11 @ SR 124

Jackson County

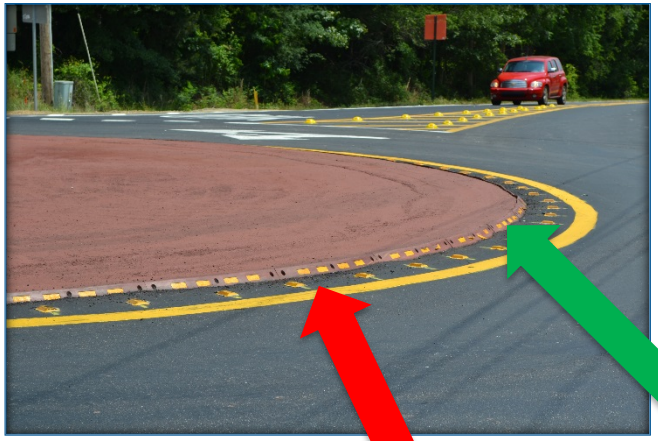
- Existing AWSC
- Operational issues – delay

	SR 11	SR 124	Galilee Church Rd
Functional Class.	Minor Arterial	Major Collector	Major Collector
Posted Speed	55 mph	55 mph	45 mph
~ADT	11,700	5,590	-

- Total entering ADT = 17k+

STOP

STOP



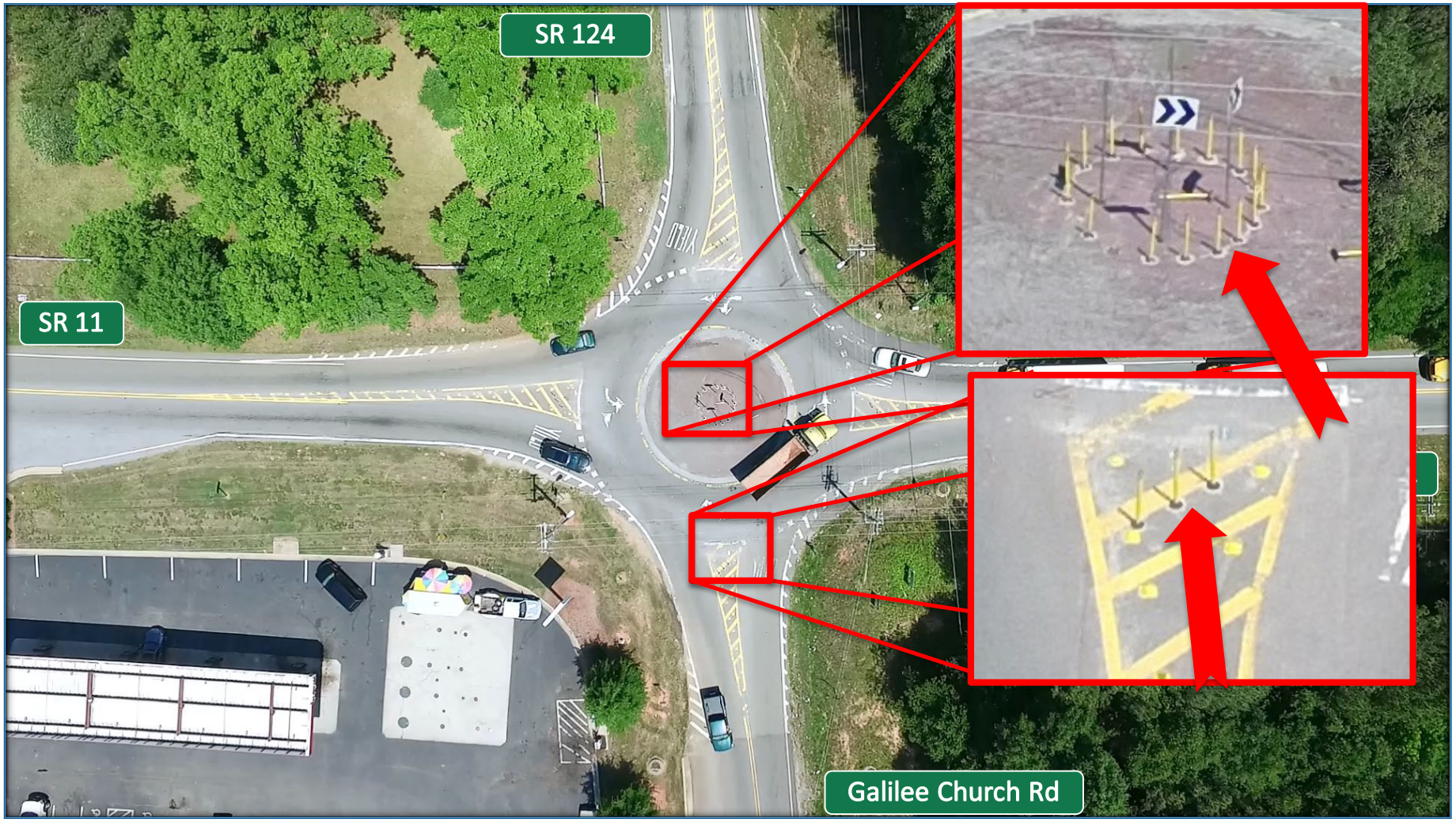
Mountable central island

Mountable curb type

RPMs around island

- Open to traffic = May 2013
- ICD = 90’

$62,994 Maintenance Funds



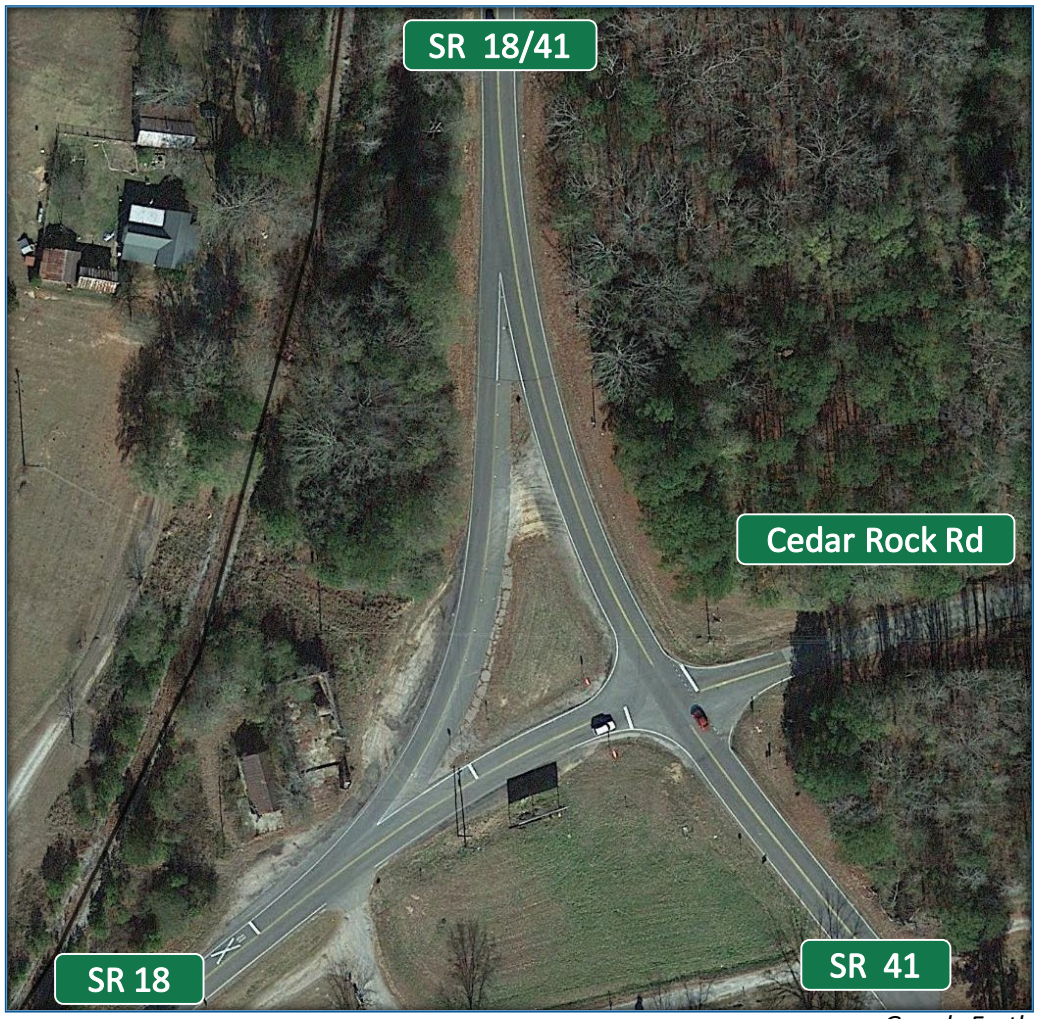
- Signs/flex posts added: July 2014

SR 41 @ SR18/Cedar Rock Rd

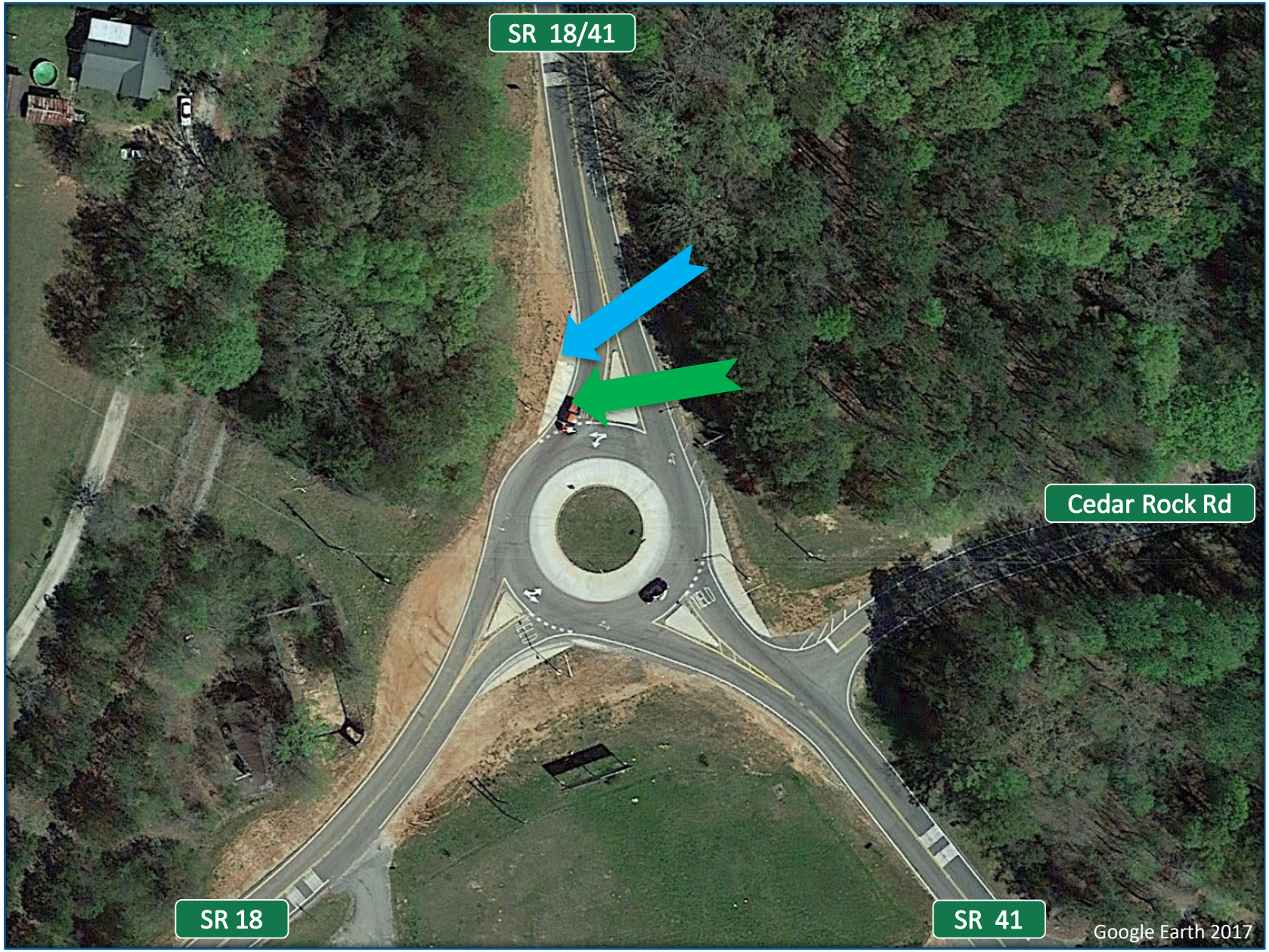
Meriwether County

	SR 41	SR 18	Cedar Rock Rd
Functional Class.	Minor Arterial	Major Collector	Major Collector
Posted Speed	55 mph	55 mph	45 mph
~ADT	3,130	1,000	430

