

Adapting to Construction with ASCT

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Nick Johnson – HDR

ITS Heartland – 04/30/2024

TOPICS

What is ASCT?

Staging Overview

Signal & ITS Design

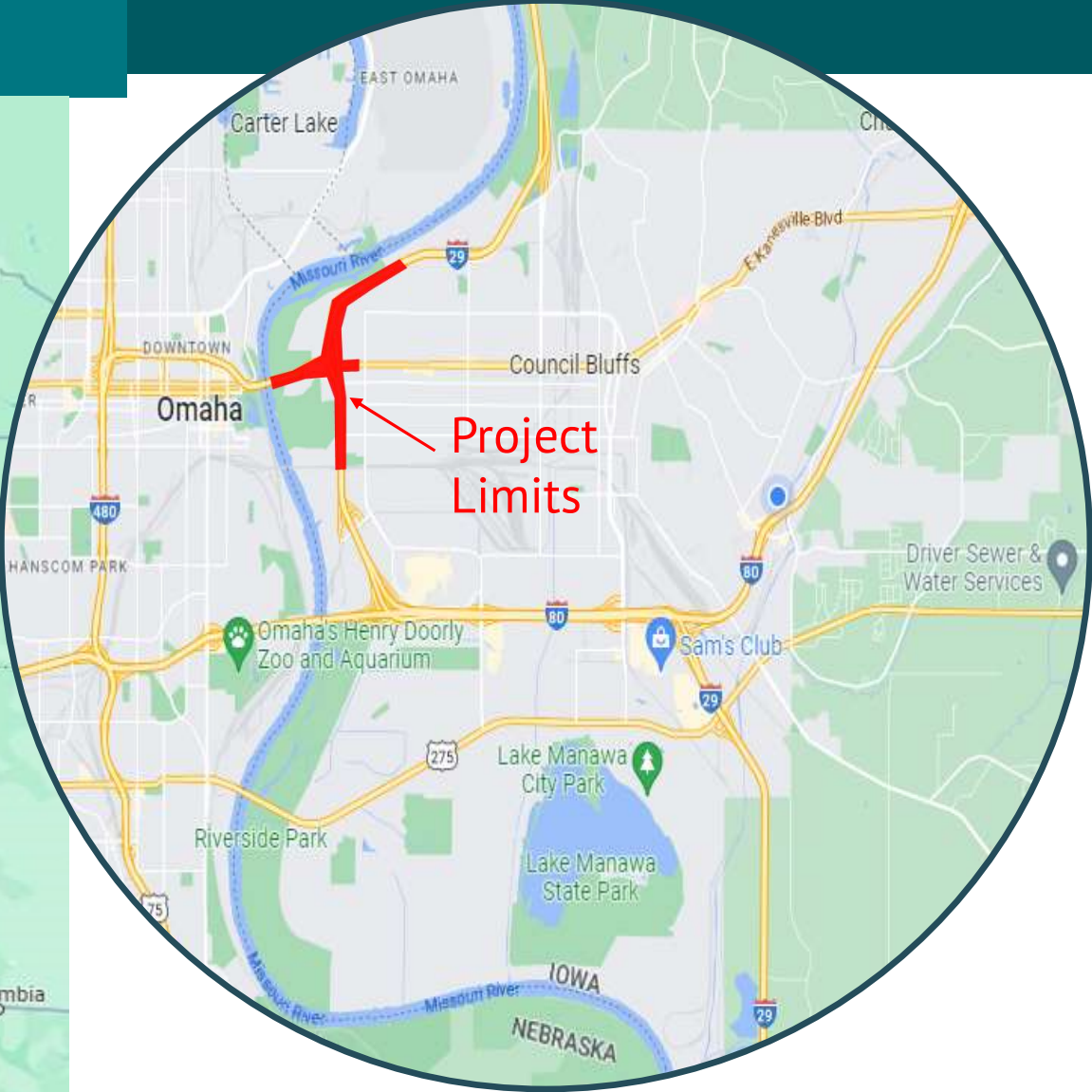
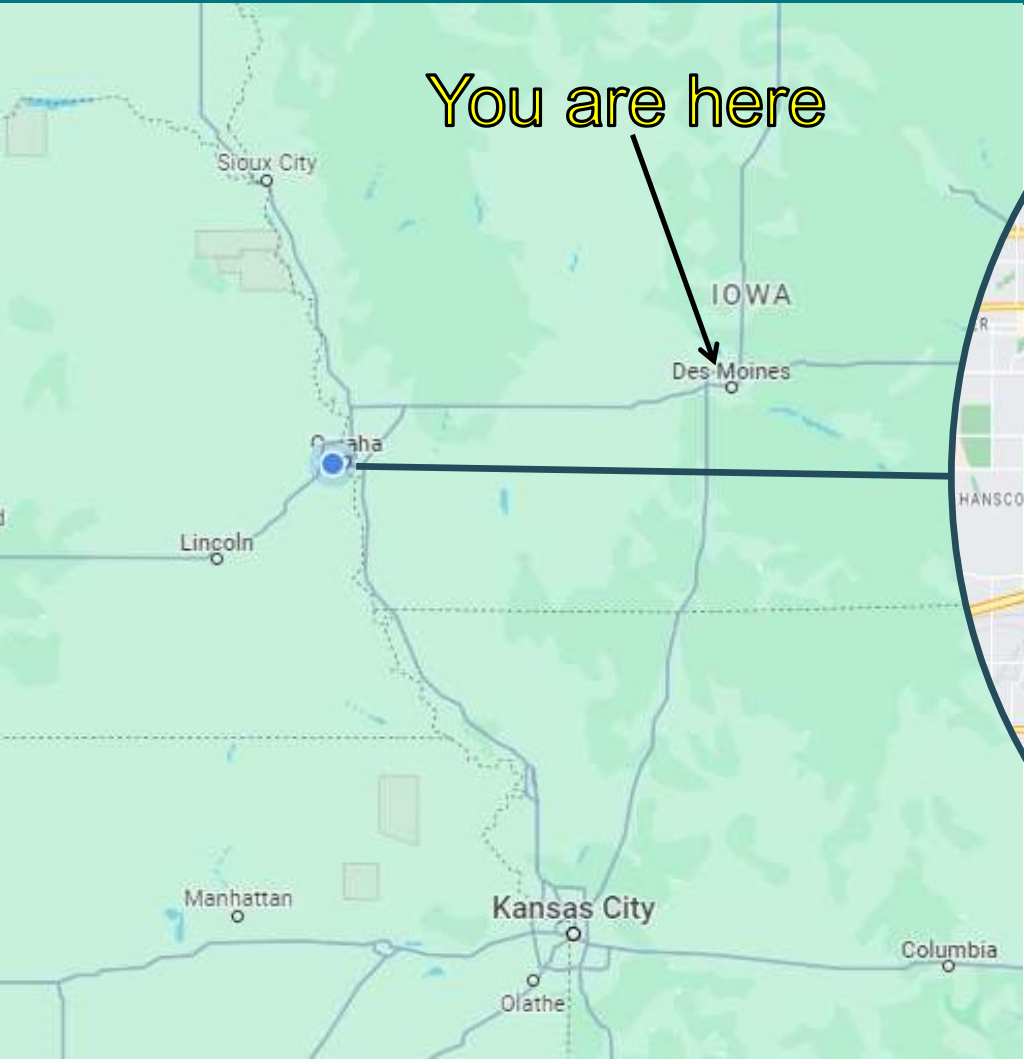
Adaptive Implementation

How it Went



Project Background

PROJECT LOCATION



PROJECT DETAILS

- \$180 million contract
- Just over 3-year Schedule – Started April 2021
- Reconstruction of the interchange between I-29 and I-480.
- Relocate 41st St interchange to 40th Street
- One-way frontage roadways provide new access between I-29 and West Broadway.
- Removal of the interchange at 35th St.





SB Frontage Rd at Broadway

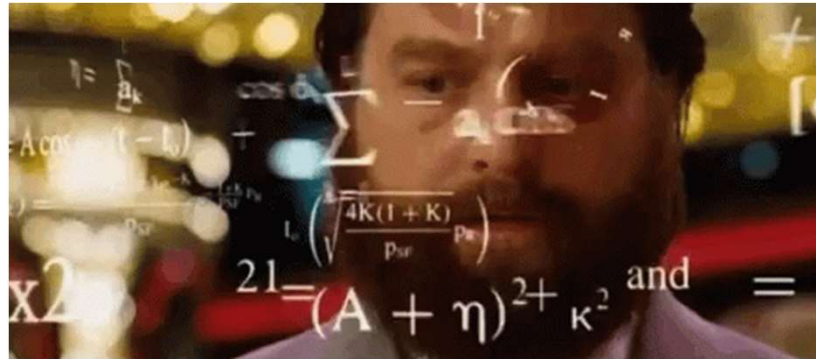
Adaptive Signal Control Technology

HOW IT WORKS

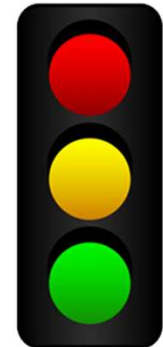
Sensors



Algorithms



Signal Timings



BENEFITS

- Real-time responsiveness
- Optimization of traffic flow
- Flexibility to adapt to changing traffic patterns
- Maintain coordination

ASCT helps with
Traffic Variability



Why Adaptive?



WHY ADAPTIVE

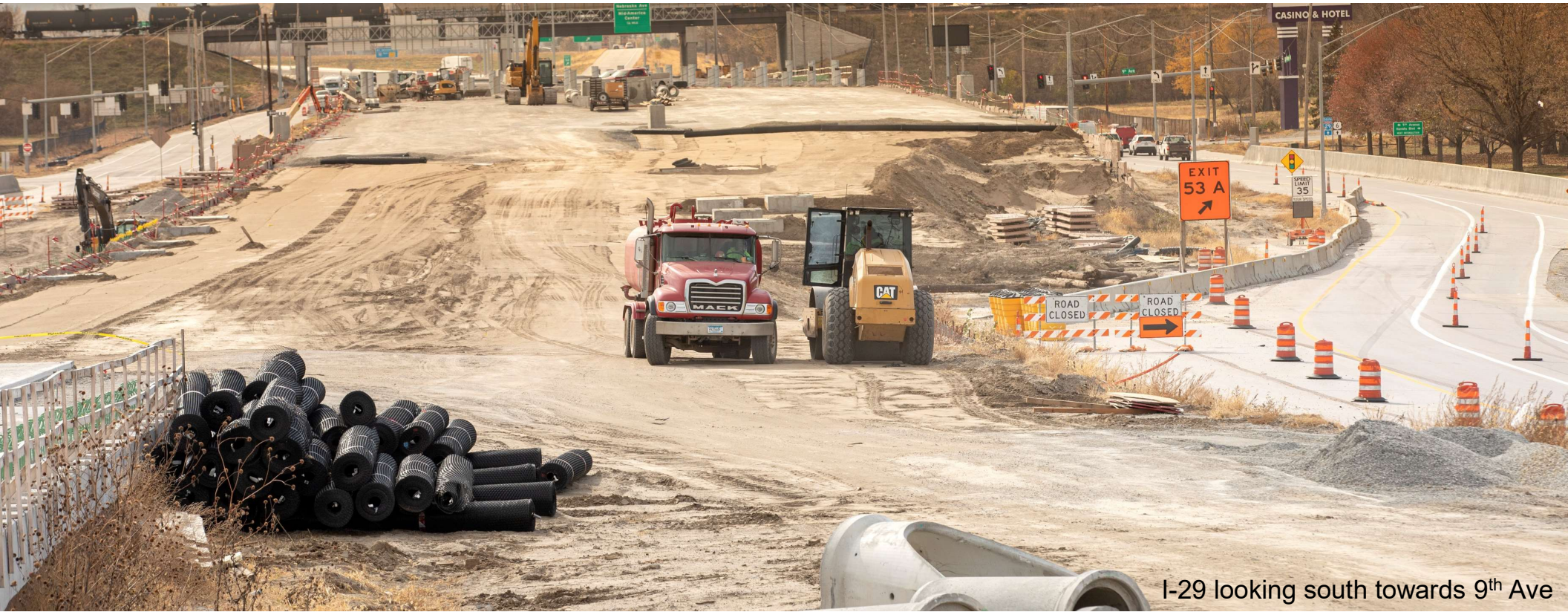
- 2 existing ASCT corridors
 - South Expressway
 - Kanesville Blvd
- Sole source new project
- Will remain in place post-construction



UNIQUE ASCT APPLICATION

- Traditional installation
 - Existing corridor
 - Known traffic demand
 - Known issues
- This installation
 - New/changing corridor
 - Unknown traffic demand
 - Unknown issues












I-29 looking south towards 9th Ave

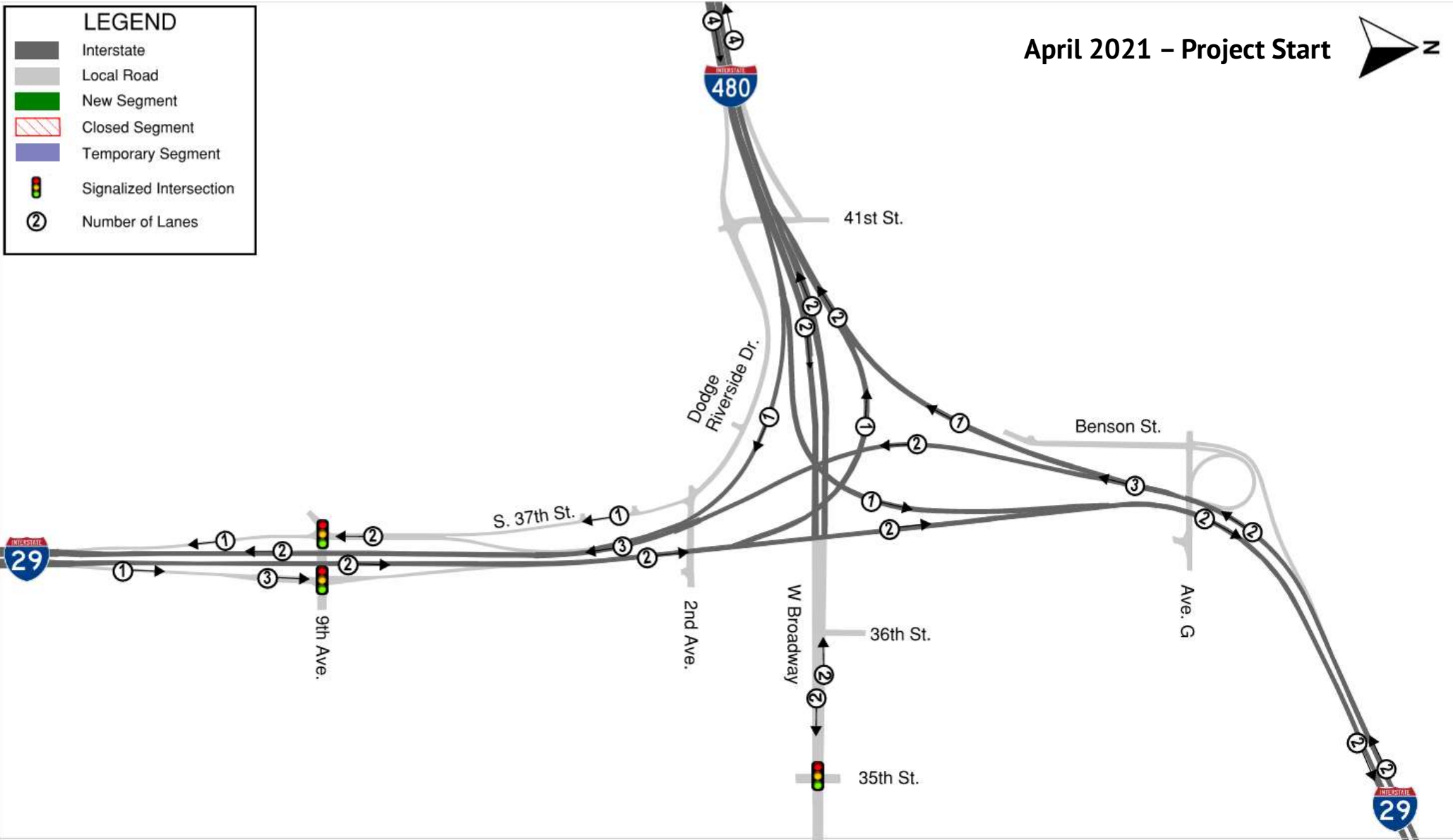
Changing Traffic Patterns

April 2021 – Project Start



LEGEND








-  Interstate
-  Local Road
-  New Segment
-  Closed Segment
-  Temporary Segment
-  Signalized Intersection
-  Number of Lanes

