Fourth & Cedar/Lockett Roundabout

February 16, 2021

CITY OF FLAGSTAFF · ARIZONA · ESTABLISHED 1882

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Highway Safety Improvement Program (HSIP)

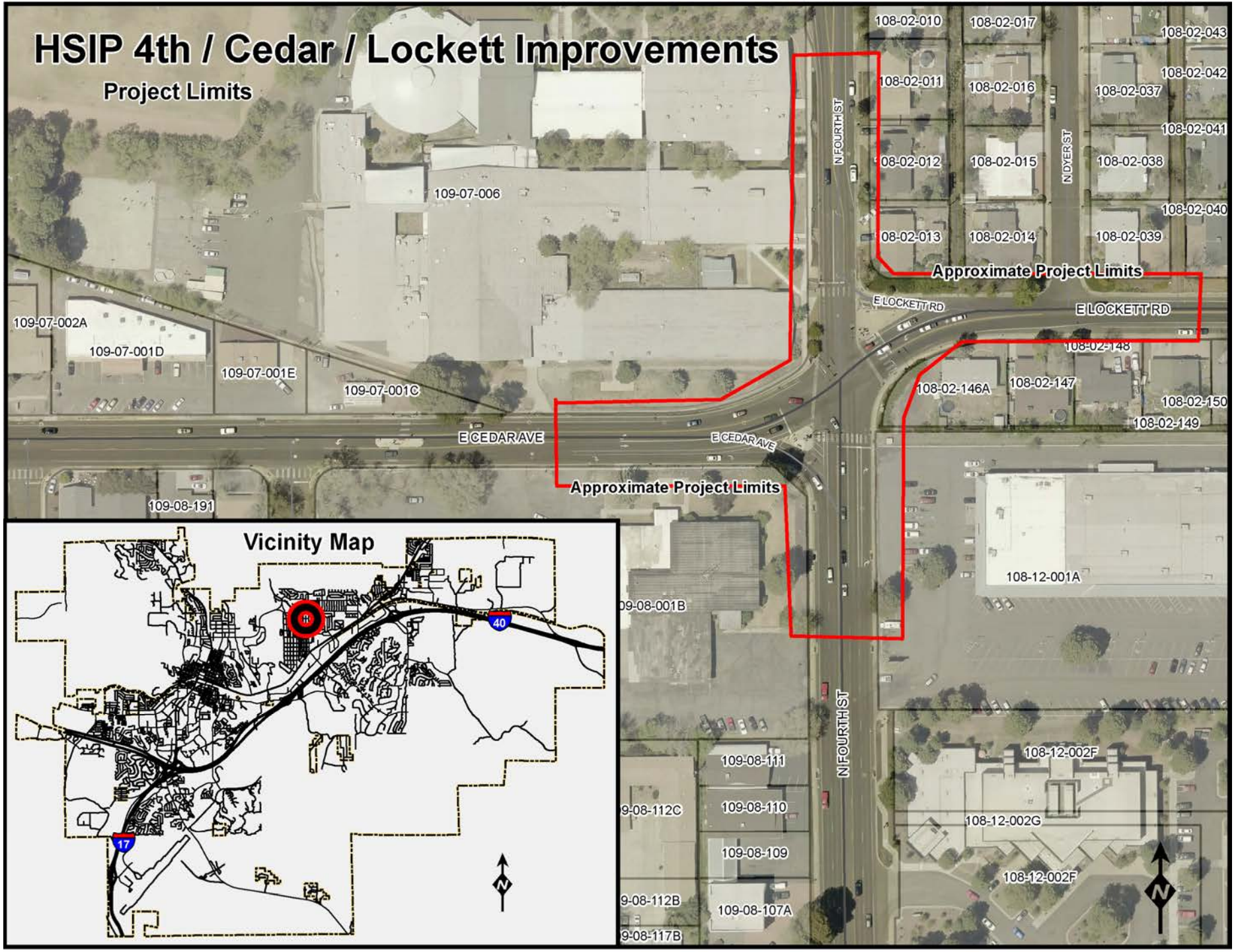
- Purpose:
  - “to achieve a significant reduction in traffic fatalities and serious injuries on all public roads through the implementation of infrastructure-related highway safety improvements.”
- Other Flagstaff HSIP Projects:
  - City-wide Sign Replacement
  - City-wide Pavement Markings
  - Beulah Bike Lanes
  - Switzer & Turquoise Roundabout
  - Guardrail Replacement

