Mini-Roundabouts for the U.S. and Traffic Models

VDOT Statewide Roundabout Workshop
Tuesday, September 17, 2013
Richmond, VA

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Program Manager, FHWA Intersection Safety R&D

Outline

- History and evolution
- Distinct features and suitable traffic conditions
- Traffic/safety problems that can be/has been solved by mini-roundabout
- Mini-roundabout traffic models developed by FHWA
- Success stories from FHWA Field Evaluation Study
- Status of FHWA field evaluation
- Public out reaches for wider implementation

Modern Roundabout

Feb. 16, 1916 – Jun. 5, 2008

- A type of circular junction invented by Frank Blackmore (UK Transport Research Lab) in 1966
- Background of this innovation
  - 1959, congestion estimated cost Britain £250 million
  - 1960, 10 M registered vehicles, would double in 1970
  - Threatened economy productivity and damaged quality of life in the polluted towns and cities
  - 1963, “Traffic in Towns” by Sir Colin Buchanan, et. al. (2-year comprehensive study) called for innovation in transport technologies

Modern Roundabout Operating Principles

Feb. 16, 1916 – Jun. 5, 2008

- All vehicles travel in one direction around a central island
- Traffic entering the circle **MUST** slow down and yield to circulating traffic
- Pedestrian crosswalks are located one full car length away from the intersection
- Curbs, signs, and pavement markings are installed to help enforce the design intents

Mini-roundabout

Feb. 16, 1916 – Jun. 5, 2008

- Invented by Frank Blackmore in 1969 to apply the modern roundabout principles to smaller intersections after witnessing too many choked up town/urban intersections

- All raised elements (central island and splitter island) should be traversable to accommodate occasional large vehicles

1st Mini-Roundabout, London Rd & Oundle Rd Peterborough, Britain (1969 – 2008)

Proven Impacts of Mini-Roundabout

- Simplify traffic flows at smaller intersections, especially odd shaped intersections.

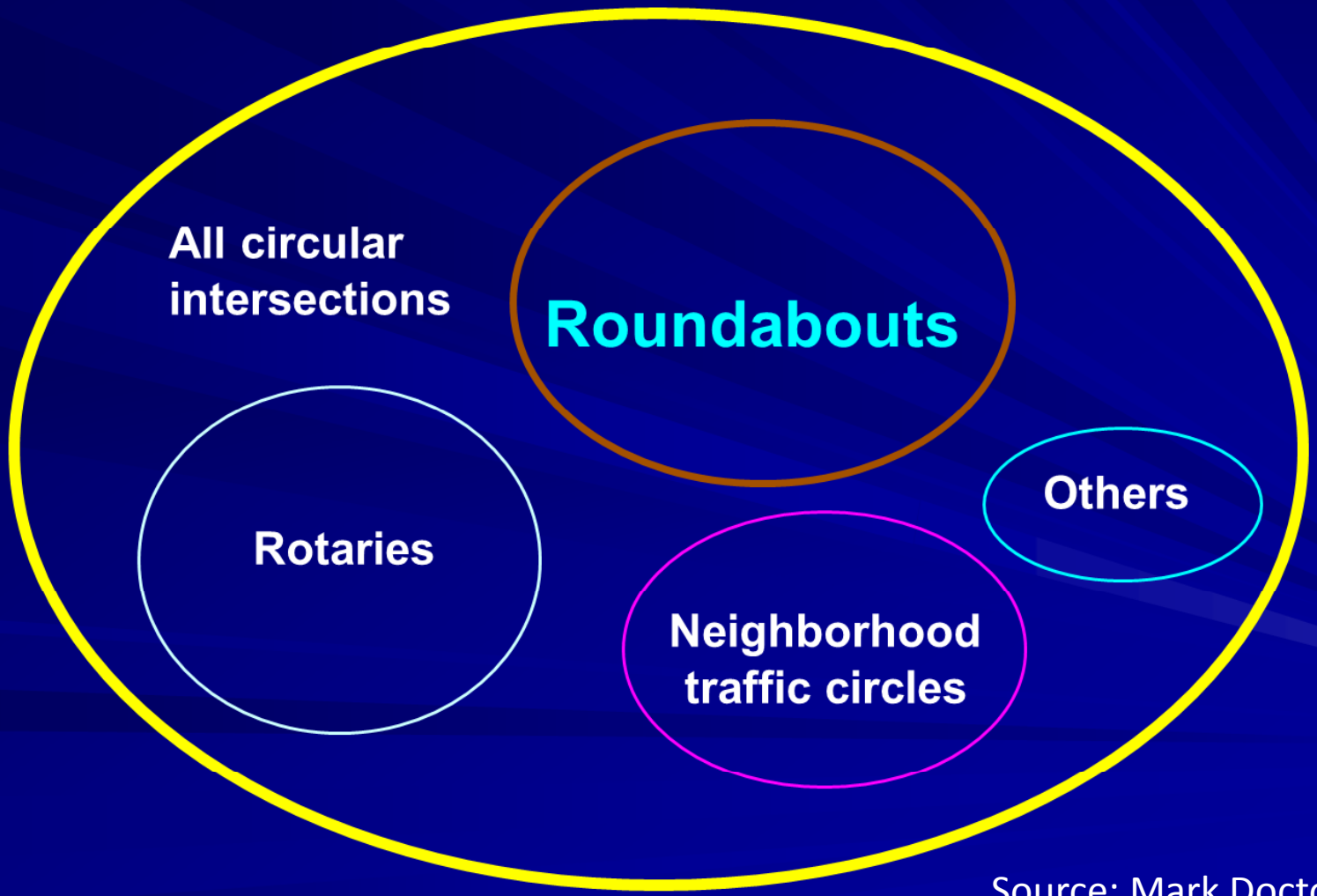
- Reduce congestion and improve safety at high volume collector road intersections currently controlled by AWSC, TWSC, and traffic signals.

It is widely used in European countries.

Why is Mini-roundabout not Widely Used in the US?

Bad memory and confusion with other types of circular intersections.

FACT: Roundabouts are a subset of circular intersections



Source: Mark Doctor, FHWA

Rotary ≠ Modern Roundabout

Neighborhood Traffic Circle ≠ Mini-Roundabout

Source: Mark Doctor, FHWA

FHWA Initiated an Effort in 2009 to Introduce mini-roundabout design to the USA

Mini-Roundabout, what is it?

- A single-lane roundabout with inscribed circular diameter (ICD) between 50 ft to 90 ft
- Defining feature is a traversable central island (and split islands) to handle large vehicles
- Advantages include:
  - More than twice the capacity of AWSC
  - Fit into existing intersection ROW
  - Improve intersection operating efficiency and safety
  - Lower cost

Suitable Locations for Mini-roundabout

- Intersections on 2-lane or 3-lane “high volume” collector roads
- Post speed 35 mph or less
- Low truck volume
- Comparable traffic demands from major and minor approaches
- Peak all entering traffic demand 900-1600 vph

Key Elements

- Central island (crown height <= 5 in)
- Splitter islands (width >= 4ft, prefer 6 ft, 10 ft)
- Circulating lane (width 14-16 ft)
- Entrance angle and deflection (control speed)
- Signing and marking
- Ped crosswalk (10 ft wide, placed 25 ft before yield line)

Make the central island as large as possible after achieving the desired circulating lane width.

Purpose of raised elements

- Enforce compliance of vehicles using designated circulating route
- Un-comfortable for small vehicles to mount
- Traversable by large vehicles
- Not causing problems for winter maintenance

Signing and Pavement Markings

Design Philosophy

- Design the elements for 97% of the vehicles that are known to use the intersection daily

- Make raised elements traversable by the top 1-3% of large vehicles that only occasionally use the intersection

Huge savings in serving the same traffic demand compared to regular sized modern roundabouts

Video

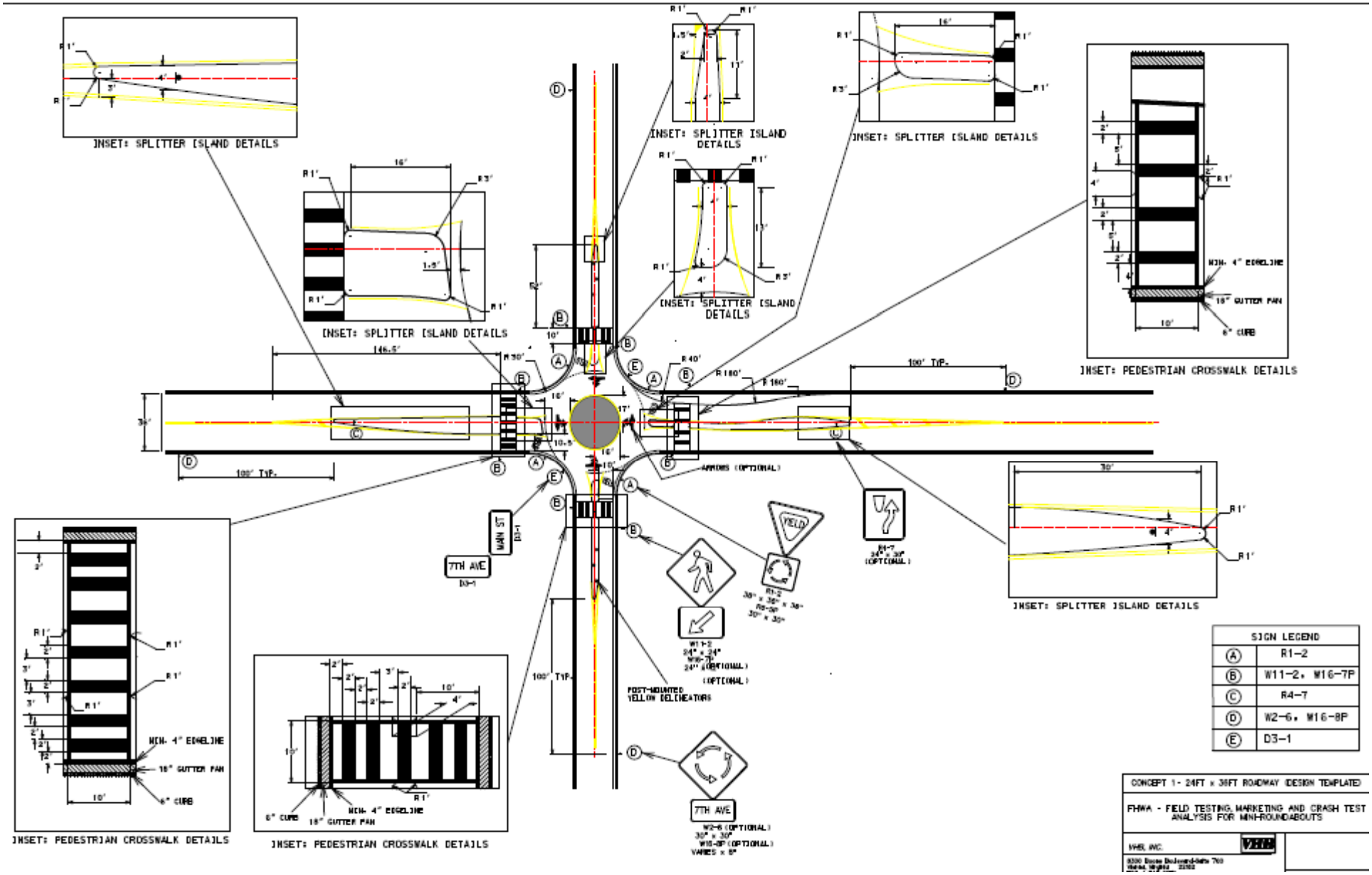
Video

Video

Mini-Roundabout Models Developed by FHWA

- CAD templates for 2-lane by 2-lane, 2-lane by 3-lane, and 3-lane by 3-lane intersections.
- CAP-X planning capacity model
- VISSIM models (priority rule or conflict zone)
- Mini-roundabout capacity equations/curves

CAD Template



CAP-X Planning Capacity Model

Capacity Analysis for Planning of Junctions

Input Worksheet

Project Name:	*Narberth, PA Mini-Roundabout Site Evaluation*
Project Number:	*Peak Hour Base N-S Volume 403, E-W Volume 1397, Total 1800*
Location	*East Wynnewood Rd and North Wynnewood Ave, Narberth, PA*
Date	February 6, 2013

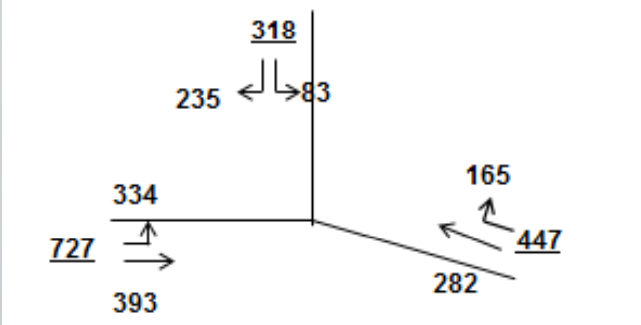
Traffic Volume Demand

	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Truck	Volume Growth
Eastbound	0	334	393	0	0.00%	0.00%
Westbound	0	0	282	165	0.00%	0.00%
Southbound	0	83	0	235	0.00%	0.00%
Northbound	0	0	0	0	0.00%	0.00%
Adjustment Factor	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Critical Lane Volume				1600		

Equivalent Pasenger Car Volume

	Volume (Veh/hr)			
	U-Turn	Left	Thru	Right

AM Peak Hourly volume = 1,493 veh/h (total)



Introduction | Input Worksheet | Results Worksheet | Conventional | Conventional Shared RT LT | QR S-W | QR N-E | QR S-E

Capacity Analysis for Planning of Junctions

Input Worksheet

Results for Roundabouts

#	TYPE OF ROUNDABOUT	Zone 1 (North)			Zone 3 (East)			Zone 2 (South)			Zone 4 (West)			Overall v/c Ratio	Ranking
		Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3	Lane 1	Lane 2	Lane 3		
9.1	50 ICD	0.45			0.83			0.00			0.68			0.83	#DIV/0!
9.2	75 ICD	0.43			0.79			0.00			0.64			0.79	#DIV/0!
9.3	1 X 1	0.37			0.70			0.00			0.55			0.70	#DIV/0!
9.4	1 X 2	0.34			0.51	0.19		0.00			0.17	0.38		0.51	#DIV/0!
9.5	2 X 1	0.10	0.28		0.68			0.00	0.00		0.50			0.68	#DIV/0!
9.6	2 X 2	0.09	0.25		0.16	0.34		0.00	0.00		0.50	0.18		0.50	#DIV/0!
9.7	3 X 3	0.05	0.05	0.21	0.16	0.33	0.18	0.00	0.00	#####	0.00	0.16	0.30	#DIV/0!	#DIV/0!

