



LONE TREE OVERPASS

***Lone Tree and Butler Intersection
June 7th, 2022***



AGENDA

✧ Approach

» Models

✧ Intersection Alternatives

» Safety Features

» Summary





Approach

- ✧ **Network Models**
 - ✧ **6-Lane Model**
 - ✧ **4-Lane Model**
- ✧ **Peak Hour**

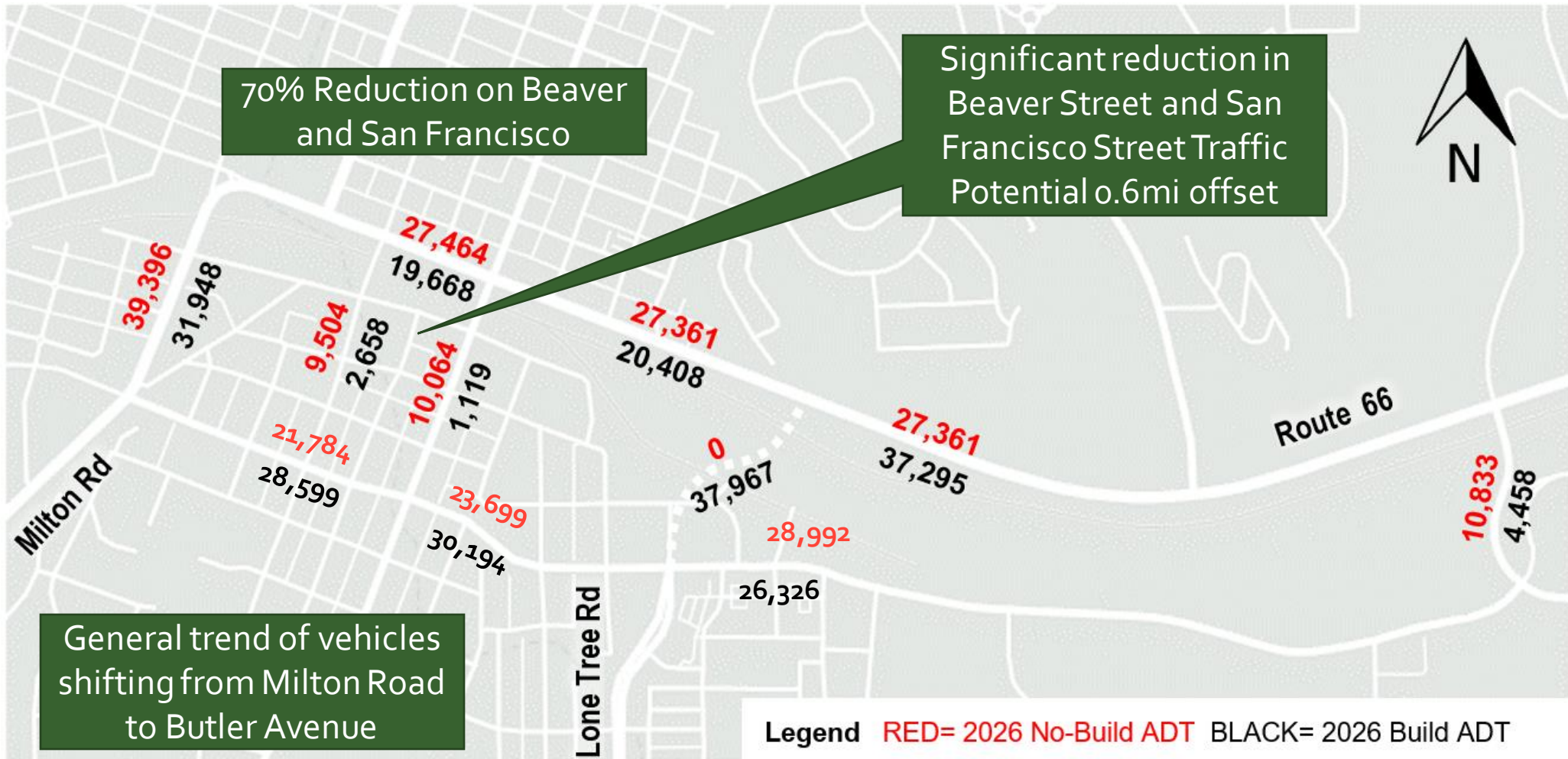


Network Model – 6 Lane Model (2026)

Year	VMT
2019	2,560,000
2026 B	2,604,000
2026 NB	2,605,000
2040 B	3,435,000
2040 NB	3,423,000

B = Build
NB = No-Build

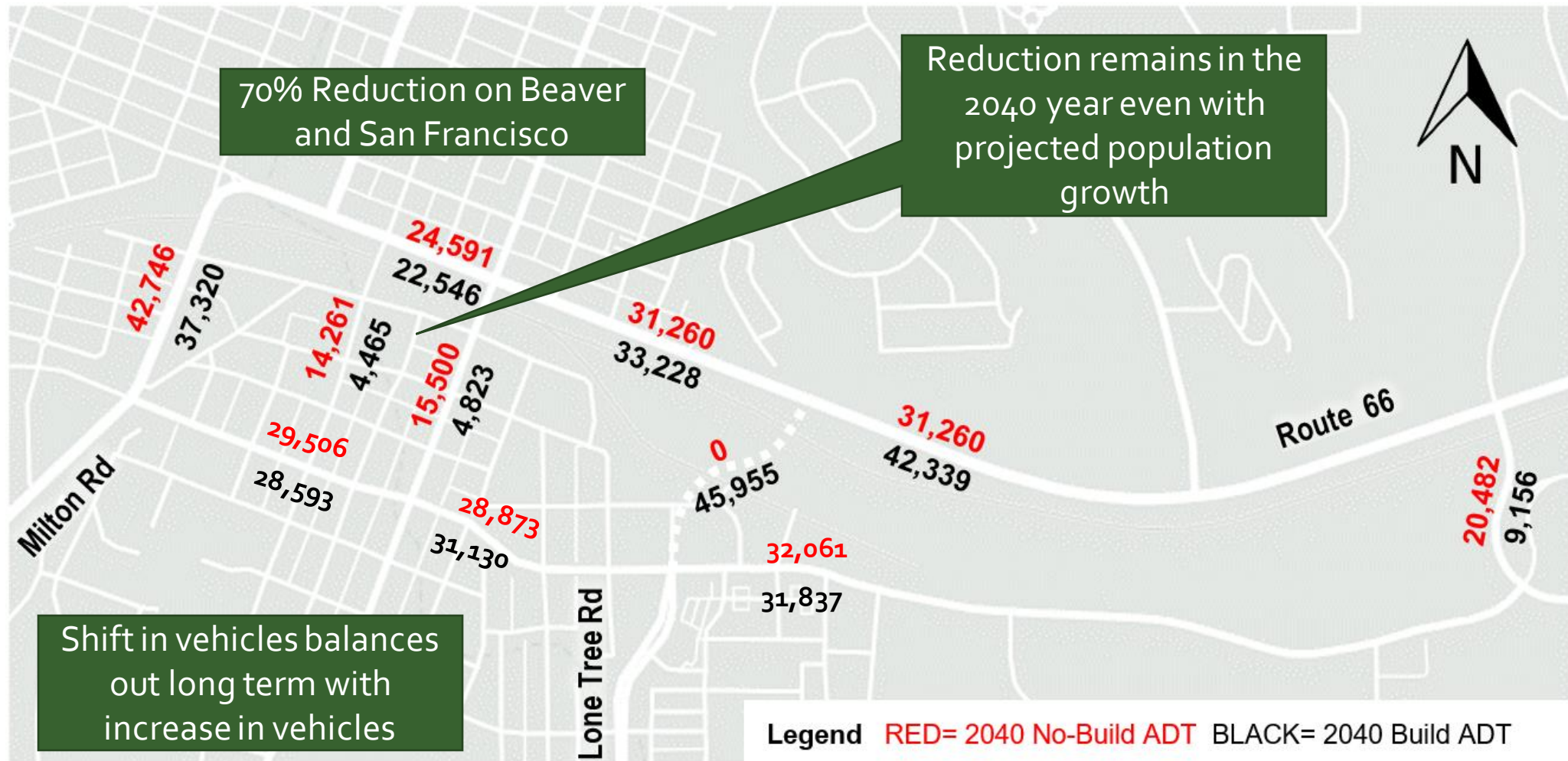
Underlying model
from MetroPlan



Network Model – 6 Lane Model (2040)

Year	VMT
2019	2,560,000
2026 B	2,604,000
2026 NB	2,605,000
2040 B	3,435,000
2040 NB	3,423,000