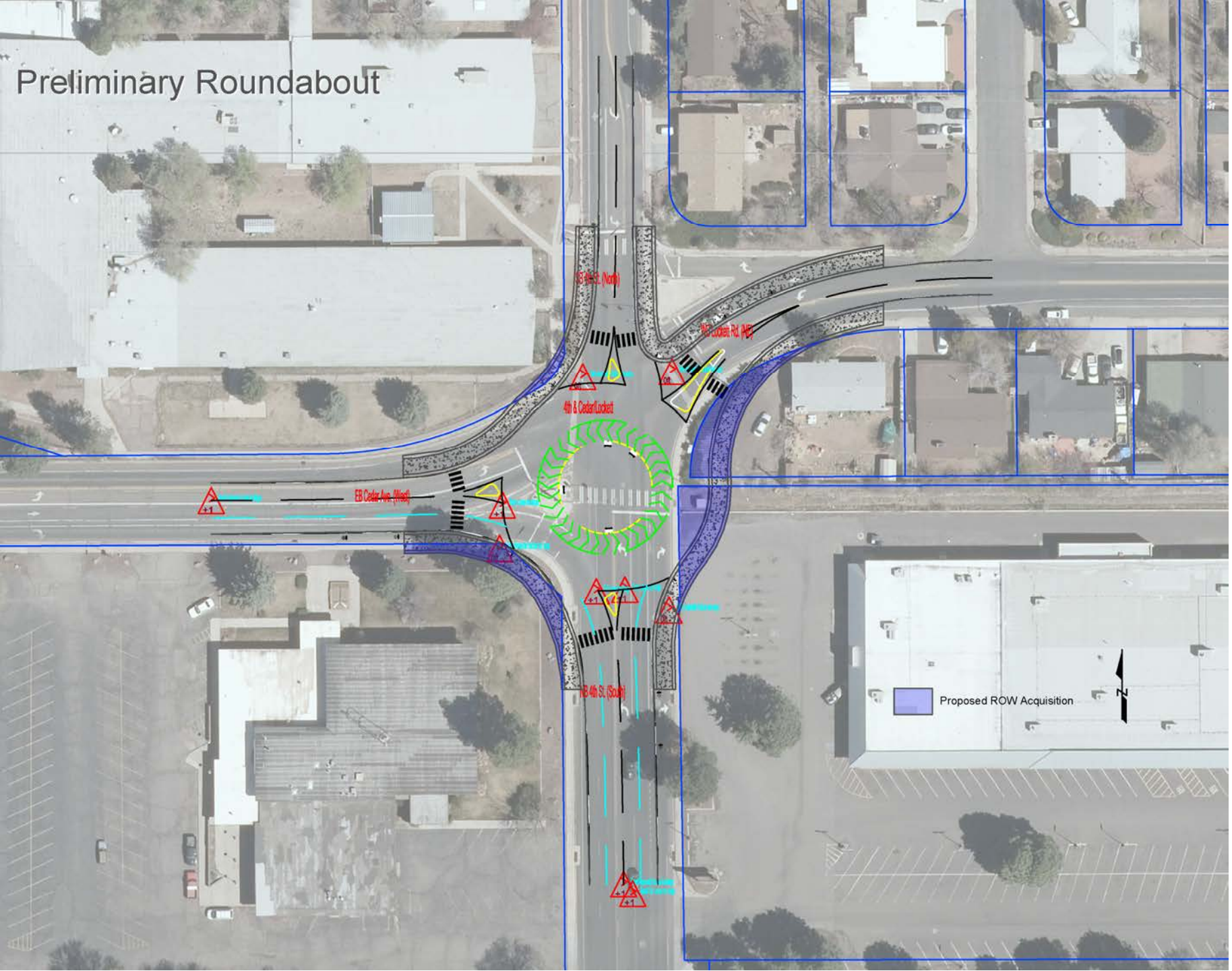
Source: Arizona HSIP Manual

Grant Process

- Application to ADOT
- Notice of Award
- Transportation Improvement Program (TIP) – MetroPlan Technical Advisory Committee (TAC) and Board
- IGA
- ADOT State Transportation Board
- ADOT hires designer, City acquires ROW, ADOT hires contractor and performs inspections

HSIP 4th / Cedar / Lockett Improvements





- Improve safety & efficiency
- Slow speeds
- Reduce angle crashes
- Add crosswalk at 4th leg
- Improve southbound left turns into CCC & library

Financial Impact

Fiscal Year 2020 - Design

- City share $30,000
- HSIP Federal Funds $450,000

Fiscal Year 2021 - ROW

- HSIP Federal Funds $92,398
- City share $30,813

Fiscal Year 2022 - Construction

- HSIP Federal Funds $1,385,968

Notes:

- City is responsible for any project costs in excess of the current HSIP grant award of $1,928,366

Common Site Applications

- A modern roundabout should be considered anywhere a traffic signal or stop control is under consideration
- Schools: Reduce vehicle speeds
- Corridors: Opportunity to shape cross sections
- Intersections with high turning volumes: Reduce delay

Photo: Lee Rodegerdts (used with permission)

Photo: Lee Rodegerdts (used with permission)

Key Objectives of Roundabout Design

- Slow entry speeds
- Appropriate number of lanes
- Smooth channelization
- Adequate accommodation for design vehicles
- Meeting needs of pedestrians and bicyclists
- Appropriate sight distance and visibility

Benefits of Roundabouts

- Safety
  - Reduce total crashes by 35% and injury crashes by 76%
- Pedestrian Safety
  - Reduced vehicle speeds,
  - Crossings focus on one traffic stream
  - May cause issues for visually impaired pedestrians
- Traffic Calming
  - Reduce vehicle speeds using geometric design

Benefits of Roundabouts (Continued)

- Operational Performance
  - Lower overall delay than other controlled intersections
  - Specific users do not receive priority
- Ongoing Operations and Maintenance
  - Lower operating and maintenance costs than a traffic signal
- Approach Roadway Width
  - May not require lengthy turn lanes
  - Greater right-of-way needs at the intersection quadrants

Benefits of Roundabouts (Continued)

- Environmental Factors
  - Less noise, fuel consumption and fewer air quality impacts
- Access Management
  - Facilitate U-turns, enabling left-turn restrictions at driveways
- Aesthetics
  - Islands offer opportunity for landscaping and art displays
- Land Use
  - Provide transition areas between different environments

Motorist and Emergency Vehicle Considerations

- Motorist considerations:
  - Improved safety
  - Allow more time to make decisions, act, and react
  - Reduce the number of directions of conflicting traffic
  - Reduce the need to judge gaps in fast traffic

- Emergency vehicle considerations
  - Benefit of lower vehicle speeds
  - Motorists should be educated to not enter a roundabout when an emergency vehicle is approaching