Results for Interchanges

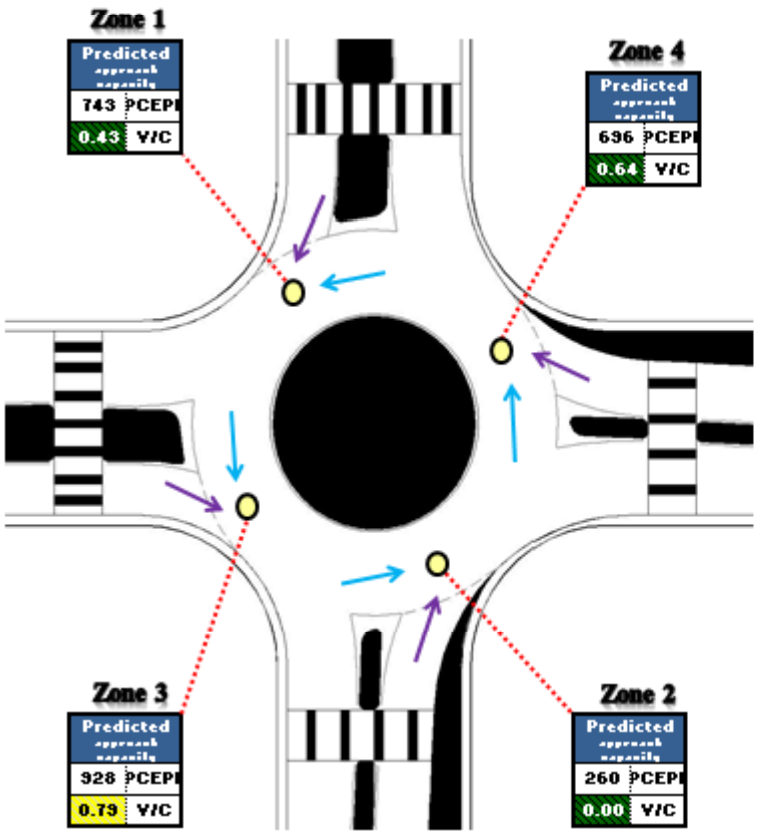
#	TYPE OF INTERCHANGE	Sheet	Zone 1 (Rt Mrg)		Zone 2 (Lt Mrg)		Zone 3 (Ctr. 1)		Zone 4 (Ctr. 2)		Zone 5 (Lt Mrg)		Zone 6 (Rt Mrg)		Overall v/c Ratio	Ranking
			CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C	CLV	V/C		
10.1	Diamond	N-S					111	0.07	439	0.27					0.27	5
10.2		E-W					334	0.21	286	0.18					0.21	2
11.1	Partial Cloverleaf	N-S					28	0.02	87	0.05					0.05	1

75' ICD Mini-Roundabout

Design and Results

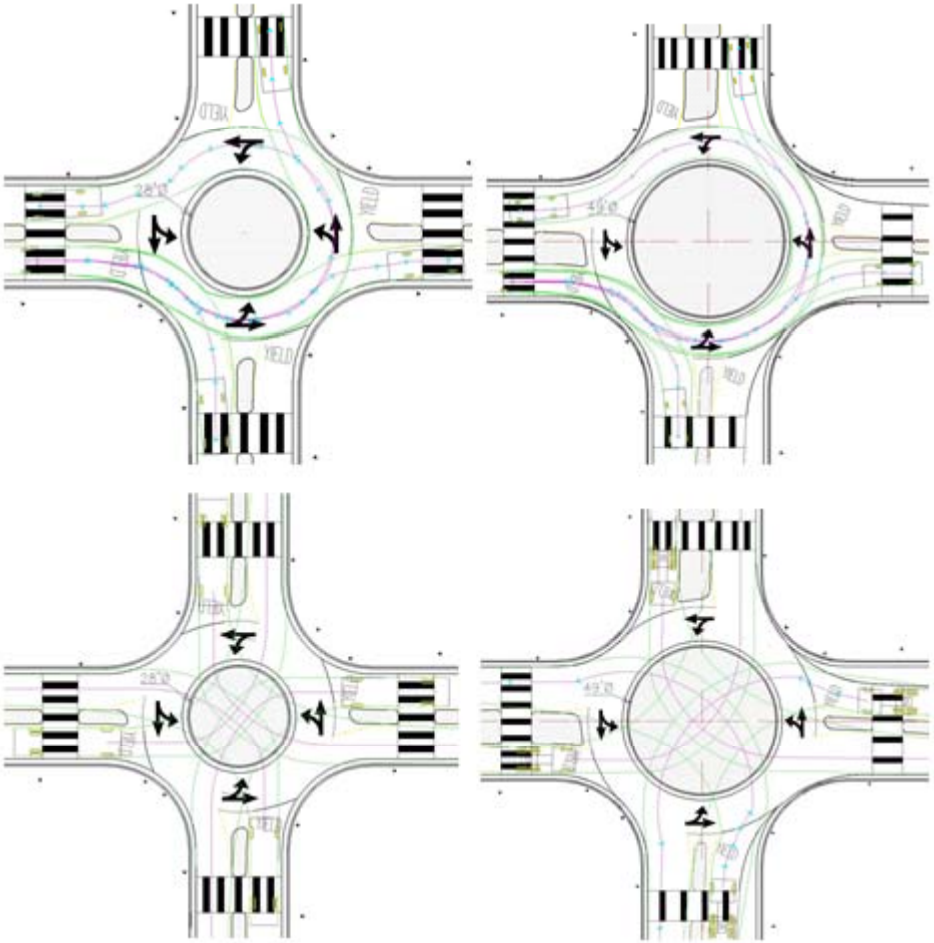
Project Name:	berth, PA Mini-Roundabout Site Evalua
rojcct Number:	our Base N-S Volume 403, E-W Volume 1397, Tot
Location	ynnewood Rd and North Wynnewood Ave, Narbe
Date	February 6, 2013

Critical Lane Volume Sum				
< 1200	200 - 139	400 - 159	≥ 1600	
VOLUME / CAPACITY RATIO:	Zone 1	0.43	Zone 4	0.64
	Zone 3	0.79	Zone 2	0.00



QR S-E | QR N-W | P DLT N-S | P DLT E-W | Full DLT | RCUT N-S | RCUT E-W | MUT N-S | MUT E-W | PMUT N-S | PMUT E-W | 50 Mini-Rndabt

VISSIM Models



Capacity Models

$$C_{50ICD} = 978 - 0.957 * V_{C,Car} - 1.341 * V_{C,HGV} \quad ; \quad R^2 = 0.987$$

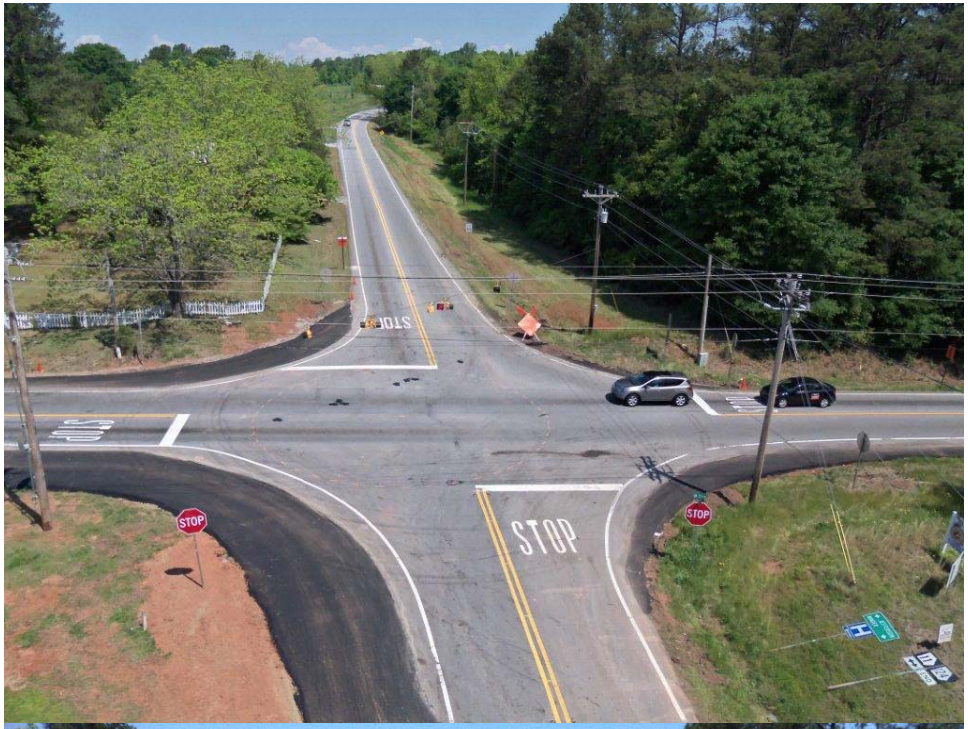
$$C_{75ICD} = 985 - 0.883 * V_{C,Car} - 1.708 * V_{C,HGV} \quad ; \quad R^2 = 0.979$$

$V_{C,Car}$ and $V_{C,HGV}$ are conflicting passenger cars and heavy vehicles, respectively.

Successful Stories

Mini-roundabout at SR 11 and SR 124 Jackson County, GA

Problem: About 50 cars recurring queue on SR 11 SB


STOP
STOP
STOP
STOP

YIELD

SCHOOL BUS
NORTH
11

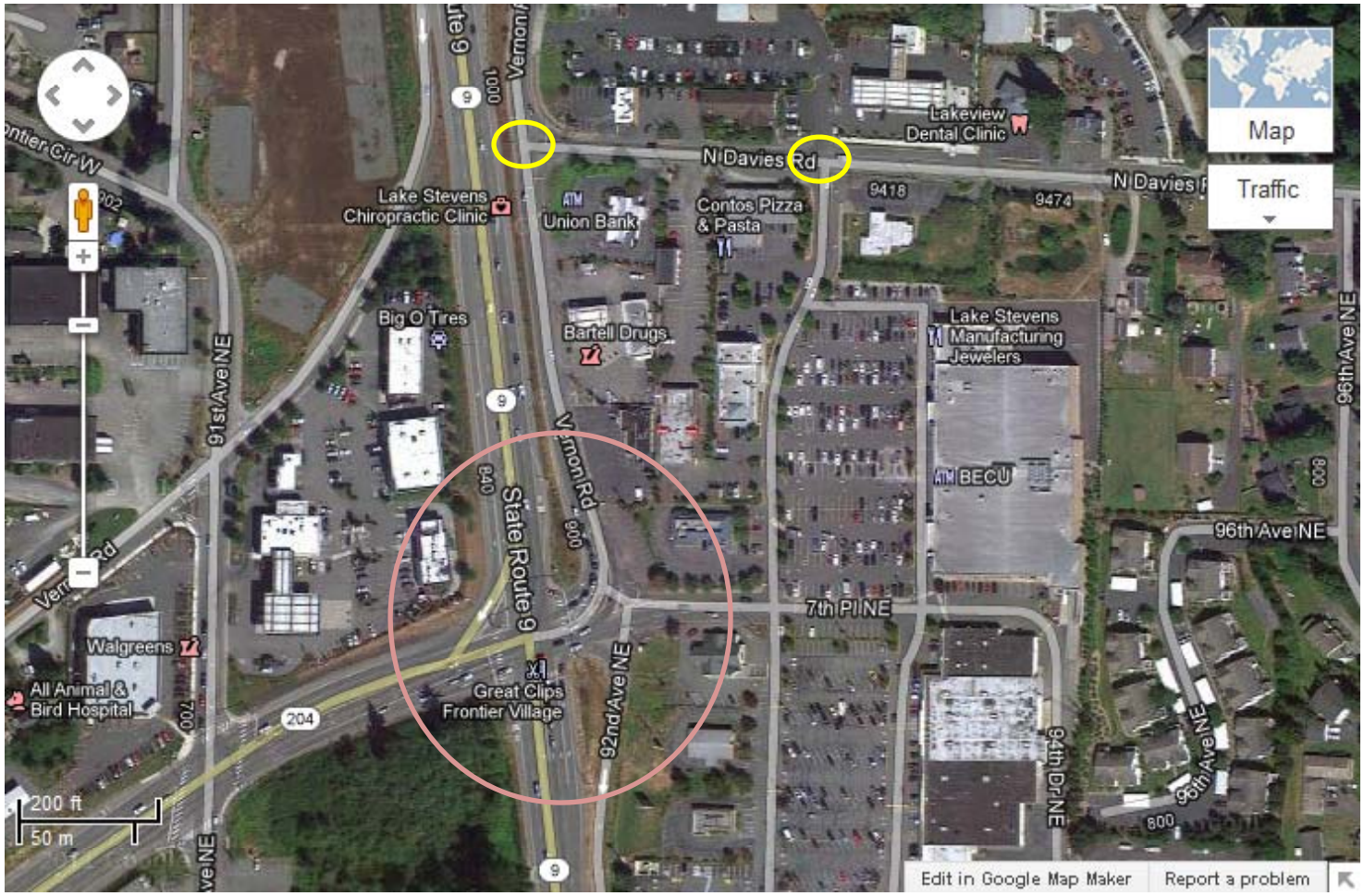
Project Information

- Engineering: 4 days
- Construction: 9 days
- Work Completion: 7.5 weeks after identification of problem