B = Build
NB = No-Build



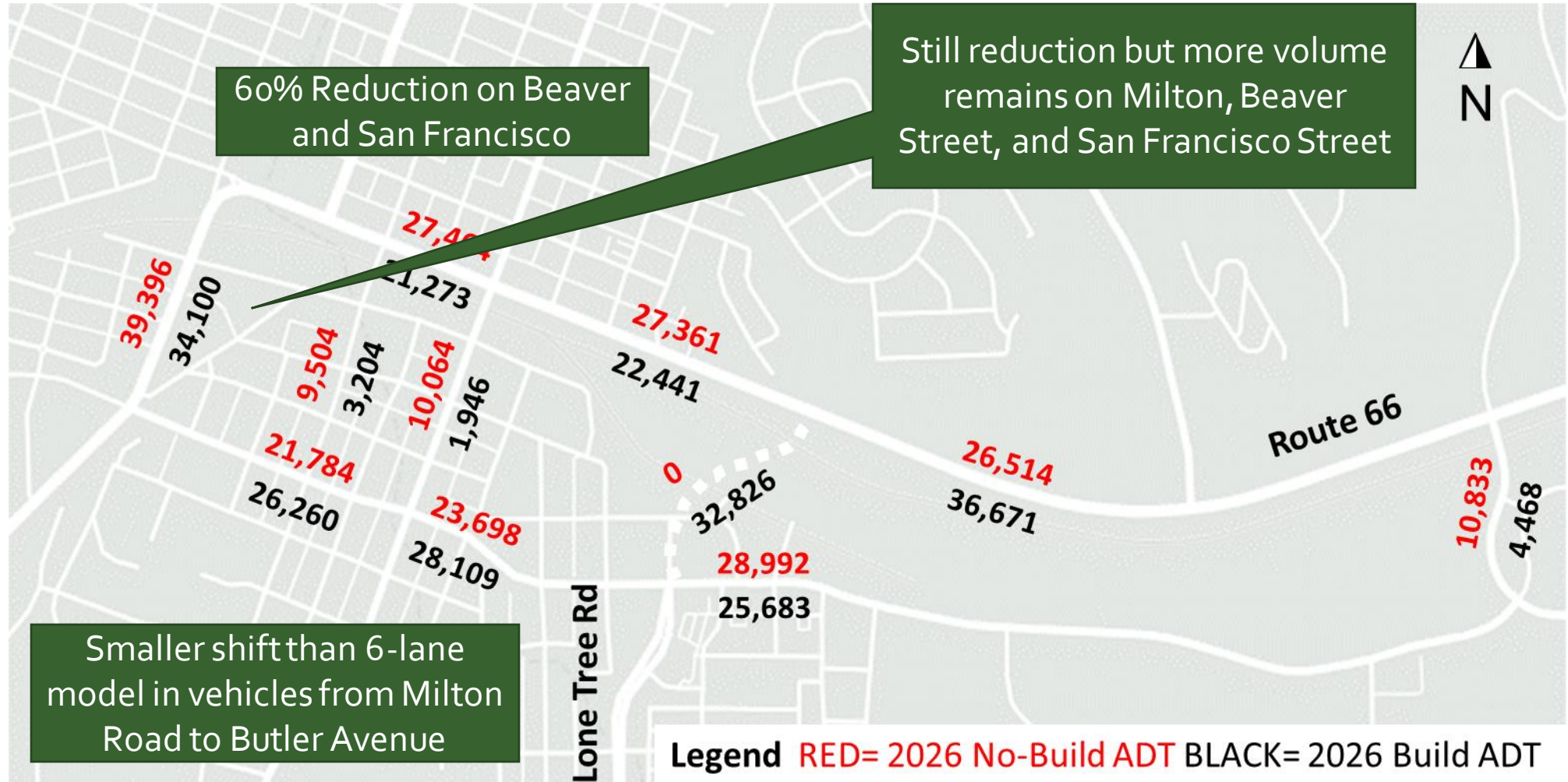
Underlying model from MetroPlan

Network Model – 4 Lane Model (2026)

Year	VMT
2019	2,560,000
2026 B	2,604,000
2026 NB	2,605,000
2040 B	3,435,000
2040 NB	3,423,000

B = Build
NB = No-Build

Underlying model
from MetroPlan

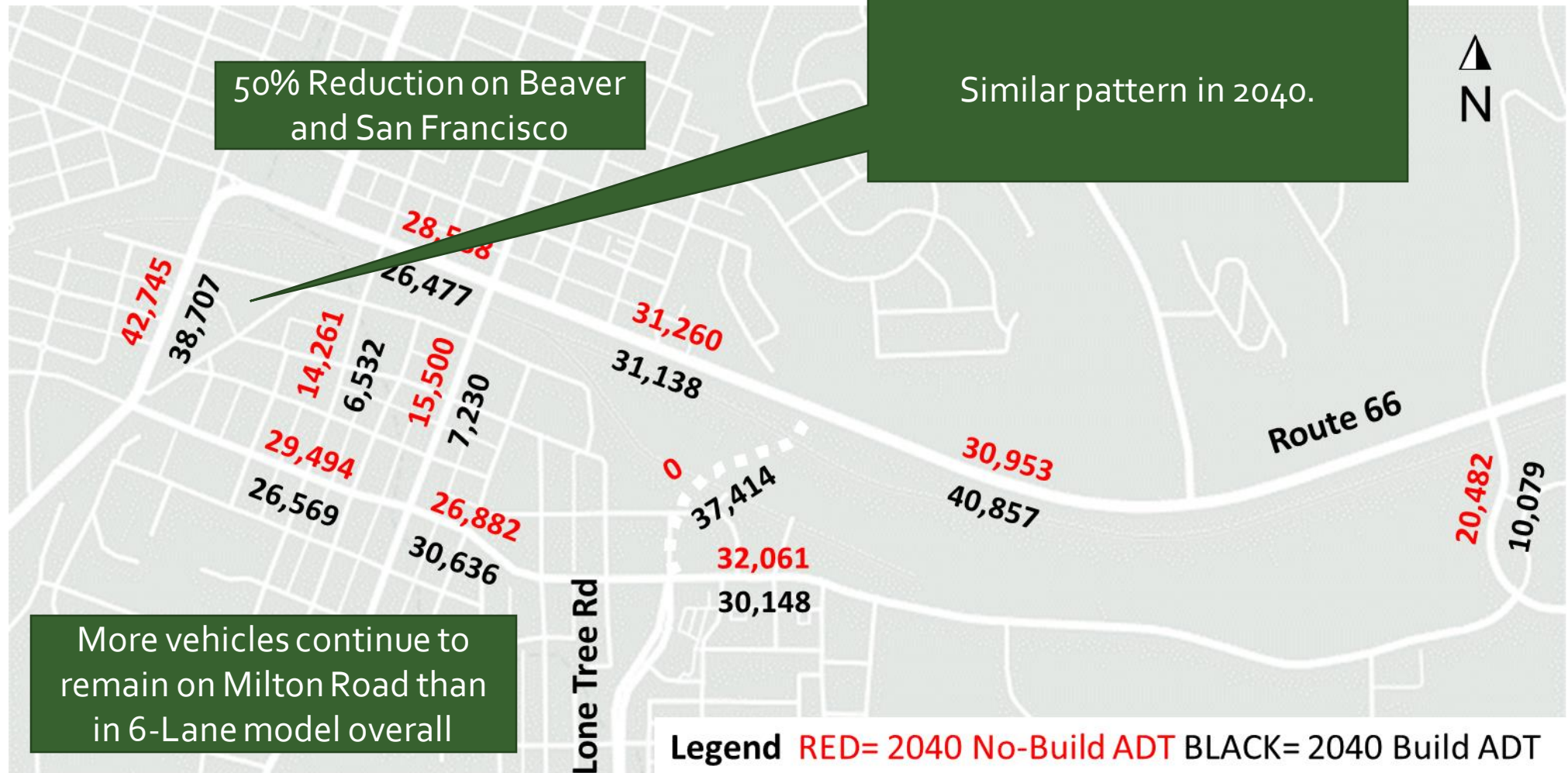


Network Model – 4 Lane Model (2040)

Year	VMT
2019	2,560,000
2026 B	2,604,000
2026 NB	2,605,000
2040 B	3,435,000
2040 NB	3,423,000

B = Build
NB = No-Build

Underlying model
from MetroPlan



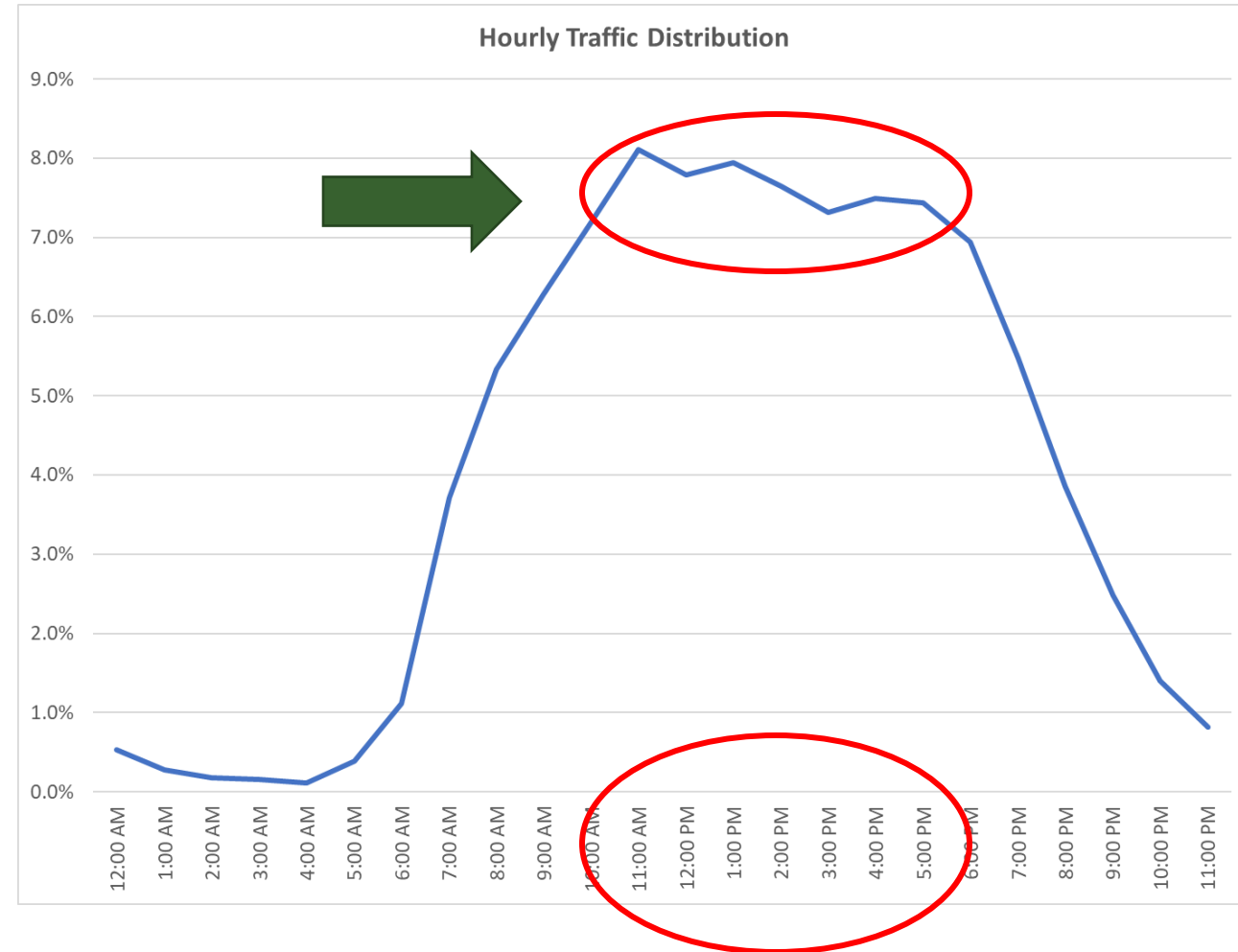
Network Differences

- ✧ **Lone Tree rebalances traffic in street network**
- ✧ **Desire by modeled traffic to use Lone Tree Road**
 - » Popular roadway choice in network, Simpler, More efficient
- ✧ **6 Lane Model**
 - » Built Out Intersection (TIA Concept)
 - » Right Turn Lanes for improved intersection efficiency
 - » Long turn storage lanes for increased roadway capacity
- ✧ **4 Lane Model**
 - » Lower Capacity at Intersection
 - » Shifts traffic back to Milton/Route 66 corridor