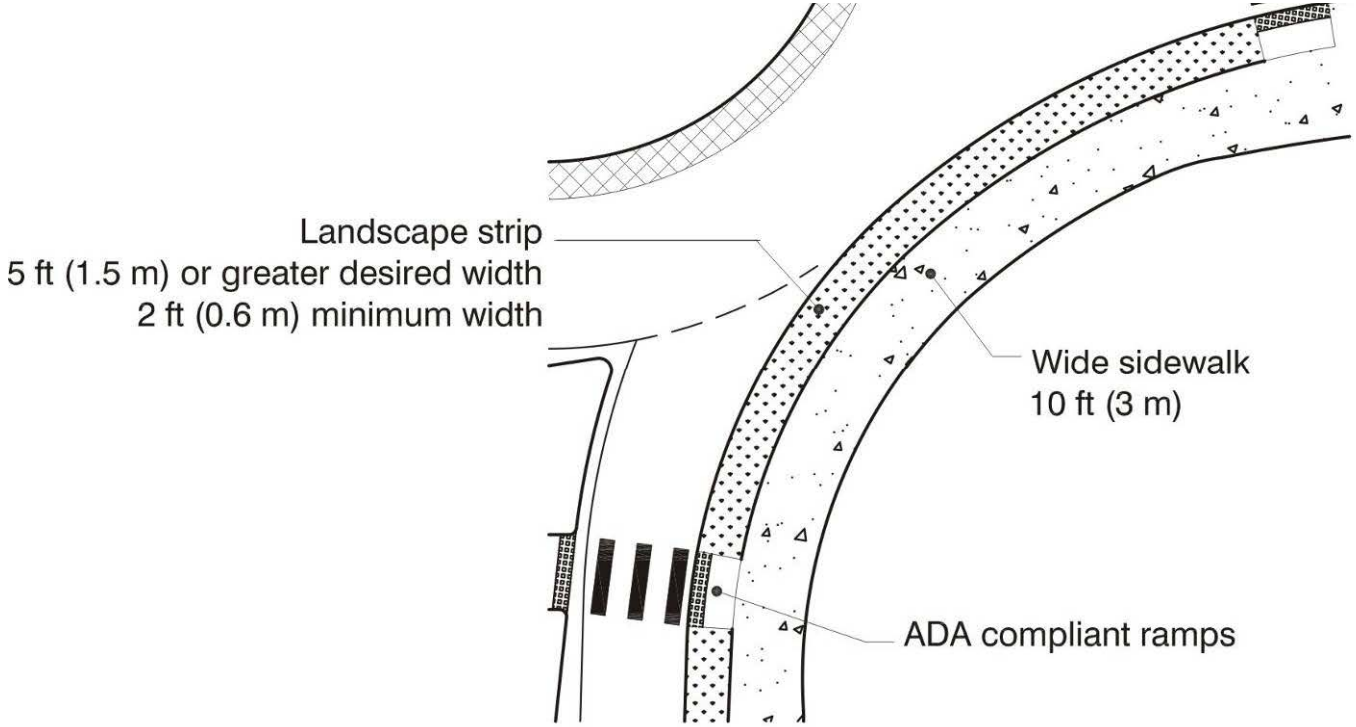
Pedestrian and Bicyclist Considerations

- Pedestrian considerations
  - Consider one direction of conflicting traffic at a time
  - Low vehicular speeds allow more time to react
  - Challenges experienced by pedestrians with vision impairments may require additional treatments to improve accessibility

- Bicyclist considerations
  - Can navigate roundabouts either as motor vehicles (take the lane) or pedestrians (adjacent pathway) depending on the size of the intersection, traffic volumes, and their experience level

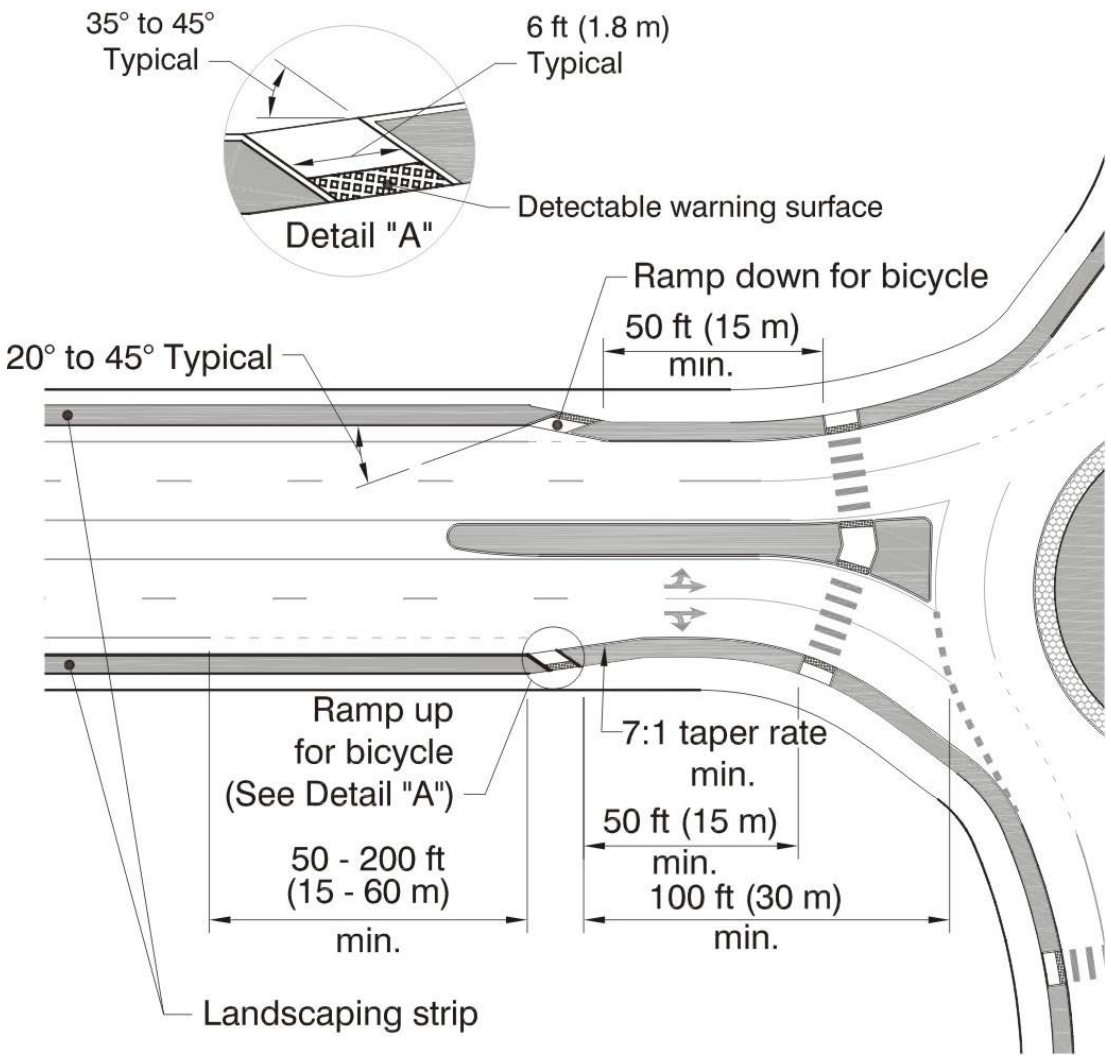
Pedestrian Design Treatments

- Sidewalks at roundabouts should be set back from the circulatory roadway
- Separation improves comfort and discourages pedestrians from crossing to the central island
- Crossings – always one direction and typically one lane