- Cost:
  - Curbing $03,510
  - Labor $19,490
  - Equipment $09,897
  - Material $40,474
  - **Total $63,353**

- Results: recurring 50 cars queue no longer exist

2 mini-roundabouts in Lake Stevens, WA



Nearby Signalized Intersection

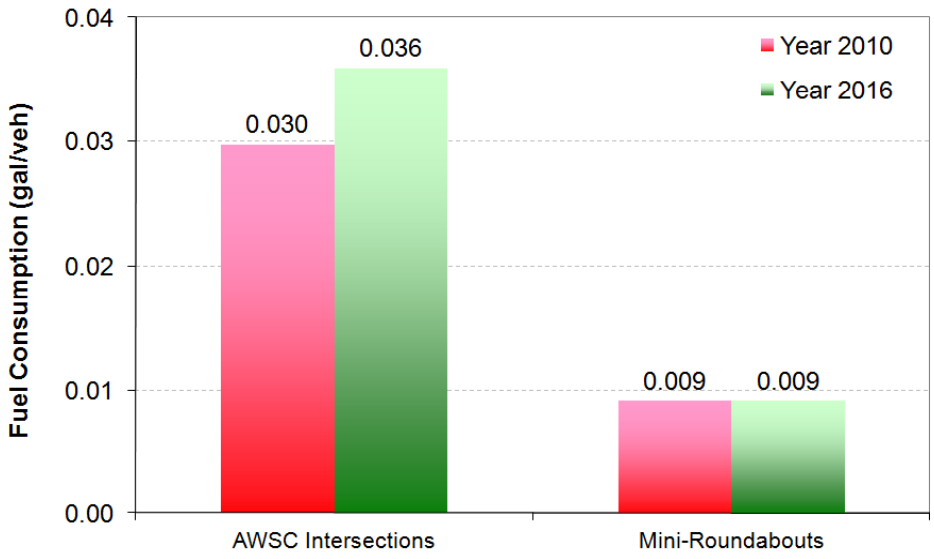
Lake Stevens Mini-Roundabout Sites

- Problems need to be addressed
  - Recurring queues at T-intersection (PM peak)
  - Queuing on Shopping Center NB makes it hard to drivers to get out of shopping center
  - Drivers observed running stop signs
  - Businesses at the shopping center feared leaving

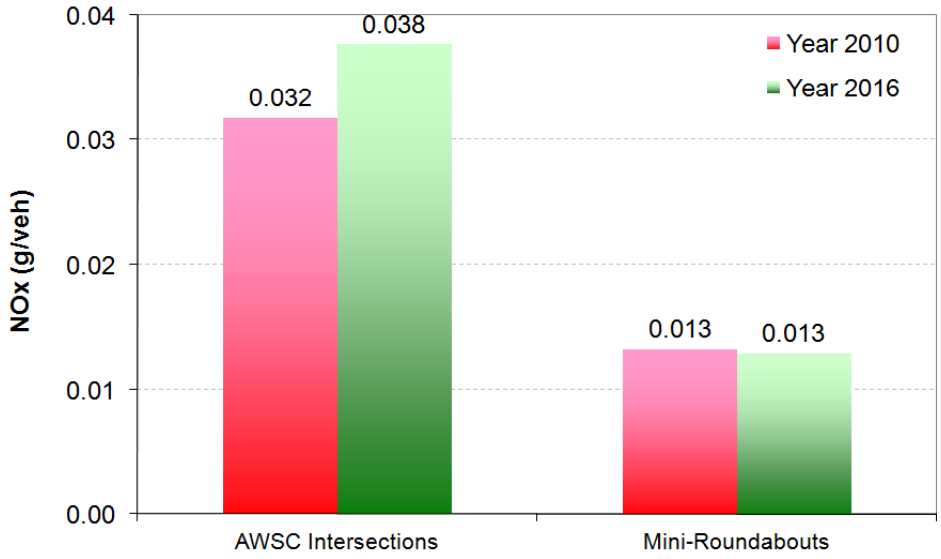
AWSC Intersections

Mini-Roundabouts

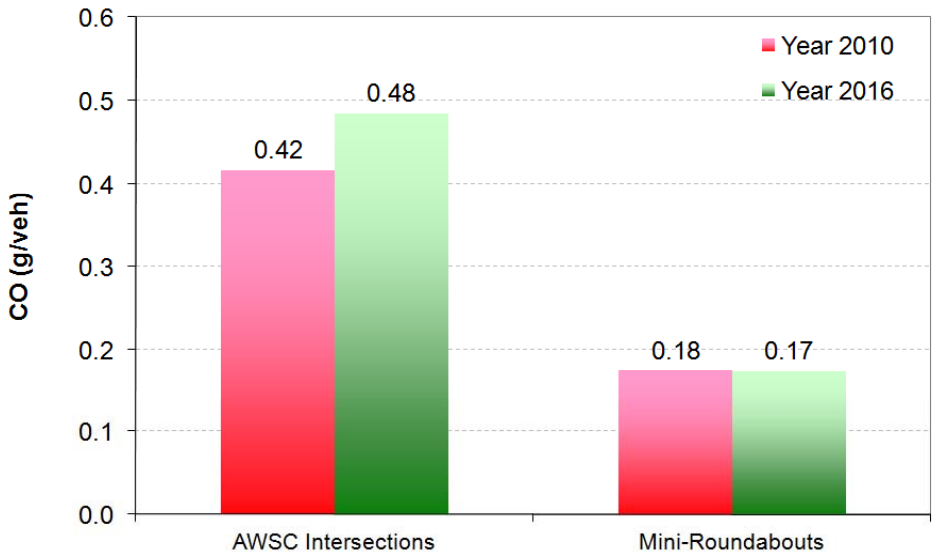
Fuel Consumption (gal/veh)



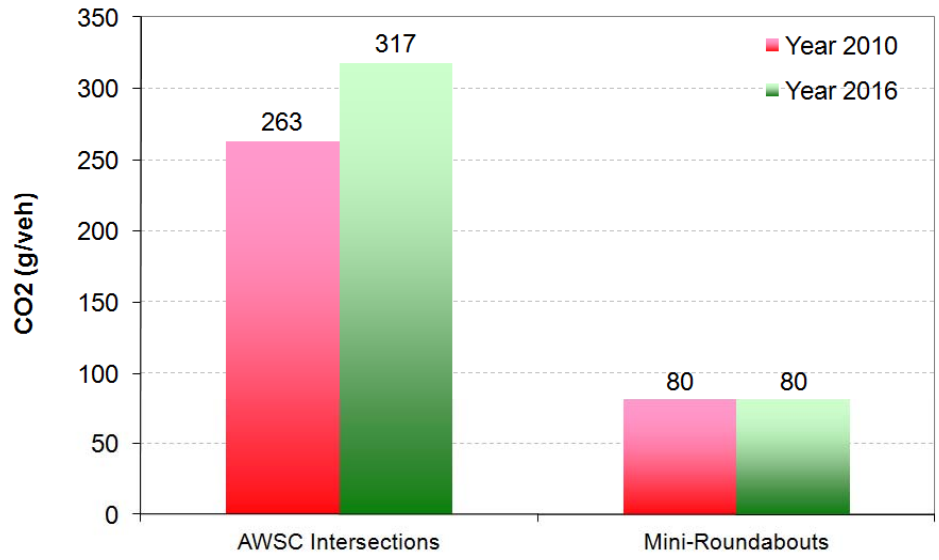
NOx (g/veh)



CO (g/veh)



CO2 (g/veh)



Before

Results

After

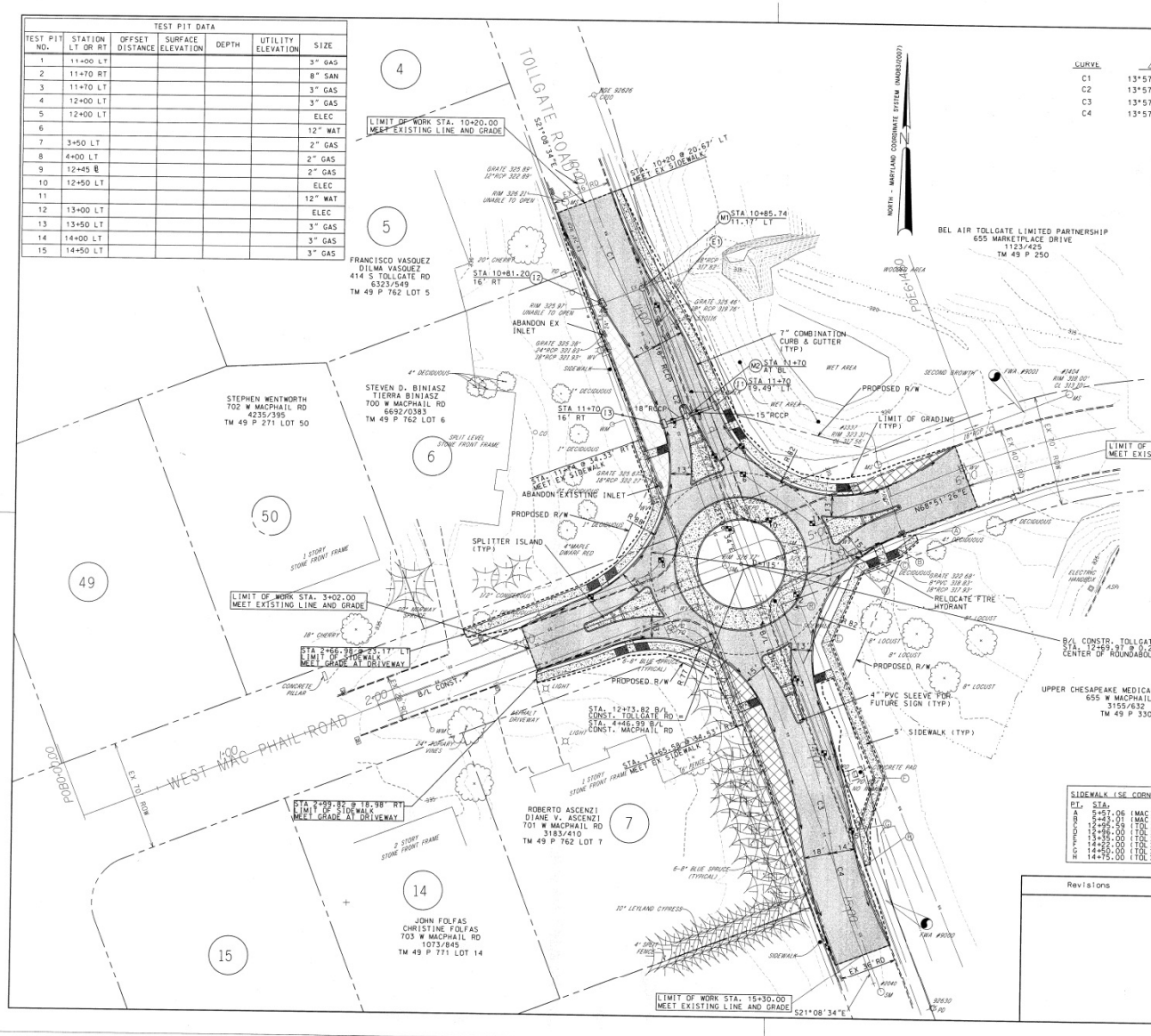
- Each mini took one day for striping (contractor) and one day for installing the central island (city staff)
- Total cost: about $20,000 for 2 mini-roundabouts

- Recurring congestion gone after minis opened to traffic.
- Traffic smoothed in and out of the shopping center
- Parking lot full more often
- 10-15% sales increase at the SAFEWAY store
- Positive feedback from Fire Department.

- Only problem was with local Transit Company that has a policy of not allowing drivers to mount raised curb/surface.