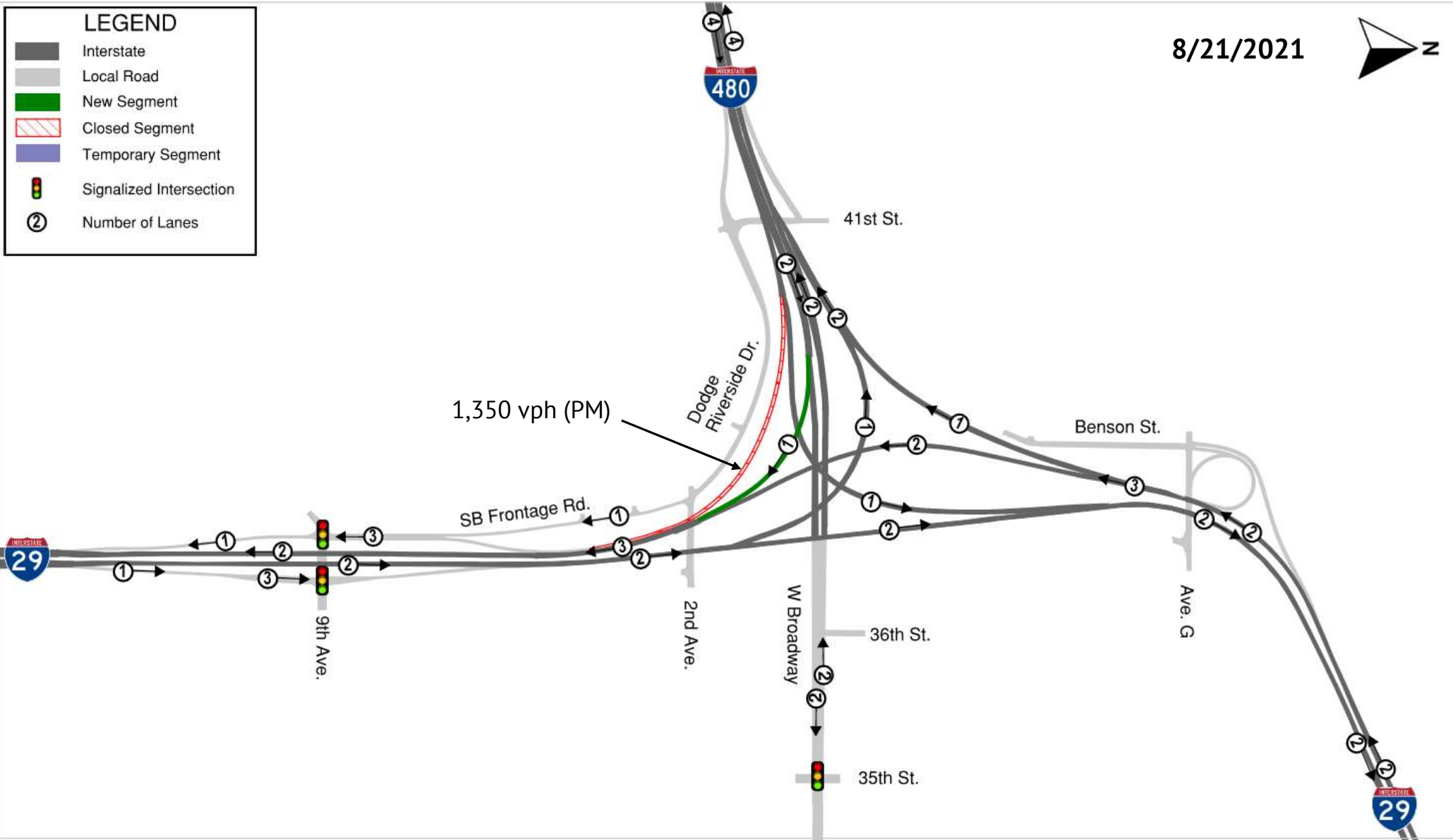


8/21/2021



LEGEND








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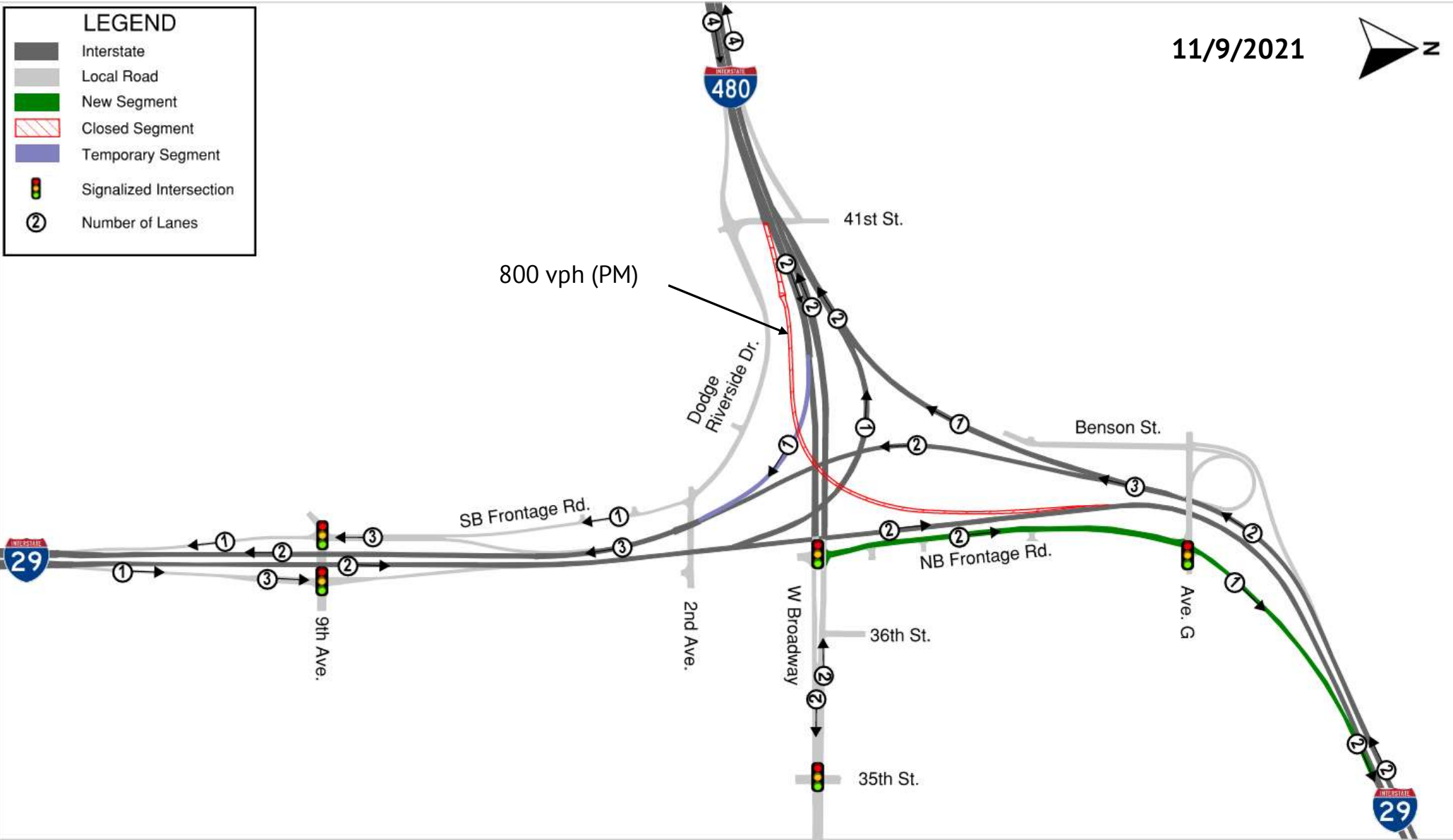


11/9/2021



LEGEND








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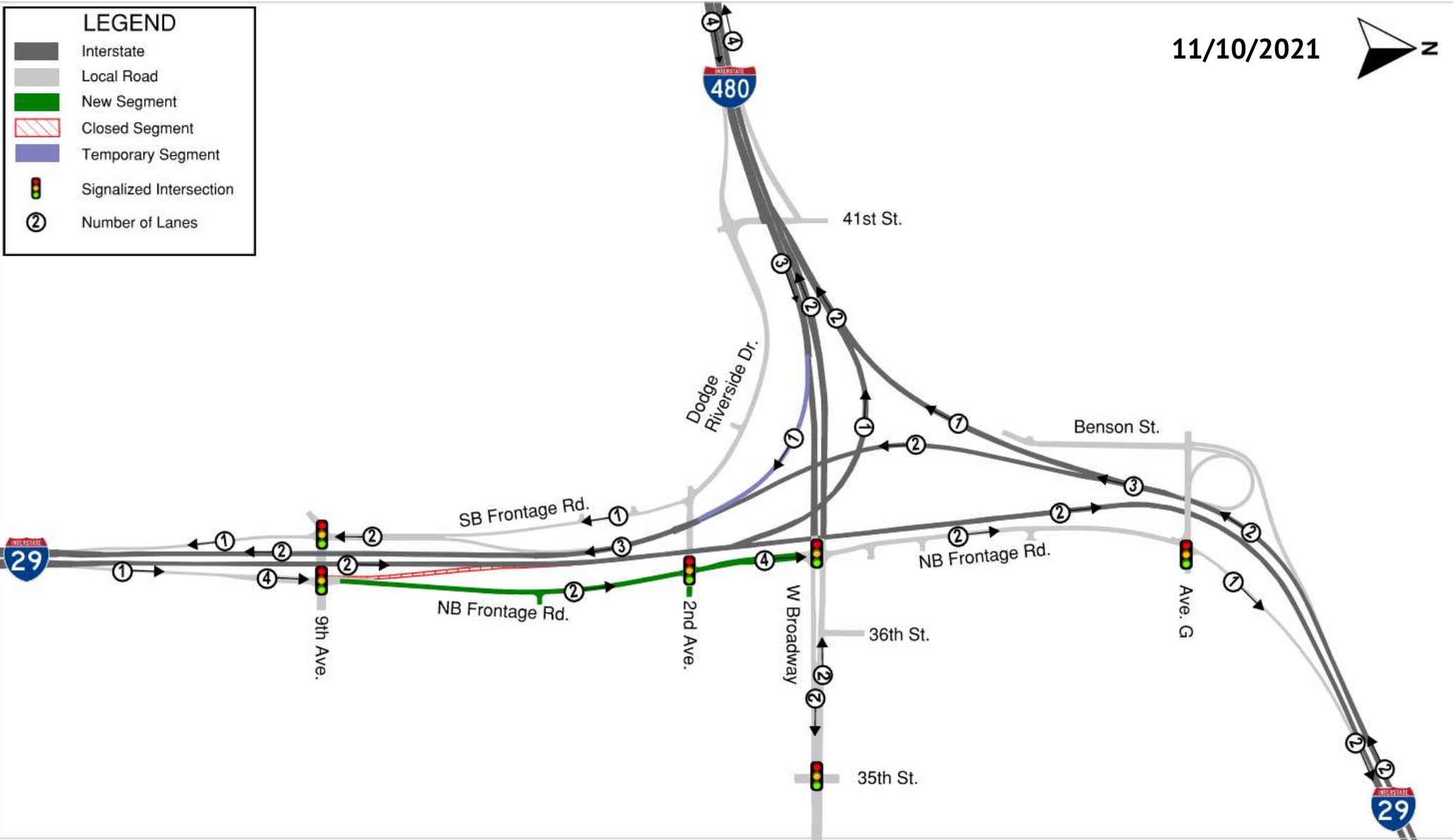


11/10/2021



LEGEND








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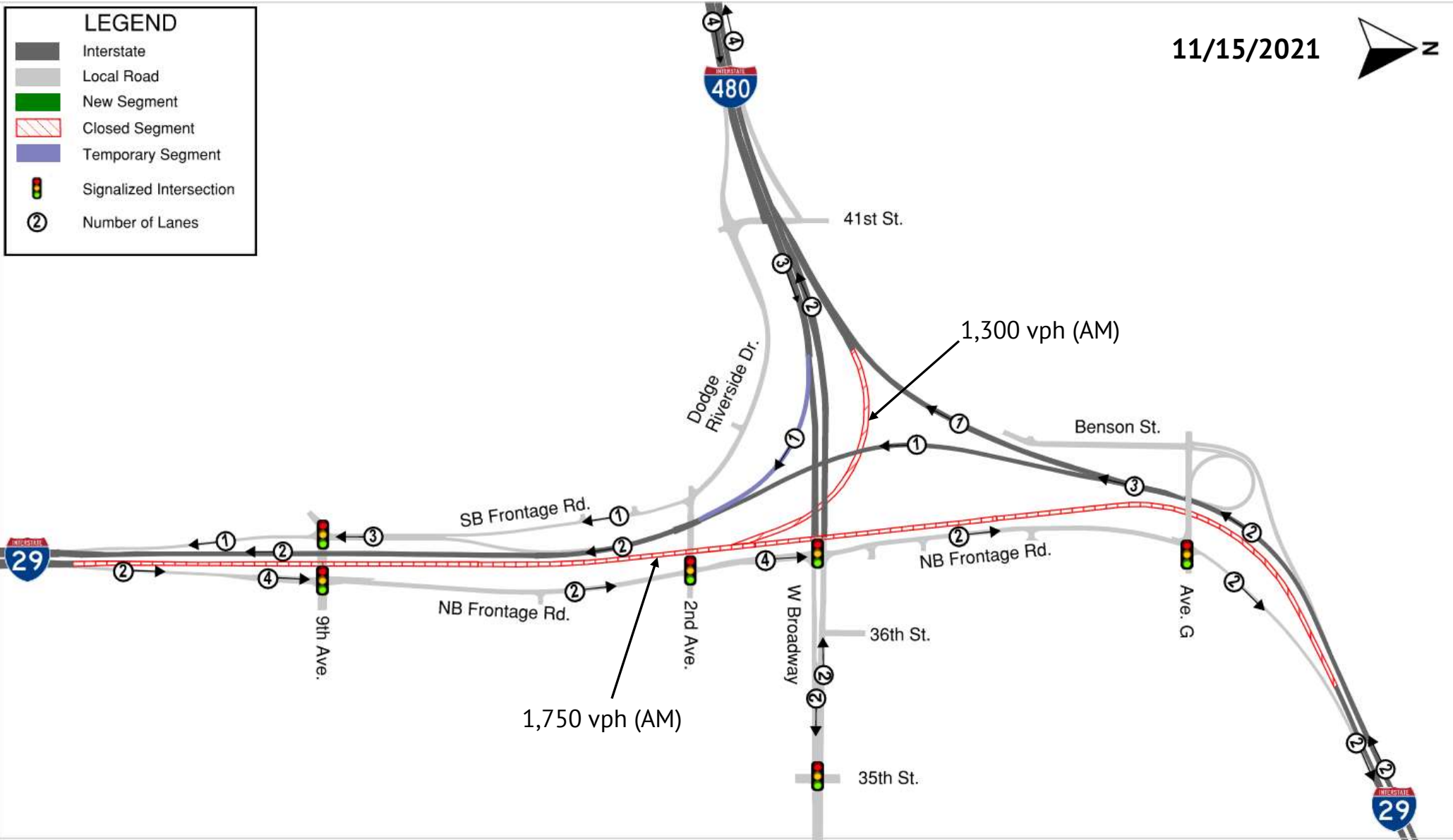


11/15/2021



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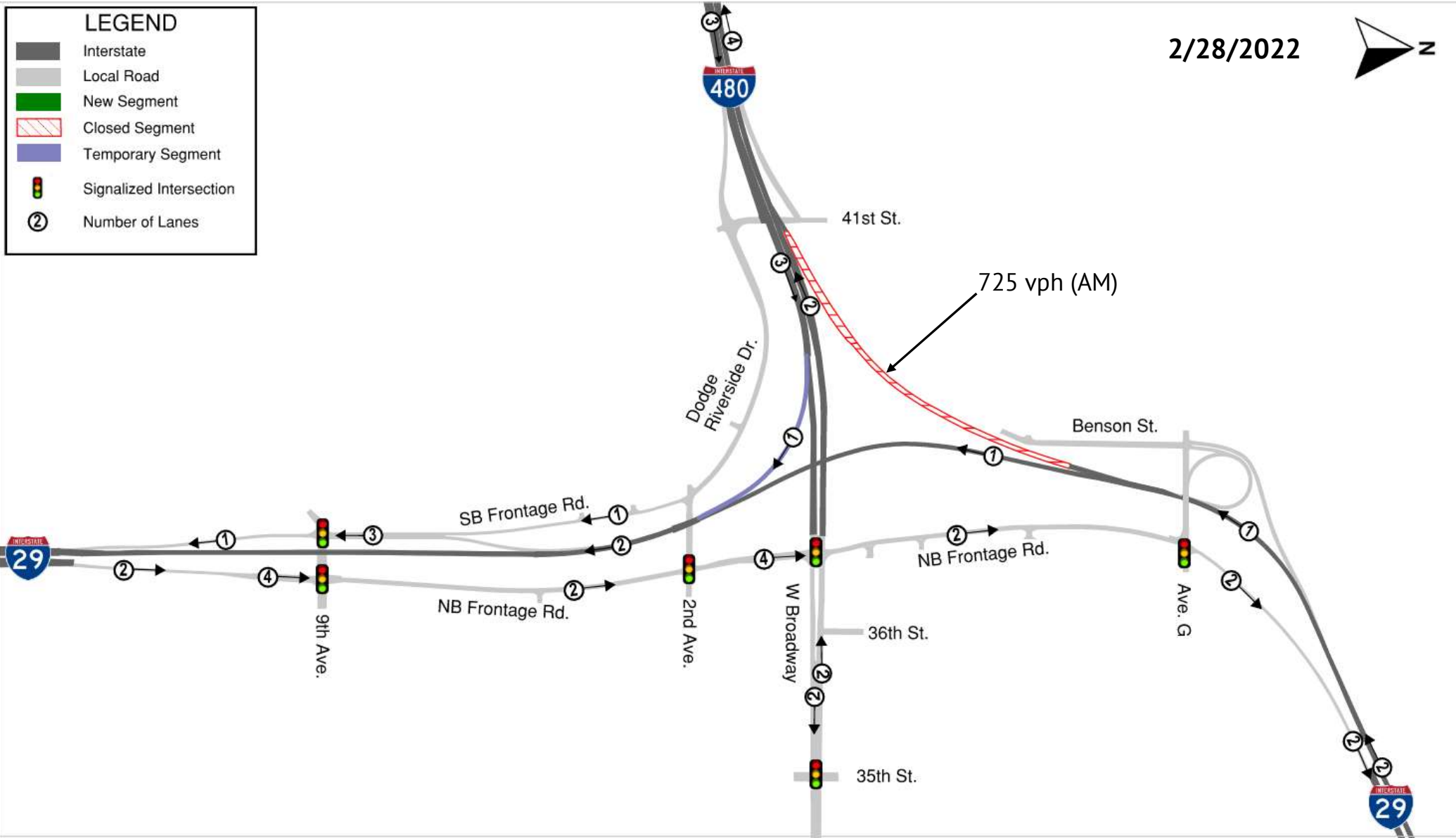