Bicycle Design Treatments

- Bicycle lanes end in advance of roundabouts
- Bicyclists may ‘take the lane’ as a vehicle in this slow speed intersection
- Bicyclist may also utilize the adjacent pathway



Bike Pavement Markings

Bike Pavement Markings

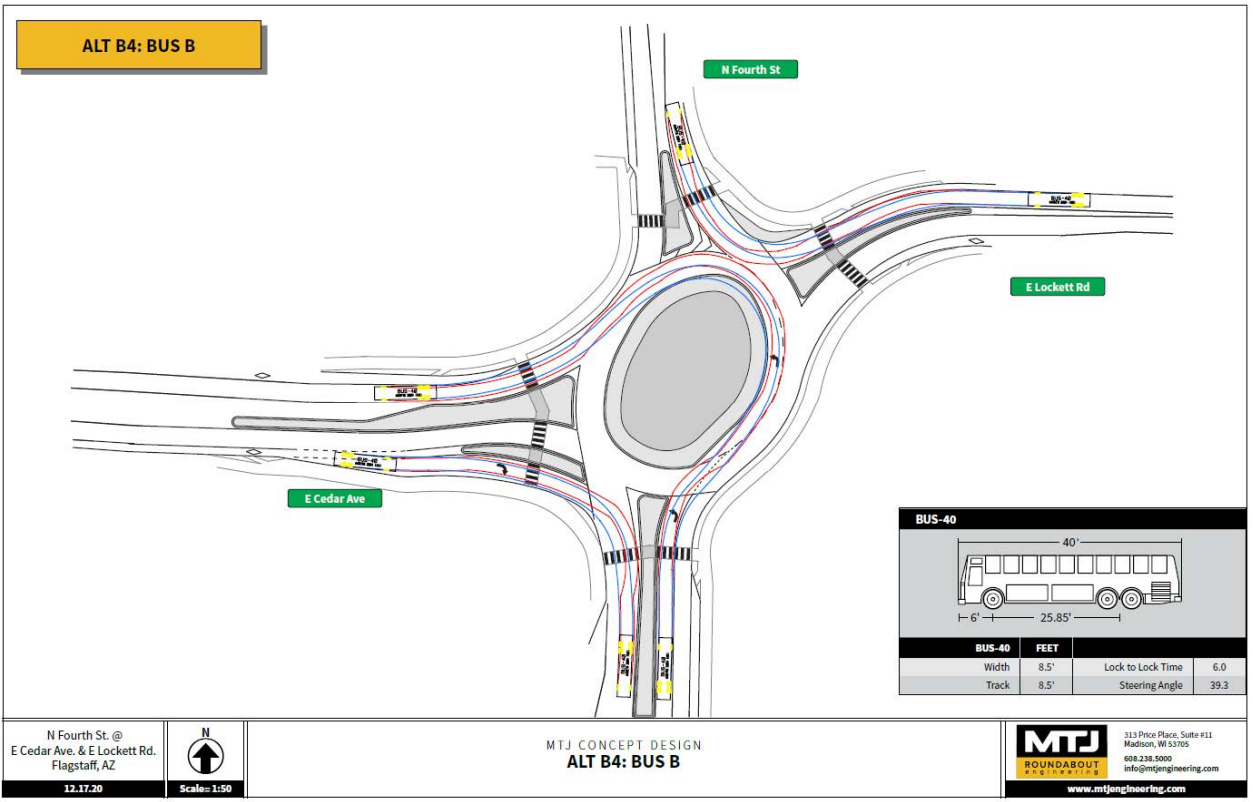
Bike Pavement Markings

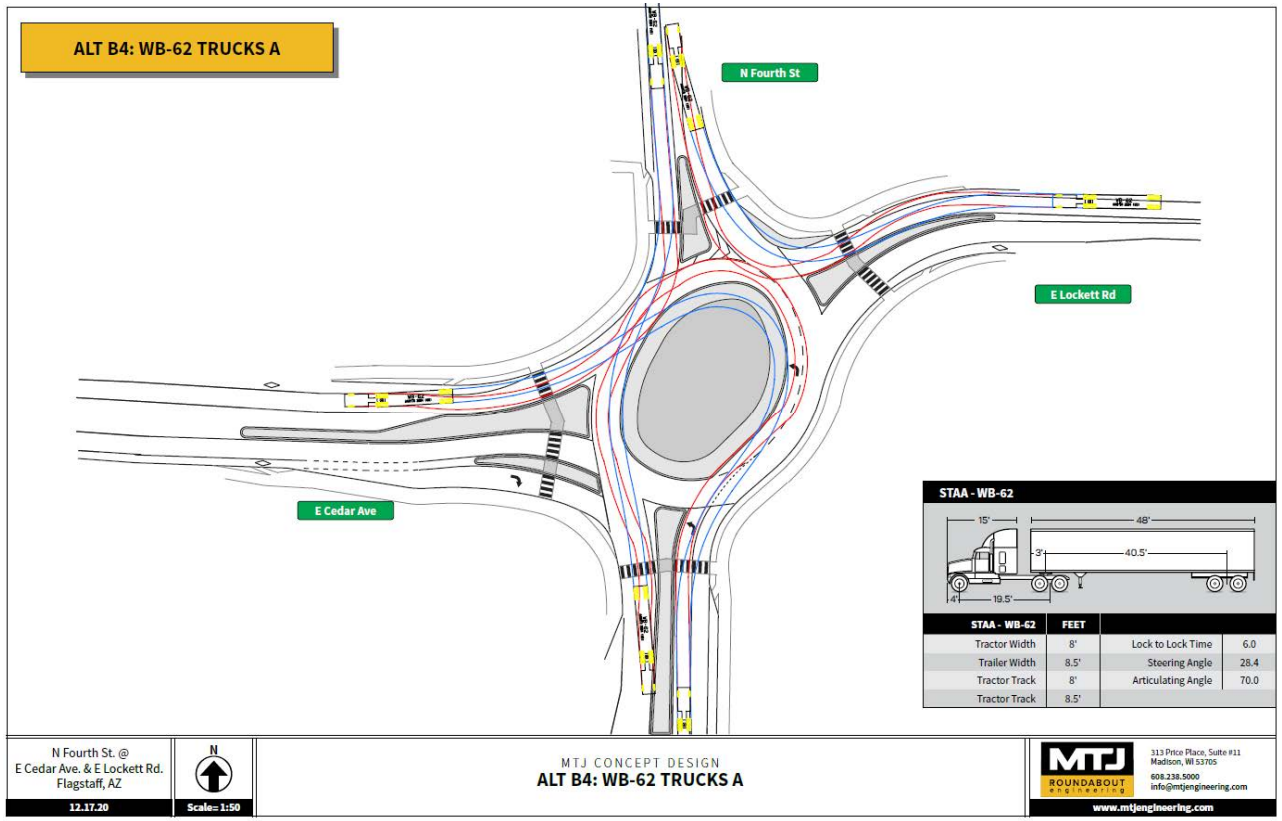
Horizontal Design