Peak Hour Analysis

- ✧ Peak Hour is a Standard Modeling Approach
- ✧ Ensures functionality for highest hour(s) on **AVERAGE** day
 - » Approximately 8.1% of ADT
 - » Less than 10% variability between 10:00am and 6:00pm
- ✧ Not worst hour of worst day of the year (not weekend tourism season)

Butler Ave, April 2022

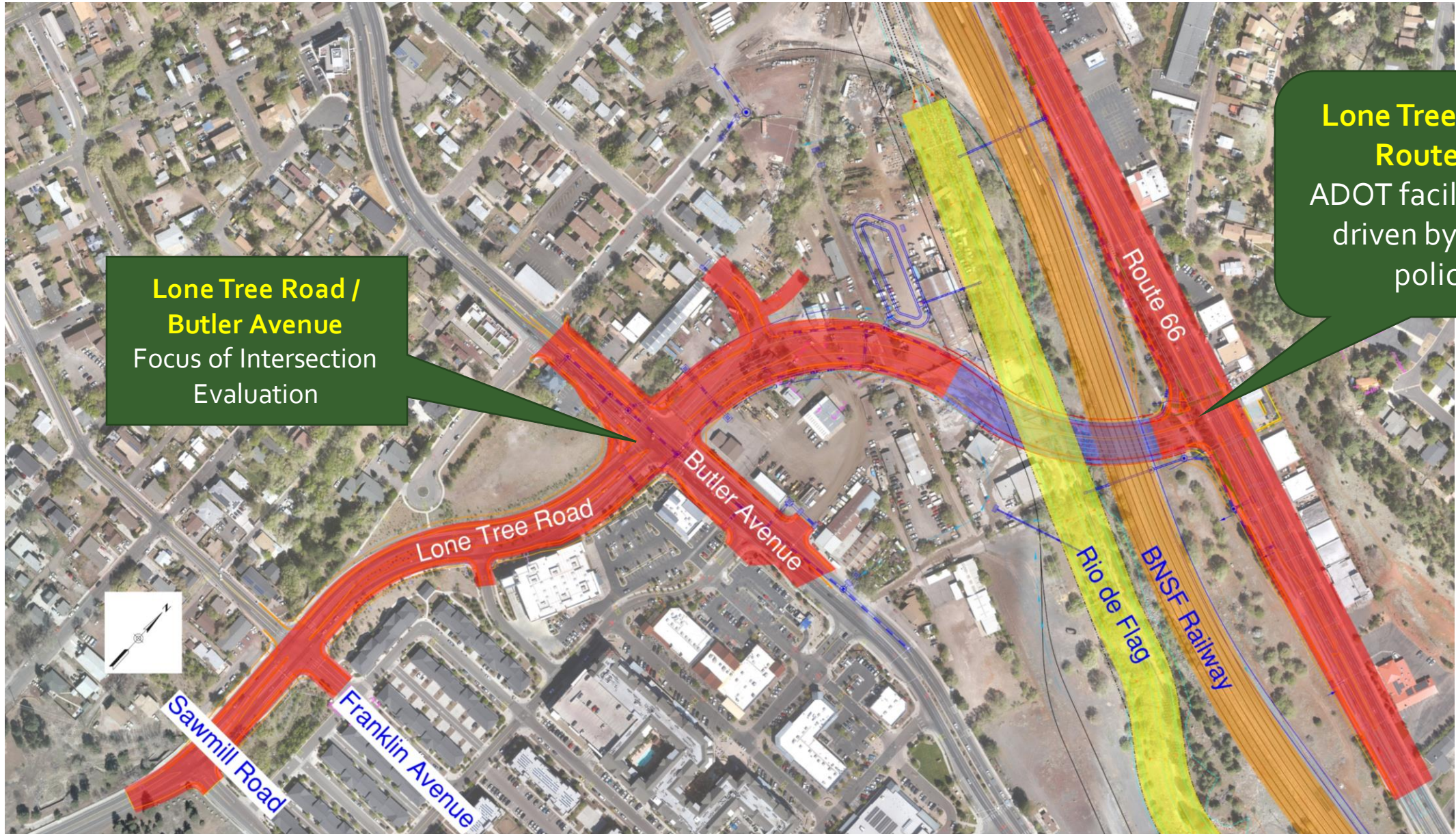


Intersections



- ✧ **Safety Features**
- ✧ **Review intersection alternatives at Butler**
- ✧ **Pedestrian / Cyclist Users**
- ✧ **Vehicles**





**Lone Tree Road /
Butler Avenue**
Focus of Intersection
Evaluation

**Lone Tree Road /
Route 66**
ADOT facility. Type
driven by ADOT
policy.



✦ Safety Features



Protected Intersection – All Alternatives

- ✧ **Corner Wedge & Speed Bump**
- To Moderate Speed
- ✧ **Corner Island**
- Separates bike/peds from motorists
- ✧ **Pedestrian Queuing**
- Visible waiting area at curb
- ✧ **Warning Markings at Conflict Points**
- Yield Markings and Ped Crossing
- ✧ **Bike Queuing Area**
- Waiting area outside of Multi-use Path
- ✧ **Bicycle Signals**
- Clarifying times to cross intersection

✧ **Directional Guidance**

- Supplemental Markings for Bikes

✧ **Bikeway Setback**

- Increase visibility and time to react to motorists



✧ **Motorist Waiting Zone**

- Space to wait for peds/bikes out of through traffic

Crash Modification Factors

Raised Median



Safety Benefits:

Median with Marked Crosswalk
46%
reduction in pedestrian crashes.²

Pedestrian Refuge Island
56%
reduction in pedestrian crashes.²

Source: FHWA Office of Safety

**Crash Reduction
Up to 77%**

Source: CMF Clearinghouse (ID 2219)

Separated Bicycle Paths

Separated bicycle lanes may provide further safety benefits. FHWA is anticipating completion of research in Fall 2022.

Source: FHWA Office of Safety

**Further Crash Reduction
Up to 25%**

Source: CMF Clearinghouse (ID 9250)

High Visibility / Colored Crosswalk



Safety Benefits:

High-visibility crosswalks can reduce pedestrian injury crashes up to **40%**¹

**Crash Reduction
Up to 19%-40%**

Source: CMF Clearinghouse (ID 4123-4124)

Leading Pedestrian Interval



Safety Benefit:

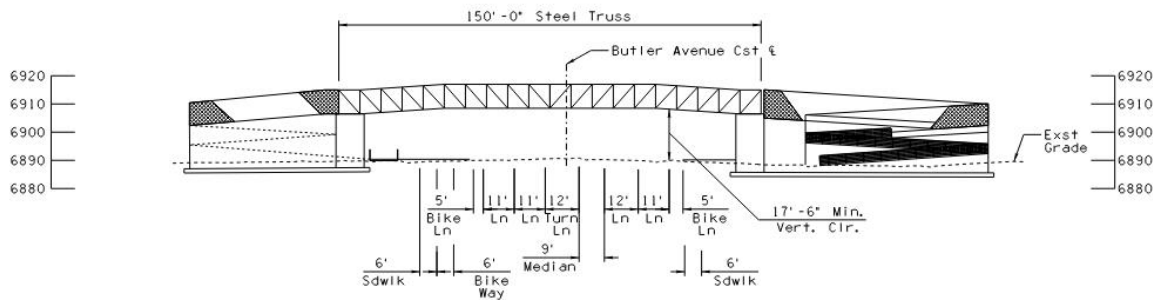
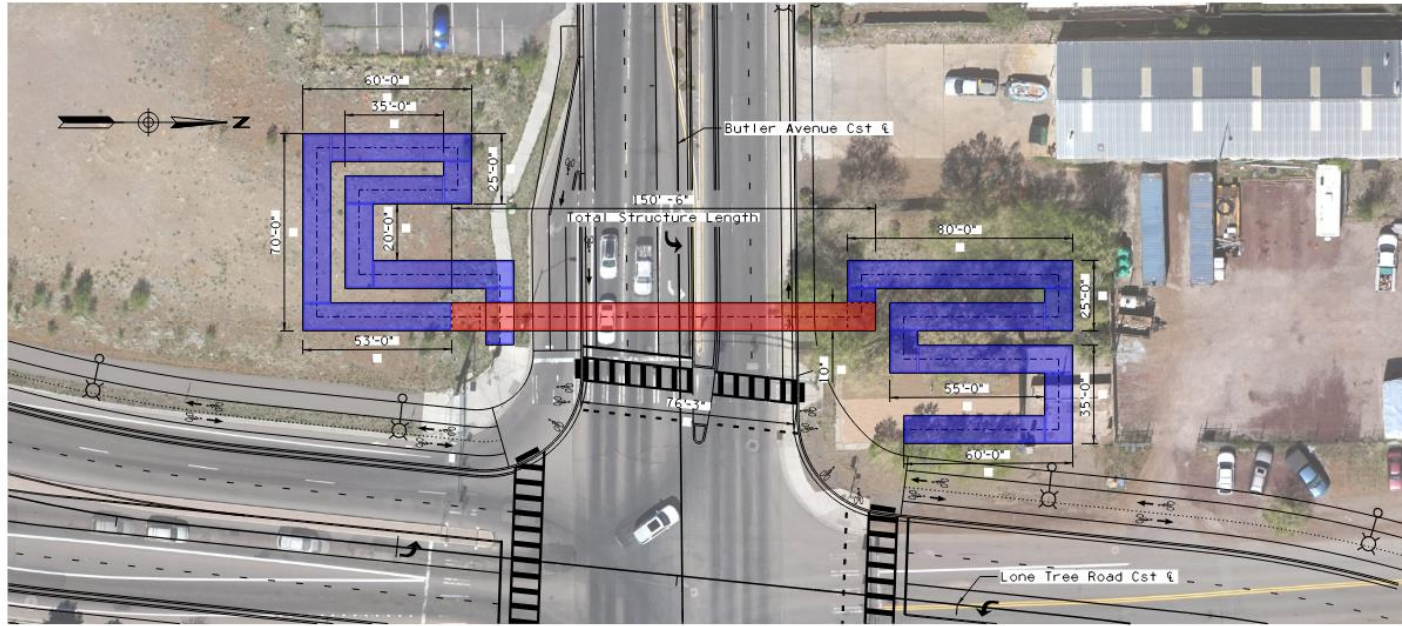
13%
reduction in pedestrian-vehicle crashes at intersections.¹