- Existing TWSC
- Safety issues – high-speed crashes

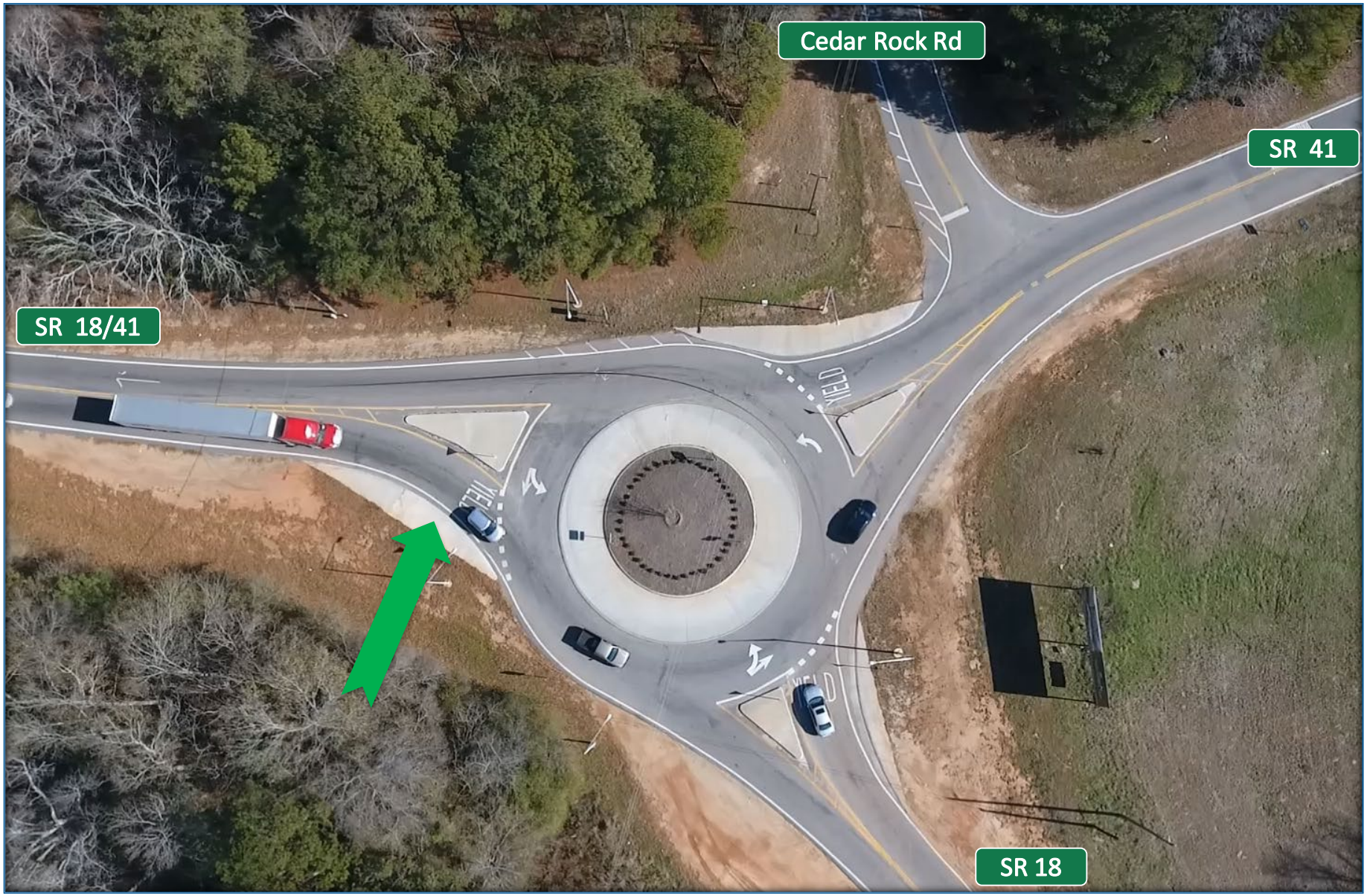


Google Earth


SR 18/41
Cedar Rock Rd
SR 18
SR 41
Google Earth 2017

- GDOT Maintenance: $41,800
- Quick Response: Grading work $199,900
  - Included Lighting: $37,560
- Open to traffic = March 2015
- ICD = 120’
- Landscaping = Spring 2017 (additional $3,445)

$241,669 Quick Response/Maintenance Funds

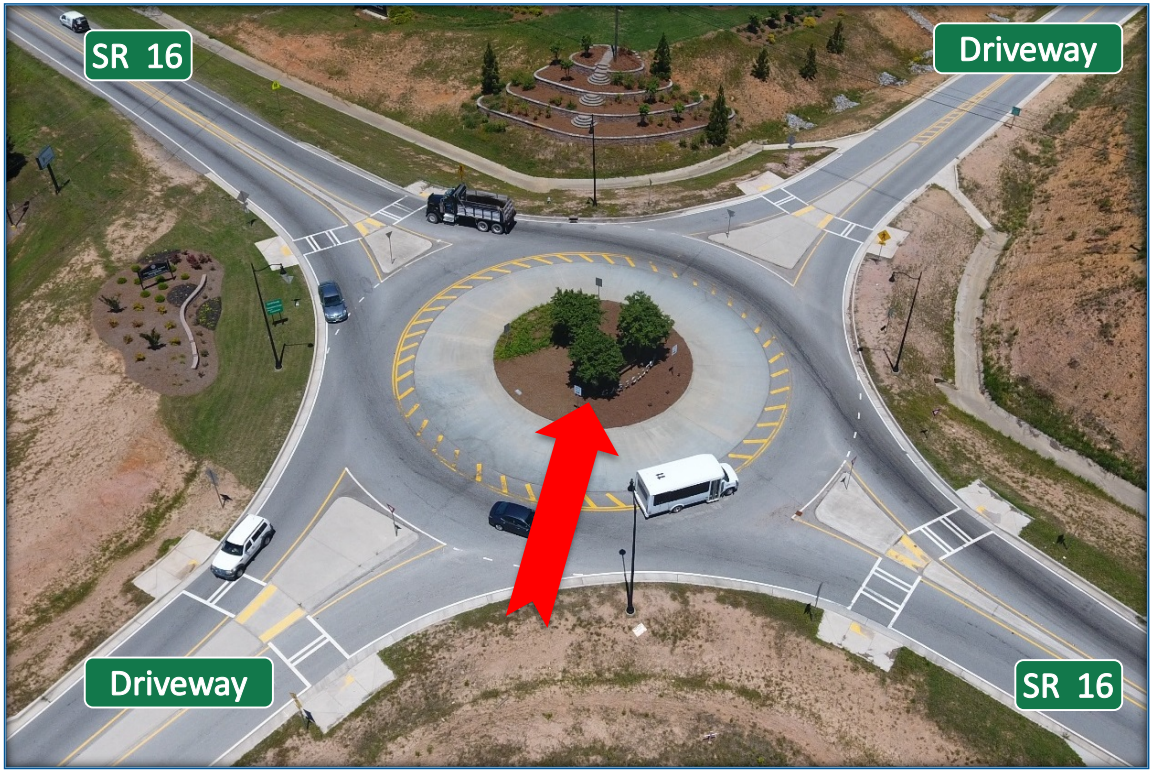

Cedar Rock Rd
SR 41
SR 18/41
YIELD
SR 18

SR 16/US 27 Alt @ Olympic Dr

Carroll County

	SR 16
Functional Class.	Principal Arterial
Posted Speed	45 mph
~ADT	12,400

- Open to traffic = October 2011
- ICD = 140’
- Local government wanted signal
- Raised median added to N as part of project.
- Landscaping added later