- Key considerations that affect horizontal design
  - Design speed - offsets
  - Vehicle Path alignment
  - Design vehicles

- Design elements influenced by these considerations
  - Size of the circle
  - Central island
  - Splitter island sizes

Design Vehicles – Busses and Trucks





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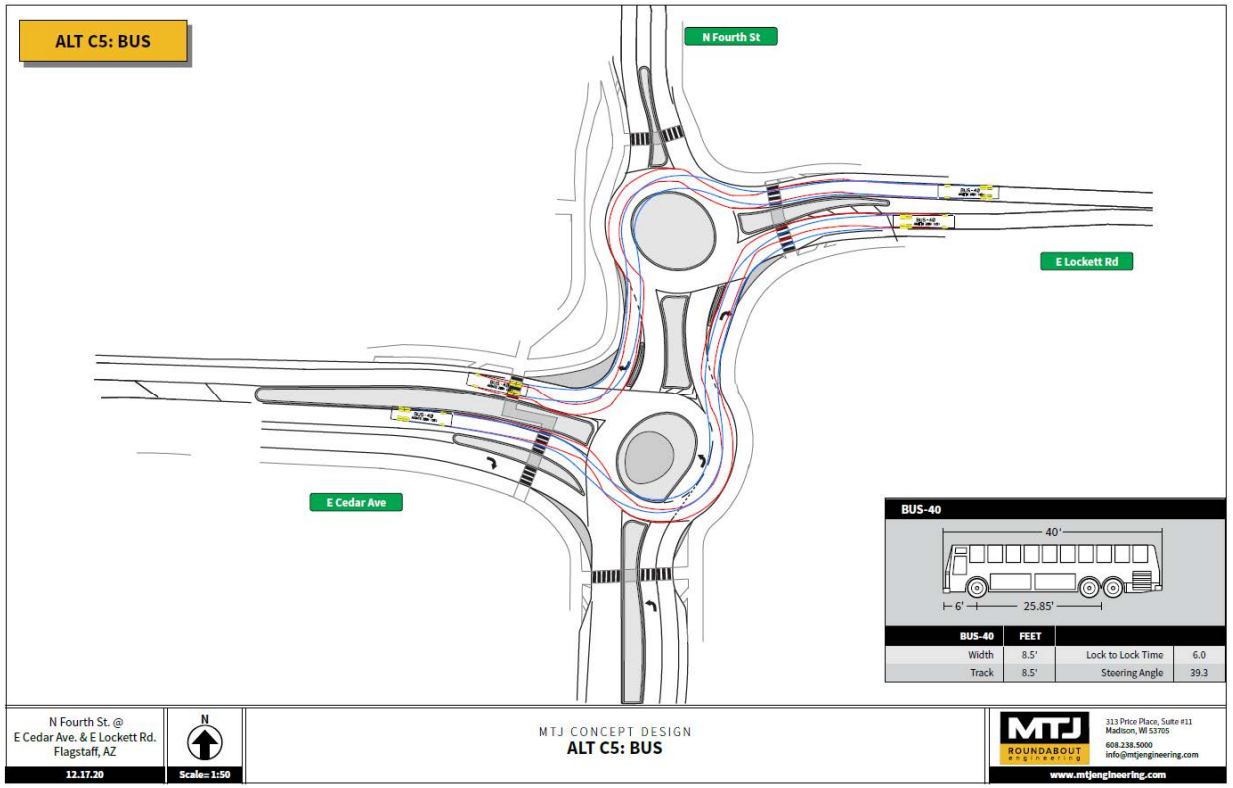
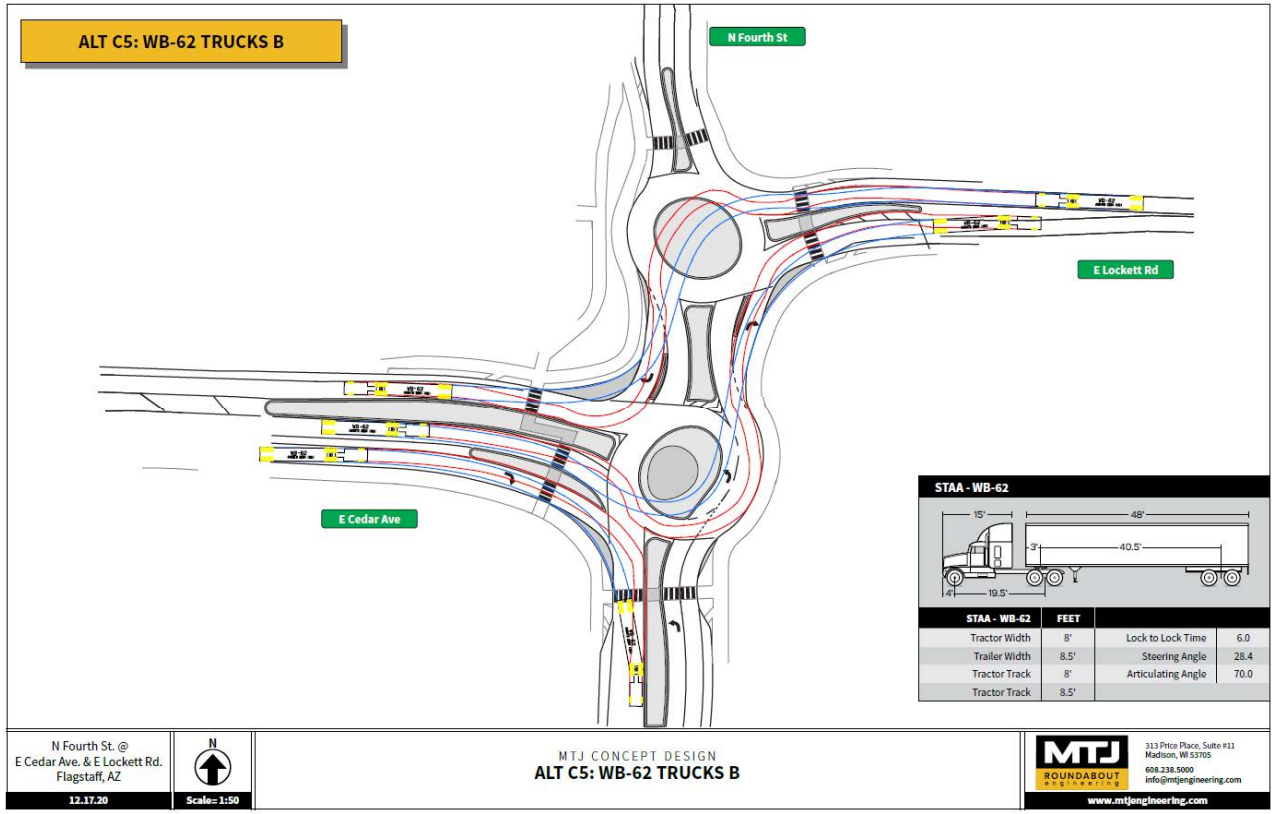