Source: FHWA Office of Safety

**Crash Reduction
Up to 10%-19%**

Source: CMF Clearinghouse (ID 9901-9918)

Pedestrian Overpass – Concept Evaluation



Notes:

1. Total length of pedestrian bridge: 763'-5"
Estimate crossing time (using the bridge): 3 Minutes 38 Seconds
2. Total length of intersection crosswalk: 76'-3"
Estimated crossing time (using the crosswalk): 22 Seconds
3. Bridge Cost Estimate: \$2,500,000.00

**ANTICIPATED PLANNING LEVEL
COST
\$2,500,000**

GENERAL FEATURES

- Span Length = 150 ft
- Approach Spans = 300 ft
- Approach Grade is 15 H : 1 V or about 6.7% to meet ADA and PROWAG requirements
- Landings oriented to be near intersection corners
- Approaches laid out to minimize right-of-way impacts
- Requires purchase of one additional parcel on northwest corner

CROSSING FEATURES

- Total Crossing Length = 760 ft
- Total Crossing Time = 3.5 mins
- Intersection Length = 76 ft
- Intersection Crossing Time = 22s

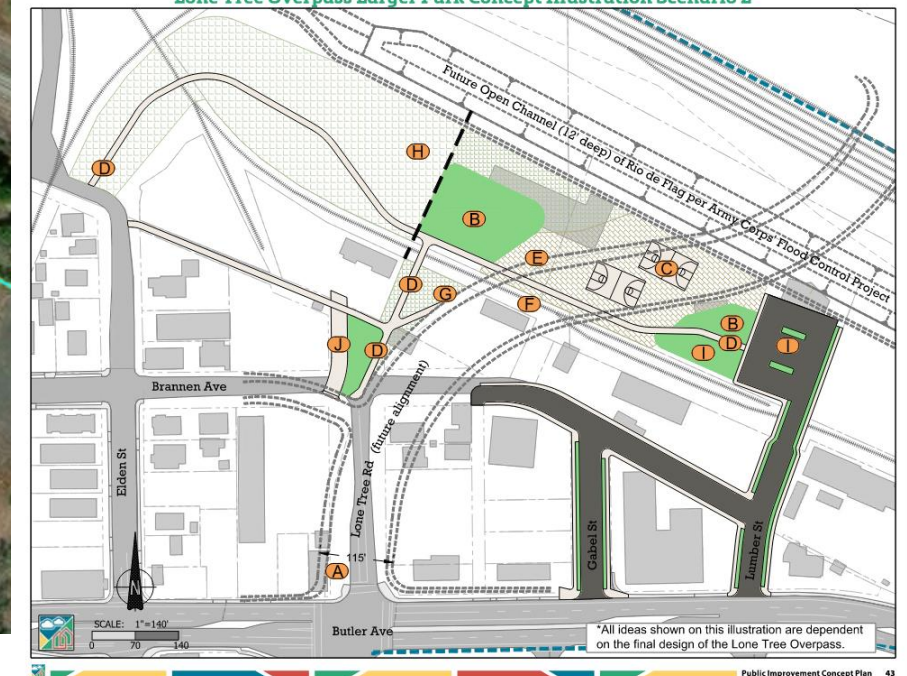
FUTS Trail Connection – Concept Evaluation



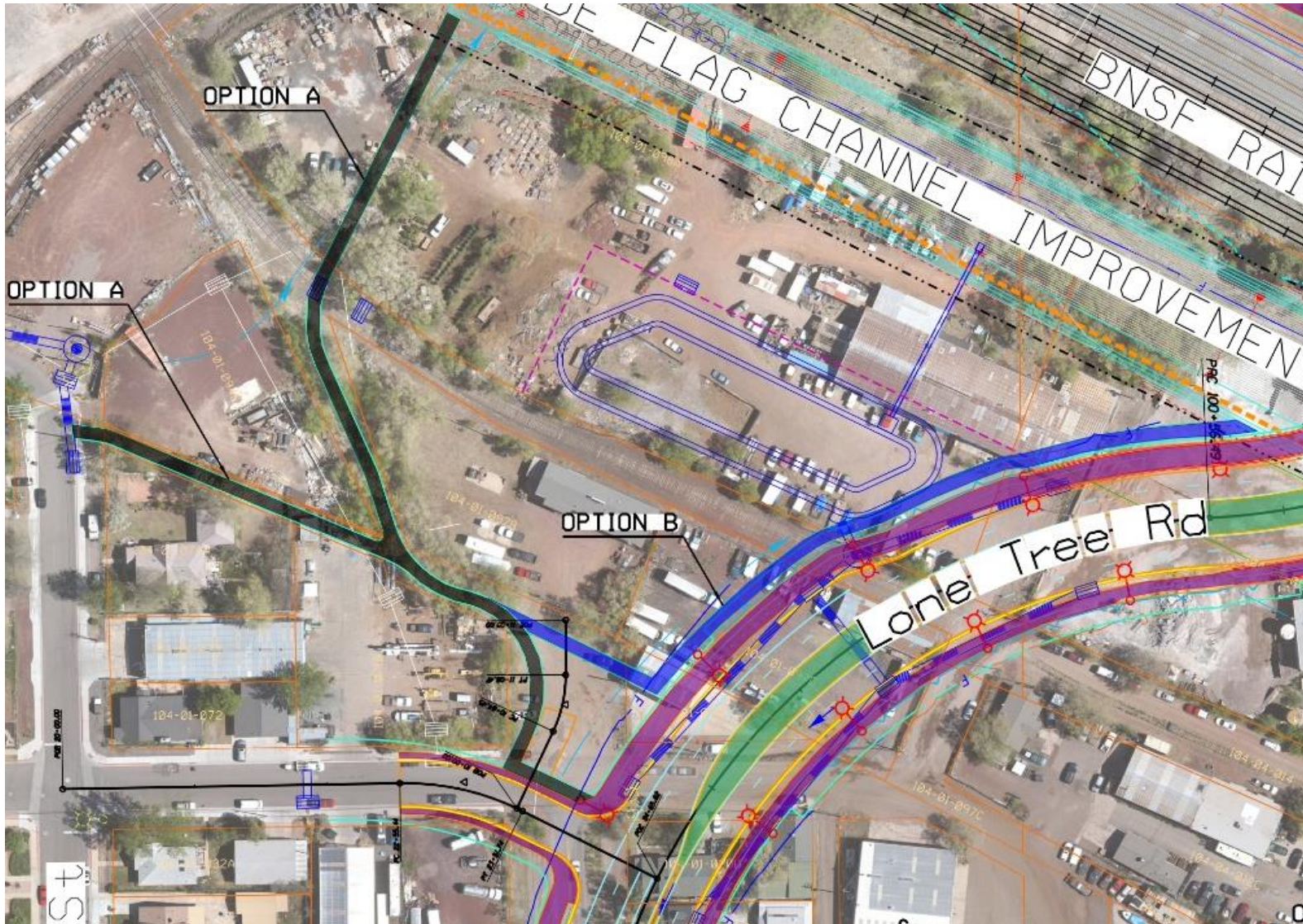
ATMP Concept

- Southside Rio Trail
 - San Francisco to Butler Avenue
- 10ft Aggregate Path
- 0.77 miles Length
- Project FUTS-166.01