2/28/2022



LEGEND








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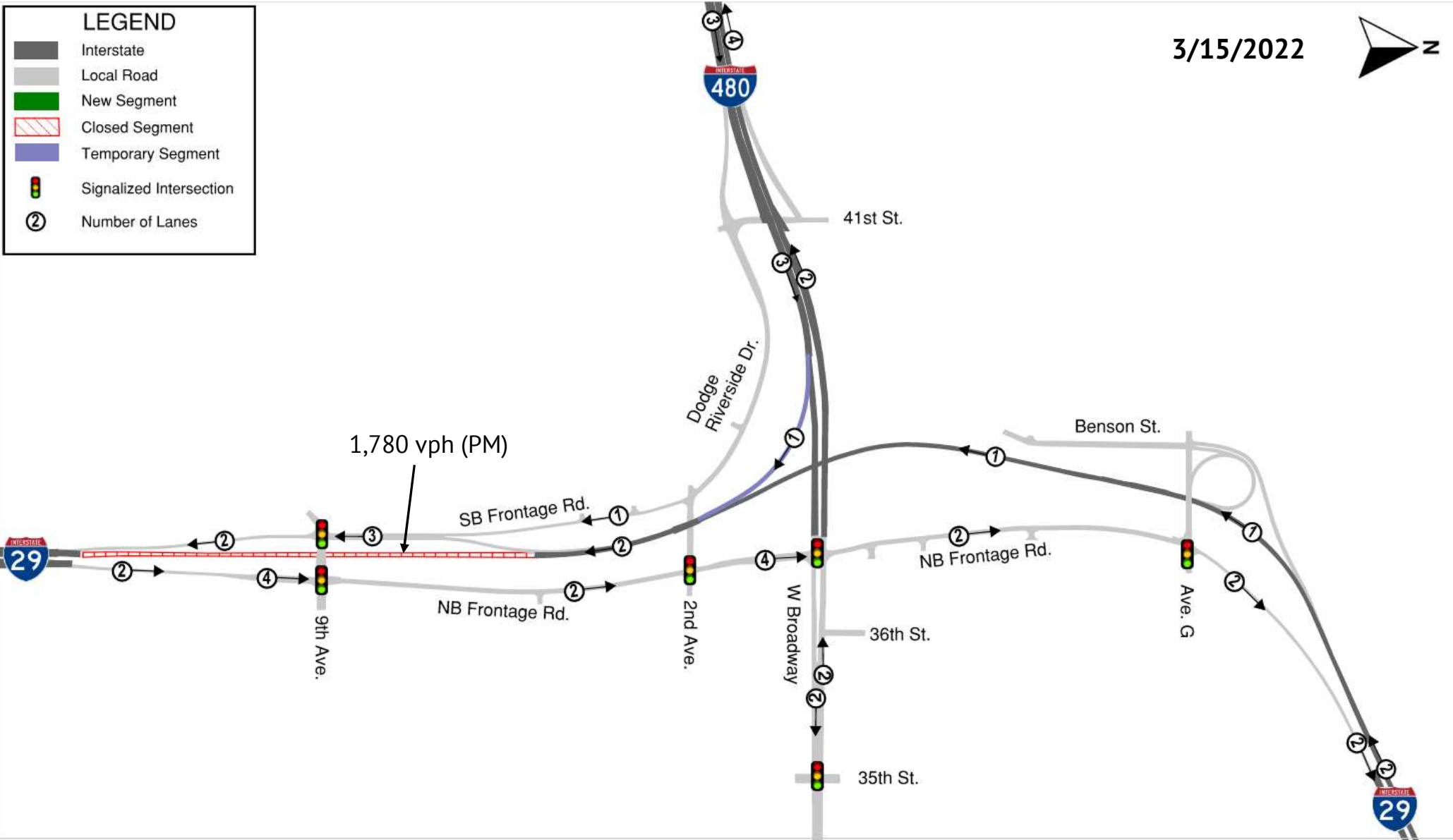


3/15/2022



LEGEND








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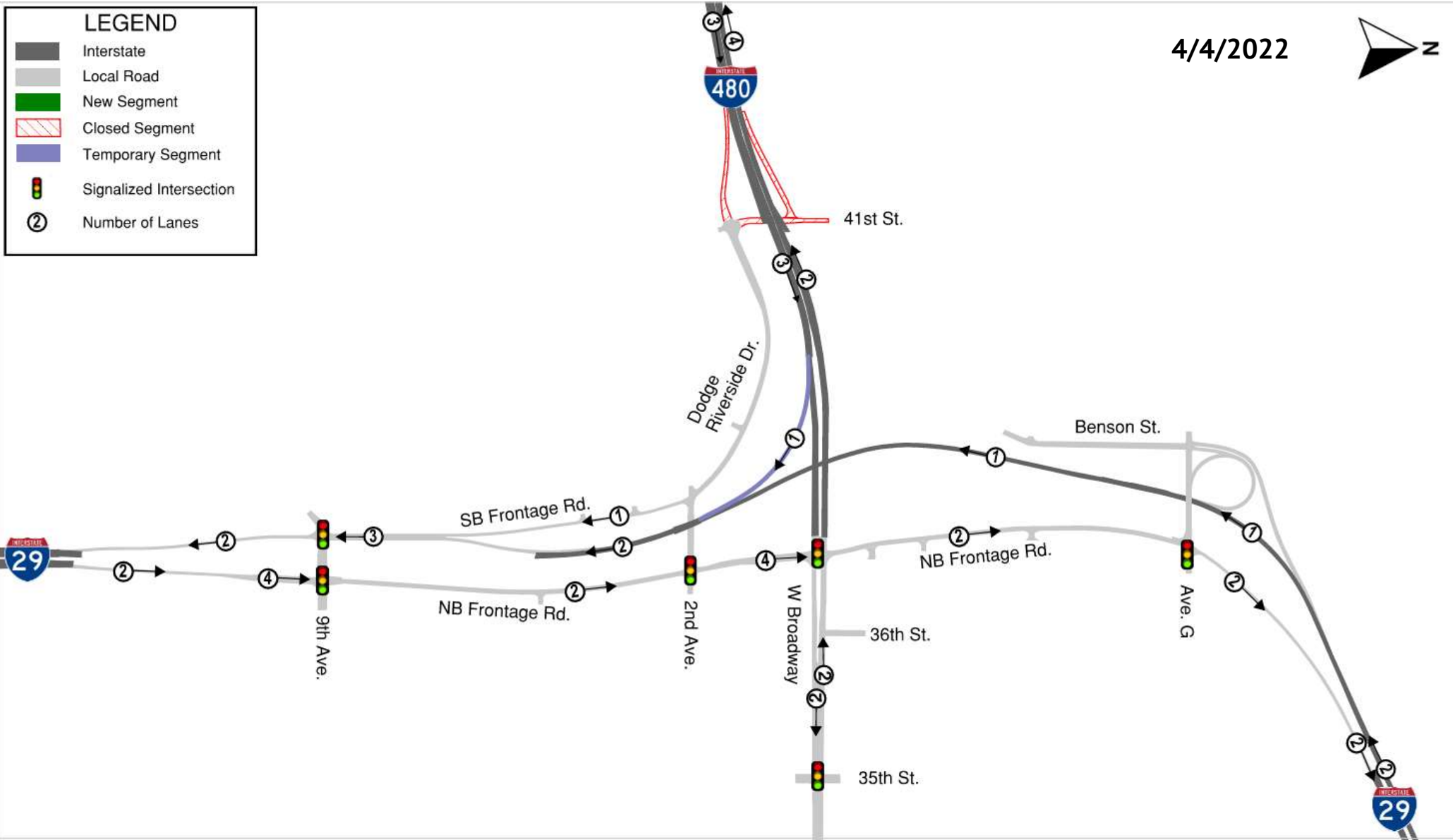


4/4/2022



LEGEND








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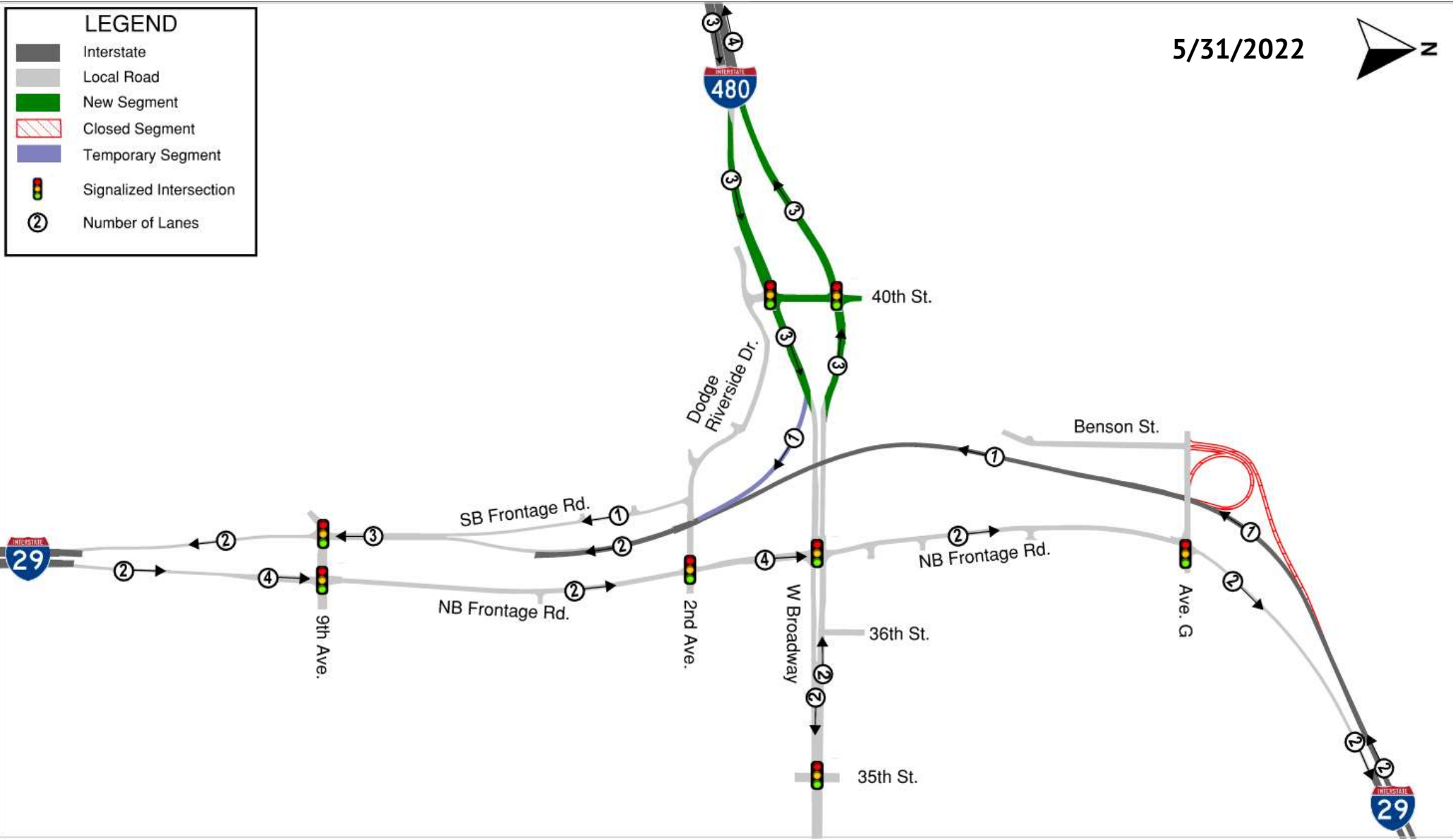


5/31/2022



LEGEND








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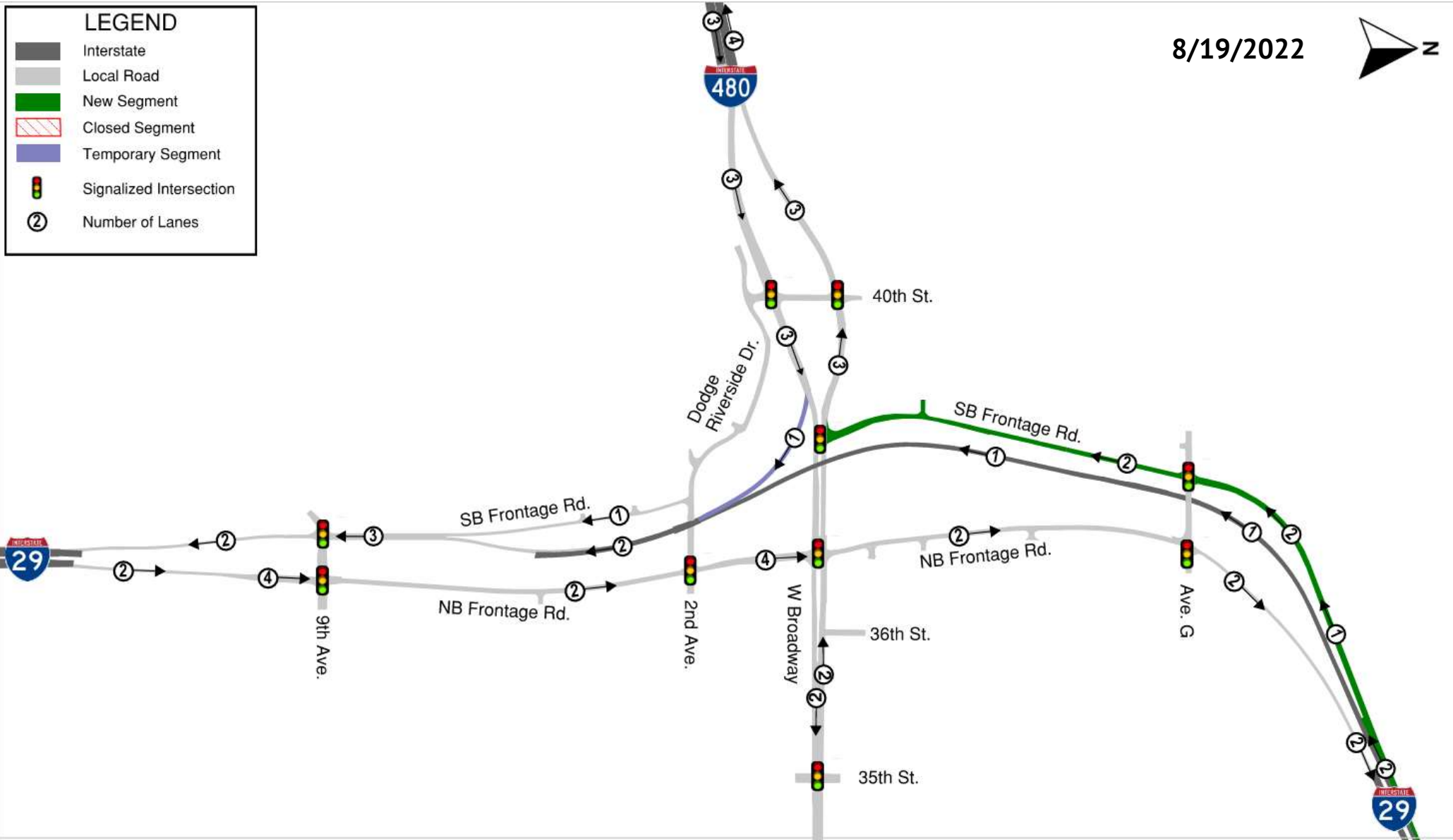