Lighting and Landscaping

- Lighting and landscaping focus driver attention on key conflict areas
- Lighting should make roundabouts conspicuous and visible to approaching drivers
- Landscaping can also discourage pedestrian traffic through center island

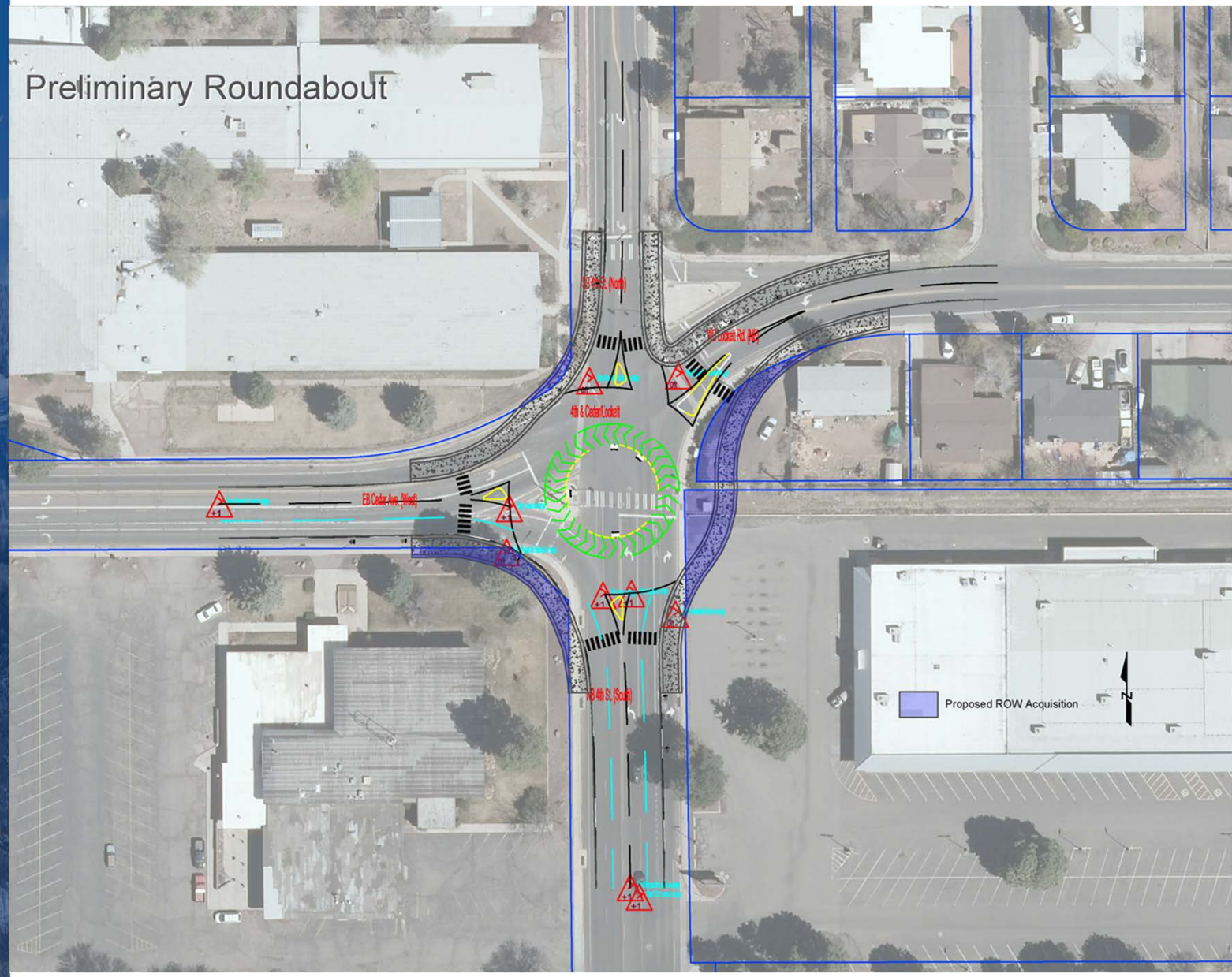
Photo: Lee Rodegerdts (used with permission)