Lone Tree Overpass Larger Park Concept Illustration Scenario 2



FUTS Trail Connection – Concept Evaluation



FUTS Concept

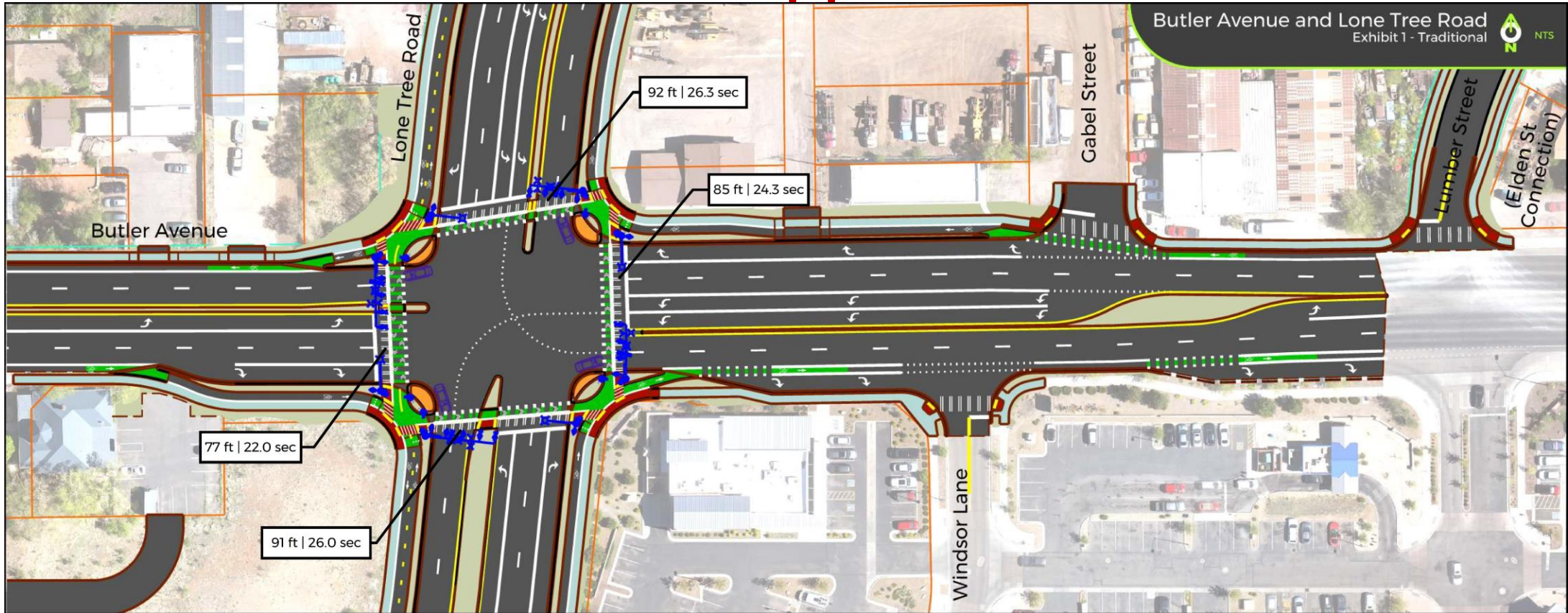
- Providing 10-ft combined utility corridor coinciding with FUTS and bicycle corridor
- Layout still being determined with ATMP, Southside Plan, and LTO
- Aligned between parcels to reduce impacts to Owners



❖ Intersection Alternatives



LTO & Butler – Standard Approach



Vehicle Features

- Two left-turn lanes (SB, WB)
- Channelized right-turn lanes (None)

Bicycle Features

- Separated bike lanes (LTO)

Pedestrian Features

- Raised median (S, W)

LTO & Butler – Standard Approach



✧ Design Features

- » Pedestrian longest crossing distance 92 ft
- » Pedestrian longest crossing time 26.3 s
- » Bike longest crossing time 5.1 s
- » Available Green Time 22.6s (EB/WB Thru-PM)*

Ped /Bike Crossing	Distance (ft)	Ped Time (sec)	Min. Bike Time (sec)
North Leg	92	26.3	5.1
South Leg	91	26.0	5.0
East Leg	85	24.3	4.7
West Leg	77	22.0	4.2

✧ Pedestrian crossing times are based on 3.5 ft/s | 2.4 mph

- » Per the Manual for Uniform Traffic Control
- » Assumes complete crossing during one single green +yellow phase
- » Slower Pedestrians, 2.8 ft/sec.(FHWA) Longest Crossing time 32.8 sec

LTO & Butler – Standard Approach



✧ Performance (2026 PM Peak)

- » Overall Level of Service D
- » Average Vehicle Delay: 46.9 sec
- » Queuing: Longest queue 599 ft (EB)

Year	Total Vehicle Delay (hours)	Fuel Used (gallons)
2026 (PM)	59.8	57.0
2040 (PM)	120.7	74.7

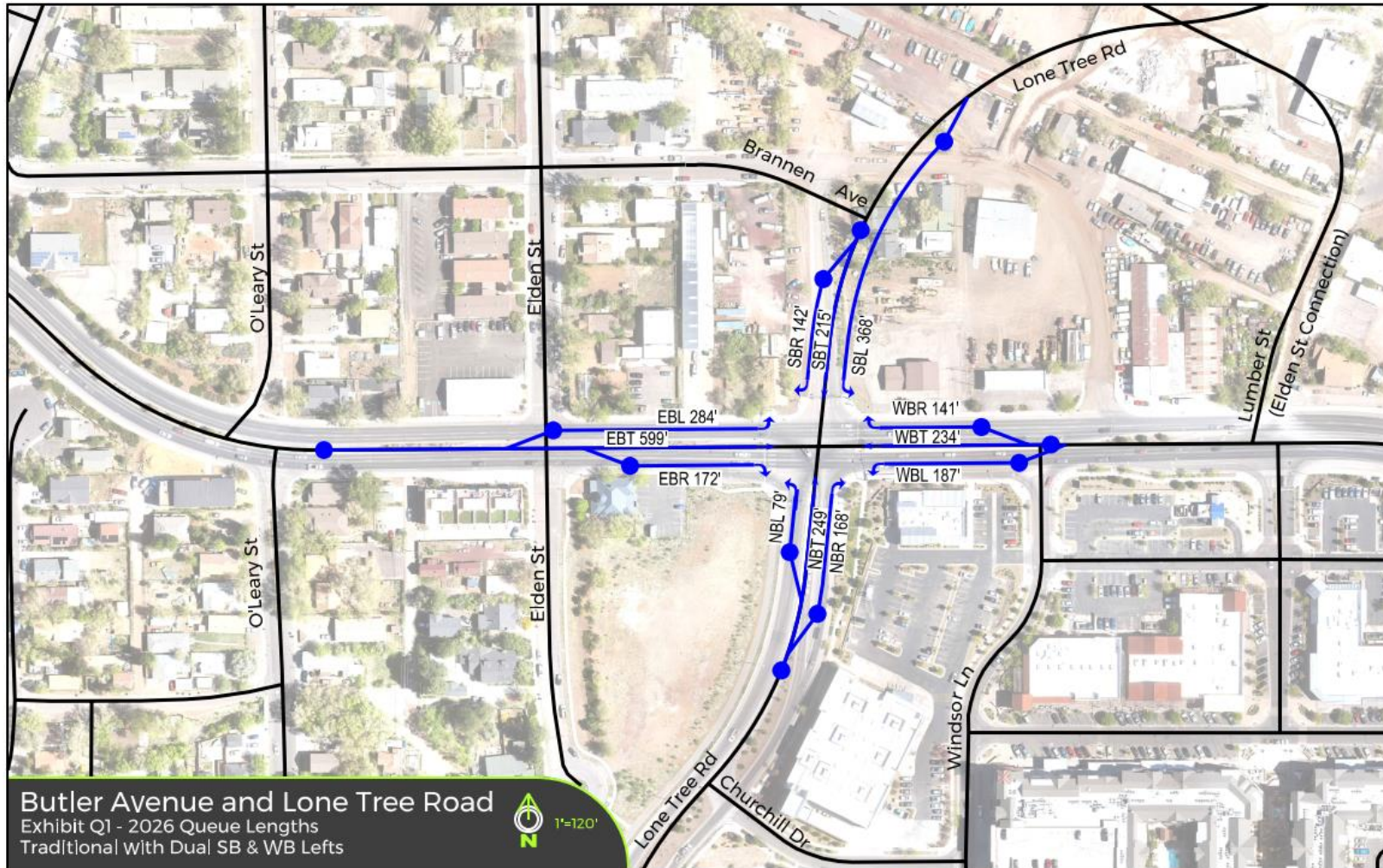
✧ Performance (2040 PM Peak)

- » Overall Level of Service E
- » Average Vehicle Delay: 70.7 sec
- » Queuing: Longest queue 772 ft

LTO & Butler – Standard Approach



» Maximum Queues - 2026

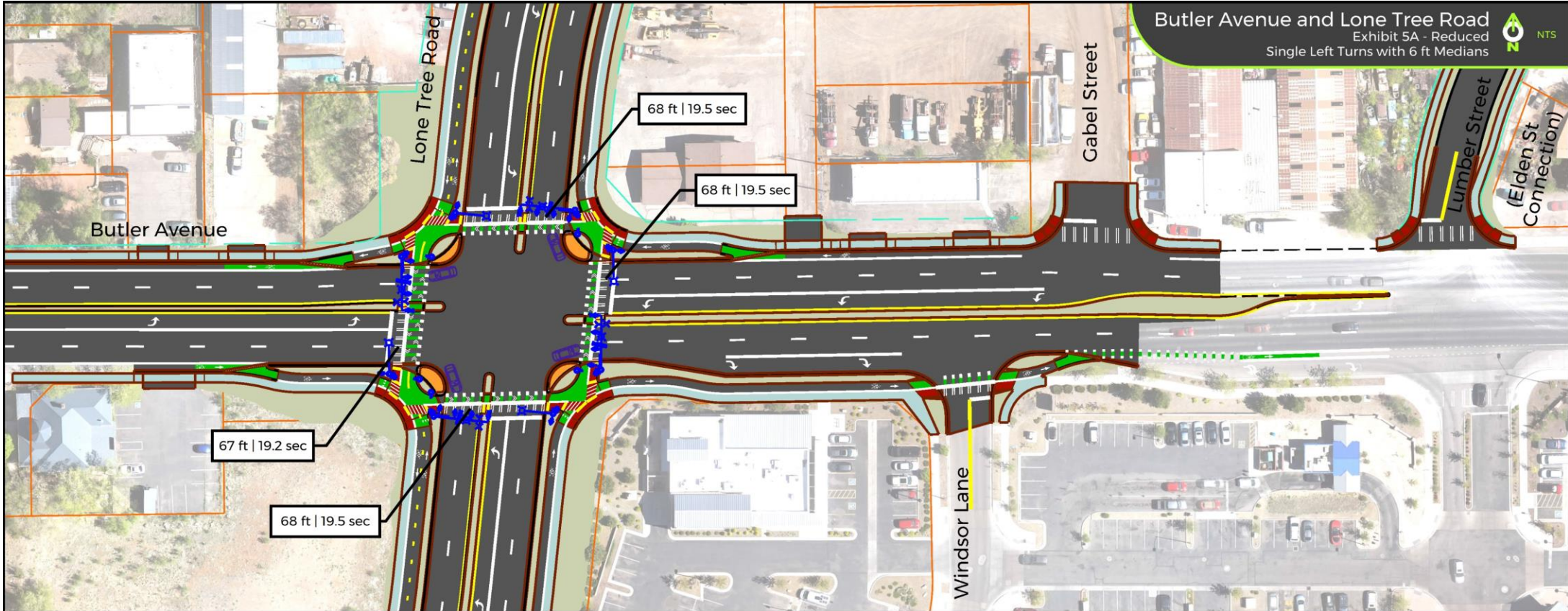


Most Queues are less than 300' but with southbound left at 368' and Eastbound through at 599'