8/19/2022



LEGEND








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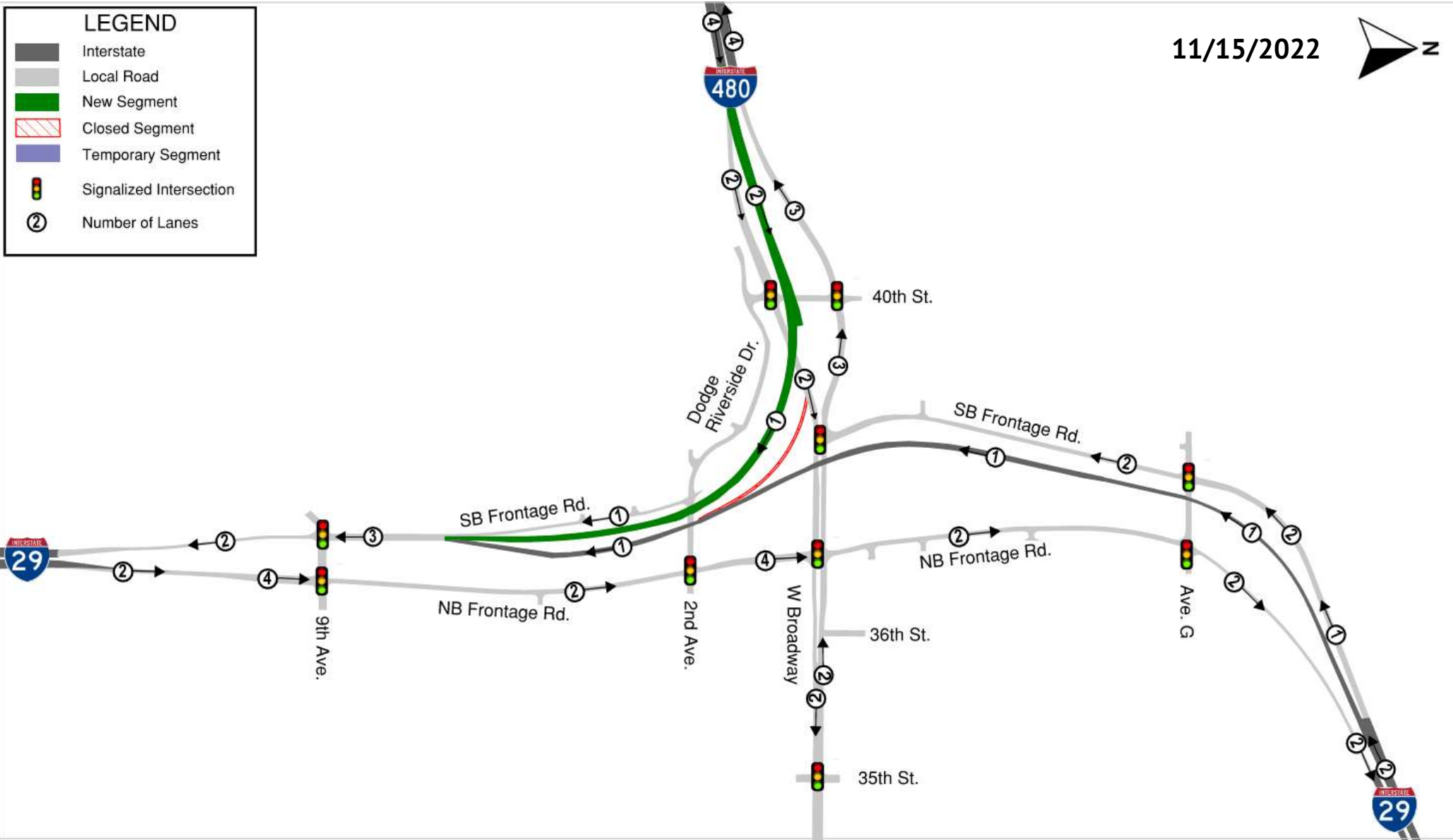


11/15/2022



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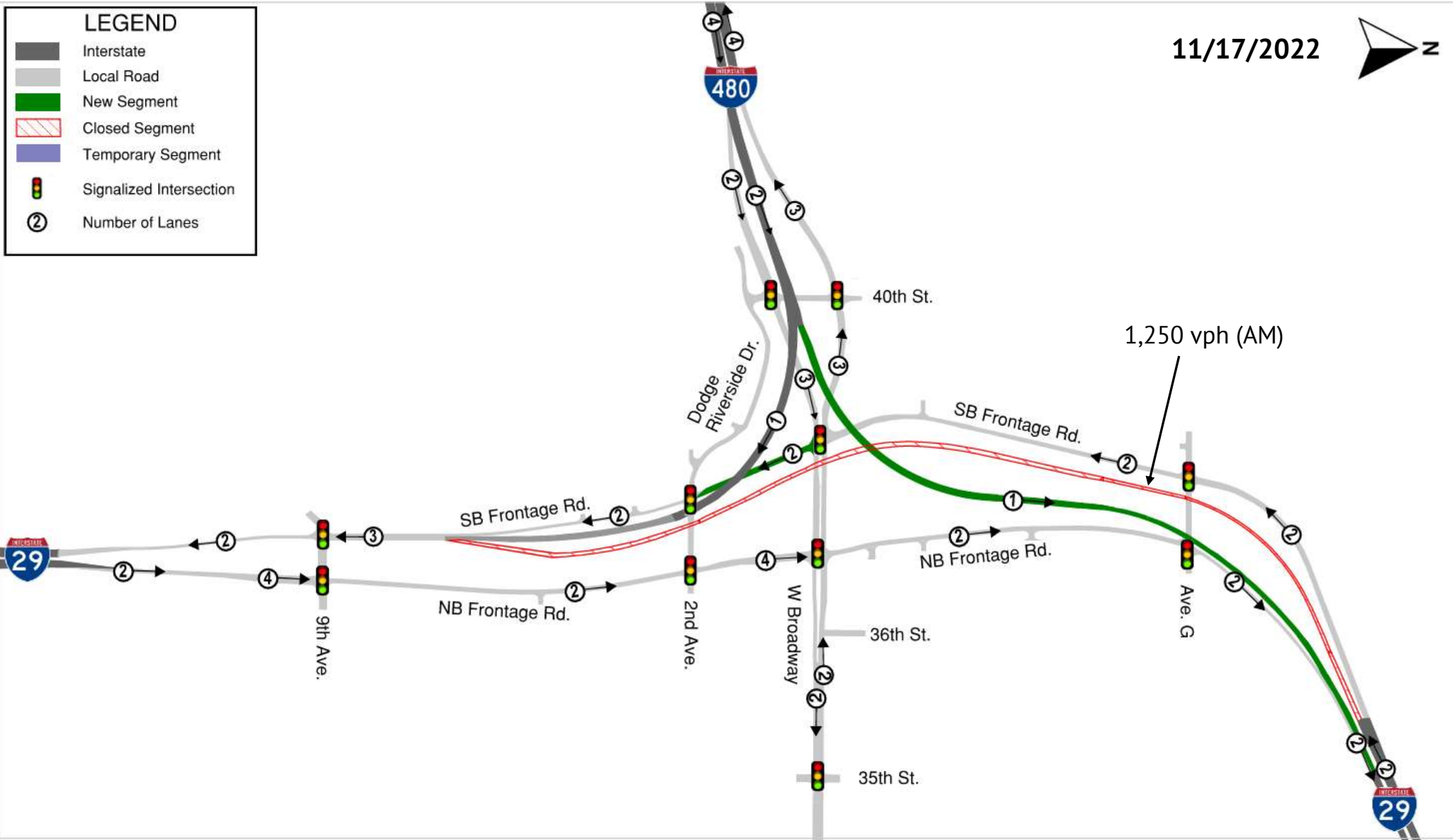


11/17/2022



LEGEND

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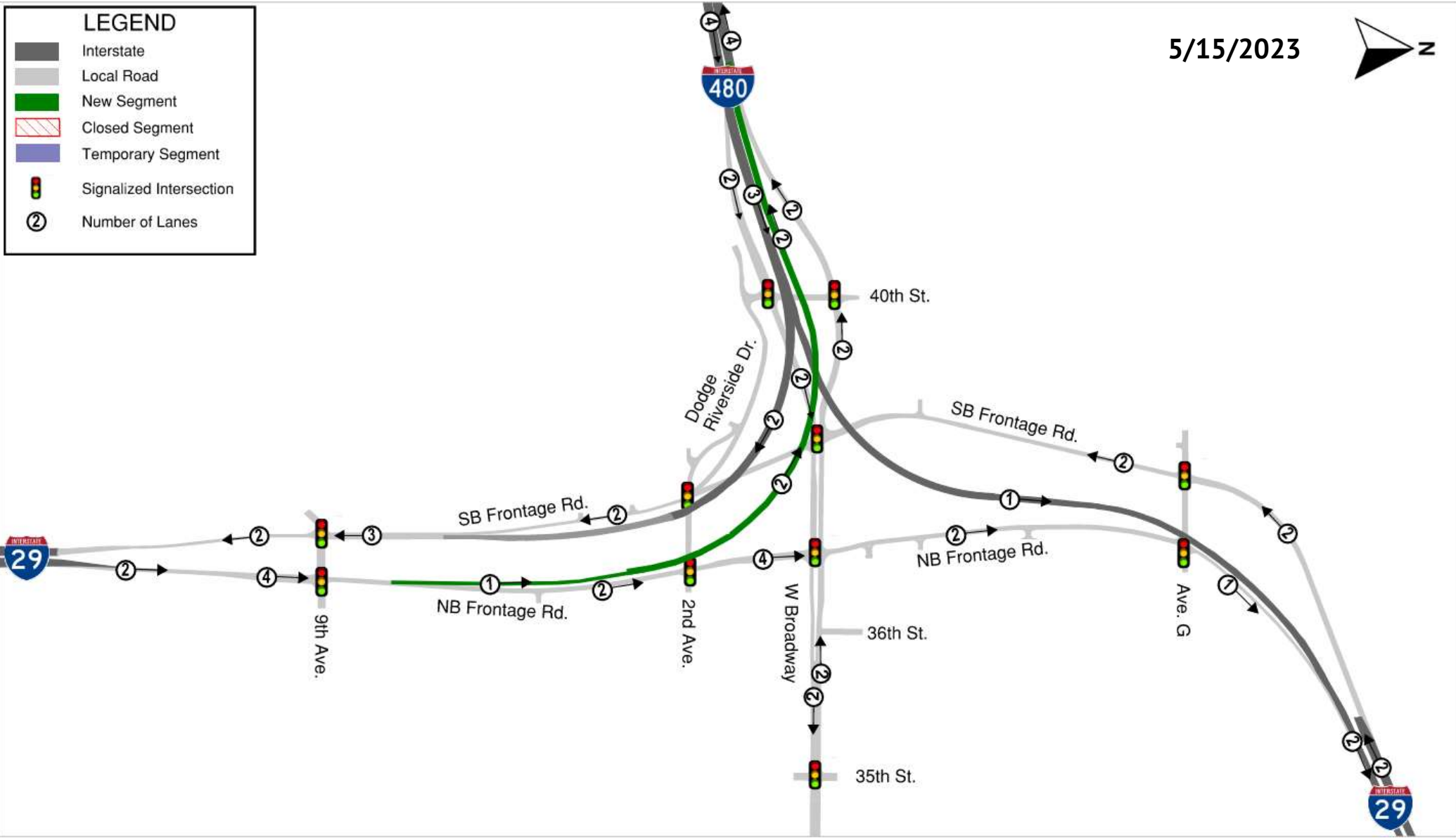


5/15/2023










LEGEND

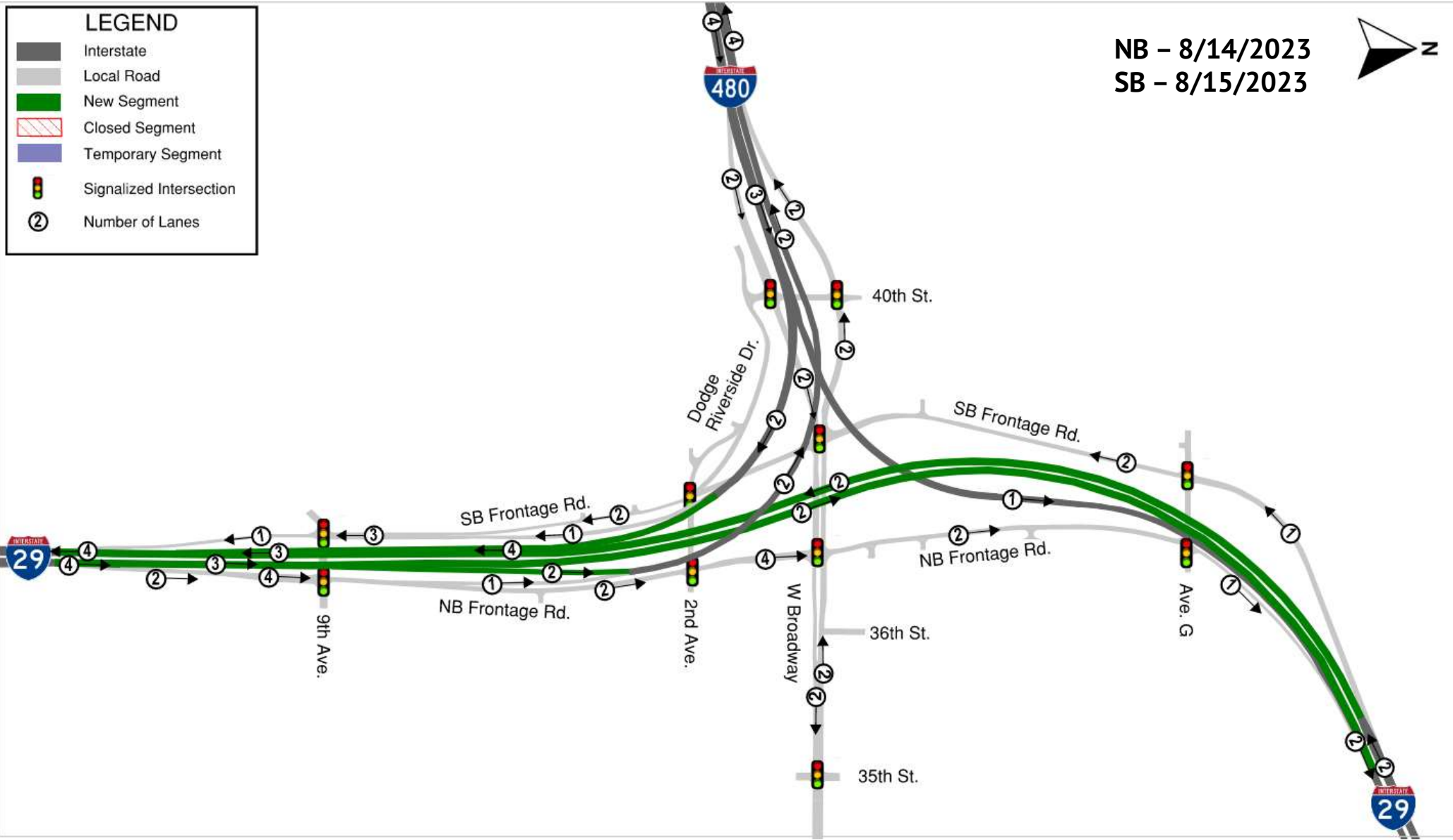
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