Other Design Details and Applications

- Right-turn bypass lanes: similar to those used at conventional intersections
- Access management: May restrict nearby driveways – more convenient U-turn opportunities
- Bus stops: Can be provided on the entry or exit side of a roundabout, but not within the circulatory roadway

Existing Conditions

Initial Concept



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Alternatives Considered

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Alt A: 170′ Circular ICD **2 Residential Impacts**

Alt B: 190′ x 160′ Non-Circular ICD **1 Residential Impact**

Alternatives Considered

Alt B-3 Two NB Lanes: No Residential Impacts 178′ x 140′ Non-Circular ICD	Alt. B-4 Two NB Lanes: 1 Residential Impact 178′ x 140′ Non-Circular ICD
	

Alternatives Considered

Alt C Double Roundabout: 1 Residential Impacts
South 100′ x 90′ Non-Circular ICD, North 90′ ICD

Alt C-4: Double Roundabout – No Residential Impacts
South 100′ x 90′ ICD, North 100′ x 80′ ICD

Alternatives Considered

Alt D	Alt E
	

ALT B4

N Fourth St. @
E Cedar Ave. & E Lockett Rd.
Flagstaff, AZ

12.17.20

N

Scale= 1:50

MTJ CONCEPT DESIGN

ALT B4: WITH AERIAL

MTJ ROUNDABOUT engineering

313 Price Place, Suite #11
Madison, WI 53705

608.238.5000
info@mtjengineering.com

www.mtjengineering.com

N Fourth St. @
E Cedar Ave. & E Lockett Rd.
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12.17.20

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MTJ CONCEPT DESIGN

ALT B4: COLOR WITH AERIAL

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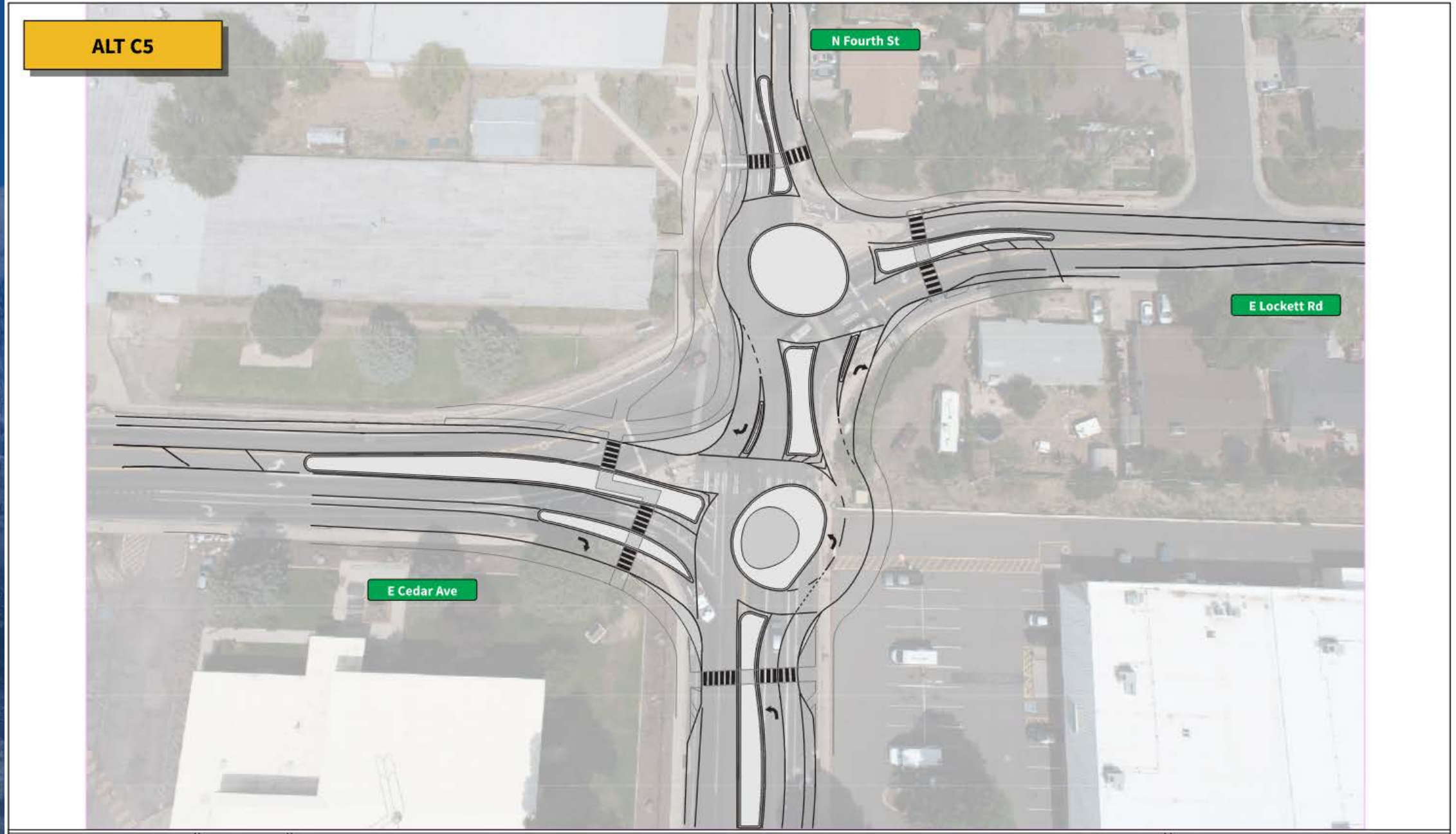

N Fourth St. @
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12.17.20

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MTJ CONCEPT DESIGN

ALT C5: WITH AERIAL

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MTJ CONCEPT DESIGN

ALT C5: COLOR WITH AERIAL

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Criteria Rating
1 - Strong Disadvantage
2 - Some Disadvantage
3 - Neutral
4 - Some Advantage
5 - Strong Advantage