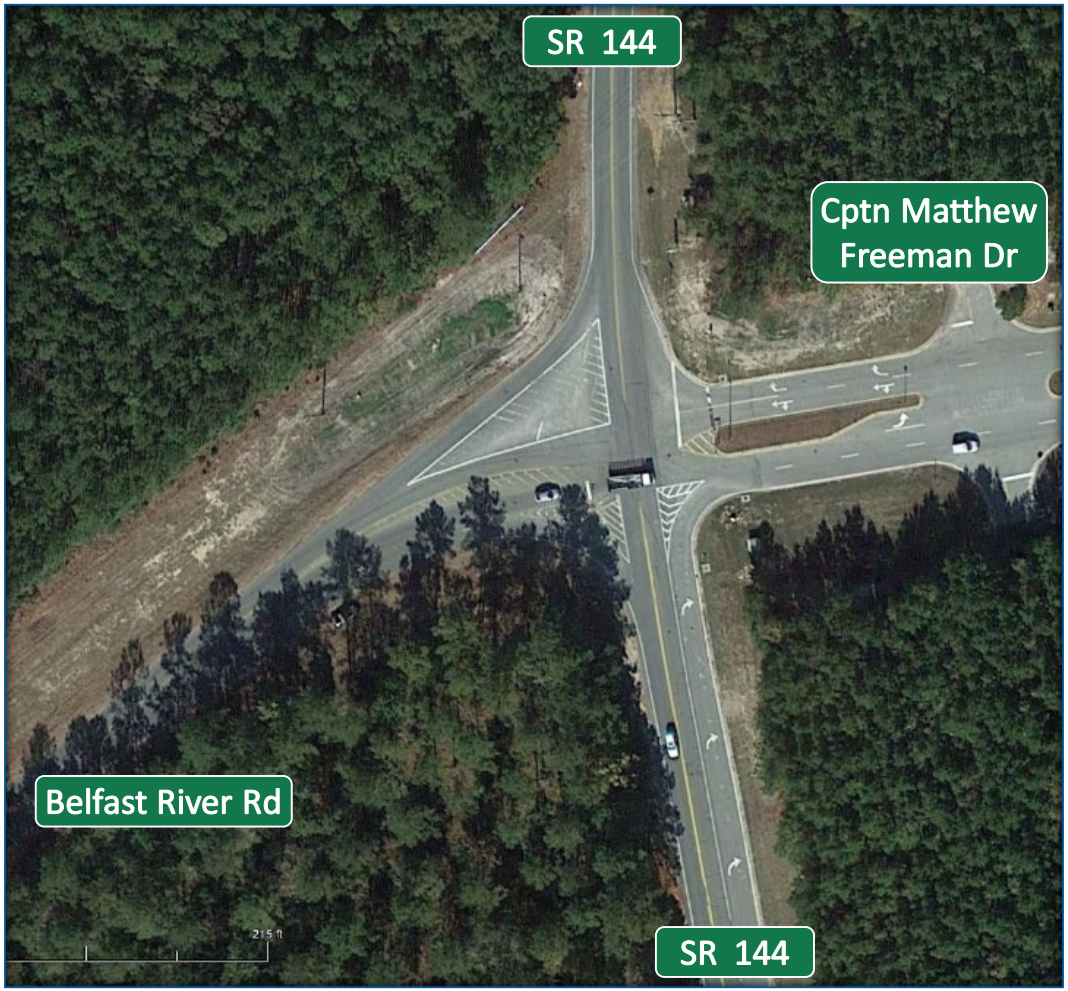
$612,214 Encroachment Permit

SR 144 @ Belfast River Rd

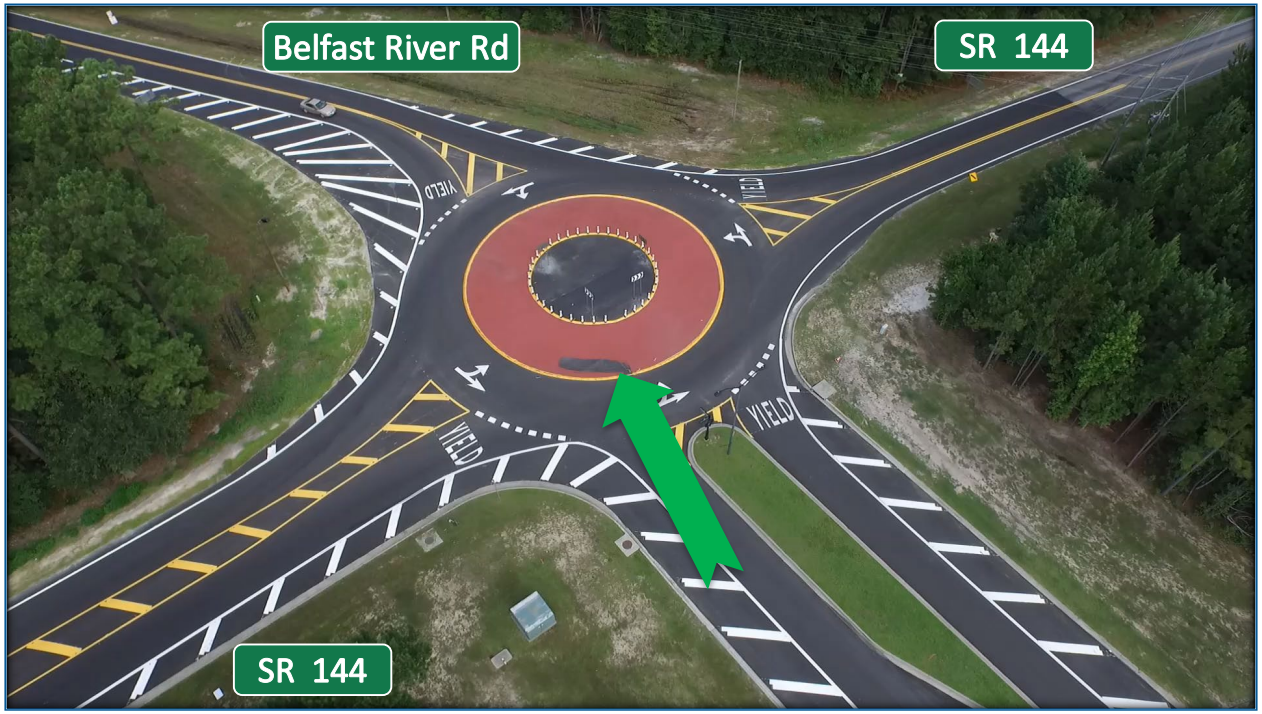
Bryan County

	SR 144	Belfast River Rd	Cptn Matthew Freeman Dr
Functional Class.	Major Collector	Major Collector	Local Rd
Posted Speed	55 mph	55 mph	25 mph
~ADT	6,170	-	-

- Temporary RB - full project to widen SR 144 includes installation of full single lane RB - let for construction in April 2018



Google Earth



- Open to traffic = July 2015
- ICD = 120’
- Quick curbing
- Permit to locals with additional GDOT funding to assist locals

$167,822 Encroachment Permit

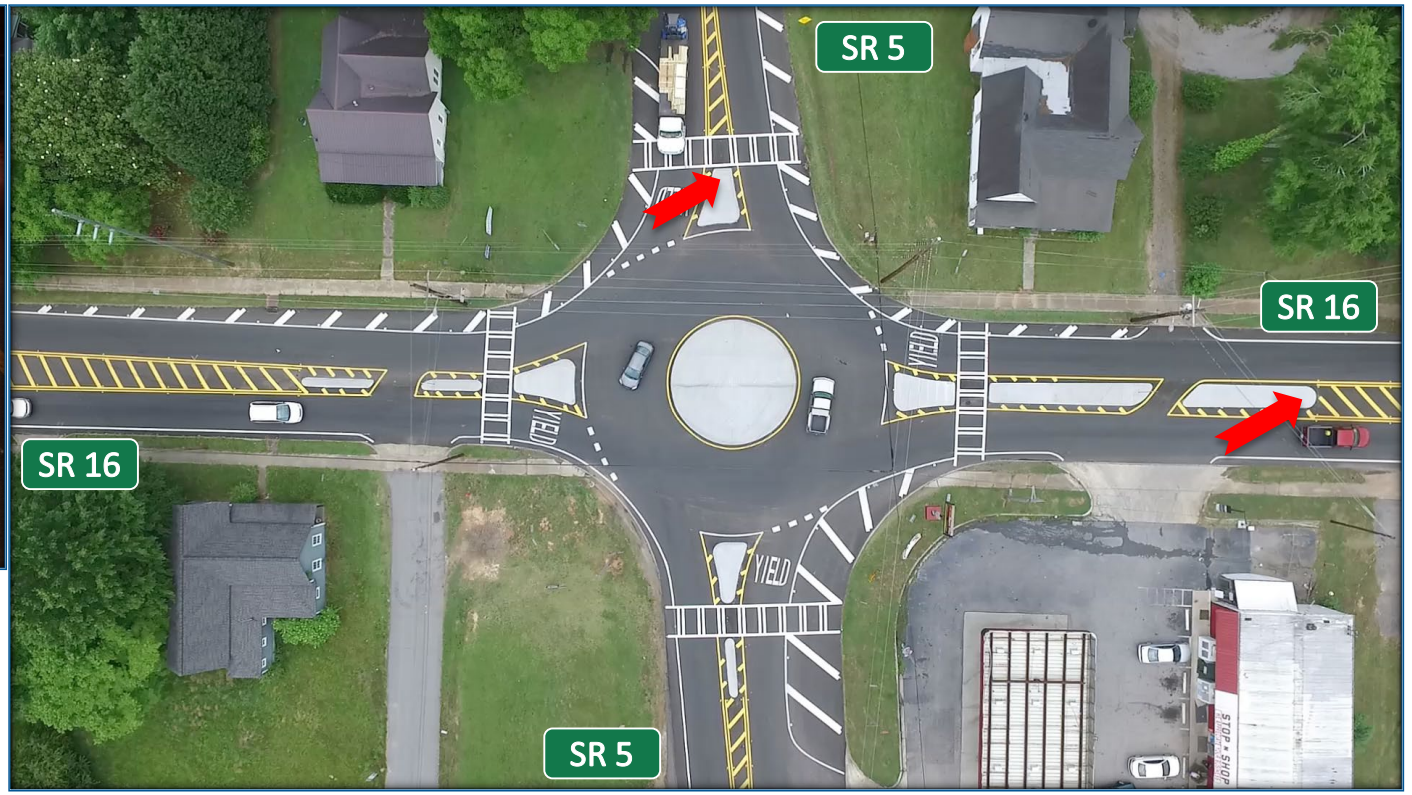
SR 5 @ SR 16/US 27 Alt

Whitesburg, Carroll County

	SR 5	SR 16
Functional Class.	Major Collector	Minor Arterial
Posted Speed	35 mph	35 mph
~ADT	2,360	12,100

- Original RAB paint and signs only - installed in 2000 with maintenance forces
- Raised concrete central island + splitters added in April 2016 through Quick Response Project
- ICD = 90’

Google Earth - 2018



- Internally illuminated bollard installed on 2 splitter islands in September/October 2018

$152,430 Quick Response Project

SR 81 @ Jackson Lake Rd

Henry County

	SR 81	Jackson Lake Rd	Snapping Shoals Rd
Functional Class.	Principal Arterial	Minor Collector	Major Collector
Posted Speed	55 mph	45 mph	45 mph
~ADT	5,310	1,160	2,060

- Open to traffic = August 2016
- ICD = 85’
- Temporary Mini RAB
- Quick Response Project = $198,879

Google Earth

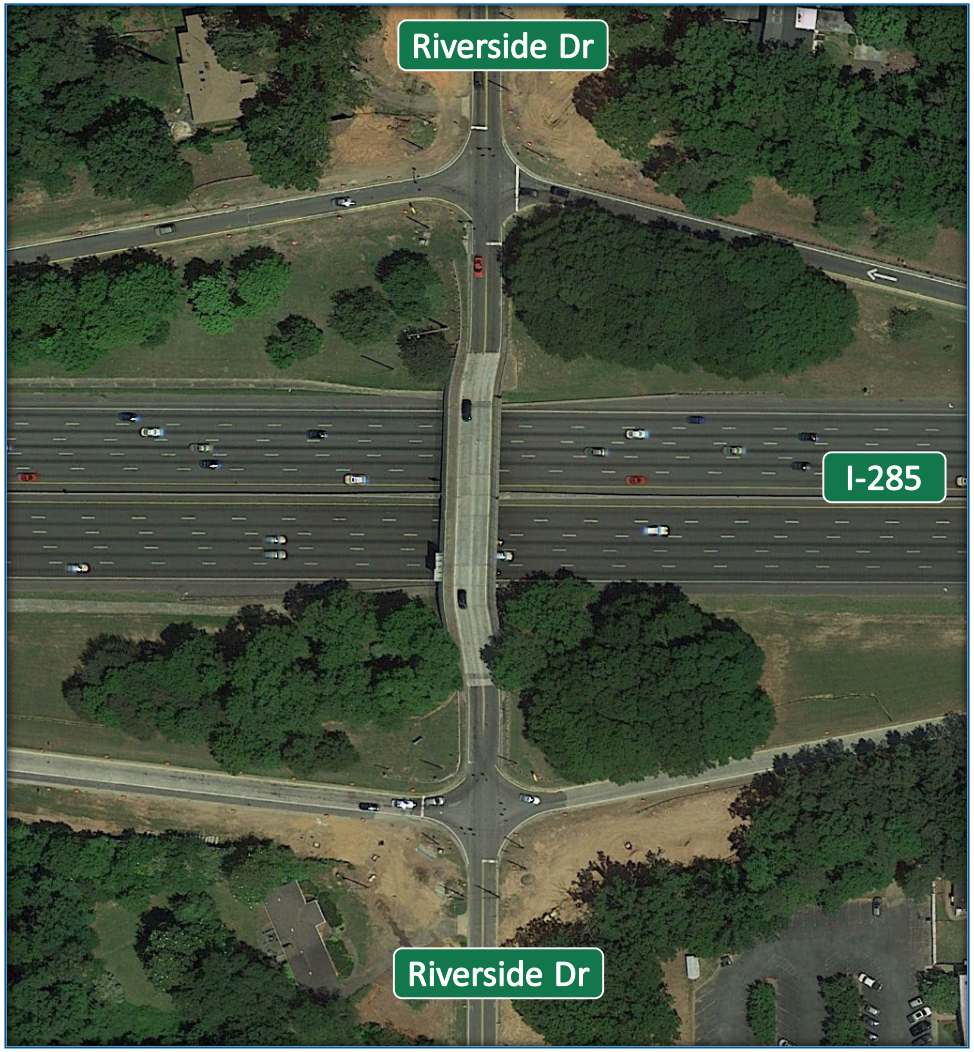
$255,879 Quick Response/Maintenance Funds