LTO & Butler – Small Footprint

5A



Vehicle Features

- Single left-turn lanes (All)
- Shared Through/Rights (All)

Bicycle Features

- Separated bike lanes (All)

Pedestrian Features

- Raised median (All)

LTO & Butler – Small Footprint

✦ Design Features

- » Pedestrian longest crossing distance 68 ft
- » Pedestrian longest crossing time 19.5 s
- » Bike longest crossing time 3.7 s
- » Available Green Time 20.1s (EB/WB Thru-PM)

Ped /Bike Crossing	Distance (ft)	Ped Time (sec)	Min. Bike Time (sec)
North Leg	68	19.5	3.7
South Leg	68	19.5	3.7
East Leg	68	19.5	3.7
West Leg	67	19.2	3.7

✦ Pedestrian crossing times are based on 3.5 ft/s | 2.4 mph

- » Per the Manual for Uniform Traffic Control
- » Assumes complete crossing during one single green phase
- » Slower Pedestrians, 2.8 ft/sec.(FHWA) Longest Crossing time 24.3 sec

LTO & Butler – Small Footprint



✧ Performance (2026 PM Peak)

- » Overall Level of Service E
- » Average Vehicle Delay: 75.6 sec
- » Queuing: Longest queue 790 ft (EB)

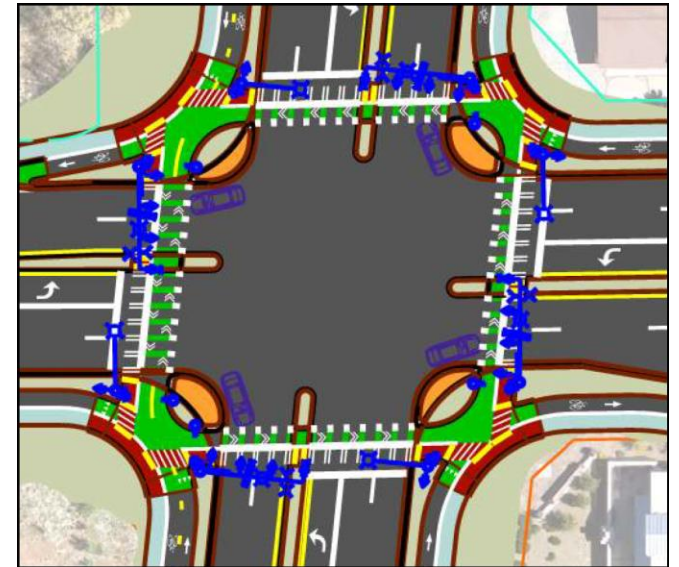
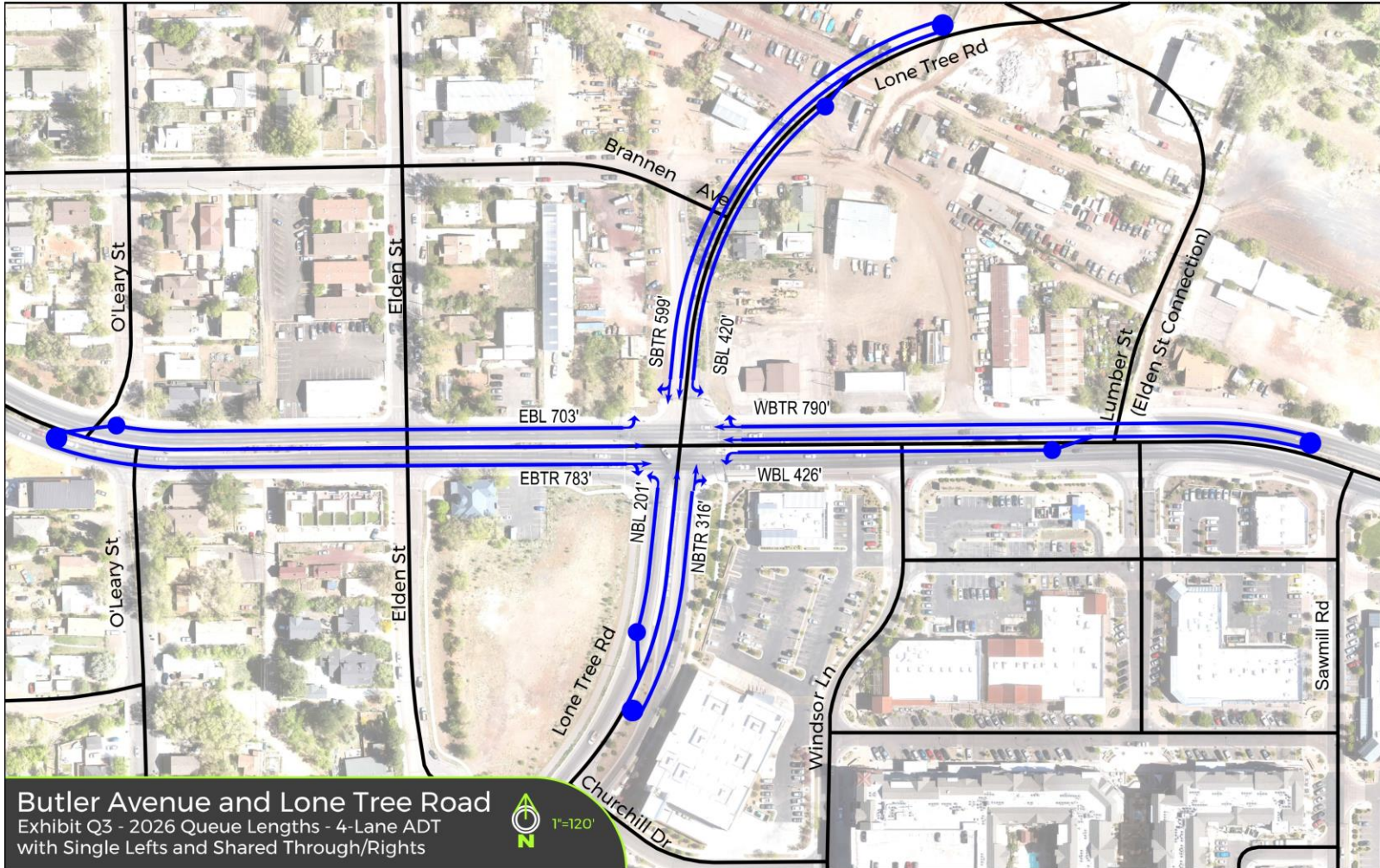
Year	Total Vehicle Delay (hours)	Fuel Used (gallons)
2026 (PM)	99.8	65.8
2040 (PM)	199.5	99.6

✧ Performance (2040 PM Peak)

- » Overall Level of Service F
- » Average Vehicle Delay: 120.7 sec
- » Queuing: Longest queue 1891 ft (EB to between Beaver St and San Francisco St)

LTO & Butler – Small Footprint

» Maximum Queues - 2026

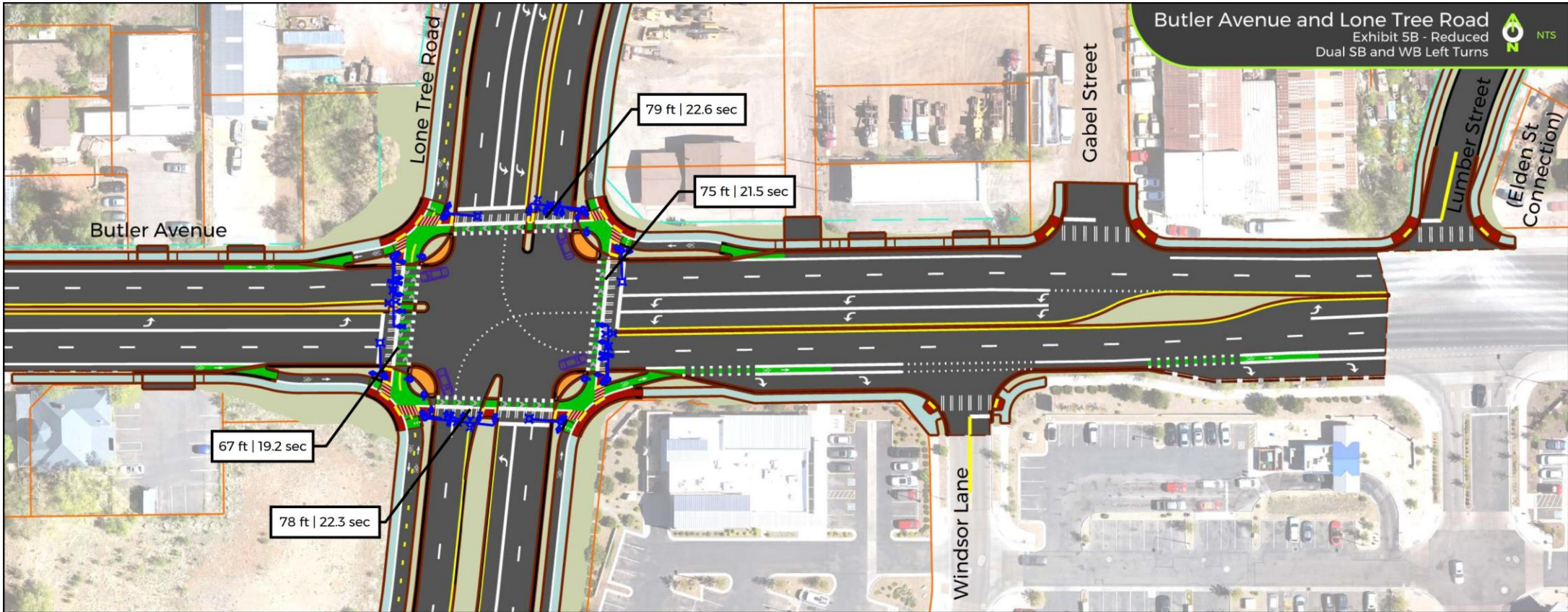


Three approaches with queues over 700' or approx. 35 cars/lane

Queues are similar to:
Moderate – A intersection (3A)
Moderate – B intersection (3B)



