Butler County’s Roundabouts
What a Modern Roundabout is not...

- If the entry lane has a stop sign...
- If you could play a game of football in the center...
- If the circular roadway has a stop sign...
- If you don’t have to slow down upon entry...
- If you have to change lanes in the circular roadway to exit...
- If you can easily drive faster than 20mph in the circular roadway...
- If it has a park for pedestrians or a building in the middle...
Rule of Priority

- Traffic approaching a roundabout is required to give priority to circulating traffic in the roundabout and to traffic exiting from the roundabout.
1st Option in Toolbox

- Every intersection
- Something must rule it out
  - Right of Way
  - $$$
  - $$$$$
  - Geometry
Safety, Safety, Safety

- Nationally, roundabouts have 40% fewer crashes, 80% fewer injuries, 90% fewer serious and fatal injuries

- BCEO Data
  - All 7 Roundabouts
  - 70% reduction in overall crashes
  - 80% fewer injury crashes
  - 100% reduction in serious and fatal crashes
12 ACCIDENTS in 6 years
(WITHIN 200 FEET OF THE INTERSECTION)
- CRASH RATE = 0.45 per MEV (Prior CR=2.1)
- 7 Failure to Control, 4 Rear-end, 1 FTY
- Only 2 Injury
- 3 snow/ice, 2 alcohol

Entering ADT = 12,050 vpd

Peak Hour = 1,500 vph
Hamilton Mason & Liberty Fairfield
(Almost a signalized intersection)
Lakota Drive West & Eagleridge Drive
Lakota Drive West & Eagleridge Drive

- **17 ACCIDENTS IN 6 YEARS**
  - (WITHIN 200 FEET OF THE INTERSECTION)
  - CRASH RATE = 0.80 per MEV (Prior CR=1.0)
  - 8 Failure to Control, 5 FTY, 4 Rear-end
  - **Zero injury crashes**
  - Smallest inscribed diameter - 110 feet

- Entering ADT = 9,700 vpd

- Peak Hour = 1,200 vph
Lakota Drive West & Eagleridge Drive
Jacksonburg Road & Morganthaler Road
Jacksonburg Road & Morganthaler Road

- **0 ACCIDENTS IN 4 YEARS**
  (WITHIN 200 FEET OF THE INTERSECTION)
  Prior CR = 3.0 per MEV
  20 crashes in 7 years (9 serious injury + 1 fatal)

- **Entering ADT = 2,700 vpd**
Jacksonburg Road & Morganthaler Road
Trenton Road & Busenbark Road
Trenton Road & Busenbark Road

- **4 ACCIDENTS IN 3 ½ YEARS**
  - (WITHIN 200 FEET OF THE INTERSECTION)
    - CRASH RATE = 0.38 per MEV (Prior CR=0.56)
    - 1 FTY, 3 Failure to Control
    - 3 injury crashes

- **Entering ADT = 8,200 vpd**

- **Peak Hour = 900 vph**
Trenton Road & Busenbark Road
Kyles Station & Lesourdsville West Chester
Kyles Station & Lesourdsville West Chester

- **2 ACCIDENTS IN 2 ½ YEARS**
  - Crash Rate = 0.32 per MEV (Prior CR=0.92)
  - Rear-end, Failure to Control (OVI)
  - Both accidents happened within 1st month

- **Entering ADT = 6,800 vpd**

- **Peak Hour = 630 vph**
Kyles Station & Lesourdsville West Chester
Kyles Station Road & Yankee Road
Kyles Station Road & Yankee Road

- **2 ACCIDENTS IN 1.5 YEARS**
  - CRASH RATE = 0.49 per MEV (Prior CR=0.82)
  - FTY, Rear-end
  - Both crashes within first 4 months

- **Entering ADT = 7,400 vpd**

- **Peak Hour = 775 vph**
Millikin Road & Mauds Hughes Road
Millikin Road & Mauds Hughes Road