I-285 @ Riverside Dr

Fulton County

	Riverside Dr	I-285
Functional Class.	Minor Arterial	Interstate
Posted Speed	35 mph	-
~ADT	4,360	6,550

- Design and Build Project
- Open to traffic = August 2016
- ICD = 120’
- Landscaping by City of Sandy Springs



Google Earth

~$1,770,000 per RB Design Build Project

SR 138 @ N Moseley Dr

Henry County

	SR 138	N Moseley Dr
Functional Class.	Principal Arterial	Local Road
Posted Speed	55 mph	35 mph
~ADT	12,900	-

- Open to traffic = August 2016
- ICD = 70’

$189,400 Quick Response Project

SR 87 @ Bass Rd

Bibb County

	SR 87	Bass Rd
Functional Class.	Minor Arterial	Minor Arterial
Posted Speed	55 mph	35 mph
~ADT	8,810	3,810

- Open to traffic = October 2017
- ICD = 95’
- Quick Response Project = $200,000

Google Earth

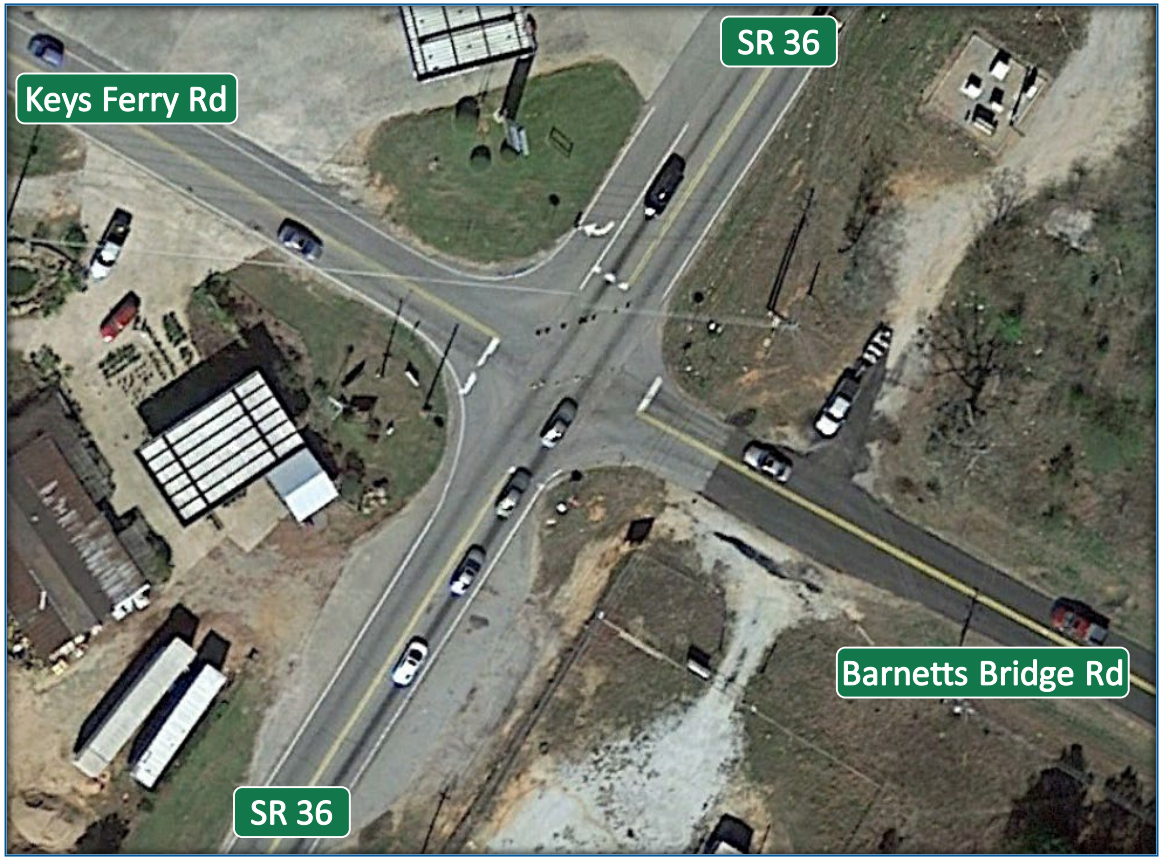
$242,750 Quick Response/Maintenance Funds

SR 36 @ Keys Ferry Rd

Butts County

	SR 36	Keys Ferry Rd
Functional Class.	Minor Arterial	Major Collector
Posted Speed	55 mph	45 mph
~ADT	6,040	2,140

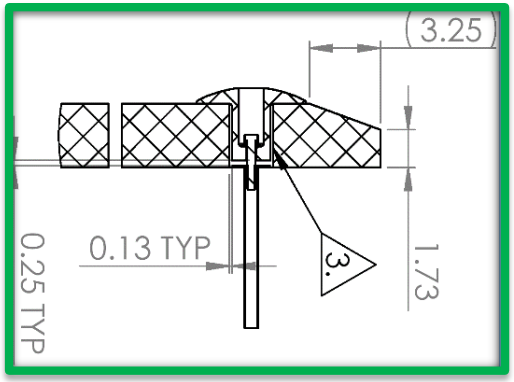
- Open to traffic = December 2017
- ICD = 68’
- SPIDER Modular - recycled plastic boards – FHWA sponsored experimental
- Road Construction (asphalt, signs, striping) = $27,437



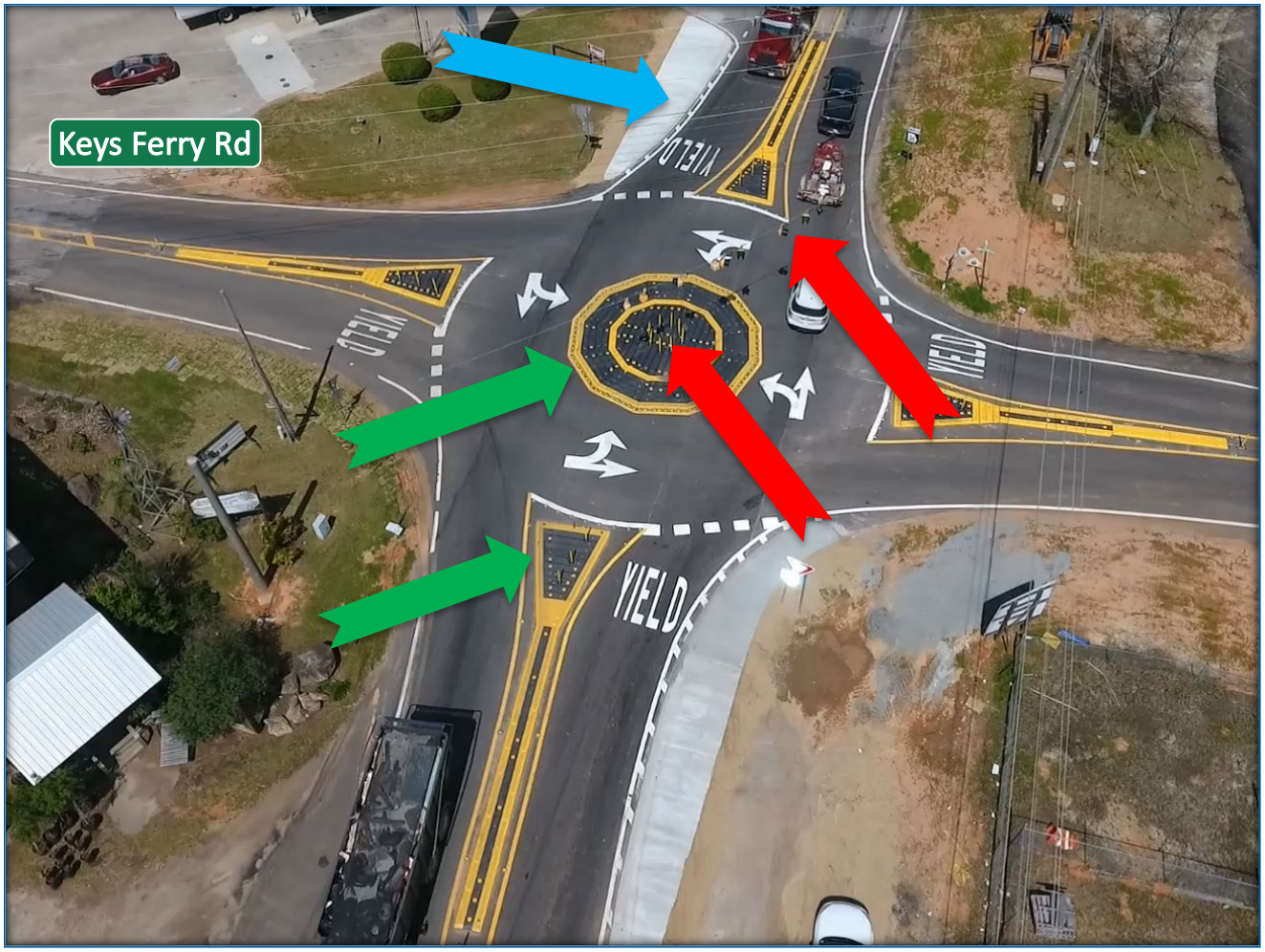
Google Earth

$44,437 Maintenance Funds *+ ~$100k*

NORTH
36


3.25
0.13 TYP
0.25 TYP
1.73
3.

SR 36


Keys Ferry Rd
YIELD
YIELD
YIELD

SR 8/US 29 @ SR 98

Danielsville, Madison County

	SR 8	SR 98
Functional Class.	Minor Arterial	Minor Arterial
Posted Speed	35 mph	45 mph
~ADT	8,690	4,970

- Existing signal
- Open to traffic = March 2018
- ICD = 120’

Google Earth

$1,148,468 GDOT Let Project

SR 44 @ Gray Bypass

Jones County

	SR 44	Gray Byp
Functional Class.	Minor Arterial	Principal Arterial
Posted Speed	55 mph	55 mph
~ADT	5,690	-

- Open to traffic = May 2018
- ICD = 160’
- Multi-lane
- Full concrete construction
- Grading Complete = $463,169

$1,348,585 Supplemental Agreement

SR 17 @ Blue Jay Rd

Effingham County

	SR 17	Blue Jay Rd
Functional Class.	Major Collector	Major Collector
Posted Speed	55 mph	55 mph
~ADT	6,850	5,320

- Open to traffic = July 2018
- ICD = 95’
- Omnidirectional RPMs installed
- Maintenance funds = $ 187,042
  Quick Response Project = $158,182