Mini-Roundabout at
S Tollgate Rd and W Macphail Rd
Bel Air, MD

TEST PIT DATA						
TEST PIT NO.	STATION LT OR RT	OFFSET DISTANCE	SURFACE ELEVATION	DEPTH	UTILITY ELEVATION	SIZE
1	11+00 LT					3" GAS
2	11+70 RT					8" SAN
3	11+70 LT					3" GAS
4	12+00 LT					3" GAS
5	12+00 LT					ELEC
6						12" WAT
7	3+50 LT					2" GAS
8	4+00 LT					2" GAS
9	12+45 ℄					2" GAS
10	12+50 LT					ELEC
11						12" WAT
12	13+00 LT					ELEC
13	13+50 LT					3" GAS
14	14+00 LT					3" GAS
15	14+50 LT					3" GAS



CURVE INFORMATION

CURVE	Δ	RADIUS	LENGTH	TANGENT	CHD BEARING	CHD LENGTH
C1	13°57'22"	310.00	75.51	37.94	S26°27'27"E	75.32
C2	13°57'22"	310.00	75.51	37.94	S26°27'27"E	75.32
C3	13°57'22"	310.00	75.51	37.94	S15°49'41"E	75.32
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COORDINATES

PT	BASELINE	STA	N	E
POB	TOLLGATE	10+00.00	675730.1860	1495025.2100
PC	TOLLGATE	10+21.80	675709.8509	1495033.0741
PRC	TOLLGATE	10+97.31	675642.4162	1495066.6335
PT	TOLLGATE	11+72.82	675574.9814	1495100.1930
PC	TOLLGATE	13+74.82	675386.5792	1495173.0530
PRC	TOLLGATE	14+50.33	675314.1112	1495193.5976
PT	TOLLGATE	15+25.84	675241.6433	1495214.1421
POE	TOLLGATE	15+52.04	675217.2095	1495223.5913
POB	MACPHAIL	0+00.00	675319.5549	1494719.7245
POE	MACPHAIL	6+14.60	675541.2375	1495123.6081

SURVEY CONTROL POINTS:

FWA #9000
REBAR W/CAP
N 675,272.662 E 1,495,229.688
ELEV 326.90'

FWA #9001
REBAR W/CAP
N 675,582.787 E 1,495,313.338
ELEV 319.19'

NOTES:

1. CONTRACTOR SHALL ABANDON EXISTING INLETS IDENTIFIED BY REMOVING EXISTING GRATE AND HEADPIECE, CONSTRUCTING BRICK BULKHEAD AT EXISTING PIPE OPENINGS AND FILLING REMAINING STRUCTURE WITH AASHTO #57 AGGREGATE
2. CURB AROUND SPLITTER ISLANDS SHALL BE STANDARD TYPE 'C' COMBINATION CURB AND GUTTER
3. ALL EXISTING GAS VALVES, WATER VALVES AND SANITARY SEWER MANHOLES SHALL BE ADJUSTED TO GRADE
4. BLUE SPRUCE TREES ALONG THE PROPERTY OF 701 W MACPHAIL RD SHALL NOT BE DISTURBED

LEGEND

CONIFEROUS TREE
DECIDUOUS TREE
SHRUB
FIRE HYDRANT
WV WATER VALVE
WM WATER METER
SD INLET
GV GAS VALVE
ROAD SIGN
LIGHT POLE
UTILITY POLE
GUY ANCHOR
PD UTILITY PEDESTAL
SPOT GRADE
CONTROL STATION
CORNER FOUND
SANITARY SEWER
STORMDRAIN
METAL FENCE
WOOD FENCE
TELEPHONE
OVERHEAD LINES
GAS LINE
ELECTRIC LINE
WOODS LINE
LIMIT OF GRADING
(B) RELOCATE
TEST PIT
FULL DEPTH PAVING
REMOVE EXISTING PAVING

SIDEWALK (SE CORNER)			
PT.	STA.	OFF.	NOTES:
A	5+57.06 (MAC)	17.19 RT	MEET EX. SIDEWALK
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D	12+96.00 (TOL)	67.98 LT	
E	13+35.00 (TOL)	30.0 LT	
F	14+22.00 (TOL)	35.0 LT	
G	14+50.00 (TOL)	19.0 LT	
H	14+75.00 (TOL)	18.26' LT	MEET EX. SIDEWALK

Revisions

HARFORD COUNTY, MARYLAND

TOLLGATE ROAD AT MACPHAIL ROAD
ROUNDABOUT
PLAN

Drawn By : GCH
Designed By : GCH
Reviewed By : JMS

Contract No :
Scale : 1" = 30'
Sheet 4 Of 11
Date : 7/2010

ADC MAP :
TAX MAP :
HCG BILLING ID No.:
HCG DWG ID No.:

TOLLGATE RD
SPEED LIMIT
30

TEST PIT DATA						
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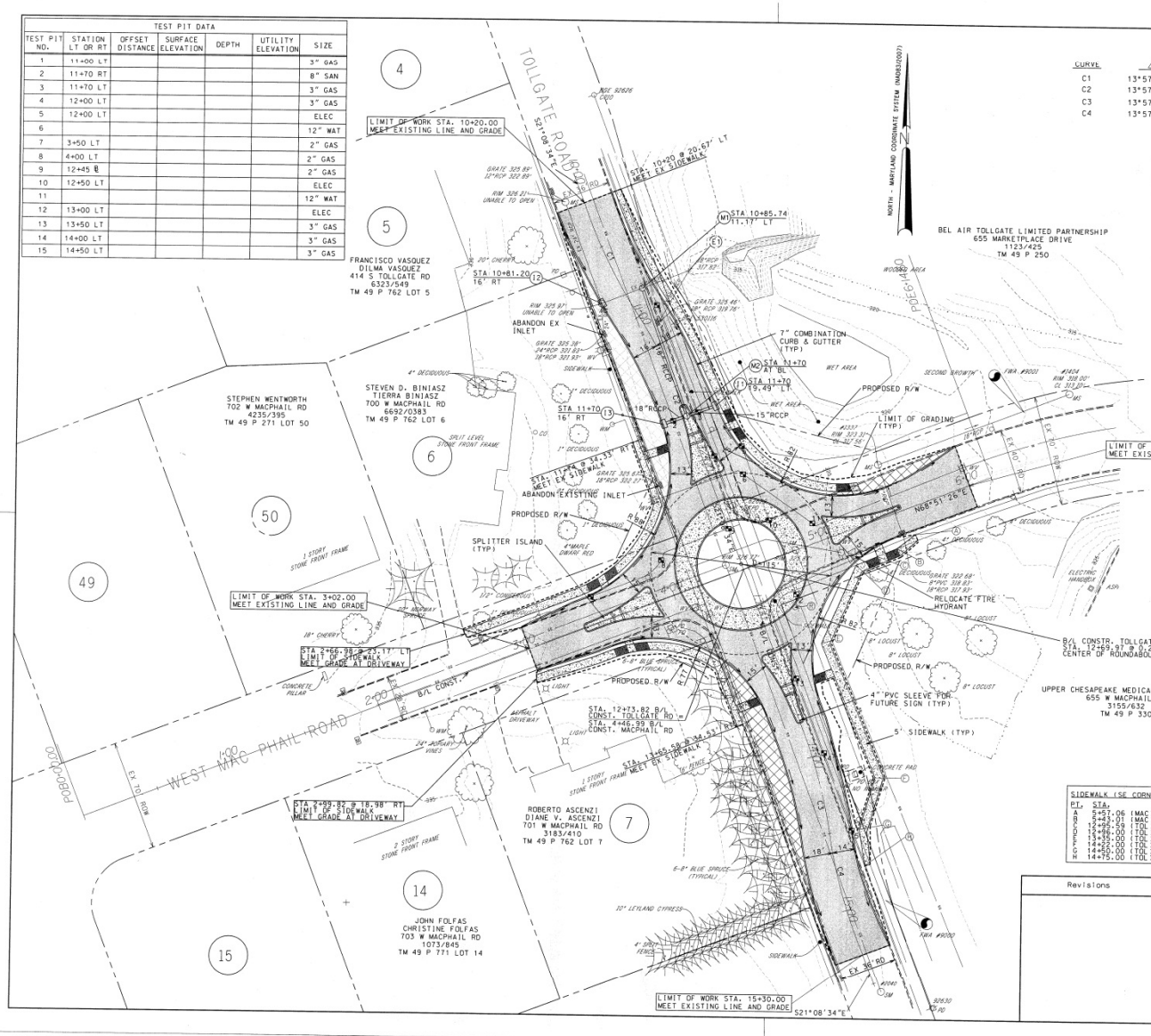

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PT	BASELINE	STA	N	E
POB	TOLLGATE	10+00.00	675730.1860	1495025.2100
PC	TOLLGATE	10+21.80	675709.8509	1495033.0741
PRC	TOLLGATE	10+97.31	675642.4162	1495066.6335
PT	TOLLGATE	11+72.82	675574.9814	1495100.1930
PC	TOLLGATE	13+74.82	675386.5792	1495173.0530
PRC	TOLLGATE	14+50.33	675314.1112	1495193.5976
PT	TOLLGATE	15+25.84	675241.6433	1495214.1421
POE	TOLLGATE	15+52.04	675217.2095	1495223.5913
POB	MACPHAIL	0+00.00	675319.5549	1494719.7245
POE	MACPHAIL	6+14.60	675541.2375	1495123.6081

SURVEY CONTROL POINTS:

FWA #9000
REBAR W/CAP
N 675,272.662 E 1,495,229.688
ELEV 326.90'

FWA #9001
REBAR W/CAP
N 675,582.787 E 1,495,313.338
ELEV 319.19'

NOTES:

1. CONTRACTOR SHALL ABANDON EXISTING INLETS IDENTIFIED BY REMOVING EXISTING GRATE AND HEADPIECE, CONSTRUCTING BRICK BULKHEAD AT EXISTING PIPE OPENINGS AND FILLING REMAINING STRUCTURE WITH AASHTO #57 AGGREGATE
2. CURB AROUND SPLITTER ISLANDS SHALL BE STANDARD TYPE 'C' COMBINATION CURB AND GUTTER
3. ALL EXISTING GAS VALVES, WATER VALVES AND SANITARY SEWER MANHOLES SHALL BE ADJUSTED TO GRADE
4. BLUE SPRUCE TREES ALONG THE PROPERTY OF 701 W MACPHAIL RD SHALL NOT BE DISTURBED

LEGEND

CONIFEROUS TREE
DECIDUOUS TREE
SHRUB
FIRE HYDRANT
WATER VALVE
WATER METER
SD INLET
GAS VALVE
ROAD SIGN
LIGHT POLE
UTILITY POLE
GUY ANCHOR
UTILITY PEDESTAL
SPOT GRADE
CONTROL STATION
CORNER FOUND
SANITARY SEWER
STORMDRAIN
METAL FENCE
WOOD FENCE
TELEPHONE
OVERHEAD LINES
GAS LINE
ELECTRIC LINE
WOODS LINE
LIMIT OF GRADING
RELOCATE
TEST PIT
FULL DEPTH PAVING
REMOVE EXISTING PAVING

SIDEWALK (SE CORNER)			
PT.	STA.	OFF.	NOTES:
A	5+57.06 (MAC)	17.19 RT	MEET EX. SIDEWALK
B	5+43.01 (MAC)	21.38 RT	
C	12+95.59 (TOL)	82.53 LT	AT RAMP
D	12+96.00 (TOL)	67.98 LT	
E	13+35.00 (TOL)	30.0 LT	
F	14+22.00 (TOL)	35.0 LT	
G	14+50.00 (TOL)	19.0 LT	
H	14+75.00 (TOL)	18.26 LT	MEET EX. SIDEWALK