NB - 8/14/2023
 SB - 8/15/2023

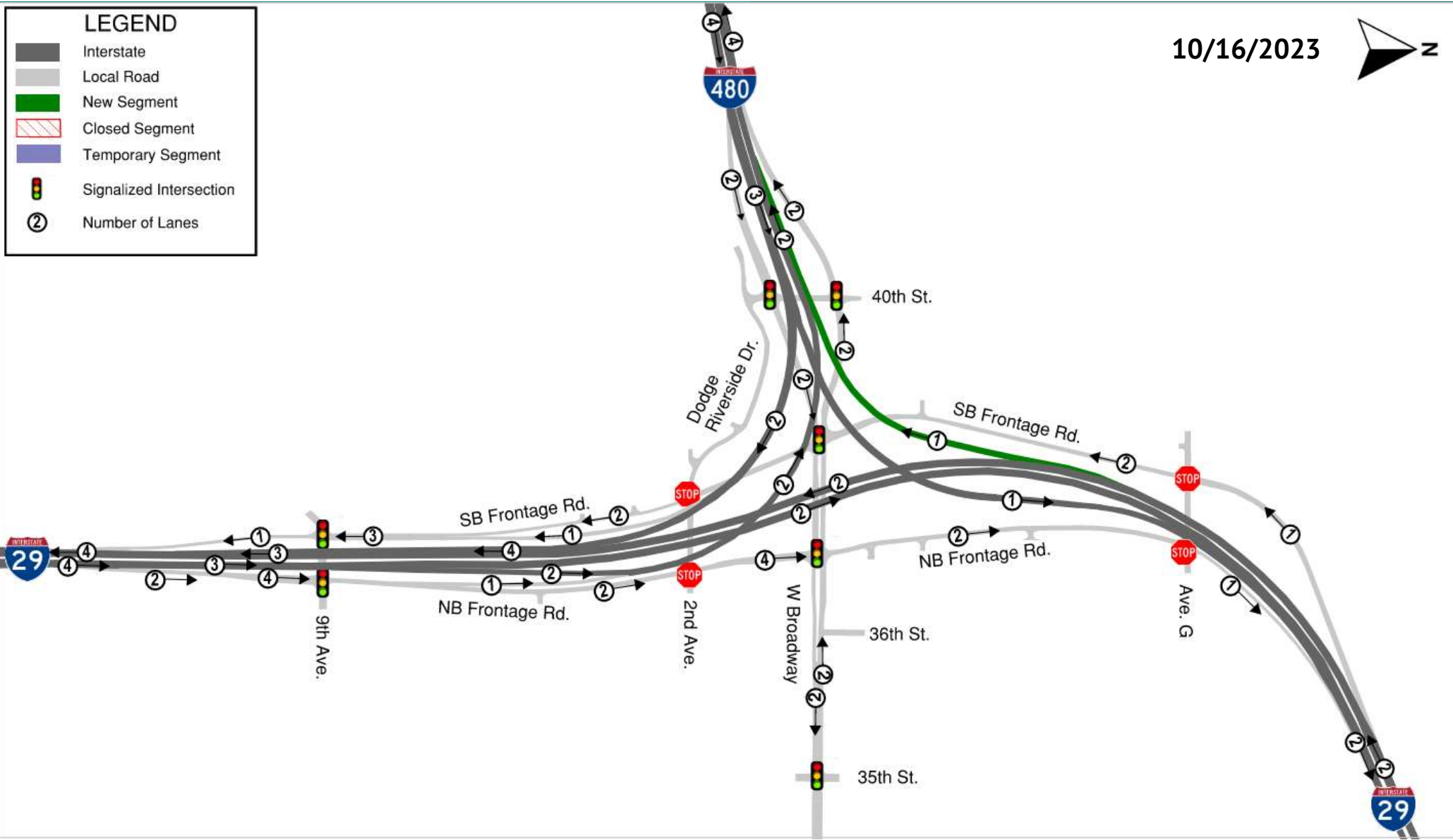


10/16/2023



LEGEND

-  Interstate
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-  New Segment
-  Closed Segment
-  Temporary Segment
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-  Number of Lanes





Signal & ITS Design

11 Total Signals

3 Existing

4 New & Temporary

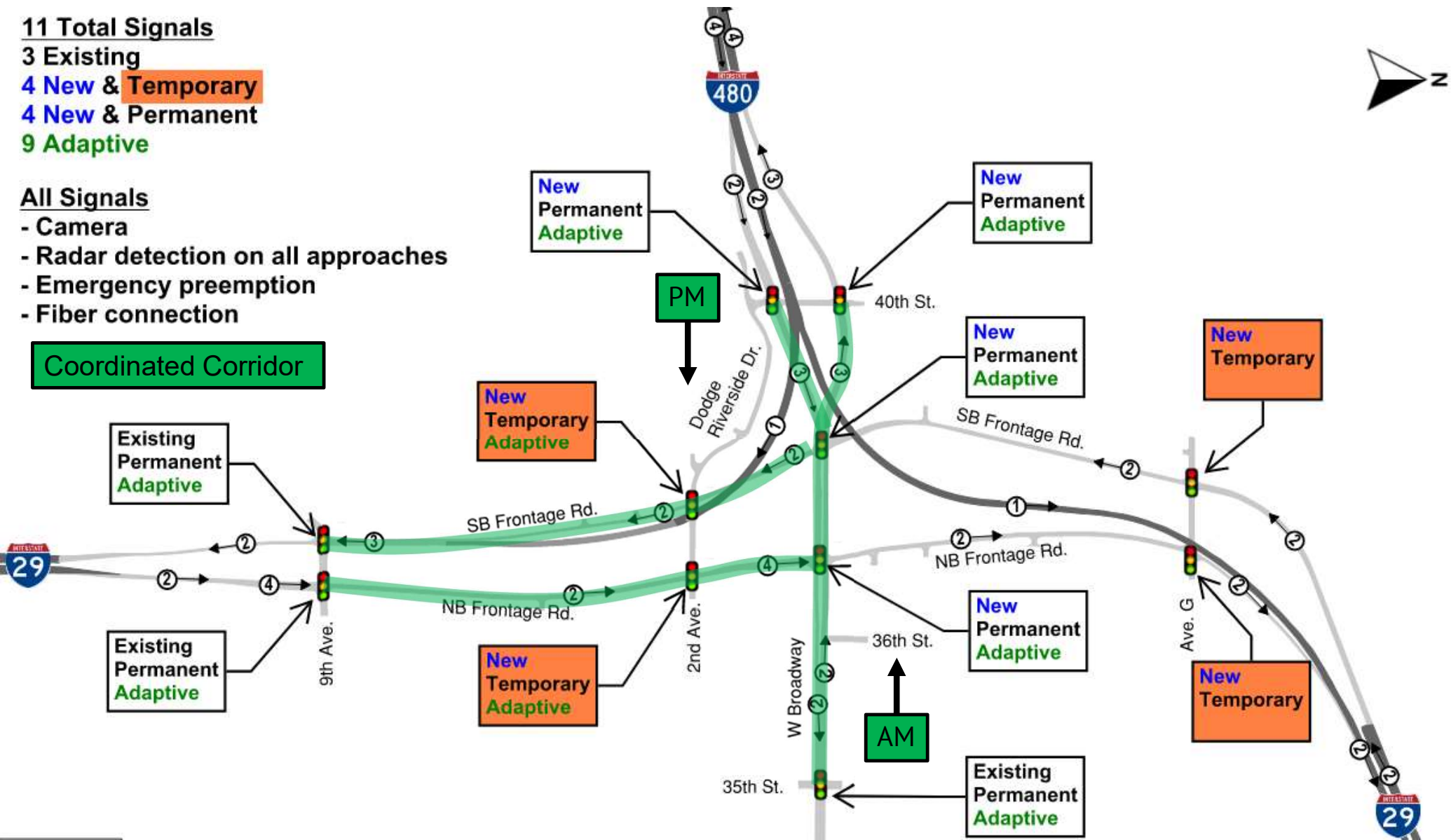
4 New & Permanent

9 Adaptive

All Signals

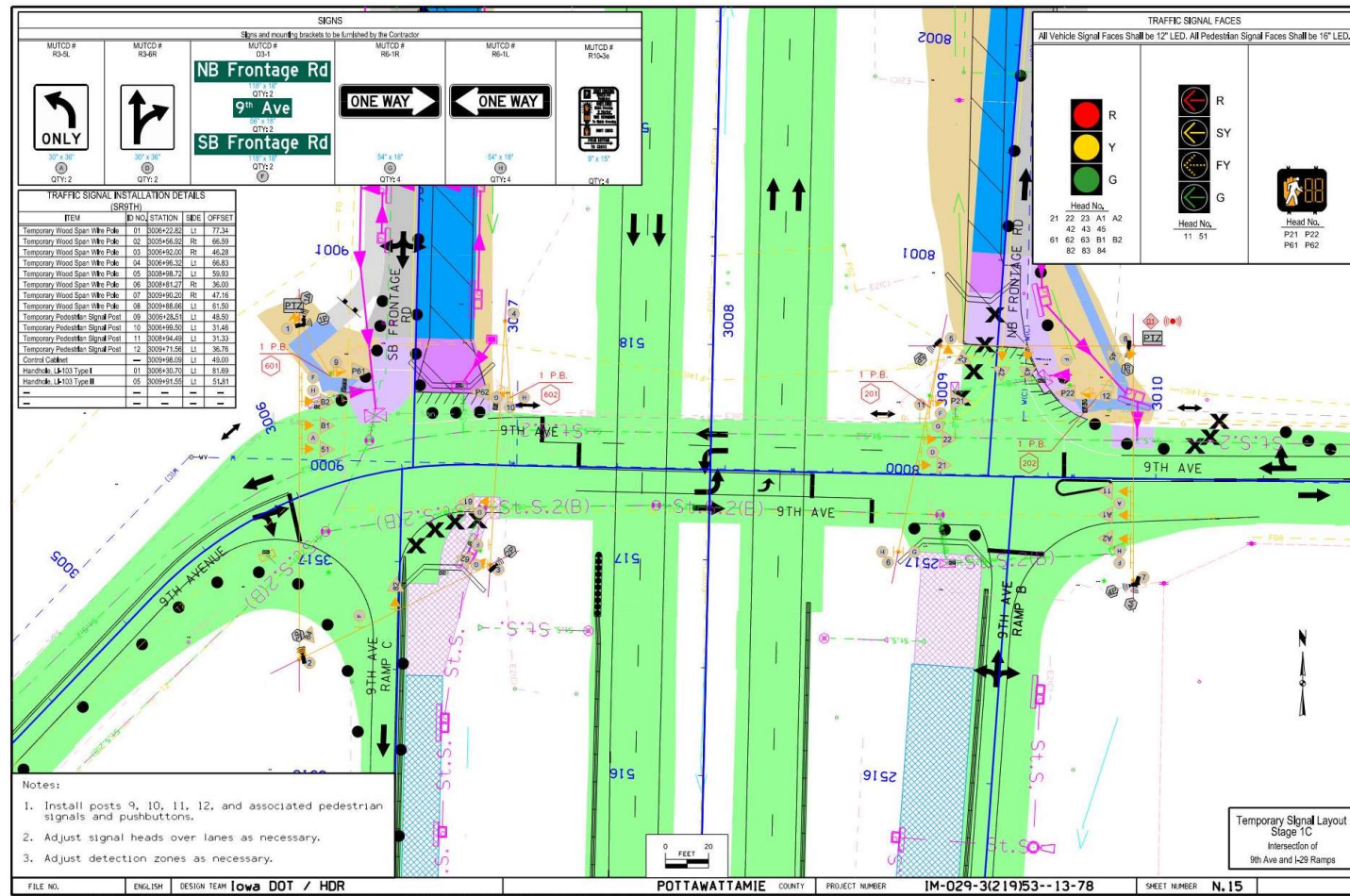
- Camera
- Radar detection on all approaches
- Emergency preemption
- Fiber connection

Coordinated Corridor



ADAPTIVE SIGNAL DESIGN

- Signal Face Arrangements
- Lane Assignment Signage
- Sensor Locations
- Detection Zone Layout



DETECTION ZONE LAYOUT

NB Frontage Road and West Broadway



Stop Bar Detector

Advanced Detector

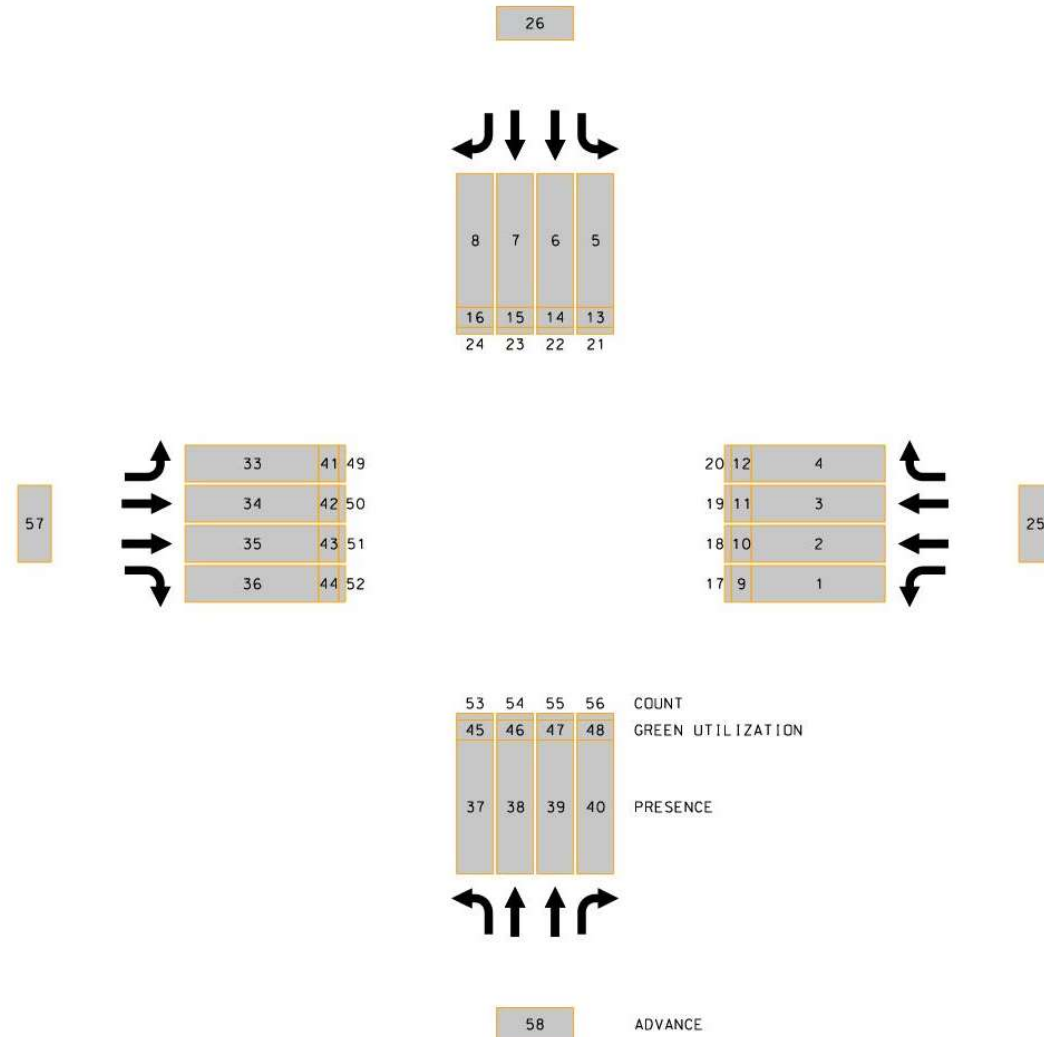


Notes:
1. Detection zones to be coordinated with the City of Council Bluffs and set in accordance with the manufacturer's specifications.

Detection Zone Layout
Intersection of
W Broadway and NB Frontage Rd

DETECTION ZONE LAYOUT

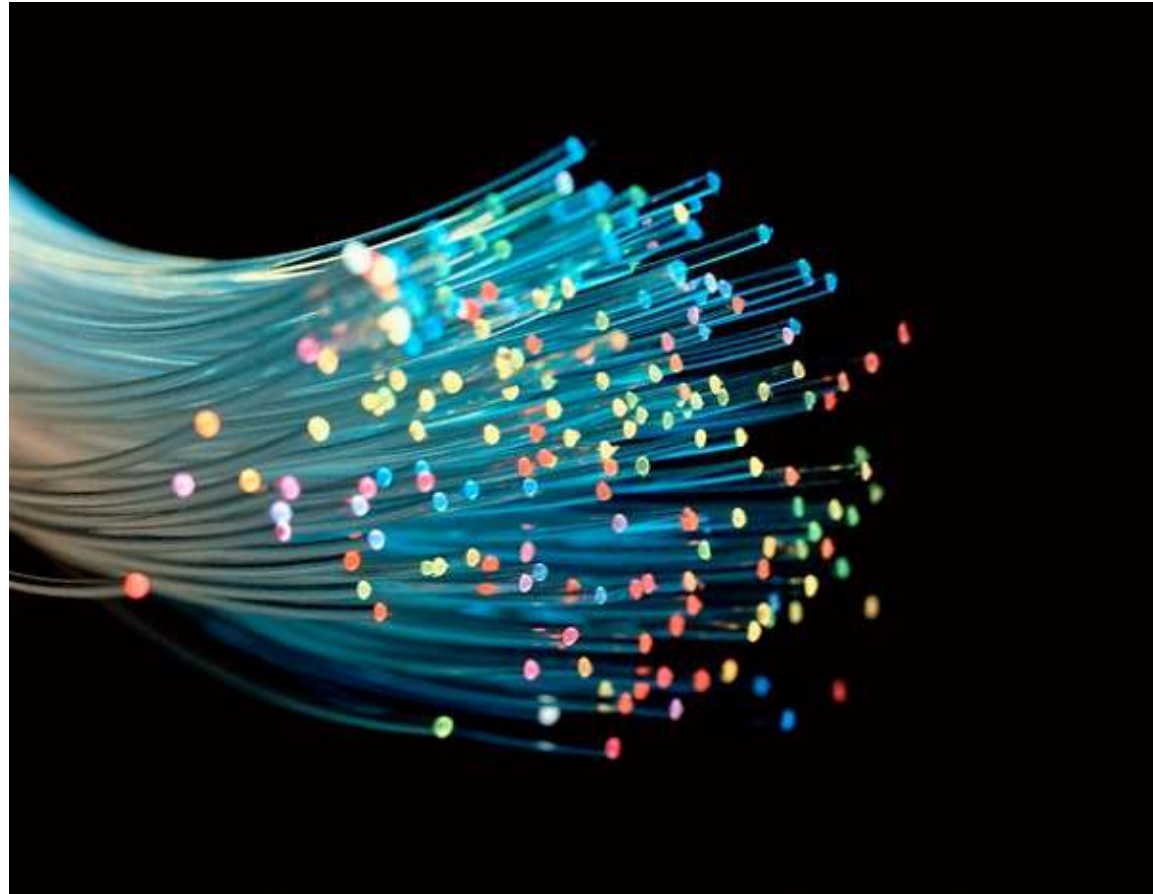
- Detector zone layout to standardize zone and channel assignments per lane.
 - Presence
 - Green Utilization
 - Count
 - Advance
- Utilized Wavetronix template to get uniform application at each intersection.