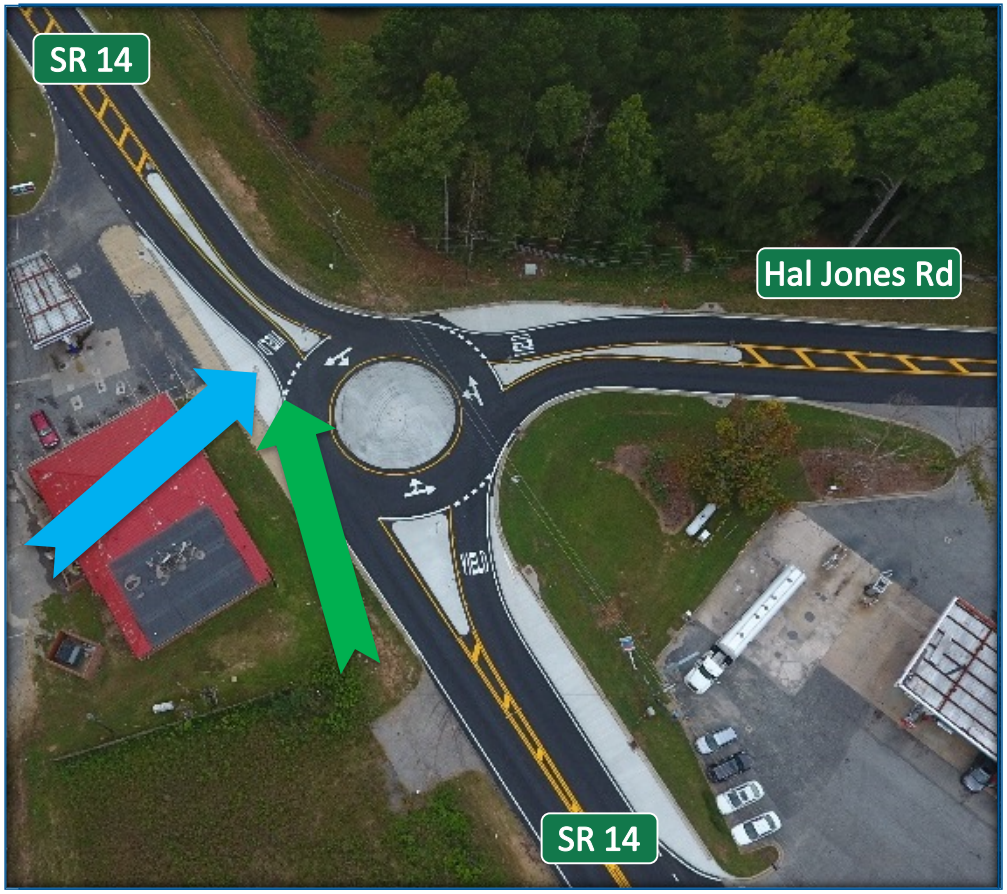
$345,224 Quick Response/Maintenance Funds

SR 14 @ Hal Jones Rd

Coweta County

	SR 14	Hal Jones Rd
Functional Class.	Minor Arterial	Local Road
Posted Speed	50 mph	45 mph
~ADT	8,640	5,150

- Open to traffic = August 2018
- ICD = 87’



Google Earth

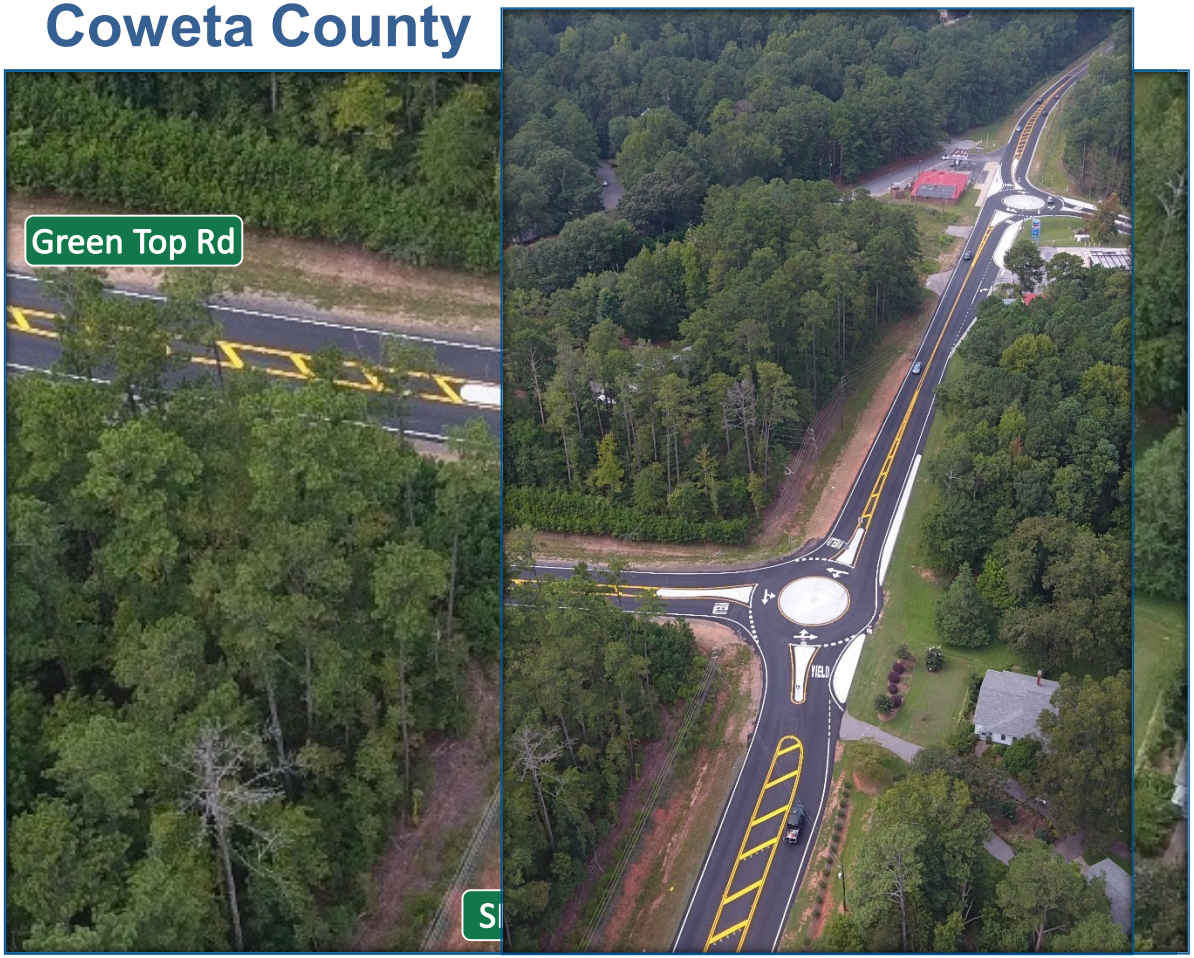
$199,447 Quick Response Project

SR 14 @ Green Top Rd

Coweta County

	SR 14	Greentop Rd
Functional Class.	Minor Arterial	Local Road
Posted Speed	50mph	45 mph
~ADT	8,640	3,380

- Open to traffic = August 2018
- ICD = 74’

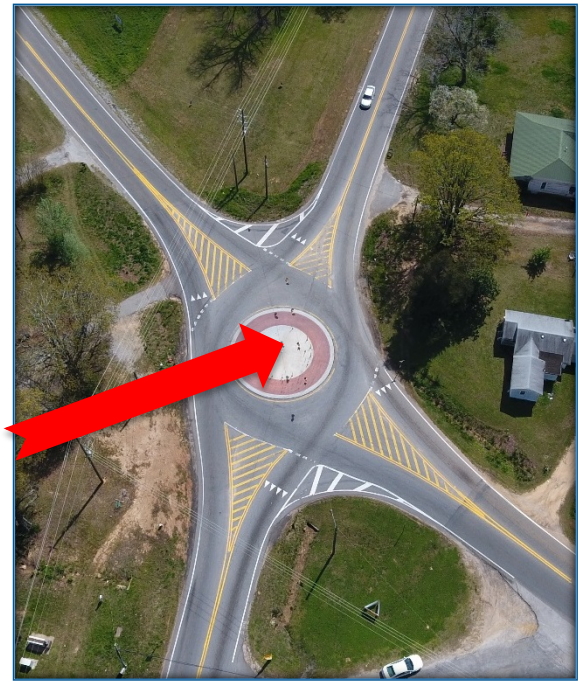


Google Earth

For both: $398,818 Quick Response Project

Other mini's in GA

- SR 212 @ SR 36, Newton County
  - Quick Response Project, in collaboration with Newton County – overlay and striping done through resurfacing contract
  - $57,490
  - Open to traffic = October 2015
  - ICD = 104'



- SR 5 @ Old Hwy 27, Carroll County
  - Maintenance Funds
  - ~$10,000
  - Open to traffic = Summer 2000
  - ICD = 90'

Other mini's in GA

- Flat Shoals Rd @ McPherson, Atlanta, DeKalb County part of enhancement project - ~$100,000
  - Urban environment
  - Part of enhancement project
  - ~$100,000
  - Open to traffic = August 2013
  - ICD = 48'

- SR 16 @ SR 54, Coweta County
  - Maintenance Funds
  - $77,100 (doesn't include asphalt + striping; done through resurfacing project
  - Open to traffic = June 2016
  - ICD = 78'

Practical Design Moving Forward

- Most examples of affordable roundabouts in Georgia have been delivered through non-conventional delivery methods:
  - Quick Response
  - Maintenance Funding
  - Permit
  - Design-Build
  - Supplemental Agreement

Practical Design Moving Forward

- We’re applying lessons learned to our conventionally delivered projects, through:
  - A practical design focus in our Roundabout Design Guidelines
  - Roundabout Cost Task Force – a multi-disciplinary GDOT team
    - Looking for ways to reduce project and construction costs
  - Roundabout & Alternative Intersection Design team (R.A.I.D.)
    - Reviews roundabouts (designs & existing)
    - Roundabout Support On-Call Contract
      - Roundabout In-Service Reviews.

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SR 902 / Craig Road

Affording Roundabouts - Case Studies Applying Practical Design Principles for Affordable Roundabouts