Revisions

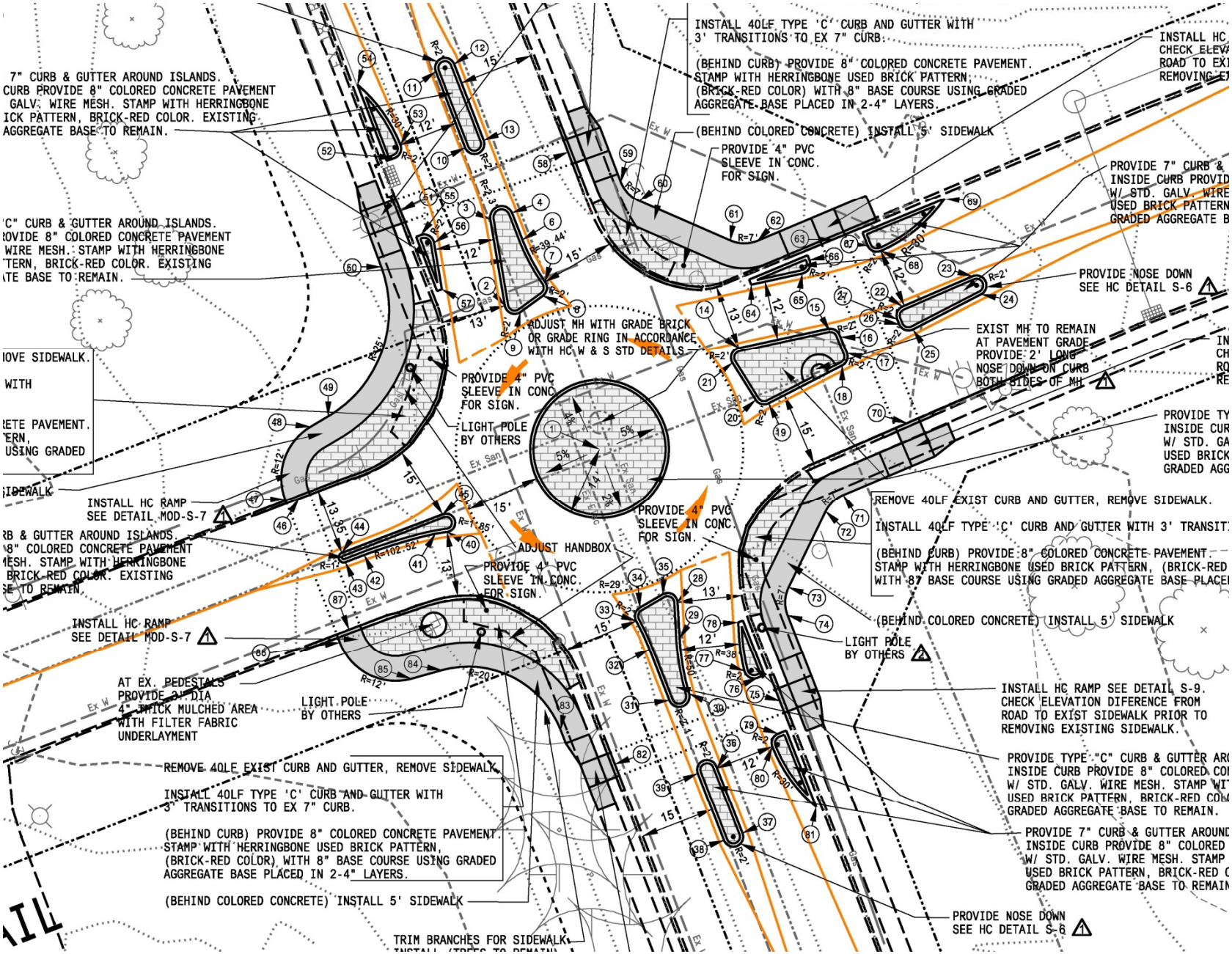
HARFORD COUNTY, MARYLAND

TOLLGATE ROAD AT MACPHAIL ROAD
ROUNDABOUT
PLAN

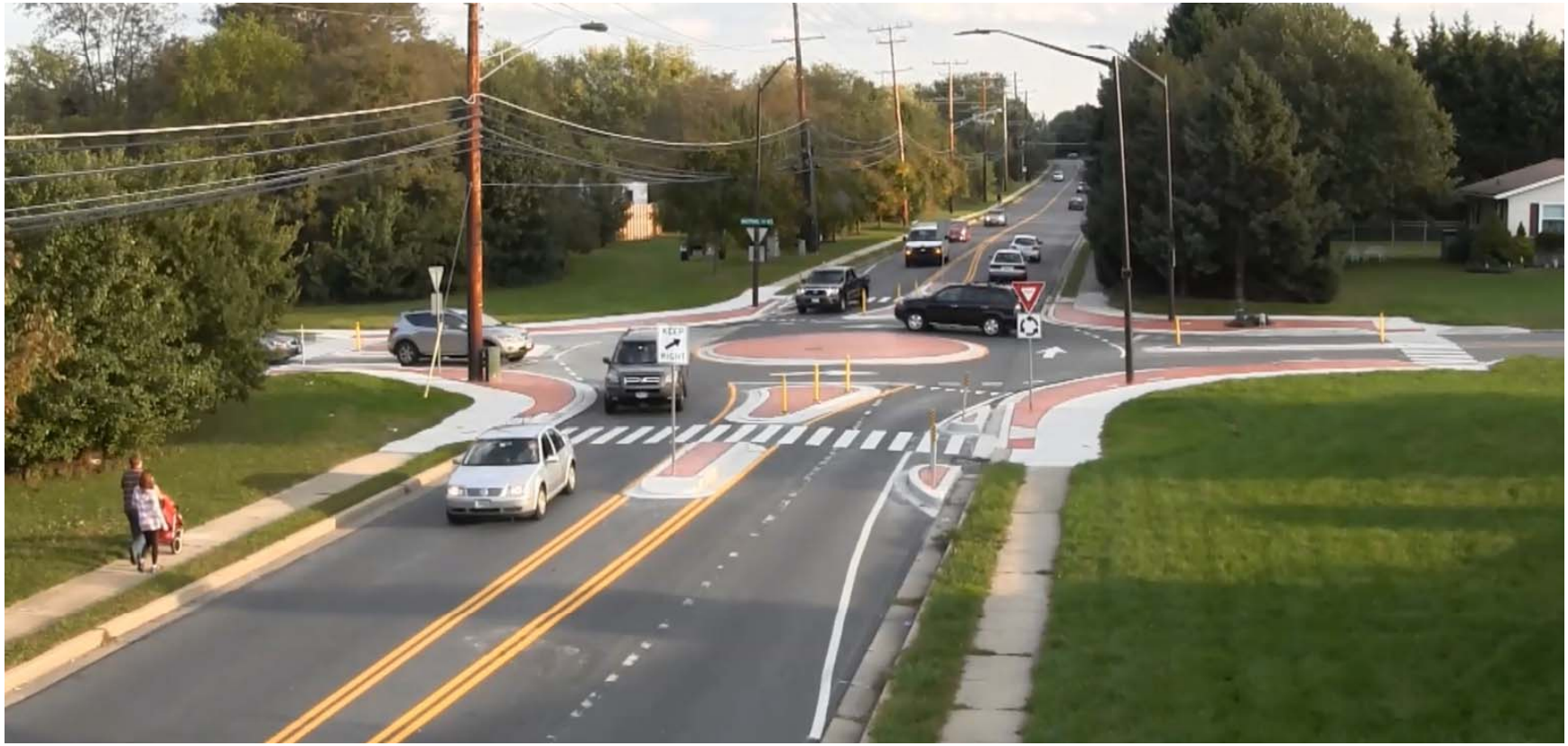
Drawn By : GCH
Designed By : GCH
Reviewed By : JMS

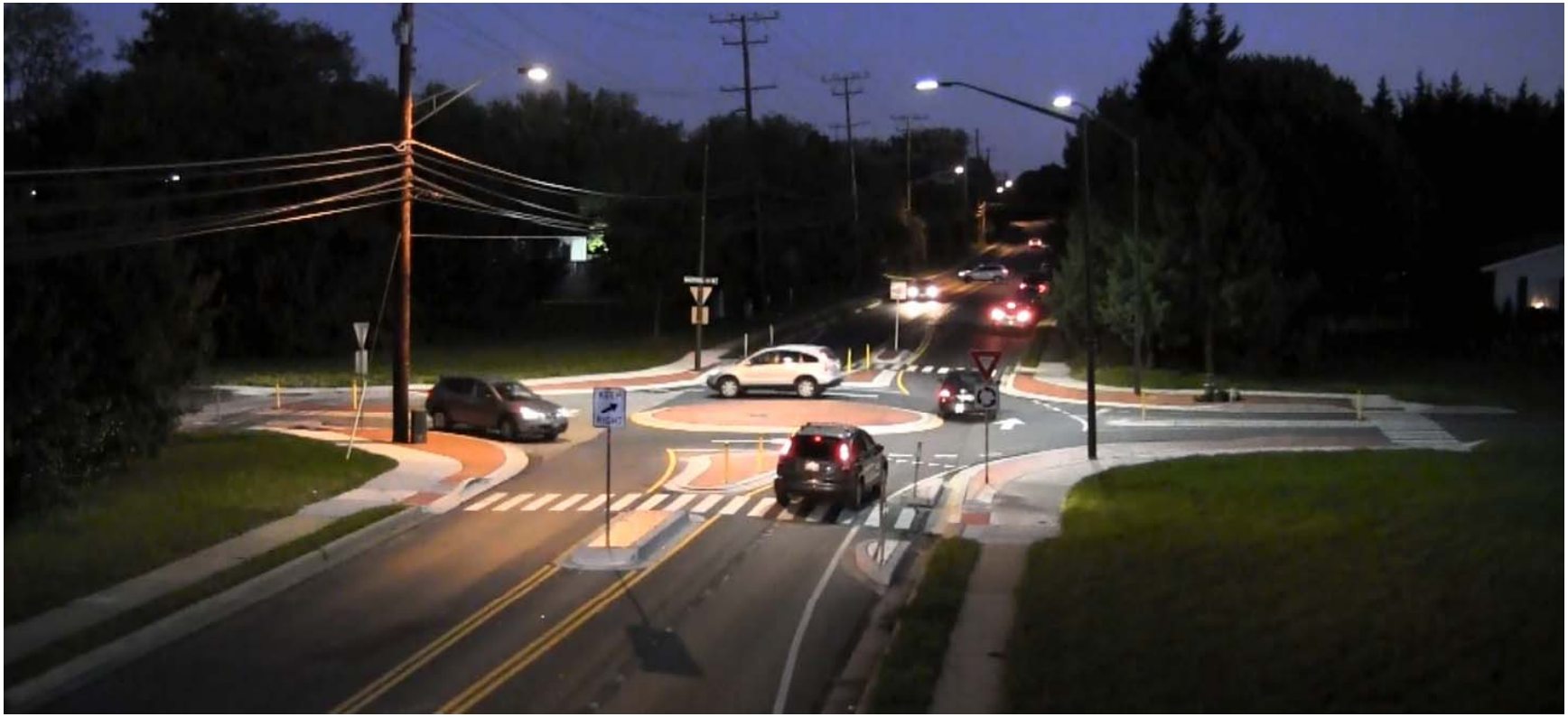
Contract No :
Scale : 1"= 30'
Sheet 4 Of 11
Date : 7/2010

ADC MAP :
TAX MAP :
HCG BILLING ID No.:
HCG DWG ID No.:


INSTALL 40LF TYPE 'C' CURB AND GUTTER WITH 3' TRANSITIONS TO EX 7" CURB.
(BEHIND CURB) PROVIDE 8" COLORED CONCRETE PAVEMENT. STAMP WITH HERRINGBONE USED BRICK PATTERN; (BRICK-RED COLOR) WITH 8" BASE COURSE USING GRADED AGGREGATE BASE PLACED IN 2-4" LAYERS.
(BEHIND COLORED CONCRETE) INSTALL 5' SIDEWALK
PROVIDE 4" PVC SLEEVE IN CONC. FOR SIGN.
7" CURB & GUTTER AROUND ISLANDS. CURB PROVIDE 8" COLORED CONCRETE PAVEMENT GALV. WIRE MESH. STAMP WITH HERRINGBONE ICK PATTERN, BRICK-RED COLOR. EXISTING AGGREGATE BASE TO REMAIN.
'C" CURB & GUTTER AROUND ISLANDS. ROVIDE 8" COLORED CONCRETE PAVEMENT WIRE MESH. STAMP WITH HERRINGBONE TERN, BRICK-RED COLOR. EXISTING TE BASE TO REMAIN.
ADJUST MH WITH GRADE BRICK OR GRADE RING IN ACCORDANCE WITH HC W & S STD DETAILS.
PROVIDE 4" PVC SLEEVE IN CONC. FOR SIGN.
LIGHT POLE BY OTHERS
PROVIDE NOSE DOWN SEE HC DETAIL S-6
EXIST MH TO REMAIN AT PAVEMENT GRADE. PROVIDE 2' LONG NOSE DOWN ON CURB BOTH SIDES OF MH
INSTALL HC RAMP SEE DETAIL MOD-S-7
ADJUST HANDBOX
PROVIDE 4" PVC SLEEVE IN CONC. FOR SIGN.
REMOVE 40LF EXIST CURB AND GUTTER, REMOVE SIDEWALK.
INSTALL 40LF TYPE 'C' CURB AND GUTTER WITH 3' TRANSIT
(BEHIND CURB) PROVIDE 8" COLORED CONCRETE PAVEMENT. STAMP WITH HERRINGBONE USED BRICK PATTERN, (BRICK-RED WITH 8" BASE COURSE USING GRADED AGGREGATE BASE PLACE
(BEHIND COLORED CONCRETE) INSTALL 5' SIDEWALK
LIGHT POLE BY OTHERS
INSTALL HC RAMP SEE DETAIL MOD-S-7
AT EX. PEDESTALS PROVIDE 3' DIA 4" THICK MULCHED AREA WITH FILTER FABRIC UNDERLAYMENT
LIGHT POLE BY OTHERS
INSTALL HC RAMP SEE DETAIL S-9. CHECK ELEVATION DIFERENCE FROM ROAD TO EXIST SIDEWALK PRIOR TO REMOVING EXISTING SIDEWALK.
PROVIDE TYPE "C" CURB & GUTTER AR INSIDE CURB PROVIDE 8" COLORED CO W/ STD. GALV. WIRE MESH. STAMP WI USED BRICK PATTERN, BRICK-RED CO GRADED AGGREGATE BASE TO REMAIN.
PROVIDE 7" CURB & GUTTER AROUND INSIDE CURB PROVIDE 8" COLORED W/ STD. GALV. WIRE MESH. STAMP USED BRICK PATTERN, BRICK-RED GRADED AGGREGATE BASE TO REMAIN
REMOVE 40LF EXIST CURB AND GUTTER, REMOVE SIDEWALK.
INSTALL 40LF TYPE 'C' CURB AND GUTTER WITH 3' TRANSITIONS TO EX 7" CURB.
(BEHIND CURB) PROVIDE 8" COLORED CONCRETE PAVEMENT. STAMP WITH HERRINGBONE USED BRICK PATTERN, (BRICK-RED COLOR) WITH 8" BASE COURSE USING GRADED AGGREGATE BASE PLACED IN 2-4" LAYERS.
(BEHIND COLORED CONCRETE) INSTALL 5' SIDEWALK
TRIM BRANCHES FOR SIDEWALK
PROVIDE NOSE DOWN SEE HC DETAIL S-6