FIBER NETWORK










- Maintaining Existing Fiber Optic Network
- Planning for New Installation
- Control Outages through Redundancy

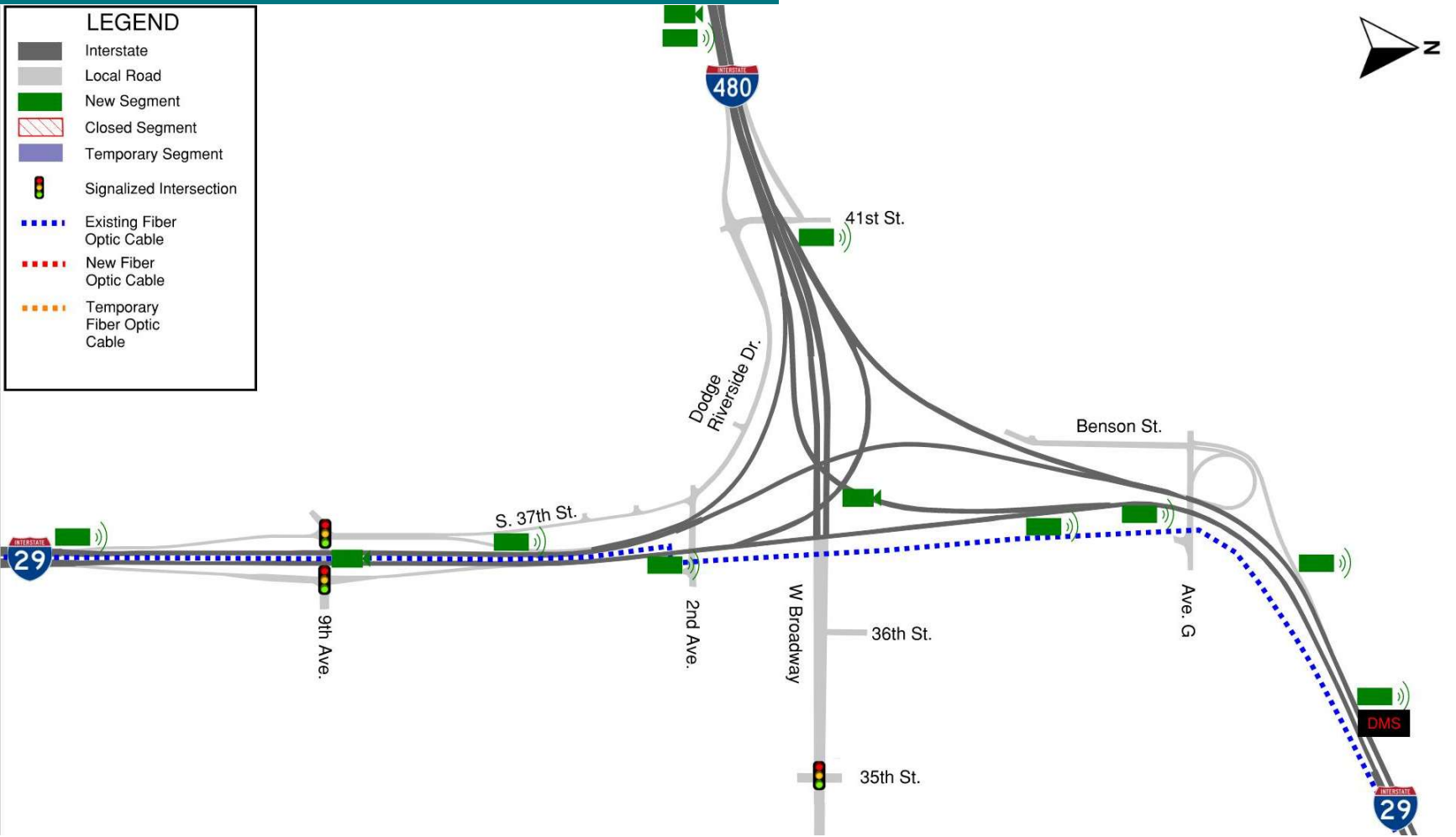
ITS staging set up to maximize use of existing devices and bring new devices online ASAP



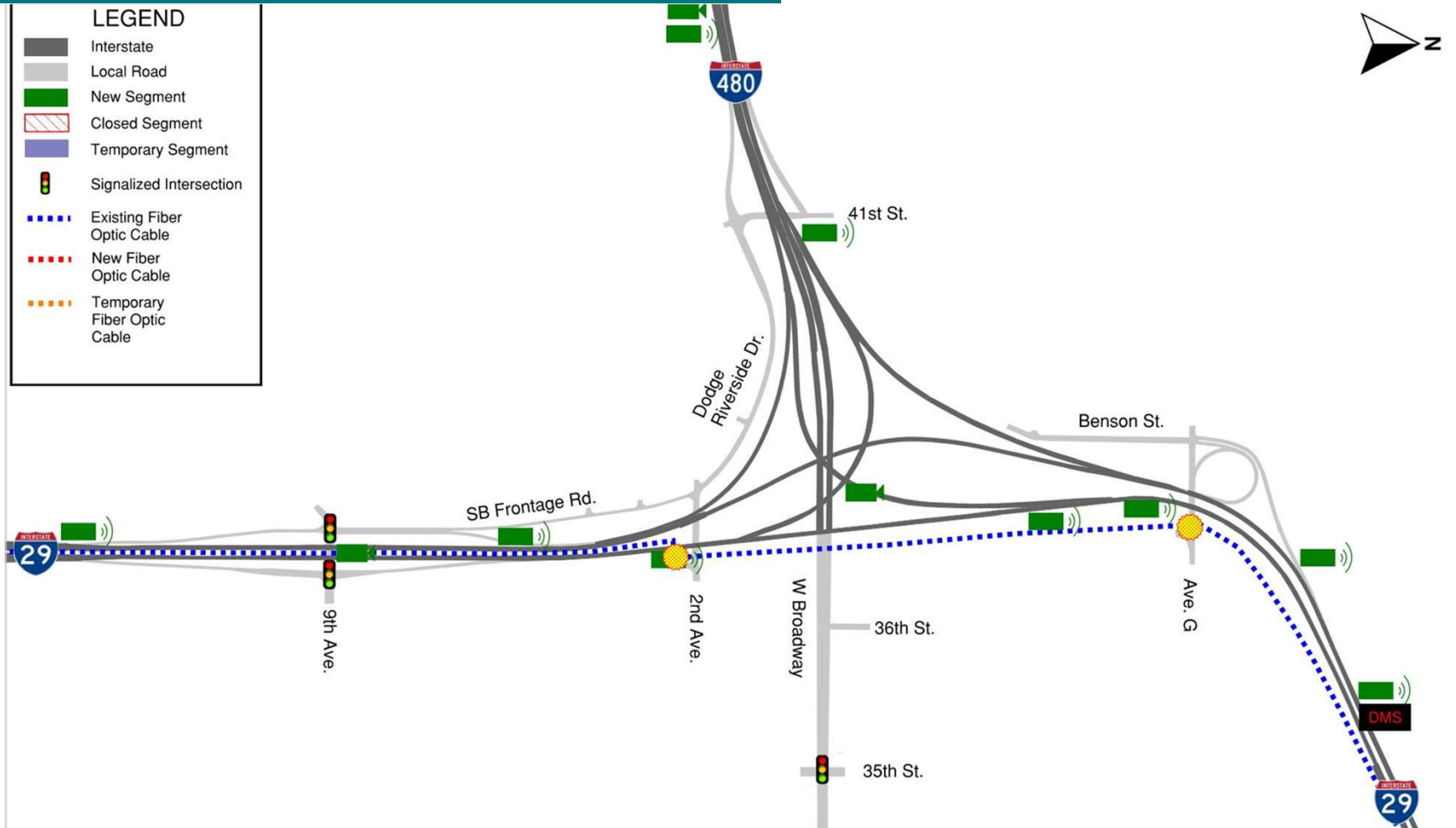
ITS STAGING OVERVIEW

LEGEND

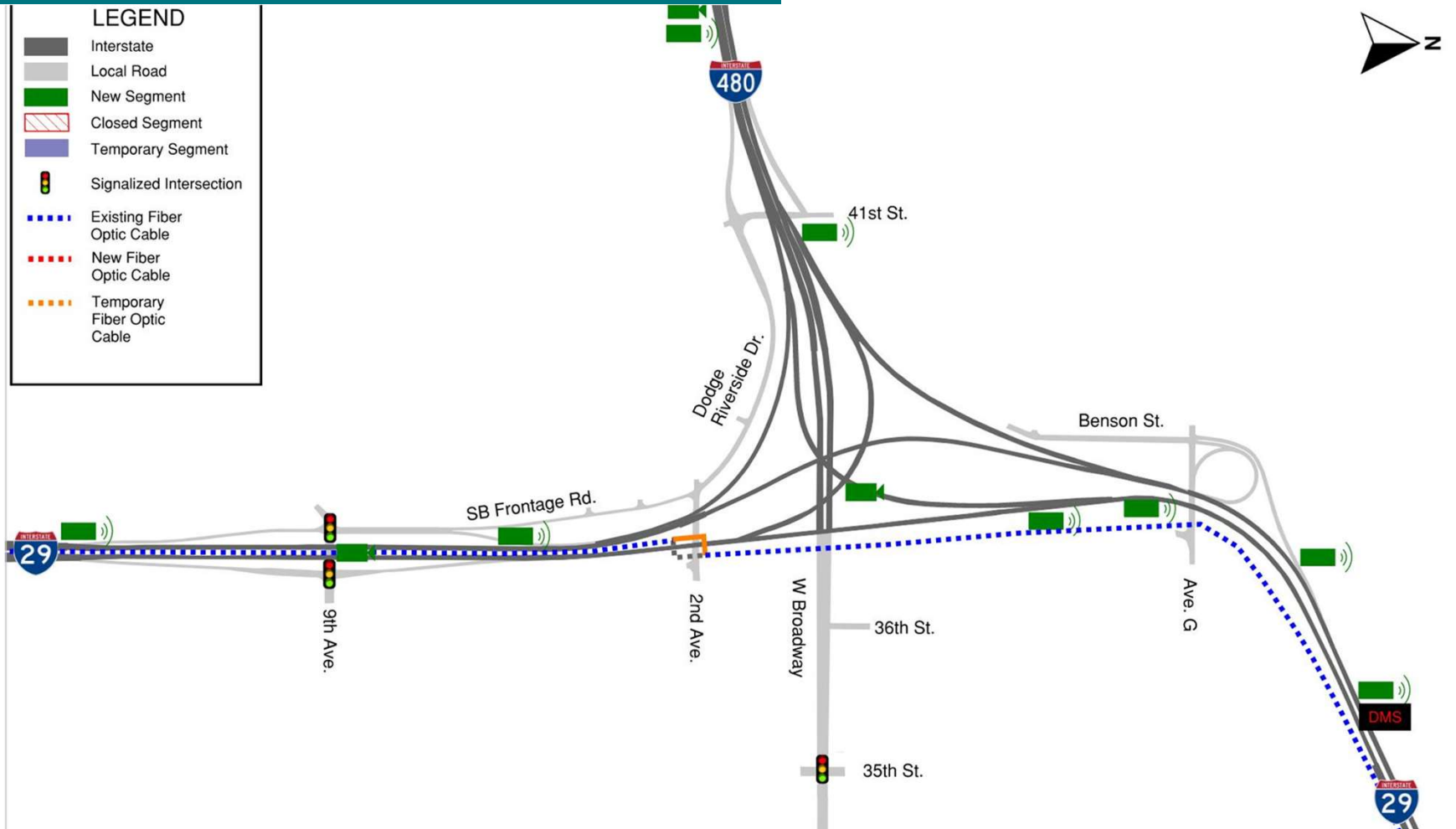
-  Interstate
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-  Signalized Intersection
-  Existing Fiber Optic Cable
-  New Fiber Optic Cable
-  Temporary Fiber Optic Cable



ITS STAGING OVERVIEW



ITS STAGING OVERVIEW



ITS STAGING OVERVIEW

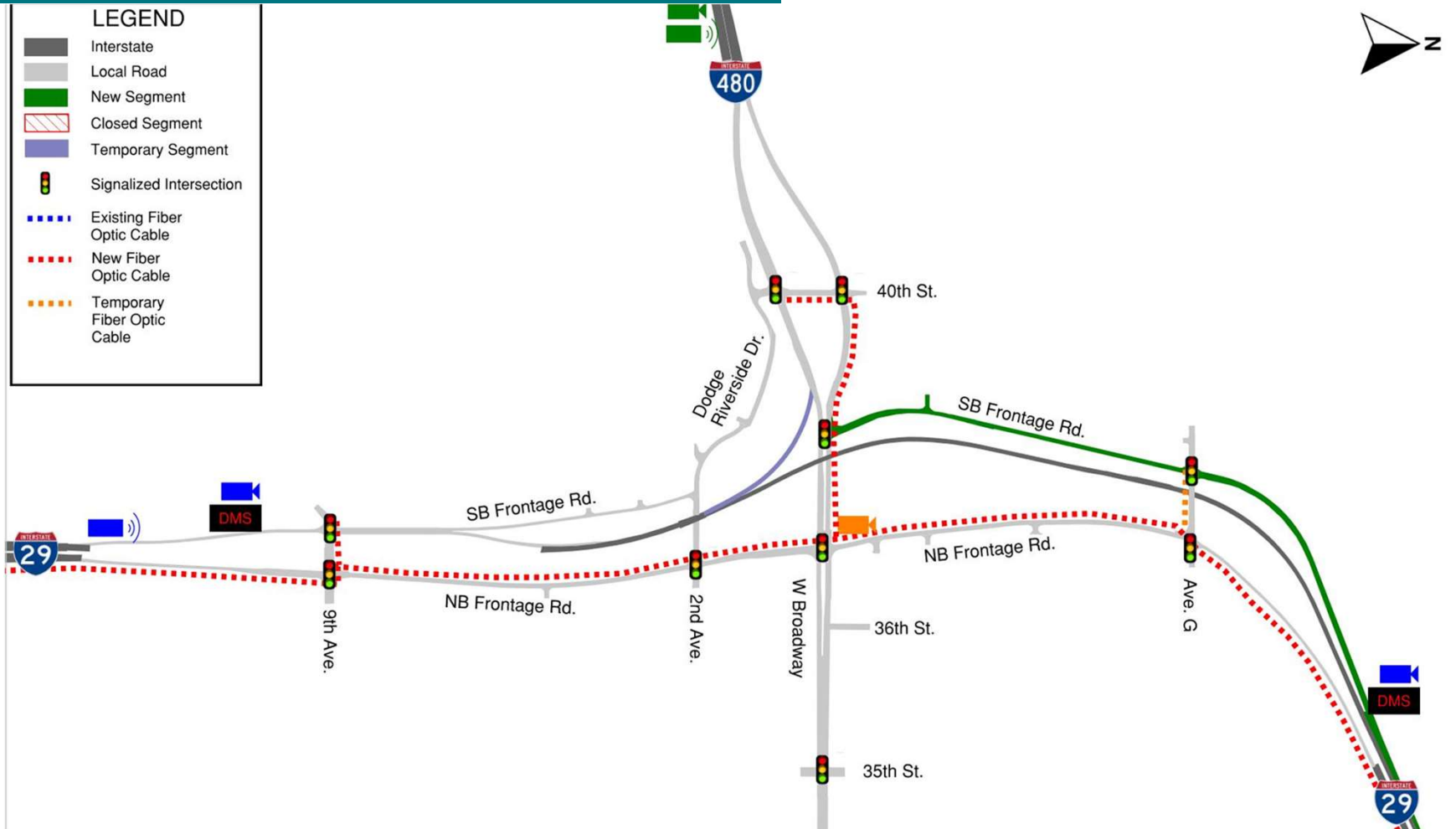
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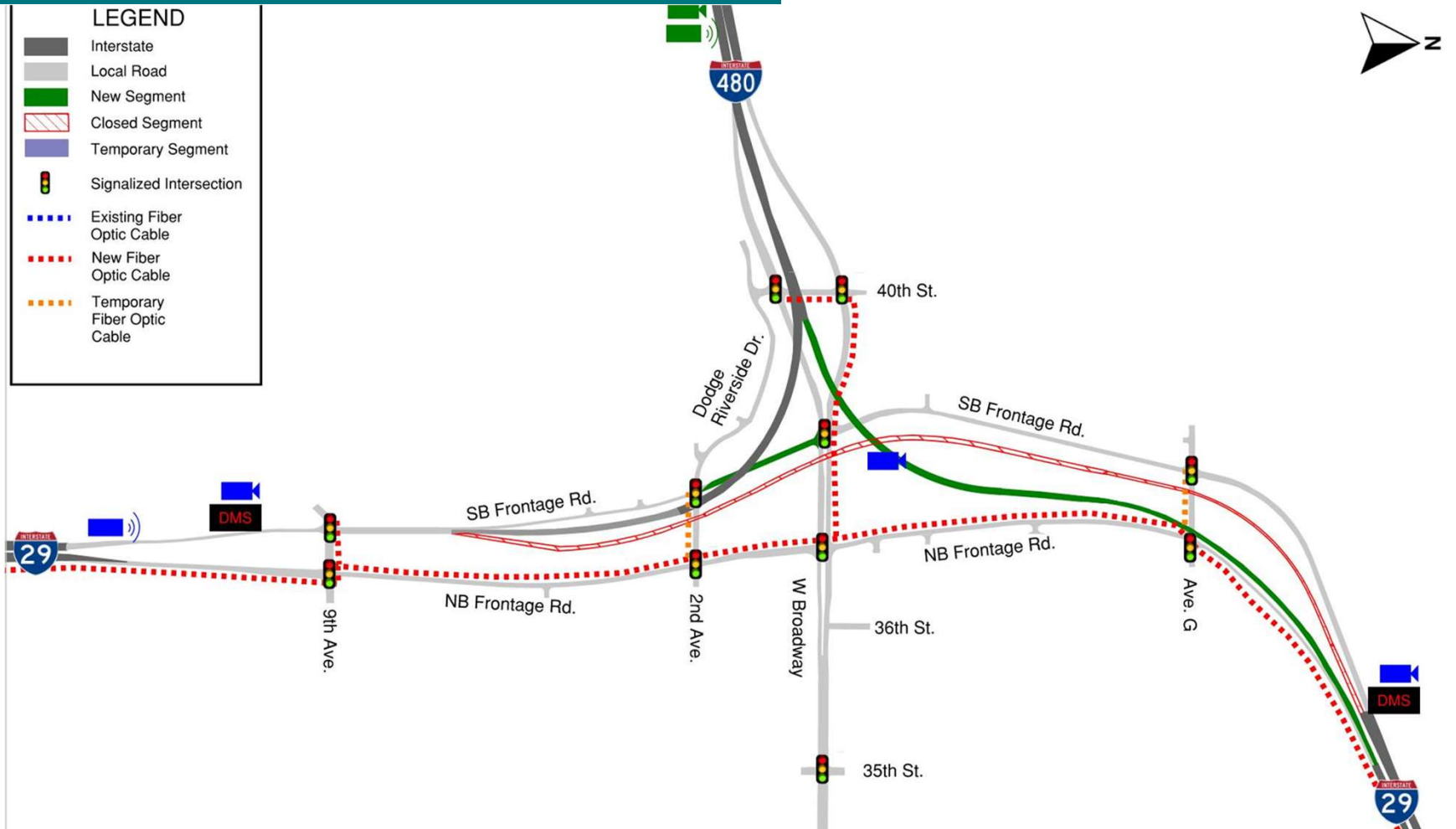
ITS STAGING OVERVIEW