Glenn Wagemann, PE

Washington State Department Transportation

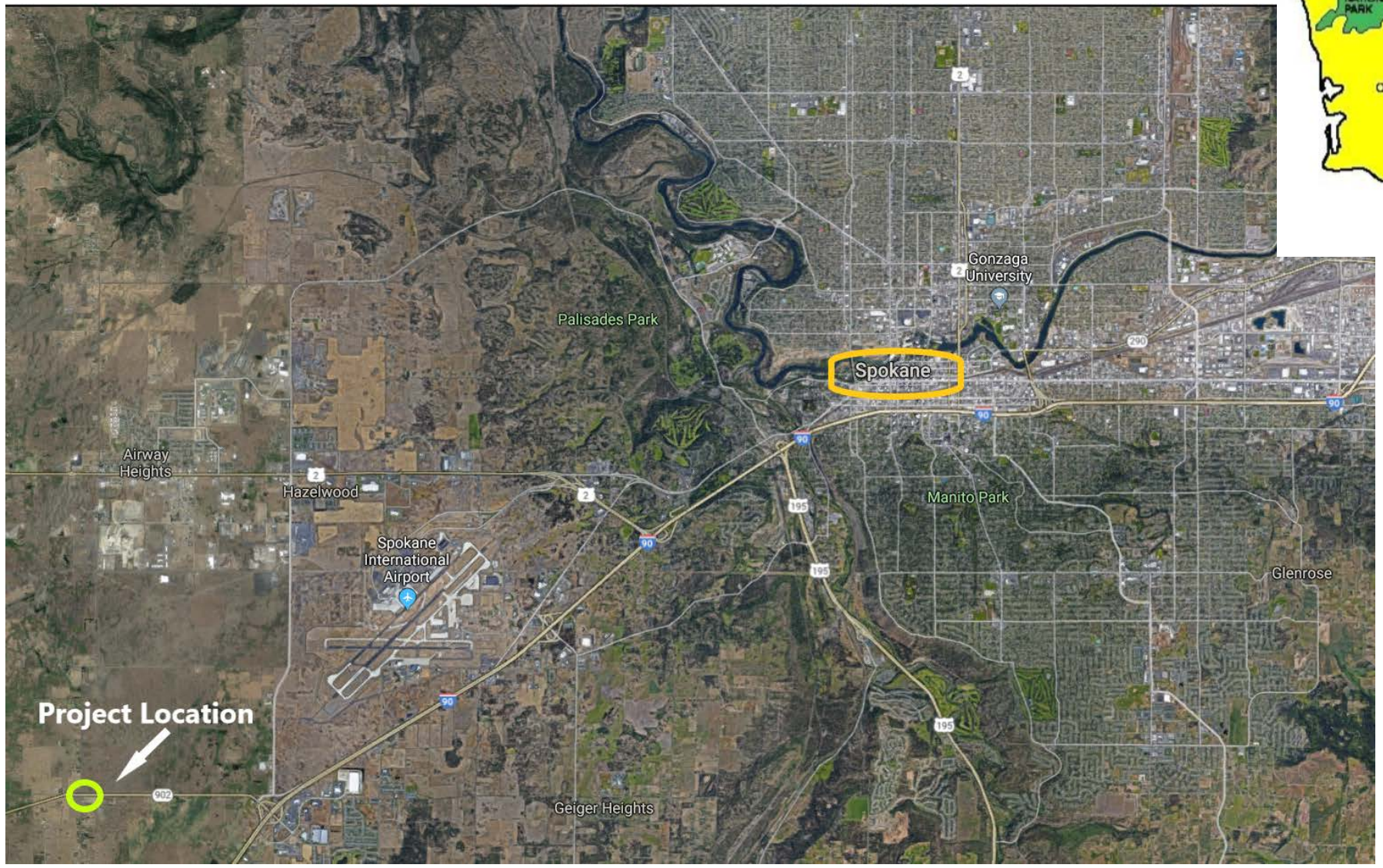
Spokane, WA

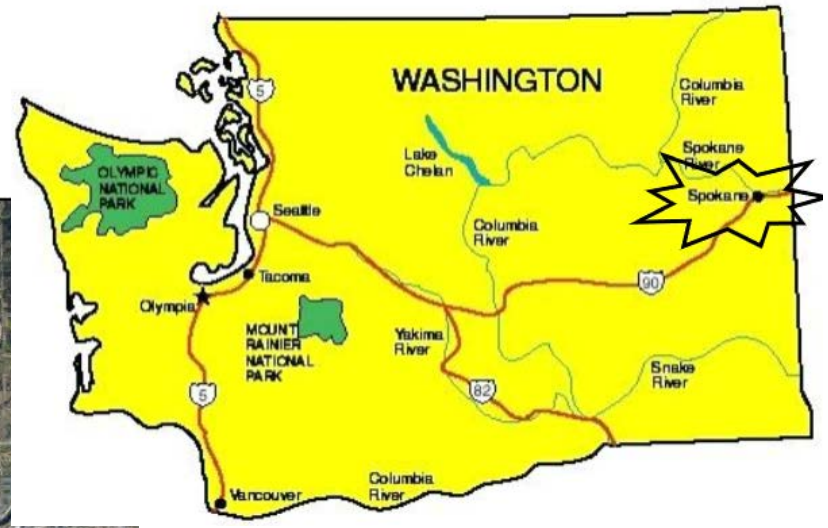
01/07/2019

Discussion Outline

- Location
- Background
- Alternatives Considered
- Opportunity
- Resulting Project
- Construction/Finished Project
- Final Observations

Location


Gonzaga University
Palisades Park
Spokane
Airway Heights
Hazelwood
Spokane International Airport
Manito Park
Glenrose
Project Location
Geiger Heights
902
90
195
290
2

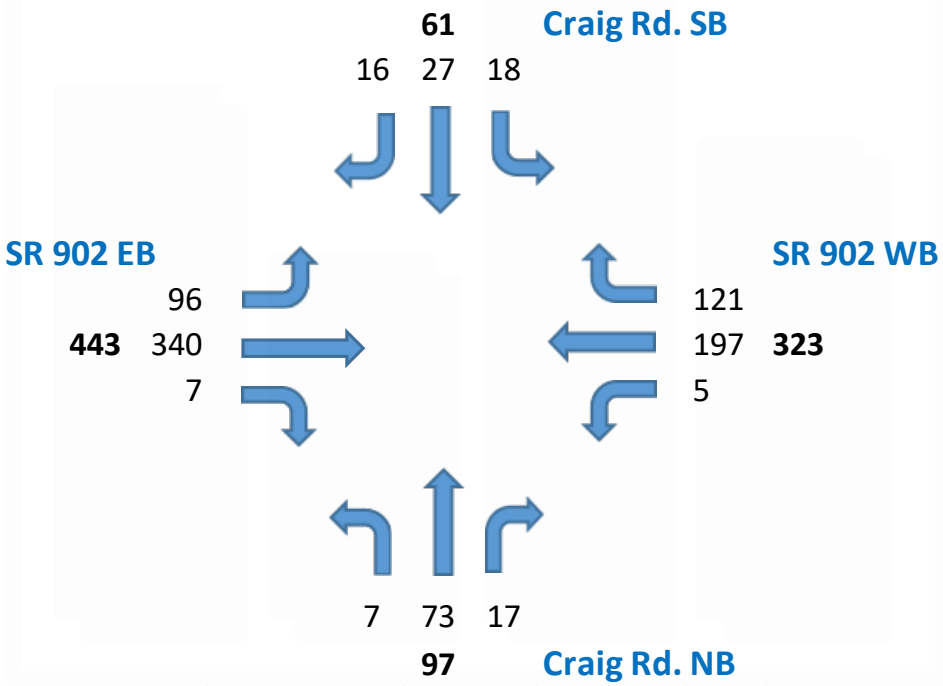

WASHINGTON
Columbia River
Spokane River
Lake Chelan
OLYMPIC NATIONAL PARK
Seattle
Spokane
Columbia River
Tacoma
Olympia
MOUNT RAINIER NATIONAL PARK
Yakima River
Snake River
Vancouver
Columbia River
5
90
82

Background

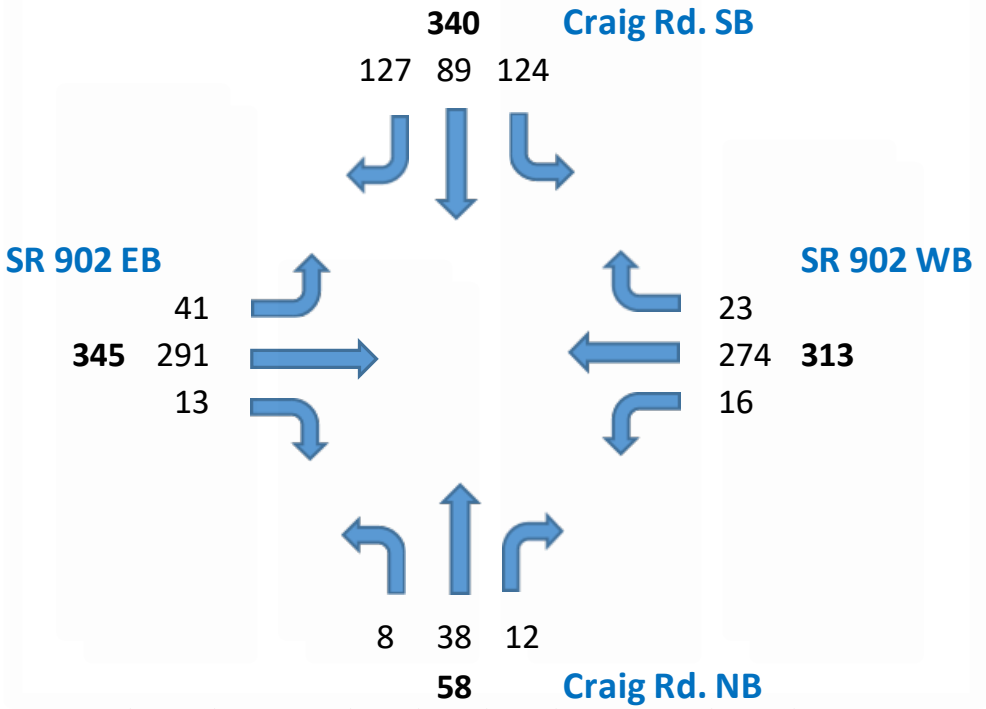
- Rural Road
- Speed limit
  - SR 902, 55 MPH
  - Craig, 45 MPH
- Volumes
- Collisions –
  - 24 in five years, 19/24 entering at angle; 1 fatal and 1 serious
- Tribal Involvement

Background- Volumes & Peak Counts

AM Peak Volume



PM Peak Volume



AADT

- SR 902 – 8,200 west, 7,600 east
- Craig north – 1,900
- Craig south – 1,800

Truck % – 5%

Alternatives Considered

WSDOT Policy - Intersection Control Analysis

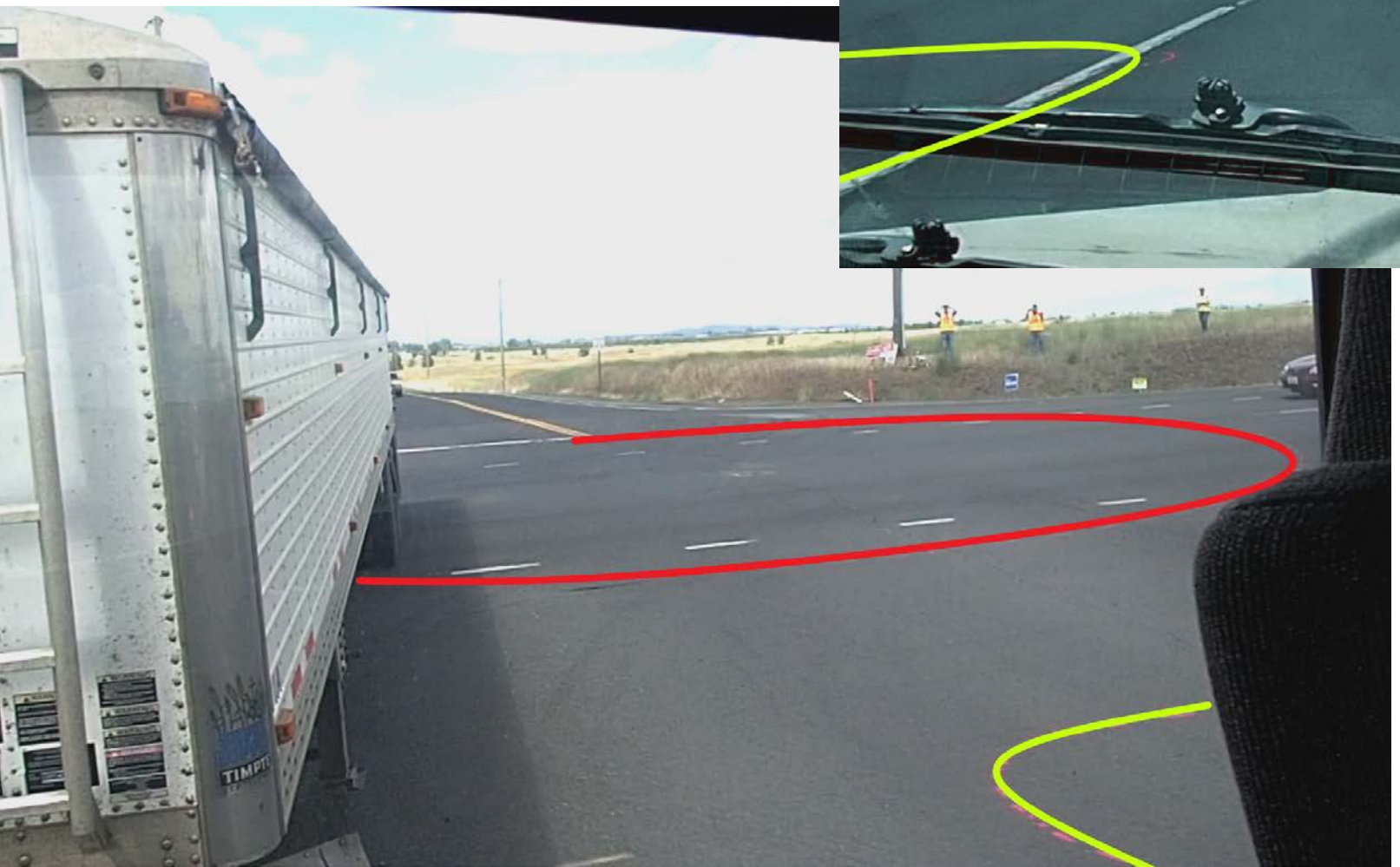
- WSDOT Design Manual Chapter 1300

Alternatives

- No Build
- Southbound Left turn Channelization per the Tribe's October 2016 study ($200k CN*)
- With the Southbound Left turn Channelization, add an Intersection Conflict Warning System ($50K CN*) and/or Flashing Red Stop Sign Beacon ($3k CN*)
- Compact Roundabout – ($300k CN*)