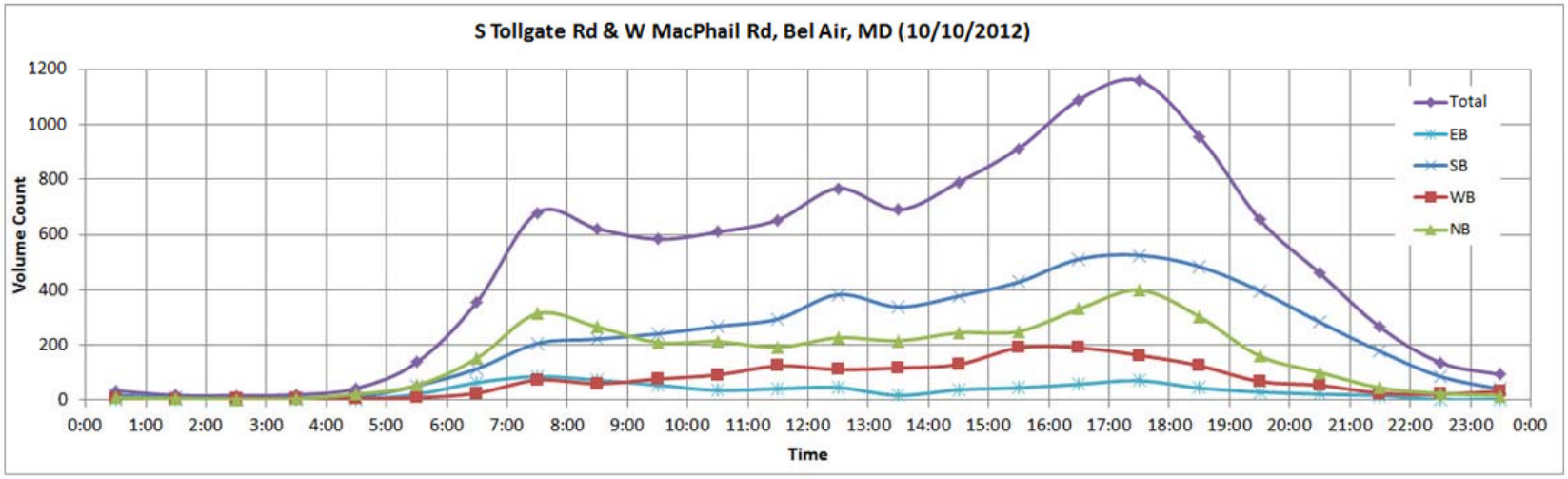
HIGHWAYS
0219


KEEP
RIGHT



Tollgate Road at W. MacPhail Road
Entering Traffic Volumes

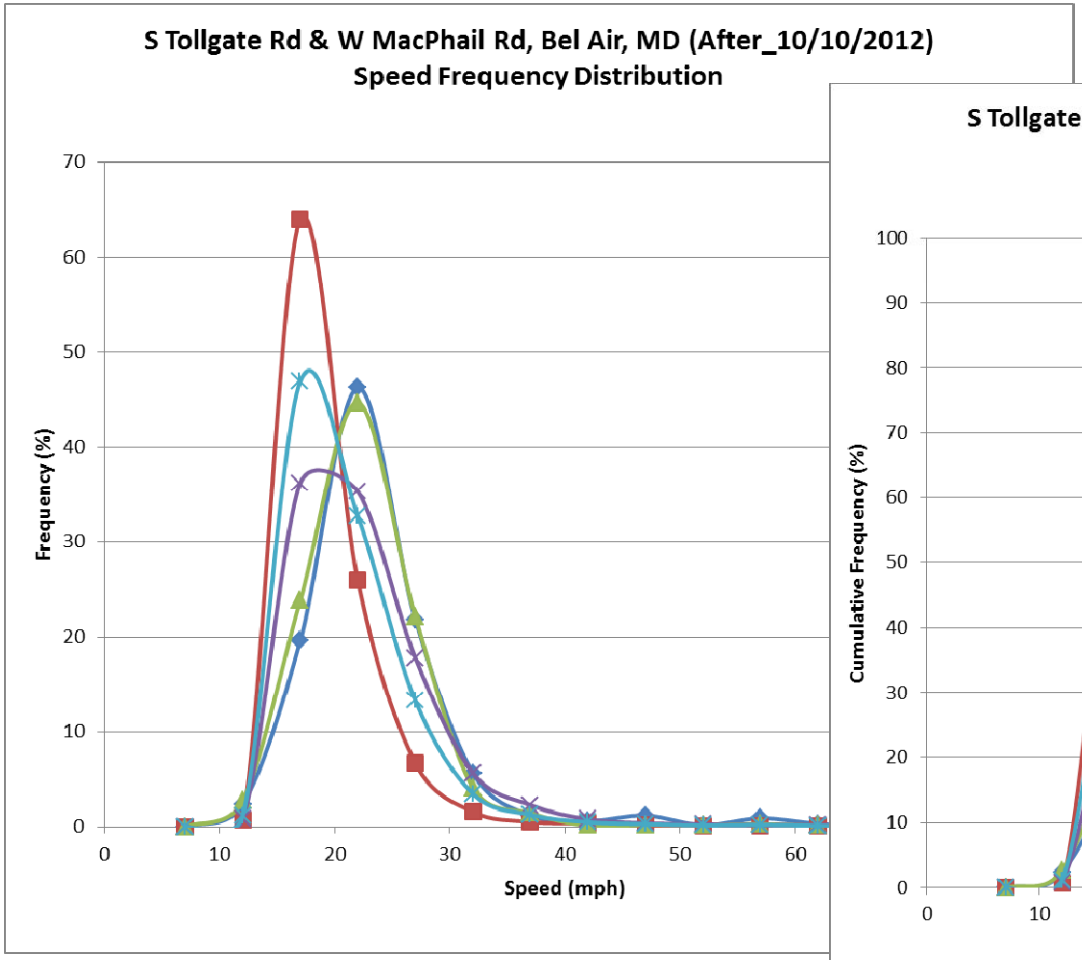
Time Range			Volume Counts				
			EB	SB	WB	NB	Total
0:00	-	1:00	1	18	7	9	**35**
1:00	-	2:00	1	10	1	6	**18**
2:00	-	3:00	1	6	6	4	**17**
3:00	-	4:00	0	10	5	5	**20**
4:00	-	5:00	4	12	5	22	**43**
5:00	-	6:00	22	52	9	54	**137**
6:00	-	7:00	64	114	26	152	**356**
7:00	-	8:00	86	206	73	314	**679**
8:00	-	9:00	73	222	60	266	**621**
9:00	-	10:00	55	241	77	210	**583**
10:00	-	11:00	36	268	92	213	**609**
11:00	-	12:00	42	295	124	192	**653**
12:00	-	13:00	46	383	111	227	**767**
13:00	-	14:00	18	338	117	216	**689**
14:00	-	15:00	38	377	129	245	**789**
15:00	-	16:00	45	428	190	250	**913**
16:00	-	17:00	58	511	190	331	**1090**
17:00	-	18:00	71	525	163	399	**1158**
18:00	-	19:00	44	484	125	303	**956**
19:00	-	20:00	30	396	68	160	**654**
20:00	-	21:00	22	283	54	101	**460**
21:00	-	22:00	17	177	26	45	**265**
22:00	-	23:00	3	86	22	25	**136**
23:00	-	0:00	3	40	33	17	**93**
Total			**780**	**5482**	**1713**	**3766**	**11741**

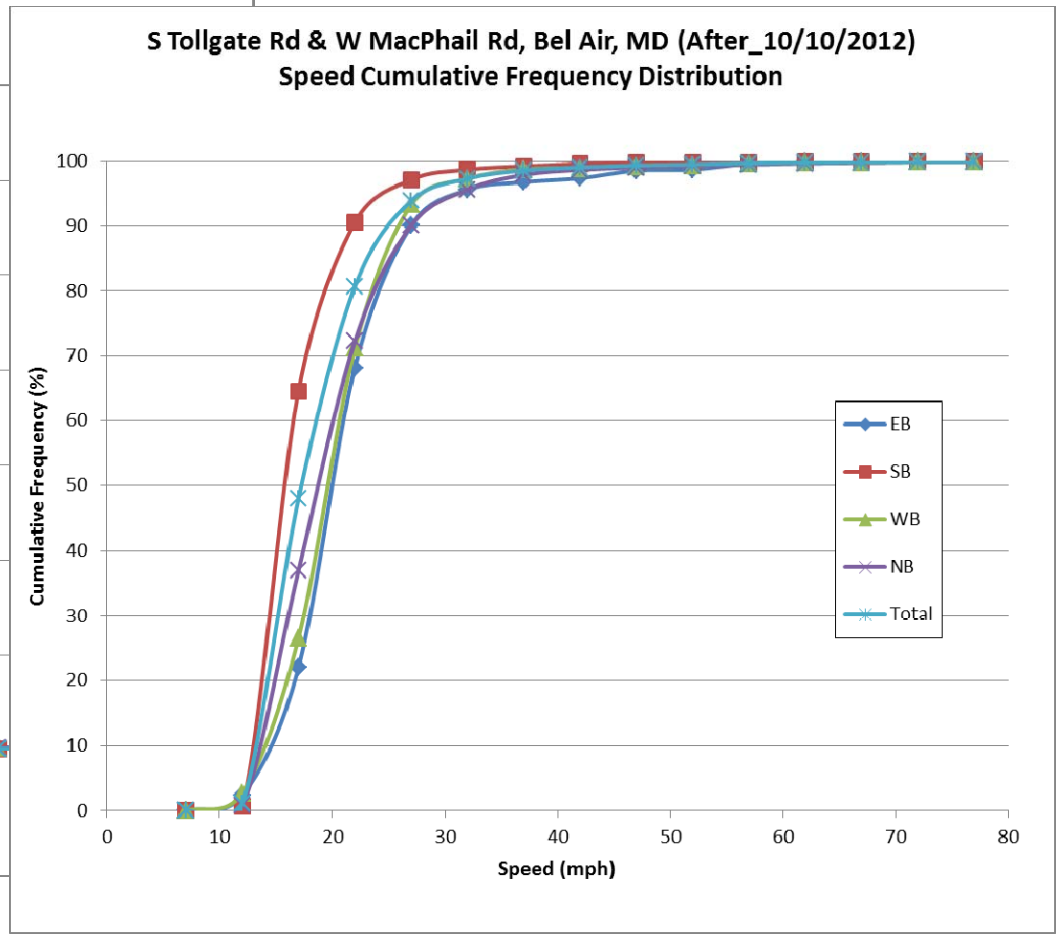


Potential Capacity

15:30	11	106	47	60	224	23.9915	MPH	83.25	F	Dry
15:45	15	111	55	58	239	22.4391	MPH	81.5	F	Dry
16:00	16	97	54	79	246	22.6796	MPH	81.5	F	Dry
16:15	13	143	46	75	277	23.3999	MPH	80.25	F	Dry
16:30	15	119	46	86	266	22.3959	MPH	79.25	F	Dry
16:45	14	152	44	91	301	21.3944	MPH	78	F	Dry
17:00	16	123	51	88	278	22.4454	MPH	77	F	Dry
***17:15	19	144	46	105	314	22.6773	MPH	75.5	F	Dry
17:30	16	138	31	102	287	21.6894	MPH	75	F	Dry
17:45	20	120	35	104	279	22.4774	MPH	74	F	Dry
18:00	11	124	35	90	260	24.1475	MPH	74	F	Dry
18:15	13	121	36	81	251	23.0521	MPH	73	F	Dry
18:30	10	118	31	69	228	22.2511	MPH	72	F	Dry
18:45	10	121	23	63	217	21.0658	MPH	72	F	Dry
Max 15-minute Counts	20	152	55	105	332					
Estimated Capacity					1328	VPH				

Speed Distribution (100 ft from entrance) of 11,037 samples





Evening Rush Hour
Approx. 1,150
Entering Volume

Pedestrian Crossings

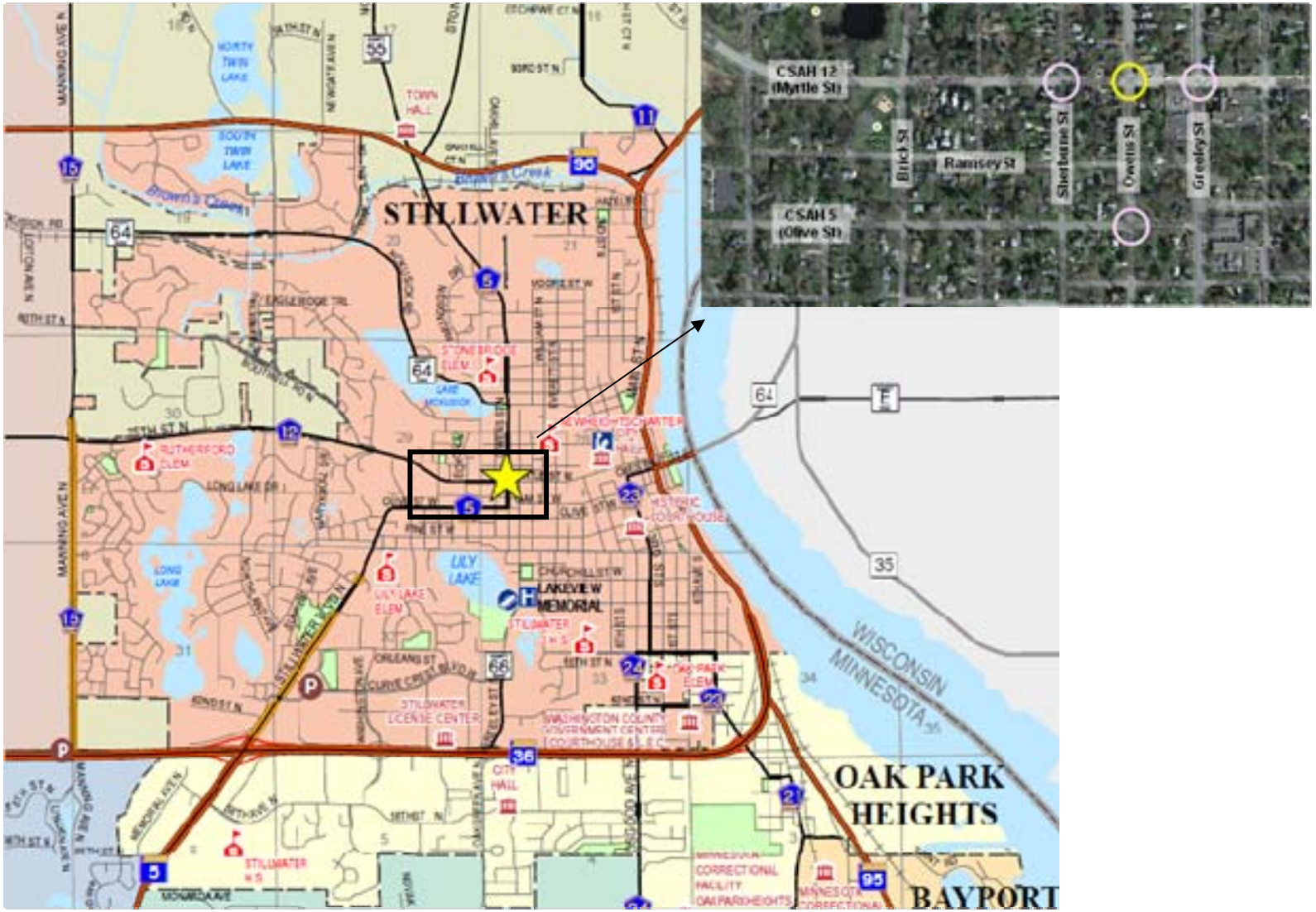
Results

- Work well operationally
- Before accidents (2008-2011)
  - 8 reported, 3 injuries (1 serious)
- After accidents (2012-2013)
  - 2 reported accidents, 1 minor injury
- Potential for serious accidents greatly reduced

  85th of 38 MPH – right angle accident

  => 15 MPH – side swipe accident
- Increased pedestrian safety.