- **1 ACCIDENT IN 1.5 YEARS**
  - CRASH RATE = 0.31 per MEV (Prior CR=0.94)
  - Failure to Control (Medical)

- **Entering ADT = 5,800 vpd**
Scheduled Roundabouts (2015)

- SR 748 & Layhigh Road
  - CR = 2.0
  - 3,400 ADT

- Eaton Road & Beissinger Road
  - CR = 1.46
  - 6,400 ADT
Software Comparison

- Hamilton Mason Road & Liberty Fairfield Road
- 12,050 Entering ADT
- Peak Hour = 1,500 VPH
- HCS 2010, Synchro, SIDRA
Conflict Point Analysis

Requirements for roundabouts
Conflict Point:
- <1,100 vph → single lane is ok
- 1,100-1,400 vph → needs further analysis
- >1,400 vph → two lanes required
  vph= vehicles per hour

Conflict Point: 1010
- 820 → 74
- 529 → 217

Conflict Point: 188
- 23 ↑
- 101 →
- 64 ↓

Conflict Point: 965

Conflict Point: 435
- 162 ↑
- 123 →
- 316 ↘
- 31 ↓

Conflict Point: 465
- 36 ↑
- 60 →
- 28 ↓
- 124
# Capacity Analysis

## AM Peak

<table>
<thead>
<tr>
<th></th>
<th>EB (Delay/LOS)</th>
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<tbody>
<tr>
<td>HCS 2010</td>
<td>17.29/C</td>
<td>7.74/A</td>
<td>6.84/A</td>
<td>65.48/F</td>
<td>41.61/E</td>
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<tr>
<td>Synchro</td>
<td>17.3/C</td>
<td>7.7/A</td>
<td>6.8/A</td>
<td>64.5/F</td>
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<tr>
<td>SIDRA</td>
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## Capacity Analysis

**PM Peak**

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Gap Acceptance

• The minimum time interval in the circulating flow when an entering vehicle can safely enter a roundabout.

• Critical Headway

• Crucial for Capacity Calculations

• Dependent on driver behavior, vehicle type and geometry

• SIDRA based on Gap-Acceptance Theory
## SIDRA vs HCM 2010 Model

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<tr>
<td>Gap Acceptance w/ empirical regression equations</td>
<td>Empirical exponential regression (volume at 1-minute intervals during oversaturation)</td>
<td></td>
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<tr>
<td>Uses a bunched arrival headway (&quot;blocks&quot;)</td>
<td>Uses a random arrival headway</td>
<td></td>
</tr>
<tr>
<td>Roundabout geometry effects follow-up headway &amp; critical gap</td>
<td>Follow-up headway &amp; critical gap values are constant</td>
<td></td>
</tr>
<tr>
<td>Avg. entry lane width, inscribed diameter, entry radius, entry angle, # of exit lanes</td>
<td>NOT USED!</td>
<td></td>
</tr>
<tr>
<td>LOS options – Sign-controlled, signalized, or SIDRA Roundabout. Signalized is default</td>
<td>LOS same as sign-controlled</td>
<td></td>
</tr>
<tr>
<td>Calibration – Environmental Factor (1.2)</td>
<td>Calibrate using known Follow-up Headway &amp; Critical Gap values</td>
<td></td>
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Calibration

- **Critical Headway**
  - Not a constant. Based on driver behavior.
  - HCS and Synchro use 5.193 sec.
  - From recent studies
    - **AVG = 4.8 sec.**

- **Follow-Up Headway**
  - Time between 2 consecutive vehicles utilizing same gap
  - Related to RA size, speeds, and circulating flow rate
  - HCS and Sychro use 3.186 sec.
  - From recent studies
    - **AVG = 2.5 sec.**
## Capacity Analysis - Calibrated

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Videos
(Hamilton Mason & Liberty Fairfield)

- AM Peak
- PM Peak
Contact Info

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