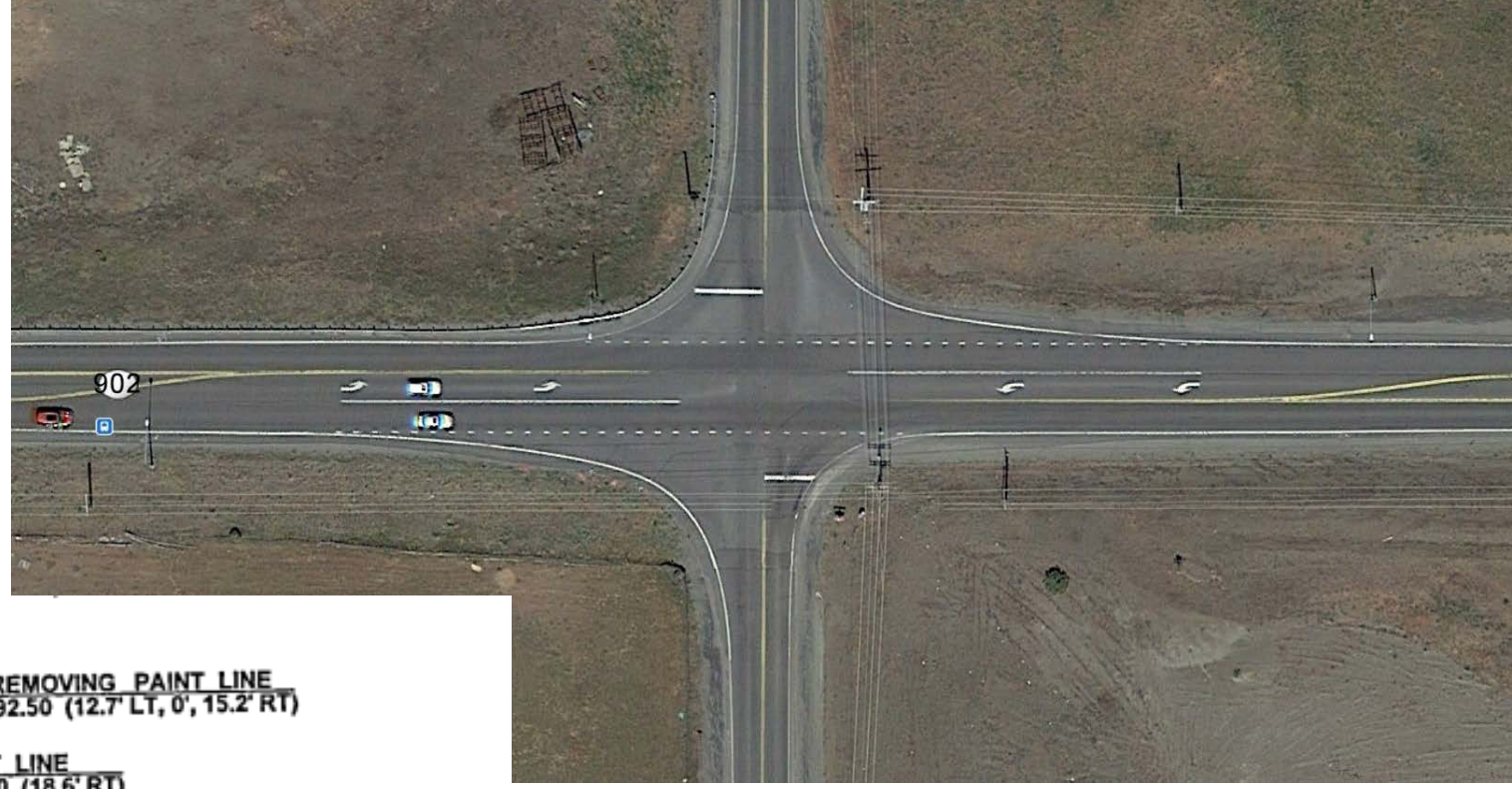
*CN = estimated construction dollars

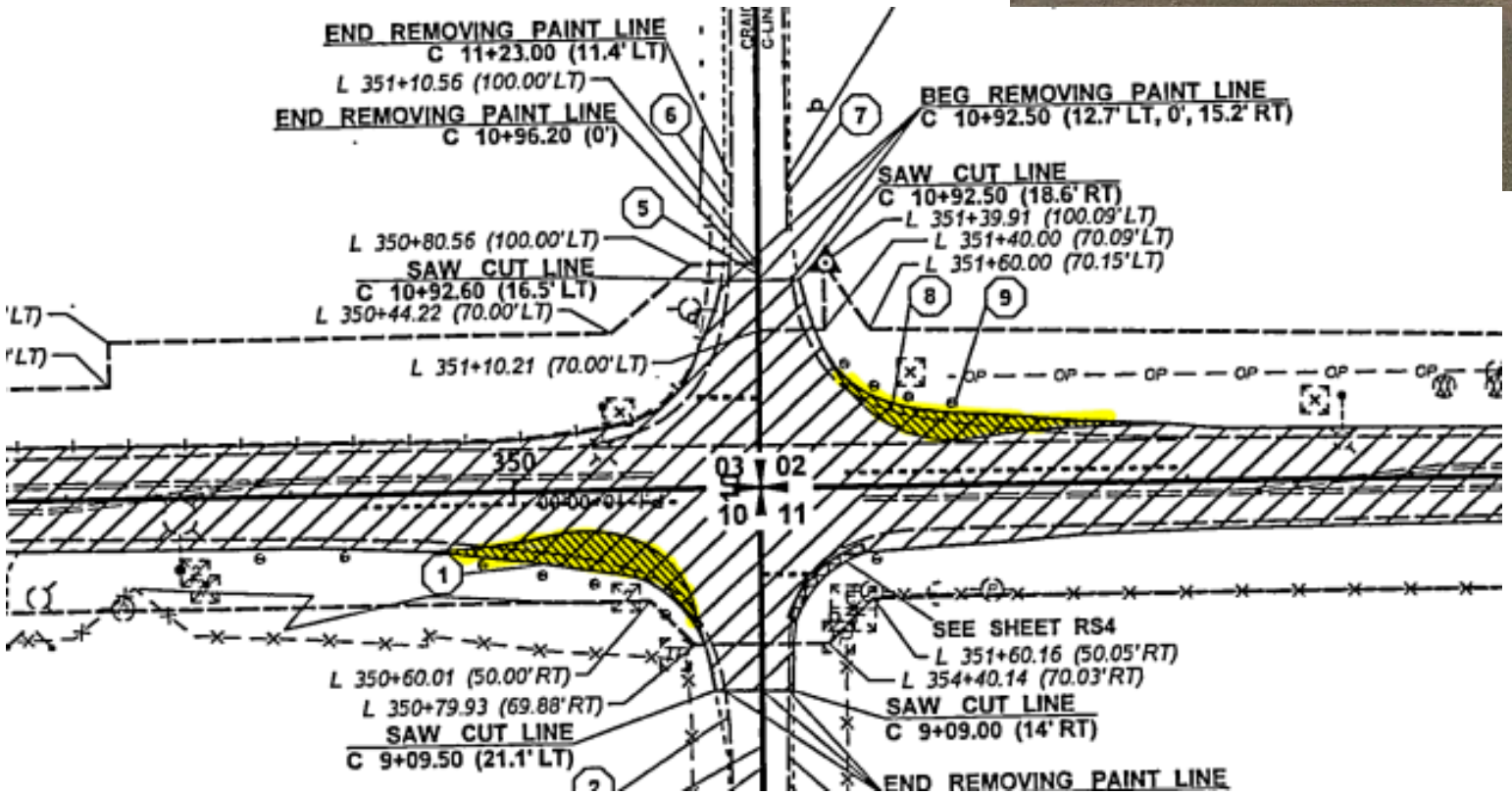
Alternatives: Considered -Gaining Support



Opportunity

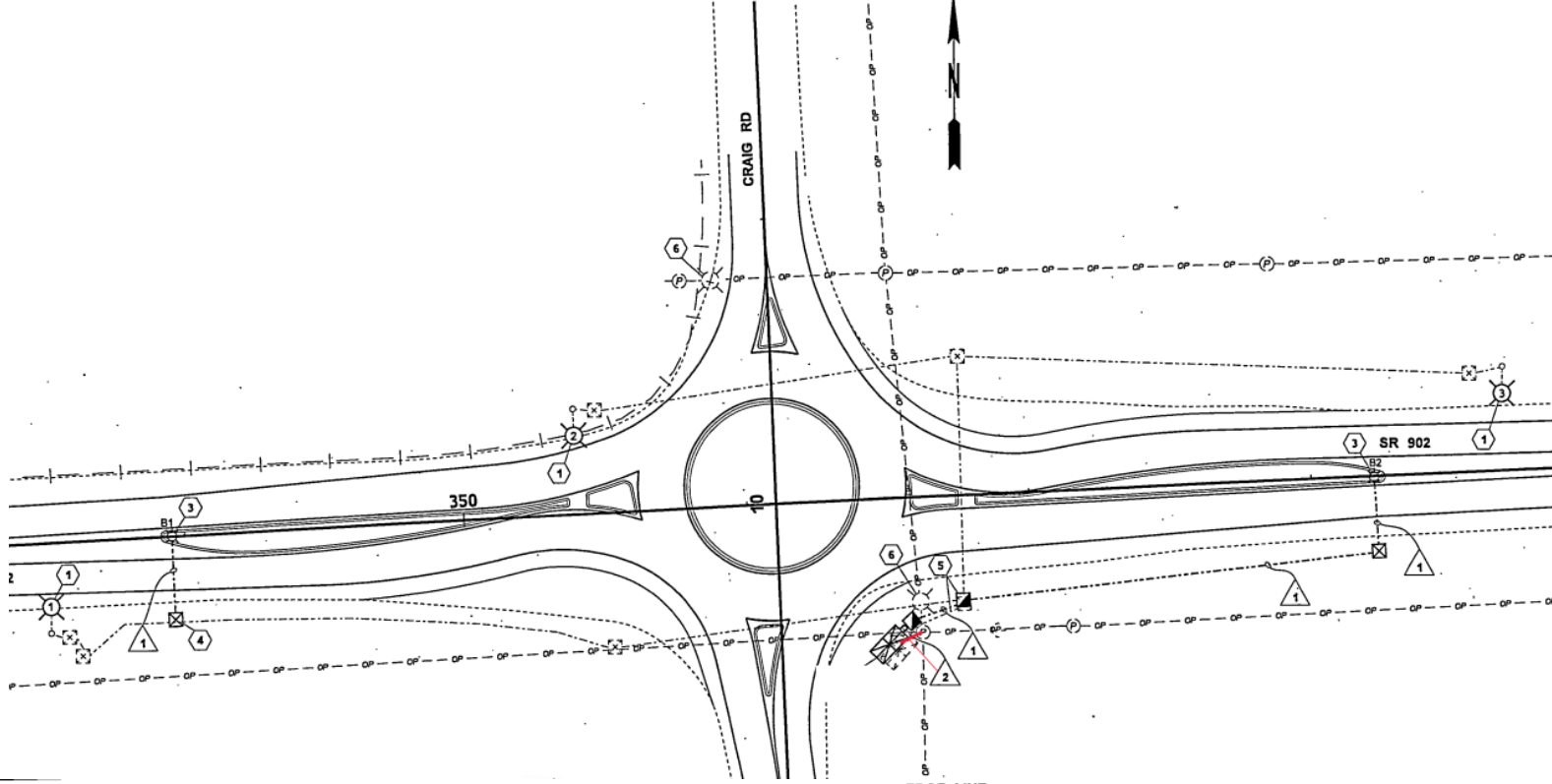
- Programmed paving preservation project set to remove 0.15’ of asphalt shoulder to shoulder
- Tribal Contribution