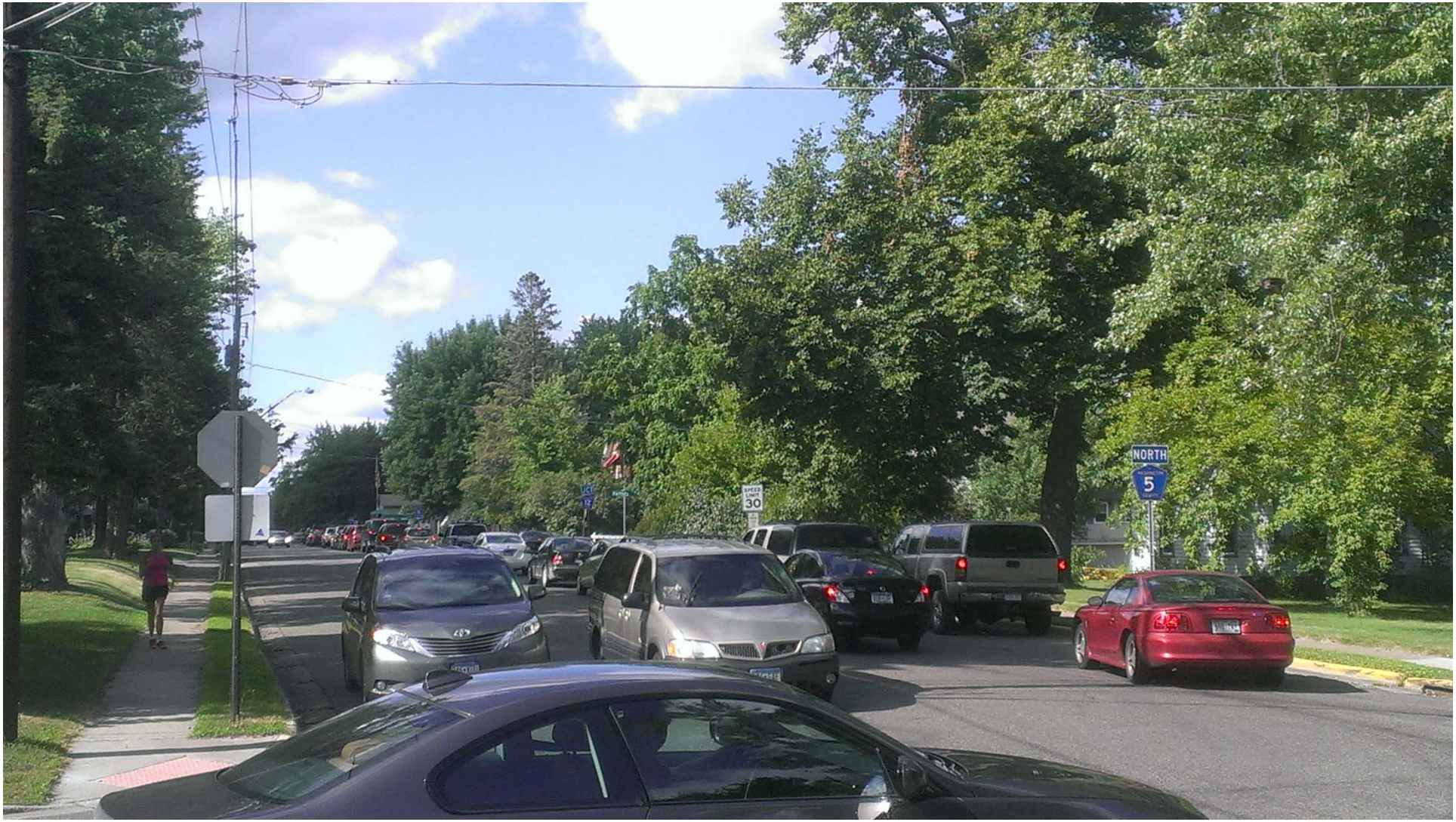
Proposed Mini-roundabout at Owens St and Myrtle St, Stillwater, MN



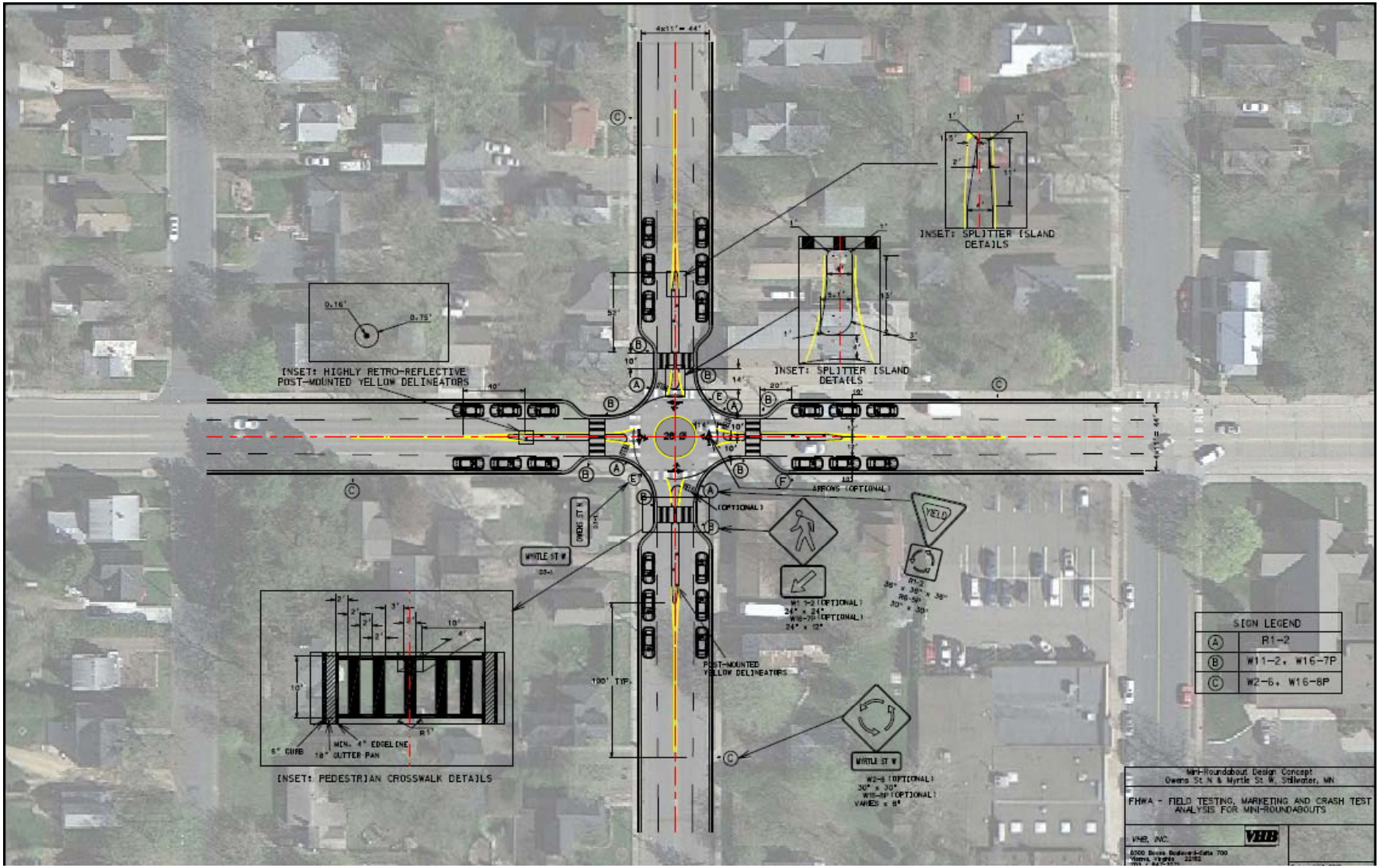
Intersection	Traffic Control	Crashes[1]	Crash Rate[2]	MnDOT Ave Crash Rate[3]
CSAH 5 (Olive St)/Owens St	Side-Street Stop	19 (3.8)	1.10	0.3
Myrtle St/Greeley St	Side-Street Stop	14 (2.8)	0.62	0.3
CSAH 12 (Myrtle St)/Sherburne St	Side-Street Stop	8 (1.6)	0.59	0.3
CSAH 12(Myrtle St)/Owens St	All-Way Stop	15 (3.0)	0.56	0.6
CSAH 5 (Olive St)/Sherburne St	Side-Street Stop	4 (0.8)	0.25	0.3
CSAH 5 (Owens St)/Ramsey St	Side-Street Stop	3 (0.6)	0.22	0.3
CSAH 12 (Myrtle St)/Brick St	Side-Street Stop	3 (0.6)	0.17	0.3
Olive St/Greeley St	Side-Street Stop	3 (0.6)	0.17	0.3
CSAH 5 (Olive St)/Brick St	Side-Street Stop	3 (0.6)	0.15	0.3
Greeley St/Ramsey St	Side-Street Stop	2 (0.4)	0.14	0.3
CSAH 5 (Stillwater Blvd)/Pine St	Side-Street Stop	3 (0.6)	0.12	0.3