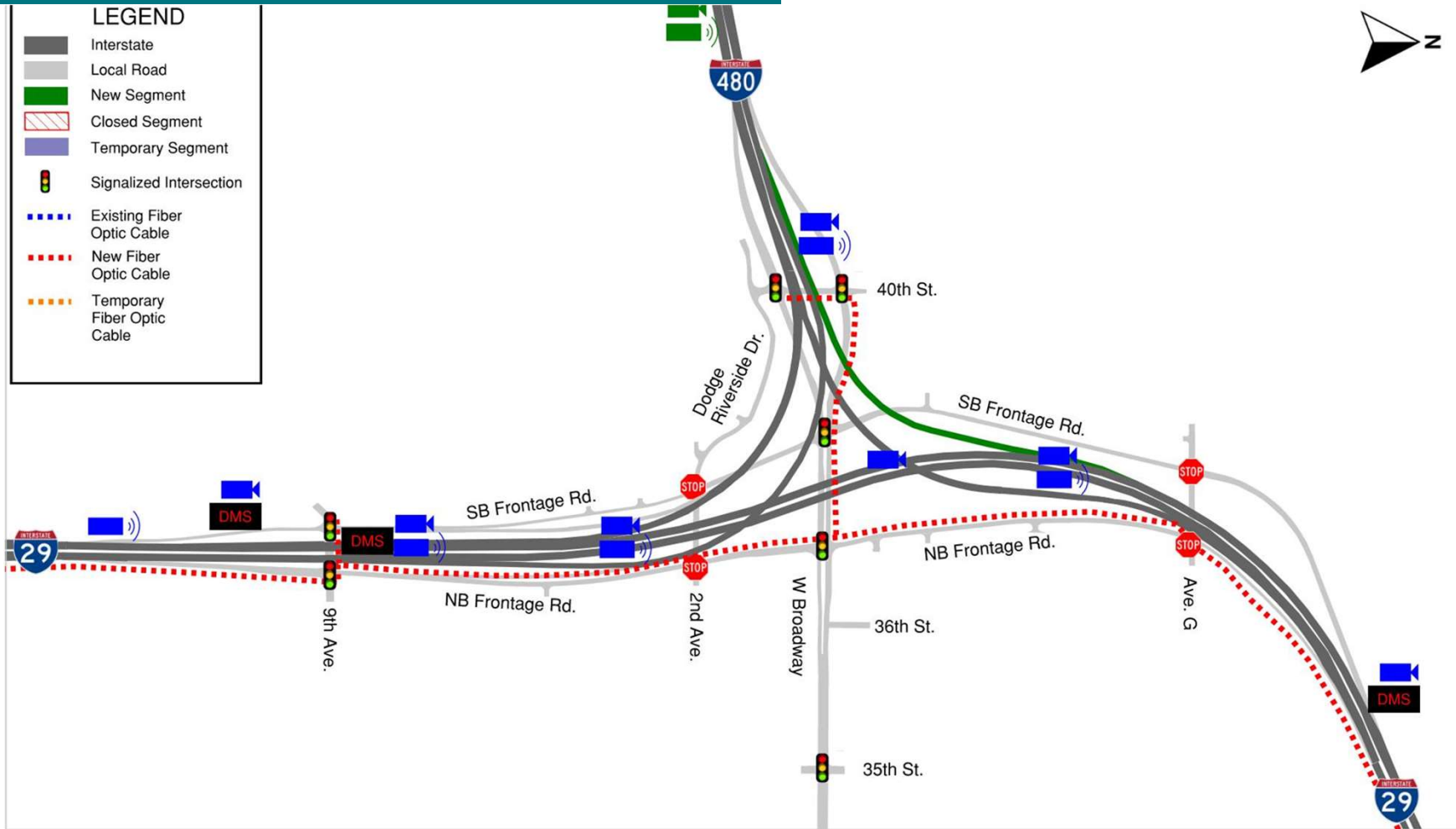
ITS STAGING OVERVIEW



ITS STAGING OVERVIEW



ITS STAGING OVERVIEW



CITY ATMS

Advanced Traffic Management System

Live Adaptive View

Live Detector View

Live Controller View

Live Camera View

The screenshot displays the CITY ATMS interface with four distinct views:

- Live Adaptive View:** Shows a table of intersection status and phase data.
- Live Detector View:** Shows a sensor setup for '3-Verification' with 8 lanes (1N-8P) and a map of the intersection.
- Live Controller View:** Shows a detailed view of the 1510 NB Frontage @ Broadway controller, including status, coordination, and a map of the area.
- Live Camera View:** Shows a live camera feed of the intersection with a timestamp of 2022-05-16 16:35:02.

ID	
Intersection Status	
Status	Active
Last Error	15:46 (33) Controller
Comm Pass%	100
Active Database	3
Active Pattern	23
Active Cycle	120
Active Offset	67

Phase	1	2	3	4
Next Split	45	40	0	35
Projected % Utilization	46	22	0	34
Target Split	45	40	0	35
Green Utilization	21	6	0	12
Green Utilization Error				

1510 - NB Frontage @ Broadway

STATUS: OK CRD STAT: OK COORDINATION: OK

PH: 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

OK: [Grid of lights]

PEL: [Grid of lights]

Out: [Grid of lights]

PCall: [Grid of lights]

Status 17:32

Map: Madison, North, S. Expressway, Southwest, Vets East, Vets West, Broadway West, Kanesville West, Gridsmart Cameras, I-29 Frontage Road

Custom / Favorites, Servers / Cameras, PTZ / 360

Could not find Current User's permissions for Bandwidth Customizations.

I-29 Frontage Road

71 - NB Frontage & W Broadway (172.16.34.1)

2022-05-16 16:35:02

COORDINATION WAS KEY

- Weekly construction meetings
- 2 ASCT coordination meetings before turn-on
 - Logistics
 - Schedule



Ames
Construction



Iowa DOT
HDR



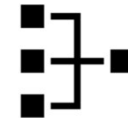
Sadler Electric



CUBIC/
Trafficware



City of Council
Bluffs Public
Works



Commonwealth
Communications

THE BIG DAY APPROACHES...

GETTING YOU THERE COUNCIL BLUFFS INTERSTATE

Northbound lanes of I-29 will be closed for reconstruction between 9th Avenue (Exit 53) and Avenue G in Council Bluffs.

A detour is in operation for thru-traffic, via I-80 and I-880.

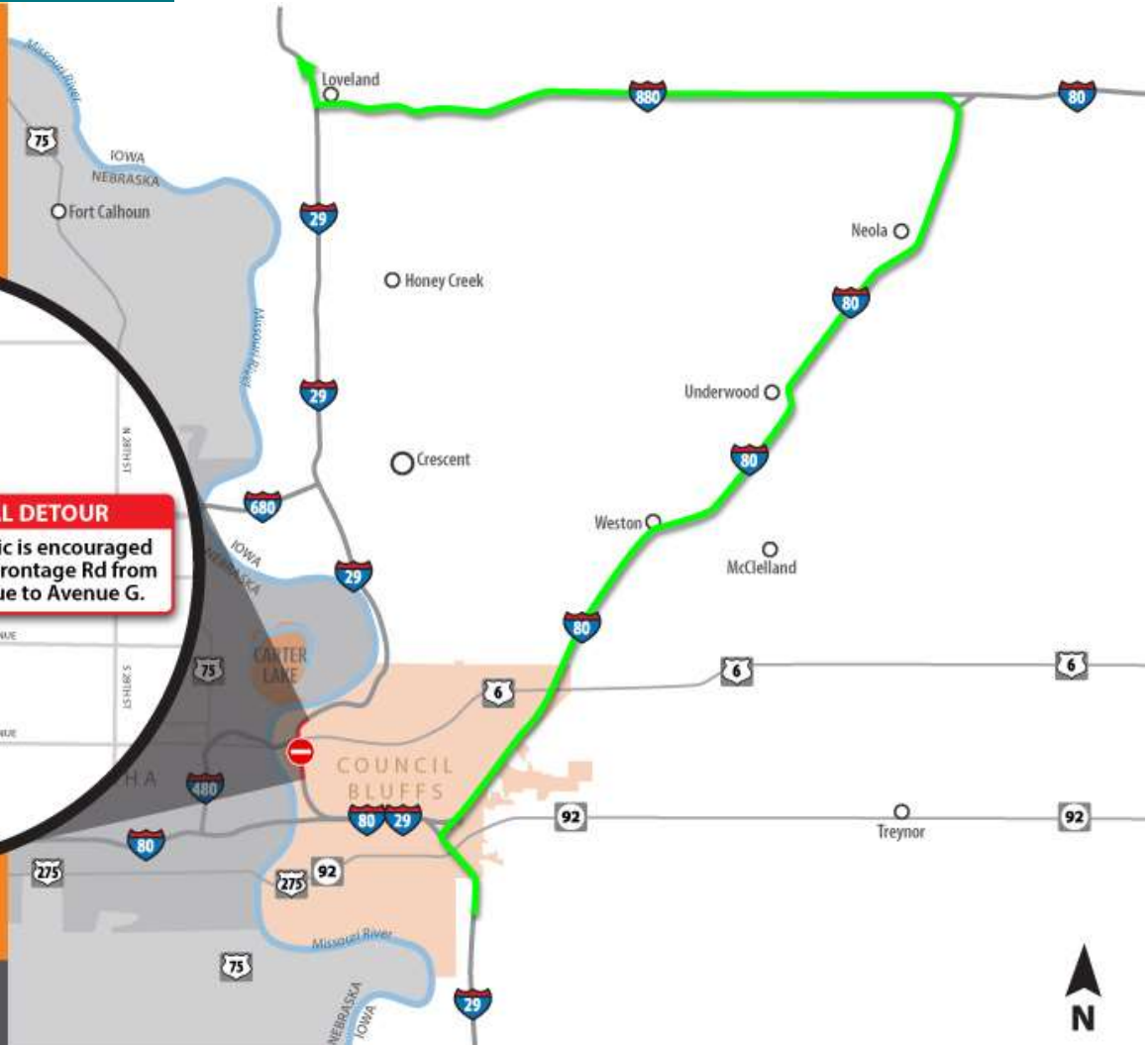
Remember to slow down, read signs, and follow detours.



Ramp or Roadway Closed to Traffic



Designated Detour



For current information on roadway conditions, visit www.511ia.org.



...AND DOUBT CREEPS IN



“There’s a lot of trucks out there.”

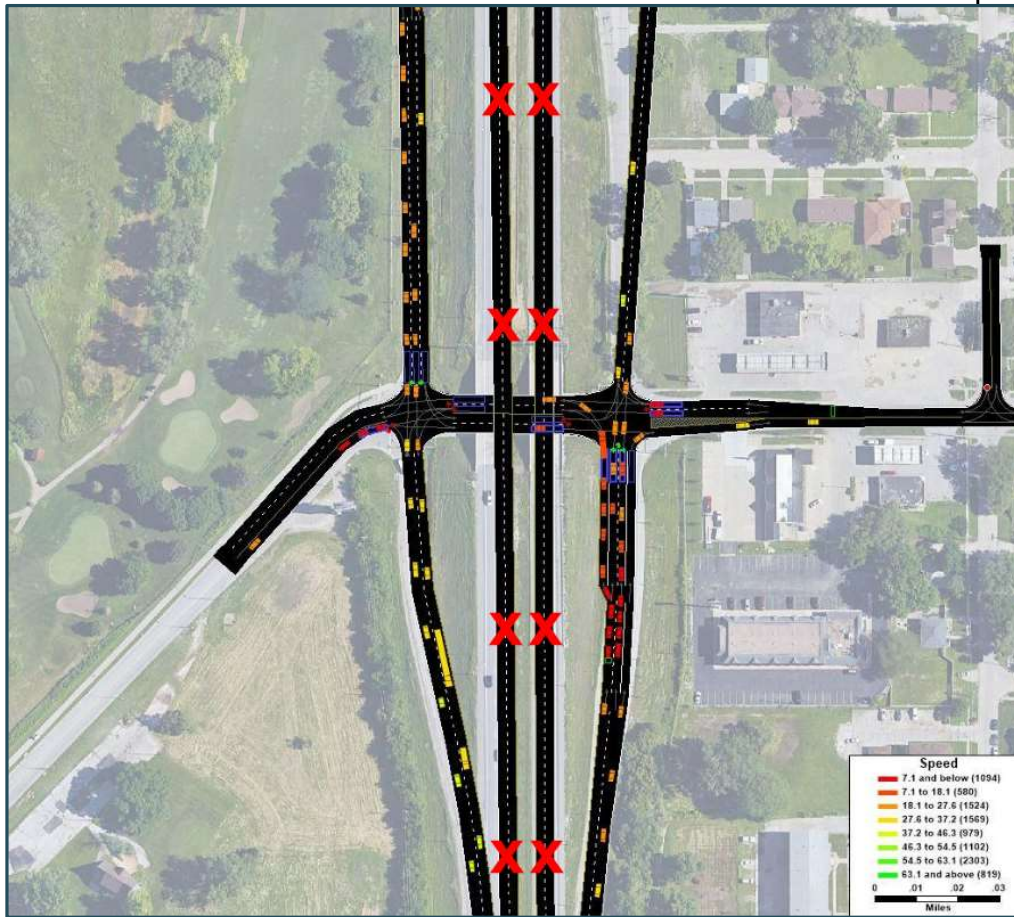


“This is going to be a parking lot for two years.”