LTO & Butler – Moderate Footprint



Vehicle Features

- Double left-turn lane (SB, WB)
- Shared Through/Rights (All)

Bicycle Features

- Separated bike lanes (All)

Pedestrian Features

- Raised median (All)

LTO & Butler – Moderate Footprint

5B

✧ Design Features

- » Pedestrian longest crossing distance 79 ft
- » Pedestrian longest crossing time 22.6 s
- » Bike longest crossing time 4.3 s
- » Available Green Time 30.3s (EB/WB Thru-AM)

Ped /Bike Crossing	Distance (ft)	Ped Time (sec)	Min. Bike Time (sec)
North Leg	79	22.6	4.3
South Leg	78	22.3	4.3
East Leg	75	21.5	4.1
West Leg	67	19.2	3.7

✧ Pedestrian crossing times are based on 3.5 ft/s | 2.4 mph

- » Per the Manual for Uniform Traffic Control
- » Assumes complete crossing during one single green phase
- » Slower Pedestrians, 2.8 ft/sec.(FHWA) Longest Crossing time 28.2 sec

LTO & Butler – Moderate Footprint

5B

✦ Performance (2026 PM Peak)

- » Overall Level of Service E
- » Average Vehicle Delay: 70.9
- » Queuing: Longest queue 499 ft (NB)

Year	Total Vehicle Delay (hours)	Fuel Used (gallons)
2026 (PM)	72.9	58.1
2040 (PM)	209.8	120.0

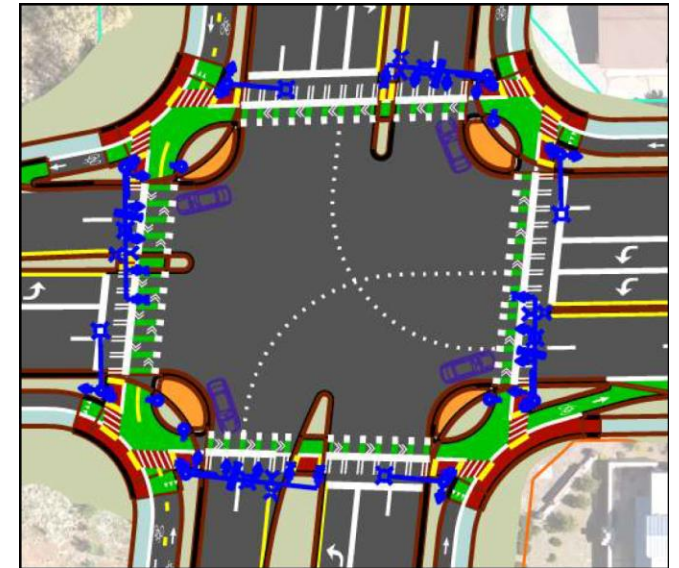
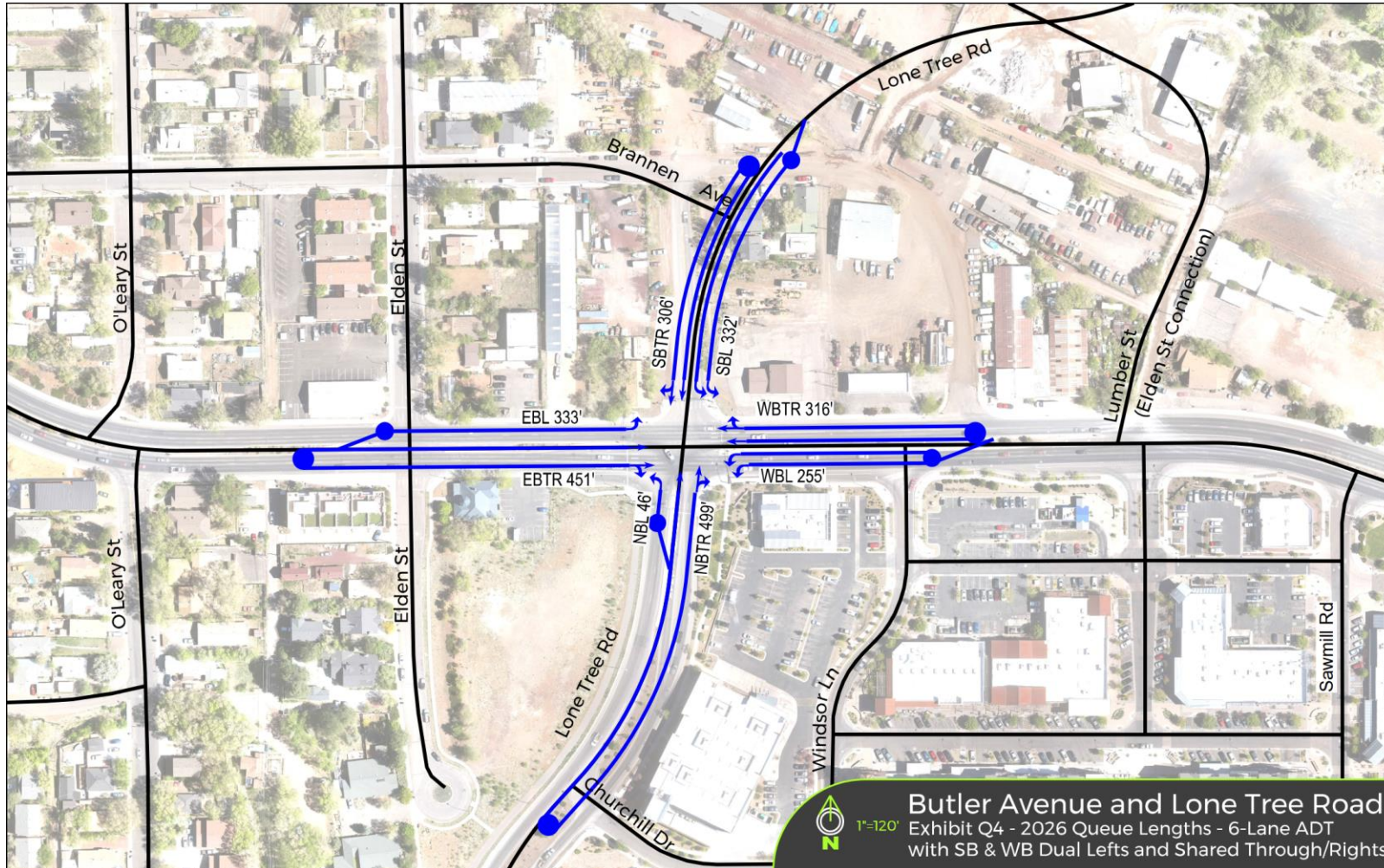
✦ Performance (2040 PM Peak)

- » Overall Level of Service F
- » Average Vehicle Delay: 145.7
- » Queuing: Longest queue 2,025 ft (EB to between Beaver St and San Francisco St)

LTO & Butler – Moderate Footprint

5B

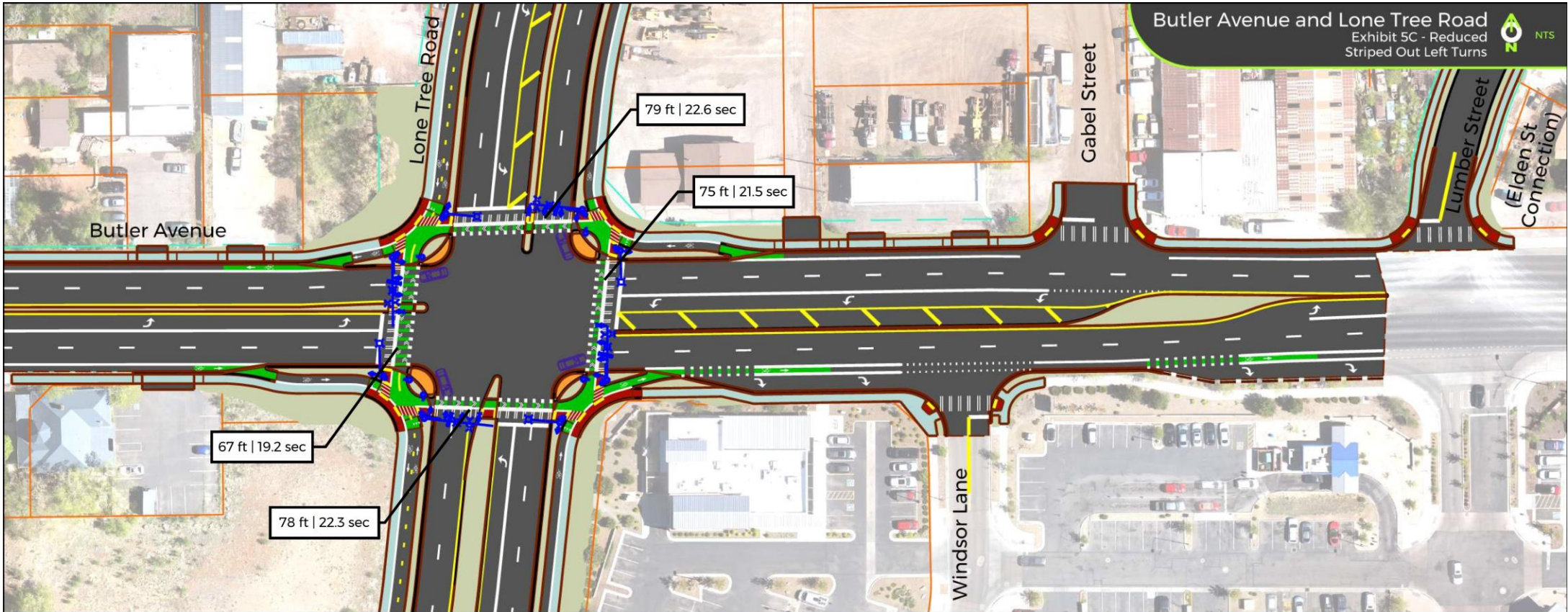
» Maximum Queues - 2026



Queues are less than 500'