		Design Alternative		
EVALUATION CRITERIA		***B4 - Single Roundabout***	***C5 - Double Roundabout***	***Existing Signal***
Geometry / Complexity		-	Two roundabouts more complex than one	-
		Net Effect	**Net Effect**	**Net Effect**
		4	**2**	**3**
Safety	Vehicular Safety	7 Vehicular Conflicts	10 vehicular conflicts	32 vehicular conflicts
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**3**	**2**
	Bike Safety	Less Merging	More Merging	No bike accomodations
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**3**	**2**
	Pedestrian Safety	Parkways (separate peds from traffic)	Crossings are further apart	Missing crossing
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**3**	**2**
	Driver Familiarity	Single roundabout more familiar	Double Roundabout	Typical
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**2**	**3**

Criteria Rating
1 - Strong Disadvantage
2 - Some Disadvantage
3 - Neutral
4 - Some Advantage
5 - Strong Advantage

		Design Alternative		
EVALUATION CRITERIA		***B4 - Single Roundabout***	***C5 - Double Roundabout***	***Existing Signal***
Constructability		Wall may be required on NE corner which may require special construction methods due to proximity of house.	Possibly more complicated traffic control. Wall may be required on NE corner which may require special construction methods due to proximity of house.	-
		Net Effect:	**Net Effect:**	**Net Effect:**
		3	**2**	**3**
Operations	Auto/Bus Level of Service	Future LOS Acceptable	Future LOS- Better AM, Similar PM	Lower LOS, Future LOS unacceptable
		Net Effect:	**Net Effect:**	**Net Effect:**
		3	**4**	**2**
	Ease of Use/Comfort for Bicycles	Wider (10') multi-use path, maybe wider lanes, maybe want seperated facility	Going through two intersections vs one using the vehicle travel lane more tough	Long crossing with intersection offsets
		Net Effect:	**Net Effect:**	**Net Effect:**
		3	**2**	**2**
	Ease of Use/Comfort for Pedestrians	With islands much shorter crossings w/o signal	With islands much shorter crossings w/o signal	-
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**4**	**3**
	Bus/Truck Accomodation	Accommodates WB 67 + Bus	Accommodates WB 67 + Bus	Accommodates WB 67 + Bus
		Net Effect:	**Net Effect:**	**Net Effect:**
		3	**3**	**3**

Criteria Rating
1 - Strong Disadvantage
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3 - Neutral
4 - Some Advantage
5 - Strong Advantage

		Design Alternative		
EVALUATION CRITERIA		***B4 - Single Roundabout***	***C5 - Double Roundabout***	***Existing Signal***
Env. Impacts	Noise Quality	Less acceleration and deceleration noise	Less acceleration and deceleration noise	No change acceleration and deceleration noise
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**4**	**3**
	Air Quality	Less emissions due to smoother flow	Less emissions due to smoother flow	More emission due to stop and go traffic and longer idling
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**4**	**2**
	HAZMAT	Removal of building would likey result in additional ACM & LBP sampling and Phase I Site Assessment	May require some additional ACM and LBP sampling.	No additional HAZMAT work required
		Net Effect:	**Net Effect:**	**Net Effect:**
		1	**2**	**3**
	Level of NEPA Documentation	Due to ROW requirements, residential displacement, impacts to access for residential/businesses, and/or community impacts, the project may require a D checklist.	Would more than likely remain under existing CE checklist	No CE required
		Net Effect:	**Net Effect:**	**Net Effect:**
		1	**2**	**3**
Utility Impacts		Similar with both	Similar with both	-
		Net Effect:	**Net Effect:**	**Net Effect:**
		2	**2**	**3**

Criteria Rating
1 - Strong Disadvantage
2 - Some Disadvantage
3 - Neutral
4 - Some Advantage
5 - Strong Advantage

		Design Alternative		
EVALUATION CRITERIA		***B4 - Single Roundabout***	***C5 - Double Roundabout***	***Existing Signal***
Access Management		Provides more management with median islands	Provides more management with median islands	Access Managed at Signal
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**4**	**2**
Right-of-Way		More property to take. (Approx. 16,000 sq. ft.)	Less property to take. (Approx. 10,000 sq. ft.)	Existing
		Net Effect:	**Net Effect:**	**Net Effect:**
		1	**2**	**3**
Stakeholder Acceptance	Bike & Ped Committee	BAC PAC Feedback	BAC PAC Feedback	BAC PAC Feedback
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**3**	**2**
	Transportation Commission	TC Feedback	TC Feedback	TC Feedback
		Net Effect:	**Net Effect:**	**Net Effect:**
		0	**0**	**0**

Criteria Rating
1 - Strong Disadvantage
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3 - Neutral
4 - Some Advantage
5 - Strong Advantage

		Design Alternative		
EVALUATION CRITERIA		***B4 - Single Roundabout***	***C5 - Double Roundabout***	***Existing Signal***
Character Improvement Opportunities		Larger Landscaping opportunities. May allow for realigning NW pedestrian access to not be elevated and possible removal of some existing wall.	Smaller Landscaping opportunities. May allow for realigning NW pedestrian access to not be elevated and removal of existing wall.	No change
		Net Effect:	**Net Effect:**	**Net Effect:**
		5	**4**	**2**
Building/Structures Impact		One residential home take. Possible driveway/access impacts to adjacent home to east of full take.	Loss of side yard and access, no building impact	No Impacts
		Net Effect:	**Net Effect:**	**Net Effect:**
		1	**2**	**3**
Project Costs	Construction	May be slightly less, but very close in cost	May be slightly more, but very close in cost	No cost, existing
		Net Effect:	**Net Effect:**	**Net Effect:**
		2	**2**	**3**
	Operations & Maintenance	Signing and Striping	Signing and Striping	Signal equipment maintenance
		Net Effect:	**Net Effect:**	**Net Effect:**
		4	**4**	**3**
	ROW	Full property acquisition	Partial property acquisitions	No change
		Net Effect:	**Net Effect:**	**Net Effect:**
		1	**2**	**3**
		Total Net Effect:	**Total Net Effect:**	**Total Net Effect:**
		70	**65**	**60**

Questions and Discussion