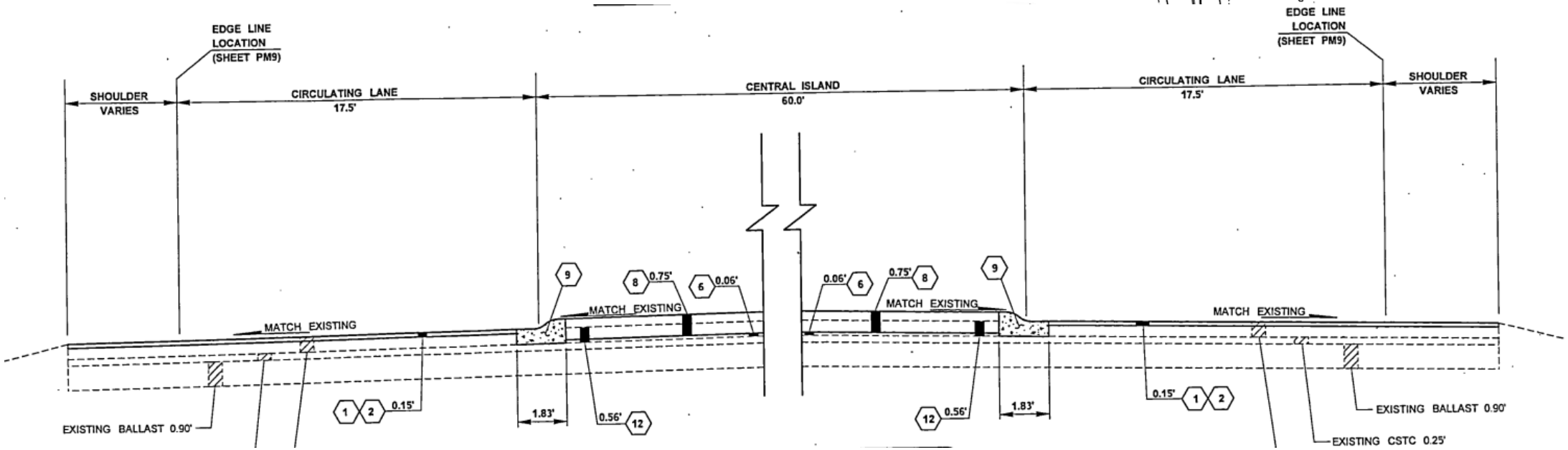




Resulting Project

- 95’ inscribed diameter compact roundabout; 60’ central island; 17.5’ circulating lanes
- 9” concrete islands
- Within existing roadway footprint
- Total Project Cost - $300,000
  - $50,000 design
  - $250,000 construction *(not including asphalt overlay)*





Construction

- 72 hour full intersection closure
  - Liquidated damages
- Roadway and splitter islands milled in advance
- High/early strength concrete

Construction

Thursday night to Friday morning at 7 AM

Construction

Friday noon – central island and Craig Road splitter islands complete

Construction

Friday noon – central island and Craig Road splitter islands complete

Construction

Saturday late afternoon – asphalt paving started

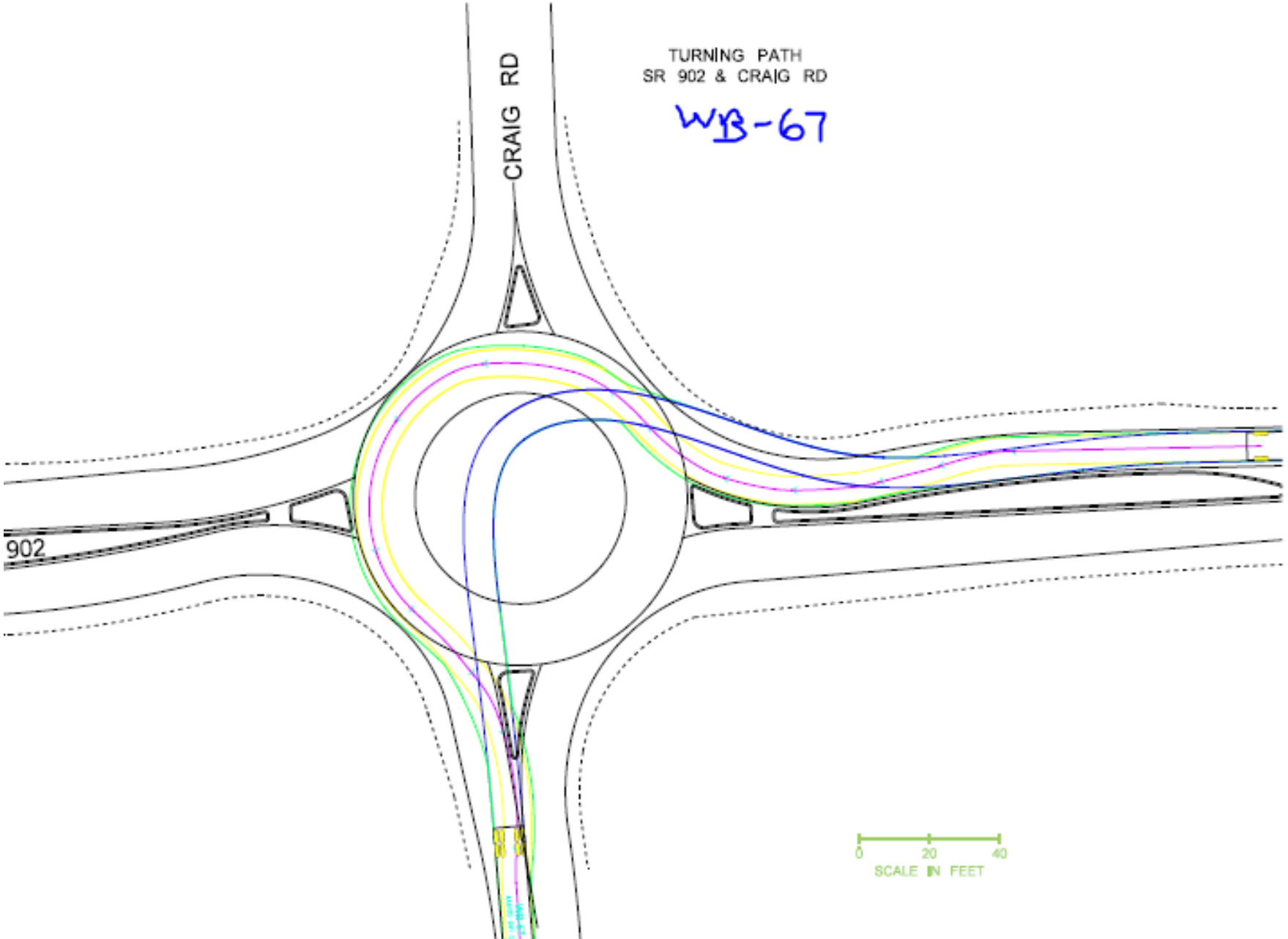
Finished Project

Finished Project

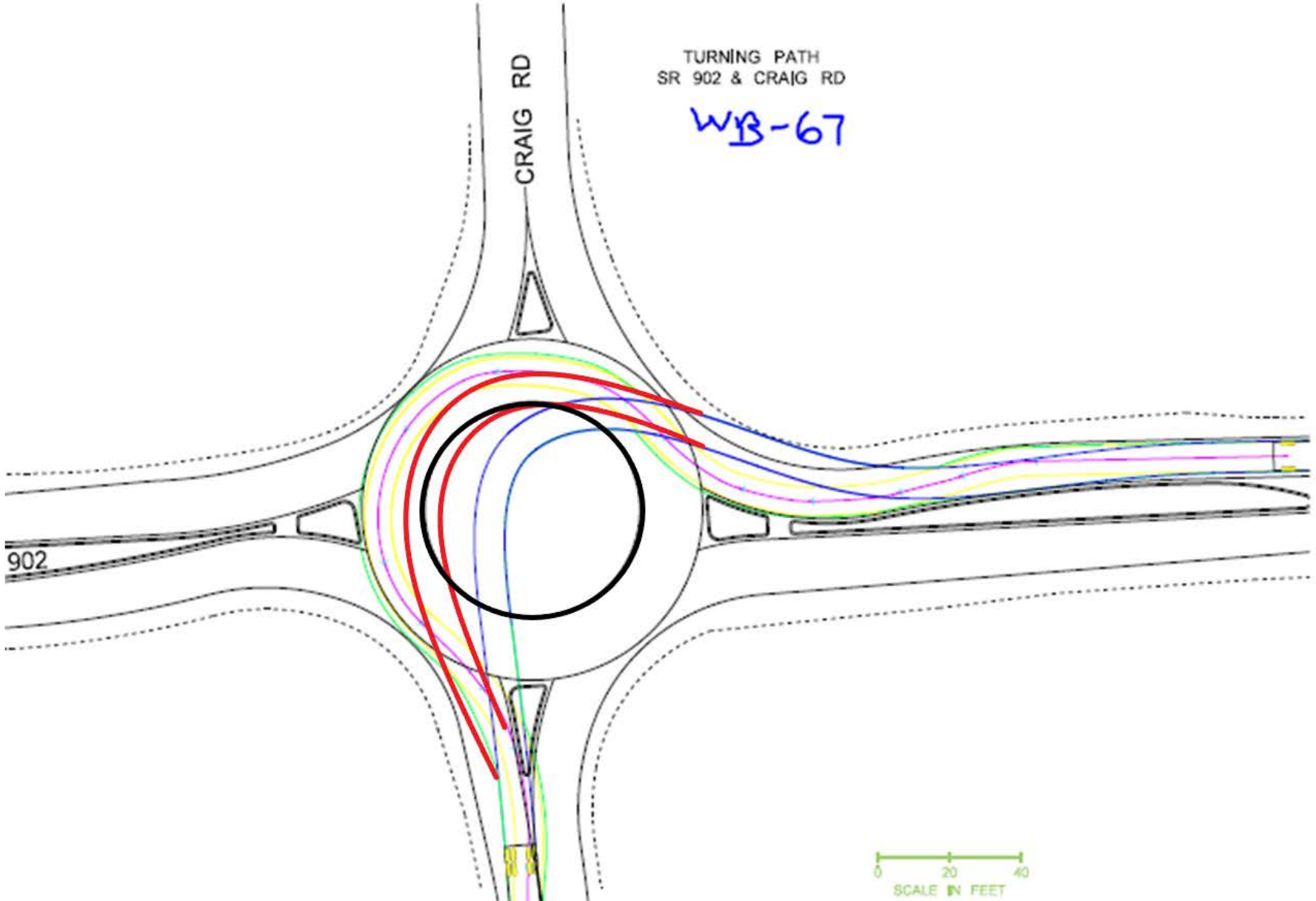
Finished Project

Finished Project

WB-67 Software Truck Swept Path Movement



WB-67 Observed Truck Swept Path Movement – Rear Tires in Red



Observed WB-67 Movement – Left Turn

Observed WB-67 Movement – Left Turn

Observed WB-67 Movement – Left Turn

Observed WB-67 Movement – Through

Observed WB-67 Movement – Through

Observed WB-67 Movement – Through

Final Observations

- Find partners
- Early involvement of the freight community
  - Field demonstration of the proposed design – “paint it on the ground and drive it”
- When possible, full intersection closure = short duration construction
- 95’ diameter compact roundabout a good fit for mix of trucks
- Why wait to fund a full size when a compact will do – Practical Solution

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GDOT Georgia Department of Transportation

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- ***Sponsoring Committee: ANB75***
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  - Update your profile

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- Credits will be reported two to three business days after the webinar
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2020
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