LTO & Butler – Modifiable - A



Vehicle Features

- Single left-turn lanes (All)
- Future left-turn lane striped (SB, WB)
- Shared Through/Rights (All)

Bicycle Features

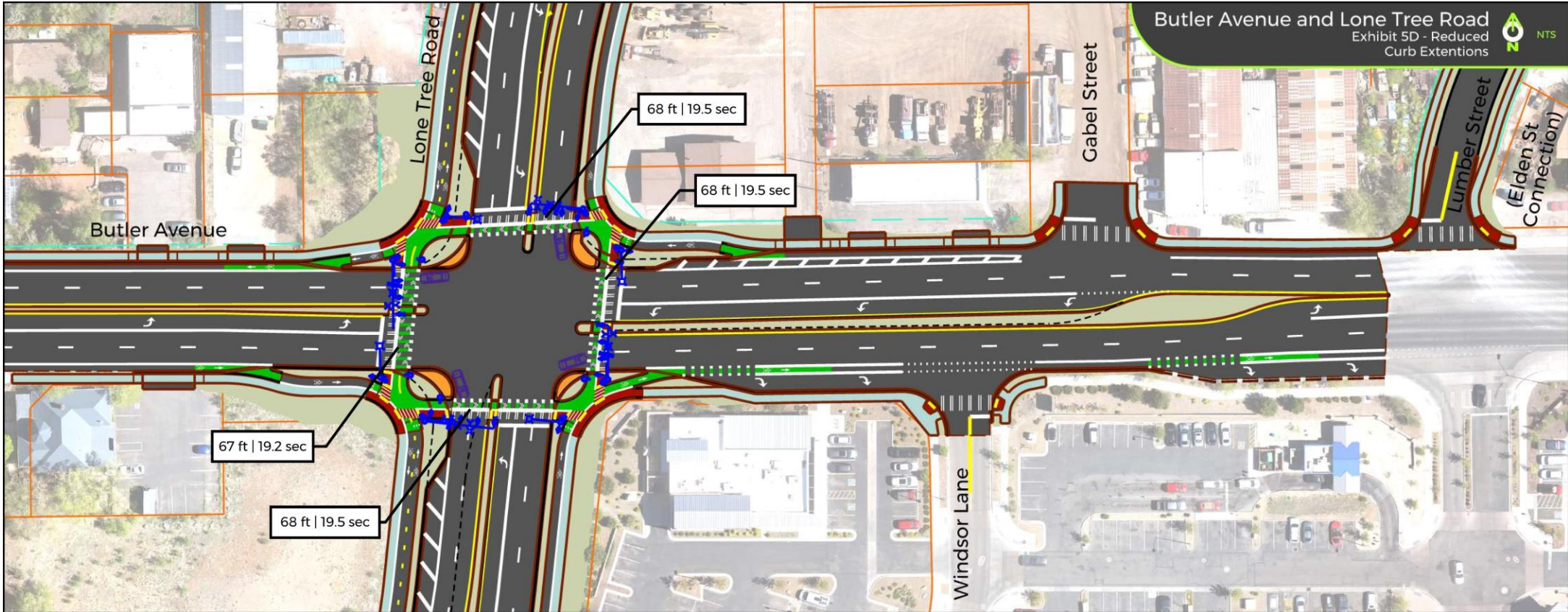
- Separated bike lanes (All)

Pedestrian Features

- Raised median (All)



LTO & Butler – Modifiable - B



Vehicle Features

- Single left-turn lanes (All)
- Future outside curbs (NB, SB, WB)
- Shared Through/Rights (All)

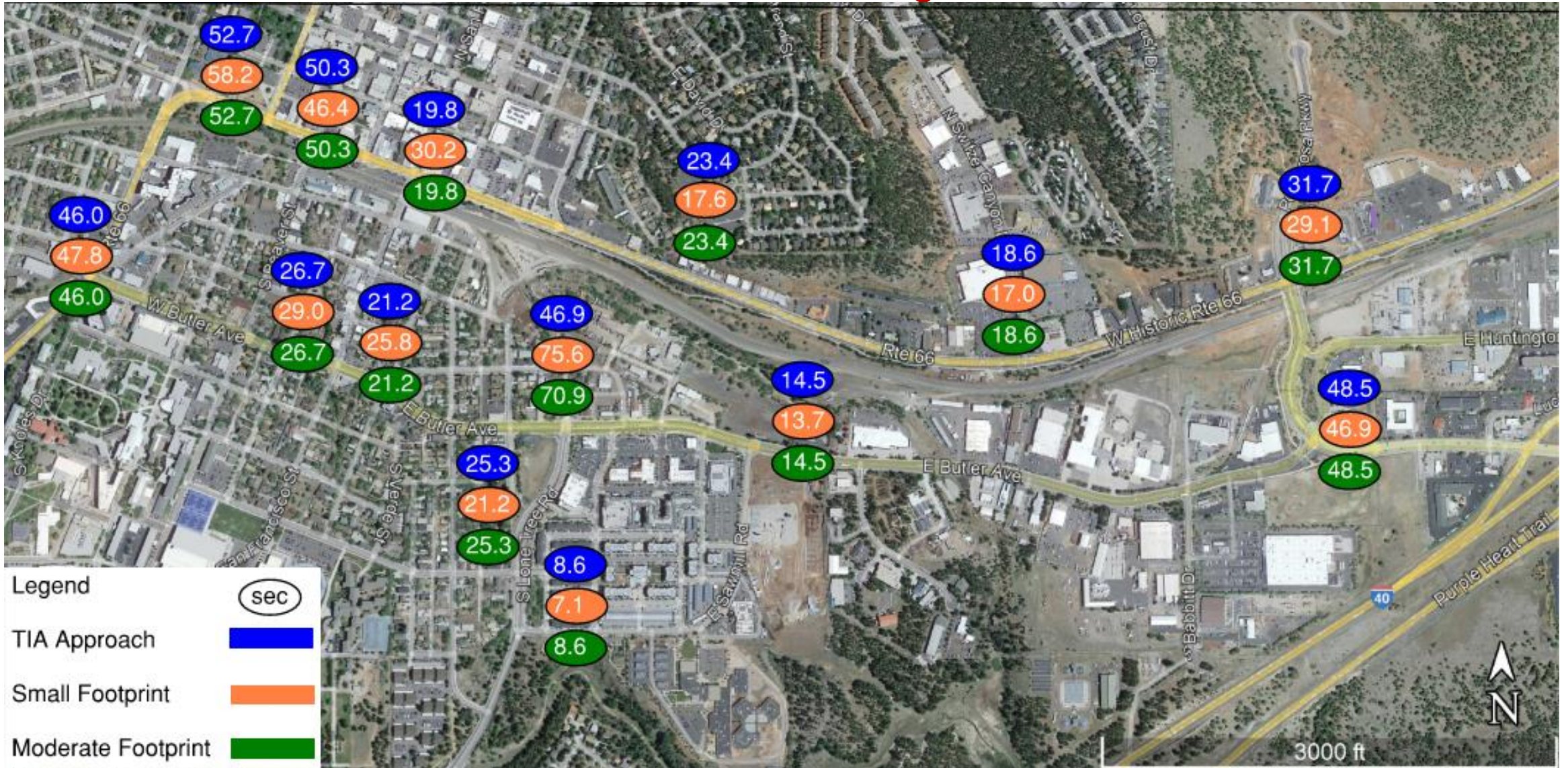
Bicycle Features

- Separated bike lanes (All)

Pedestrian Features

- Raised median (All)

LTO & Butler – Network Summary 2026



LTO & Butler – Network Summary 2040





ADOT Meeting – April 25th Report Out

✧ Concerned about Options 5A and 5B for LTO/Butler

- » Significant degradation in operations/queuing from original TIA submittal
- » Concern remains regarding SB queuing in 2040 backing into and impacting ADOT US 66 intersection
- » Extensive EB queuing (2,000+ ft) and LOS F of Butler intersection does not allow future flexibility to balance directional operations



Mountain Line – May 3rd Report Out

- ✧ Excited to see project move forward with more connections
- ✧ Mountain Line does not intend to realign routes to the bridge but may use connection in emergencies
- ✧ **Four key routes pass through Butler/Lone Tree: 3/4/7/14**
 - » EB Thru, WB Thru, NB Left, and EB Right
 - » 5A/5B Scenarios present an average 5 second delay between options
- ✧ **Not looking to relocate stops in this area but is requesting coordination for any impacts to existing stops**
- ✧ **Interested in exploring Transit Signal Priority along Butler Corridor**
 - » At a minimum provide cabinet space for future compatibility



✦ Summary



LTO & Butler – Intersection Summary

Evaluation Criteria	Standard S	Small Footprint 5A	Moderate Footprint 5B	Modifiable - A 5C	Modifiable - B 5D
Protected/Separated Bicycle Facilities	All Legs ●	All Legs ●	All Legs ●	All Legs ●	All Legs ●
Pedestrian Crossing Length/Time	26.3 s ◐	19.5 s ●	22.6 s ◑	22.6 s ◑	19.5 s ●
Total Fuel Used (Gallons/Hr) (2026)	57.0 ●	65.8 ◐	58.1 ●	65.8 ◐	65.8 ◐
Average Vehicle Delays (2026)	46.9 s ●	75.6 s ◐	70.9 s ◐	75.6 s ◐	75.6 s ◐
2040 Projection Compatible	High ●	Low ◑	Moderate ◐	Moderate ◐	Moderate ◐
Construction Cost	\$1,800,000 ◐	\$1,090,000 ●	\$1,300,000 ◑	\$1,300,000 ◑	\$1,340,000 ◑
Compatible with City Code:	Yes	No	No	No	No

- Legend:
- 5 – Great
 - ◑ 4 – Good
 - ◐ 3 – Average
 - ◒ 2 – Below Ave
 - 1 - Poor