Stillwater
Washington County, MN

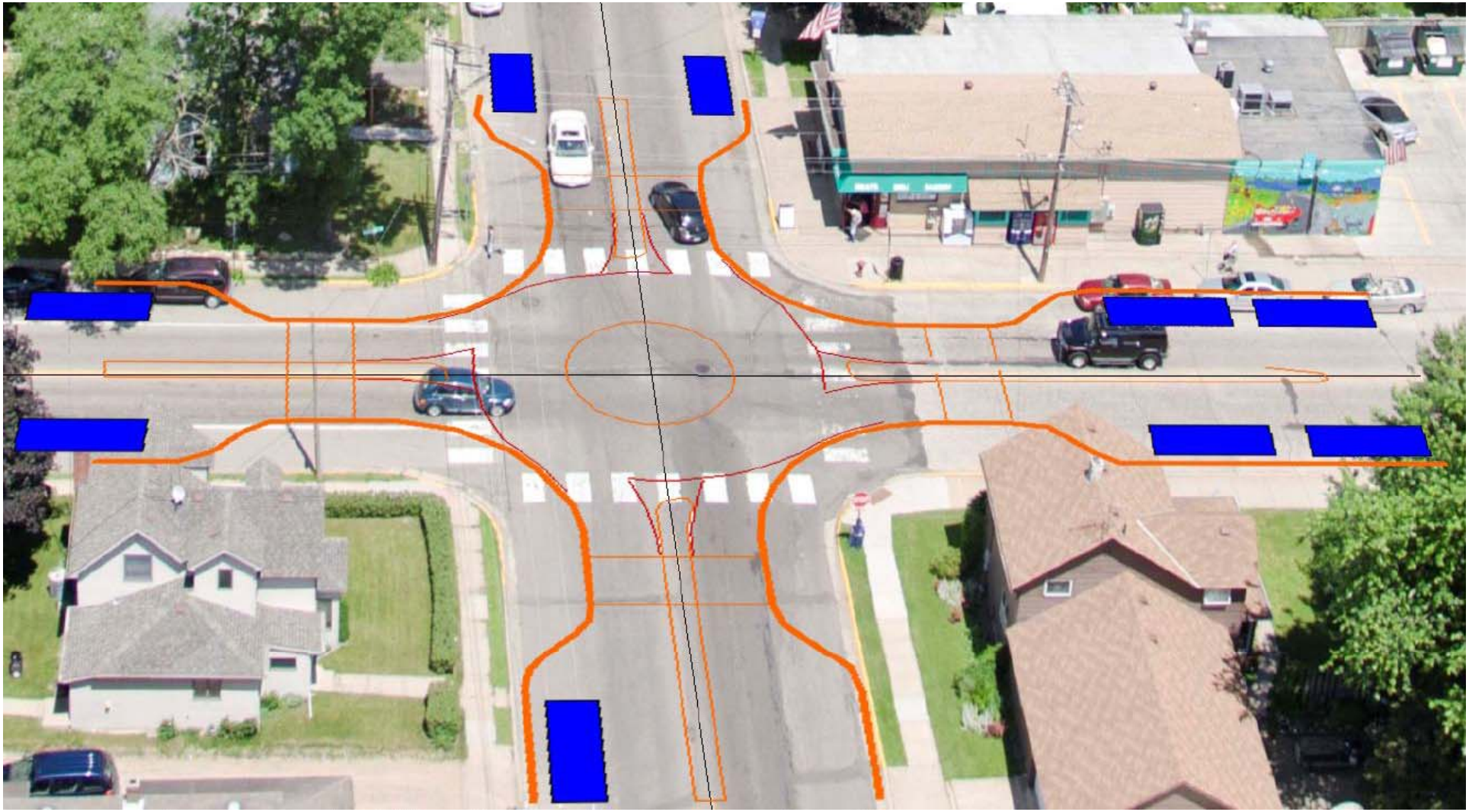
Stillwater
Washington County, MN

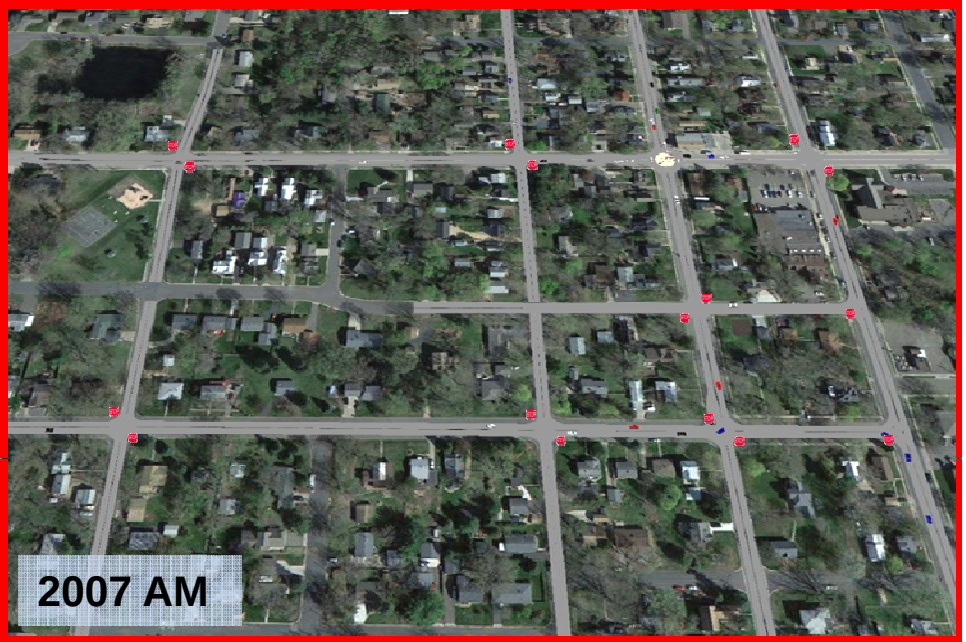
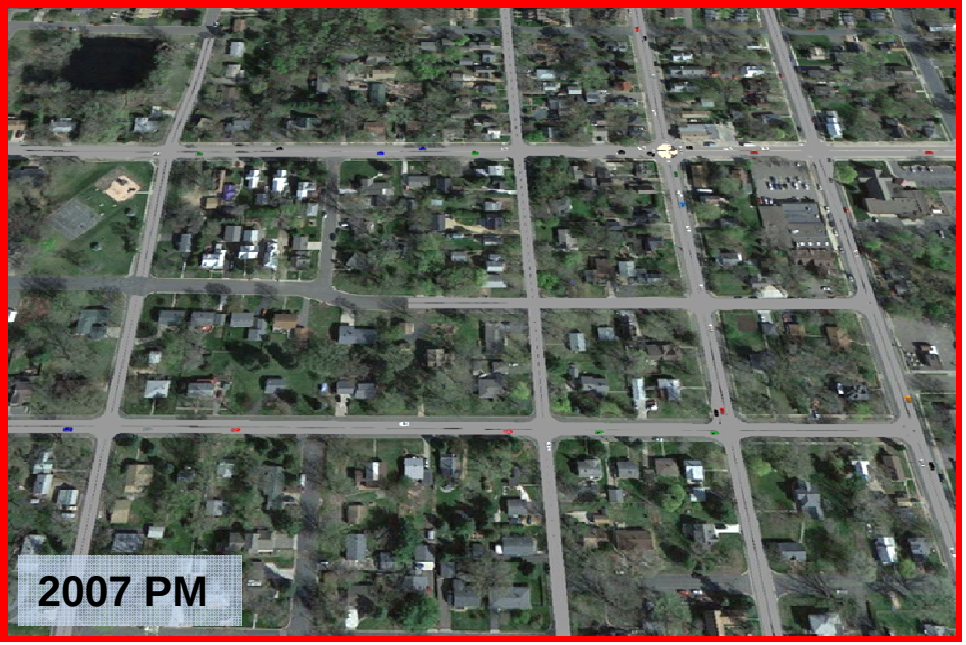


Stillwater
Washington County, MN



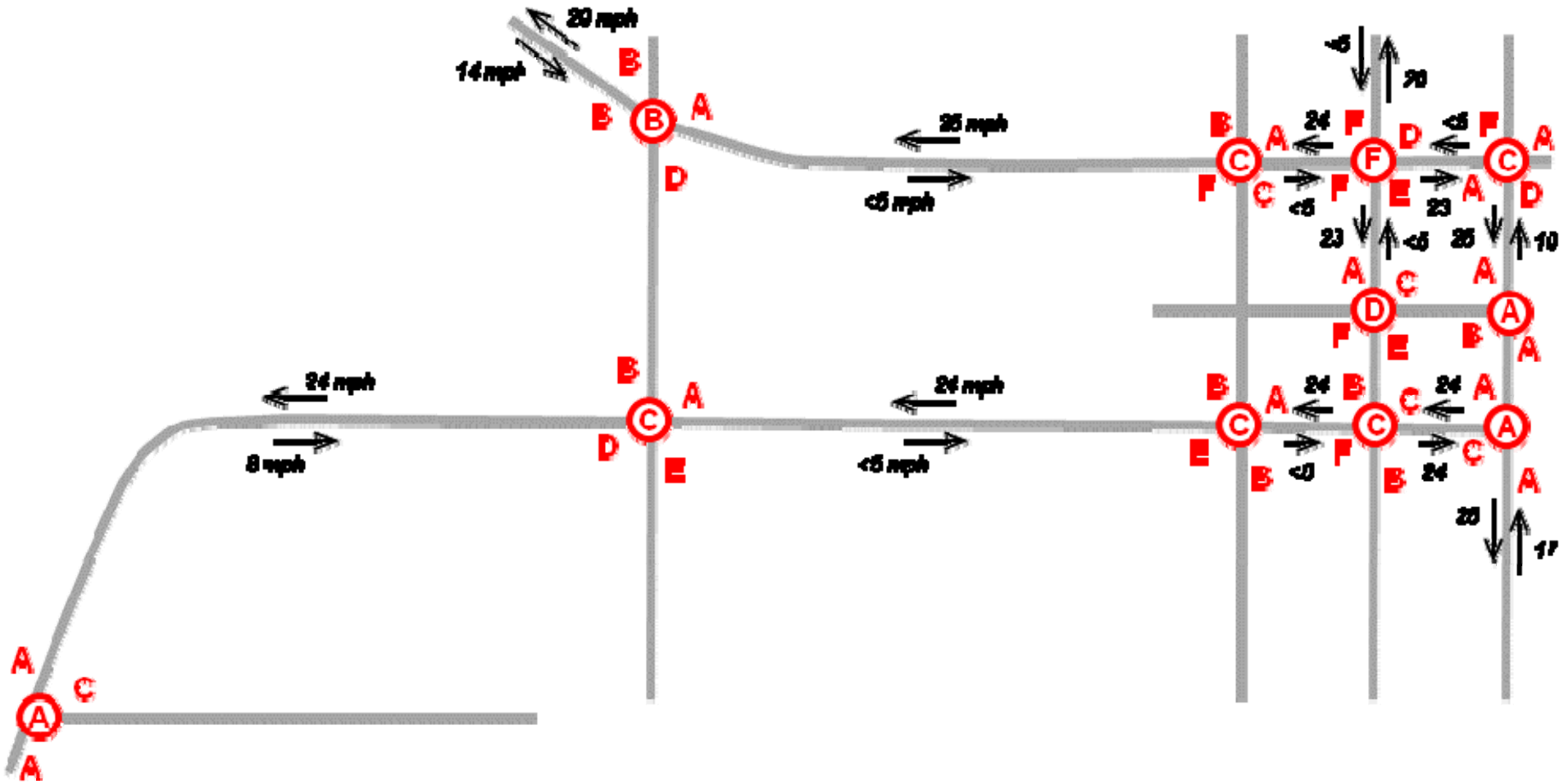
Stillwater
Washington County, MN



Stop-Controlled Intersection	Mini-Roundabout
	
	

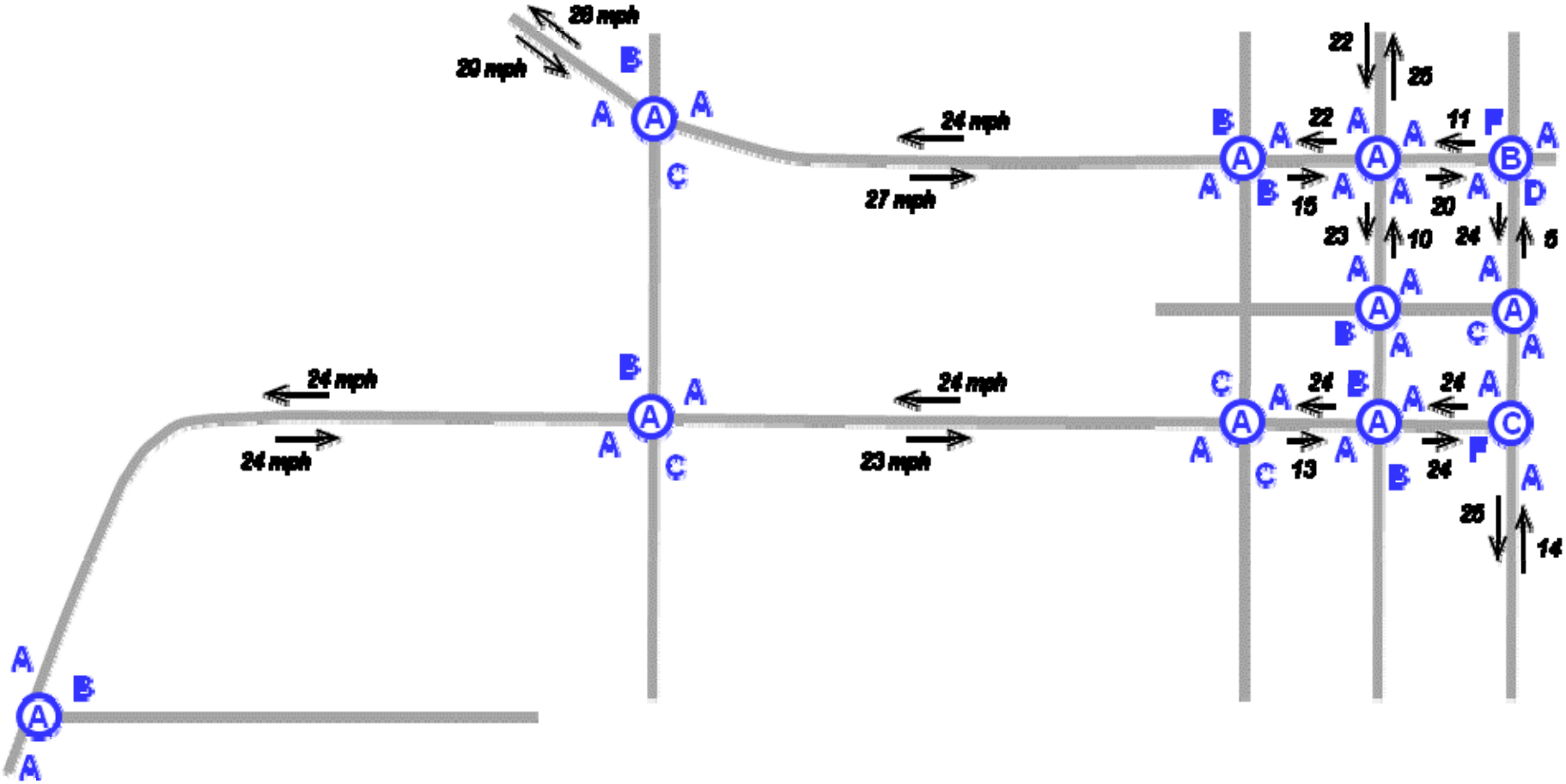
No Build 2007 PM

Video



Mini-Roundabout 2007 PM

Video



Annual User Time Savings

Traffic Scenarios	Total Veh-Hr of Travel (veh-hr)		Travel Time Savings, *D* (veh-hr)	Annual Cost Saving, *D*×($13.67/hr× 260days/yr) ($)
	AWSC	Mini-rdbt		
2007 Traffic	110.3	65.8	44.4	157,800
2017 Traffic	205.3	134.1	71.3	253,400

Note: $13.67/hr is the adjusted 2013 value of time ($/hr) recommended by Office of Secretary of Transportation (2011). The cost savings calculation is for week days (52 week/yr x 5 days/week = 260 days/yr), and during PM peak hour only Computation assumed all vehicles single occupancy.

FHWA Evaluation Status

- 10 sites completed as of August, 2013
  - Takoma Park, MD (2 sites, $25,000 total)
  - Baltimore, MD (1 site)
  - Lake Stevens, WA (2 sites, $20,000 total)
  - Snohomish Co., WA (1 site, $367,000)
  - Bel Air, MD (1 site, $172,000 + $20,000 LED lights)
  - Elmira, NY (2 sites, $97,500 total)
  - Jefferson, GA (1 site, $63,353)

- Recruiting 5-7 sites for evaluation

Selling the Concept to the Public and Elected Officials

Converting an AWSC to a Mini-Roundabout is like replacing a low capacity router with a high capacity router !!!

Mini-roundabout Can be Context Sensitive

MARYLAND

Summary of Viable Applications of Mini-roundabouts

- Unclog bottleneck at AWSC intersection
- Reduce major road approaching speed and provide more gaps to minor road traffic
- Improve access for pedestrians and bicyclists
- Revitalize shopping center
- Eliminate local network wide traffic congestion

Take Aways of Mini-Roundabout

- Mini-roundabout is NOT neighborhood traffic circle
- Mini-roundabout has more than twice the capacity of AWSC because it can serve 3-4 vehicles a time.
- Mini-roundabout is cost efficient because it is designed for 97-98% of the vehicles using the intersection.
- Mini-roundabout can be made context sensitive

Q and A?

Wei Zhang, Ph.D., P.E.

Program Manager, Intersection Safety R&D, FHWA

Tel: (202)493-3317

Email: Wei.Zhang@dot.gov