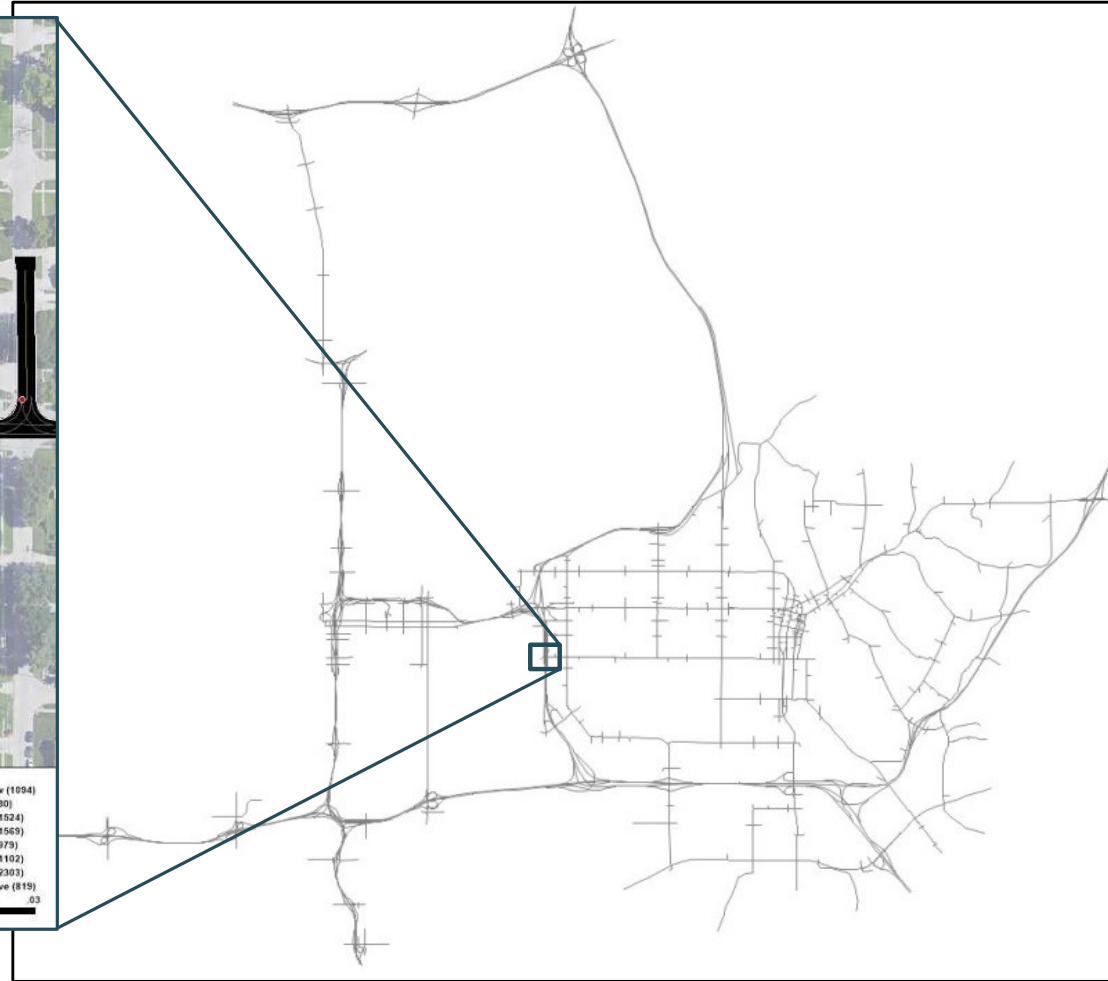


“We can keep the interstate open if we change the staging like this.”

IT'S GOING TO WORK ... RIGHT?



Transmodeller: I-29 Closure at 9th Ave



Transmodeller Council Bluffs Network

IT BETTER WORK



Construction
Signal Timing Plans
Programming/Testing

Implement TOD Plans
Verify Signal Operation
Modify as Needed

Collecting Traffic Data
Calibrating ASCT Parameters

Field Calibration
ASCT Verification

April 2021

11/9/21

11/10/21

11/15/21

11/30/21

Project Start

Opened NB Frontage Rd north of Broadway.
2 new signals.

Opened remainder of NB Frontage Rd.
1 new signal.

Closed I-29 NB

Adaptive turned on

Added new signals to the system

Did it Work?

NB FRONTAGE RD DETOUR

- NB Frontage Rd Detour:
 - 1.5 mile route
 - 4 signals
 - 35 mph
- Average PM Peak Travel Time for NB Frontage Rd
 - a. 3 minutes 40 seconds
 - b. 5 minutes 20 seconds
 - c. 6 minutes 30 seconds
 - d. 8 minutes 10 seconds
- Average control delay of 65 s/veh
 - 16.25 s/veh/signal

Wejo Data Points
(Connected Vehicles)
Data provided by ISU CTRE



PERFORMANCE MEASURES

- ATSPMs 
 - Provider purchased by another company
- INRIX 
 - Bi-annual map update
- Wejo – 
Connected Vehicle Data



HISTORICAL REPORTS



SynchroGreen - Green Utilization

Report Date: 04/06/2022

ID: 1510

Name: NB Frontage @ Broadway

Date Time	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	Target Cycle
04/05/2022 15:00:21	7	12	0	9	0	13	0	0	72
04/05/2022 15:01:51	5	6	0	11	0	4	0	0	74
04/05/2022 15:03:22	10	6	0	15	0	13	0	0	83
04/05/2022 15:04:42	10	9	0	15	0	17	0	0	88
04/05/2022 15:06:11	14	10	0	3	0	21	0	0	93
04/05/2022 15:07:41	4	13	0	3	0	7	0	0	78
04/05/2022 15:09:01	4	10	0	22	0	23	0	0	93
04/05/2022 15:10:41	9	10	0	13	0	20	0	0	86
04/05/2022 15:12:01	17	9	0	11	0	5	0	0	92
04/05/2022 15:13:32	12	14	0	12	0	32	0	0	90
04/05/2022 15:15:11	8	13	0	7	0	12	0	0	84
04/05/2022 15:16:41	12	16	0	14	0	25	0	0	93
04/05/2022 15:18:11	12	16	0	17	0	8	0	0	106
04/05/2022 15:19:51	11	12	0	12	0	16	0	0	95
04/05/2022 15:21:32	8	18	0	18	0	6	0	0	99
04/05/2022 15:23:01	10	16	0	13	0	16	0	0	103
04/05/2022 15:24:51	14	16	0	10	0	13	0	0	100
04/05/2022 15:26:32	11	18	0	15	0	25	0	0	106
04/05/2022 15:28:12	14	18	0	12	0	11	0	0	110
04/05/2022 15:30:02	22	21	0	16	0	48	0	0	110
04/05/2022 15:31:51	15	19	0	12	0	9	0	0	110
04/05/2022 15:31:54	15	19	0	12	0	9	0	0	110
04/05/2022 15:31:56	15	19	0	12	0	9	0	0	110
04/05/2022 15:32:21	15	19	0	13	0	9	0	0	118

Important Reports

- Split History
- Green Utilization
- Target Allocation
- Detector Faults
- Preemptions

AUTOMATED SYSTEM ALERTS

Alarm Notification from ATMS Server



ATMS Admin <SignalAlert@councilbluffs-ia.gov>

To SignalAlert@councilbluffs-ia.gov

Reply

Reply All

Forward



Mon 8/29/2022 9:55 AM

Retention Policy 2019 0365 - Delete All 6 Months (6 months)

Expires 2/25/2023

This item will expire in 4 days. To keep this item longer apply a different Retention Policy.

ID : 1530 Name : 40th St @ EB Broadway/Ramp B

08/29/2022 09:54:55 On [258] Communications Failure.(0)

Important Alerts

- Communication Failure
- Detector Failure
- Signal Flash
- On Battery
- Door Open
- Congestion Warning

Benefits Observed

ADAPTING TO INTERSTATE TRAFFIC

I-29 NB Closure to 9th Ave Exit Ramp

North I-29NB @ RR Crossing (CBTV68) 11/15/2021 17:16:03



ADAPTING TO INTERSTATE TRAFFIC

I-29 at 9th Ave (looking south)

South I-29 @ 9th Ave (CBTV18) 11/15/2021 17:05:49



Back of queue

I-29 NB CLOSED

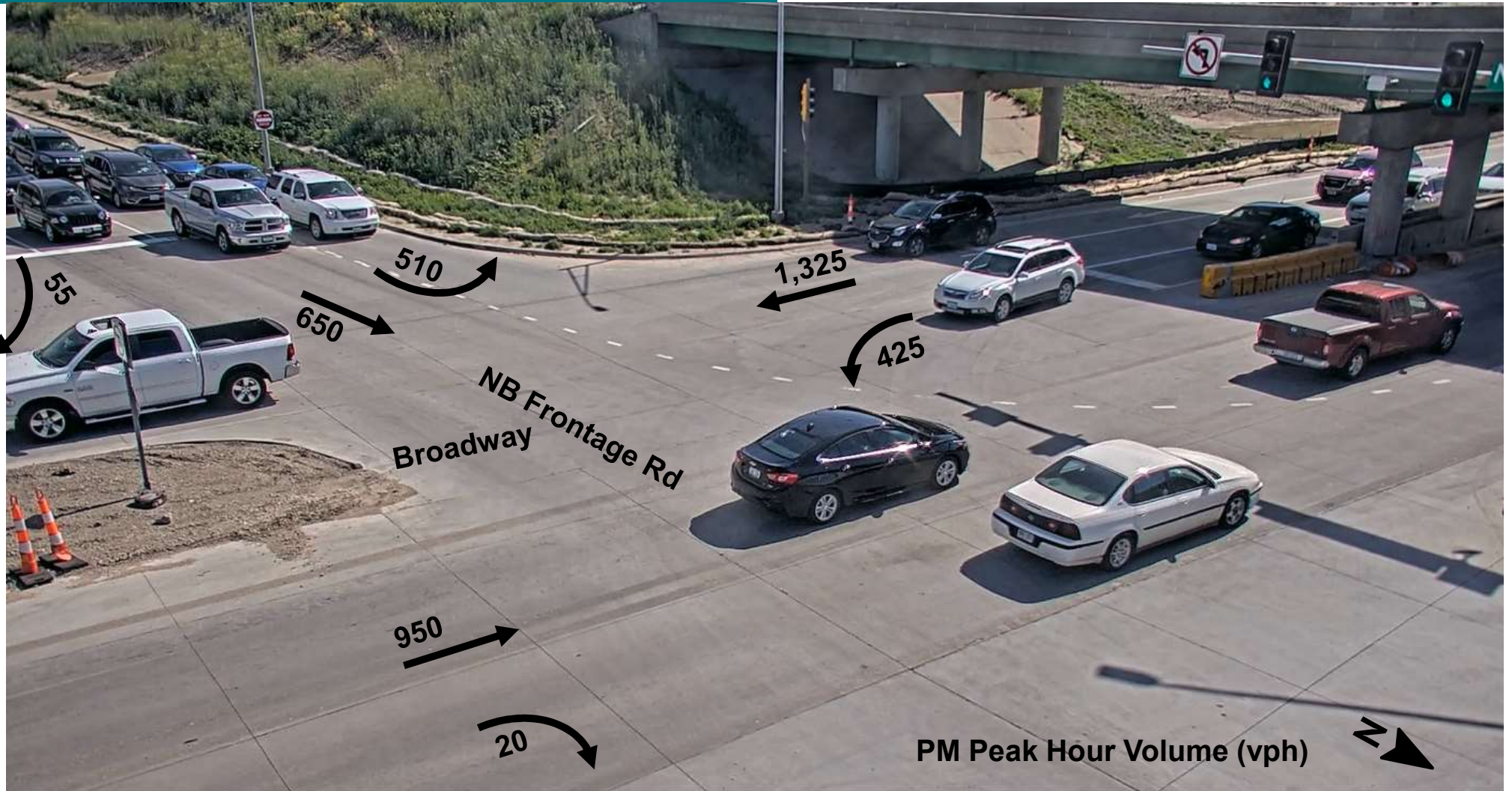
ADAPTING TO INTERSTATE TRAFFIC

NB Frontage Rd at 2nd Ave



ADAPTING TO INTERSTATE TRAFFIC

NB Frontage and Broadway (looking SW)



ADAPTING TO INTERSTATE TRAFFIC

I-480 Closure at 40th St (looking east)

East I-480 @ MO River Bridge (CBTV20) 06/01/2022 16:38:47



ADAPTING TO TRUCKS

SB Frontage Rd at Broadway (looking north)



02/08/23 01:19:43 PM

ADAPTING TO CONSTRUCTION VEHICLES

NB Frontage and Broadway (looking south)



ADAPTING TO CRASHES

WB Broadway at 40th St



03/17/23 12:17:51 PM

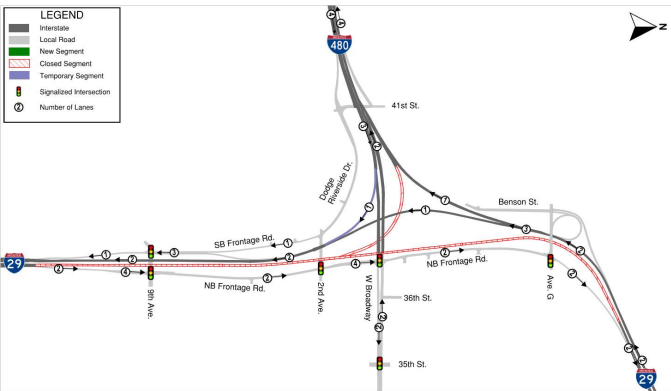
ADAPTING TO ARTERIAL LANE CLOSURES

NB Frontage and Broadway (looking east)

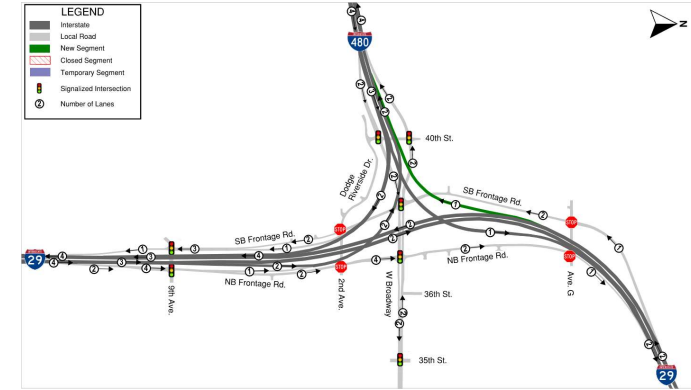
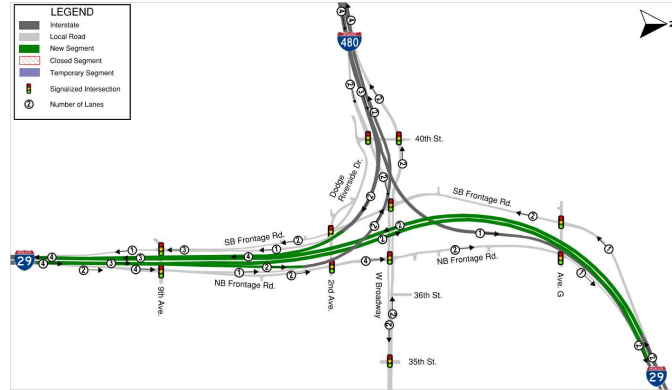
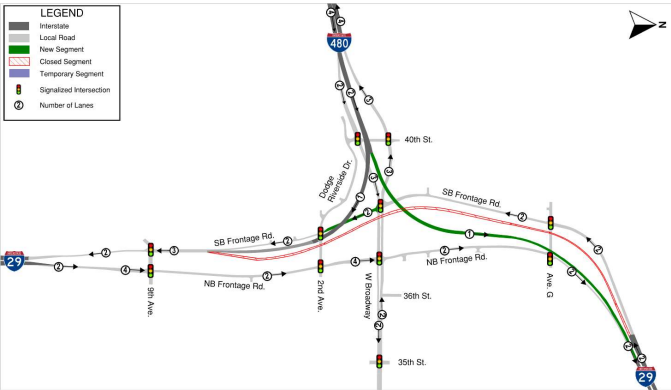
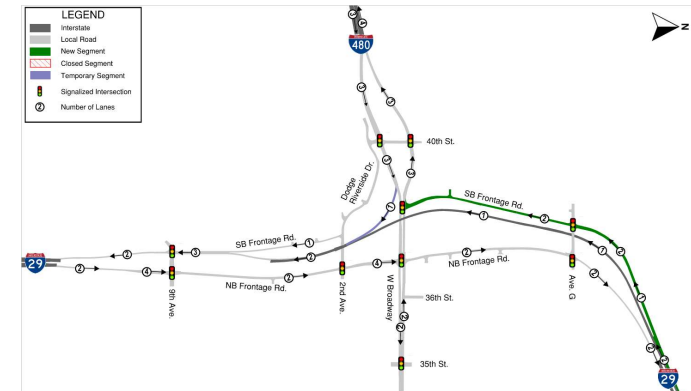
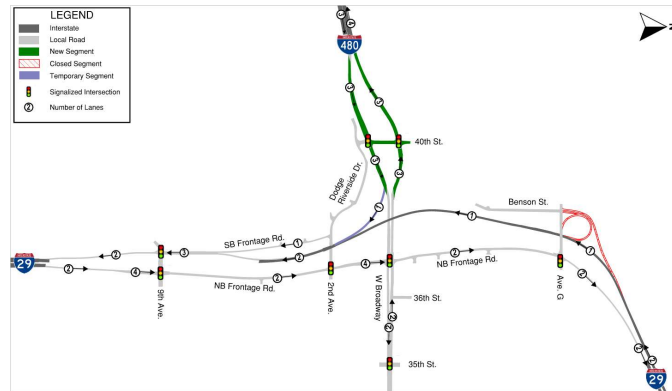
East I-29N @ I-480E Flyover (CBTV71) 10/17/2023 12:34:54



ADAPTING TO DEMAND CHANGES

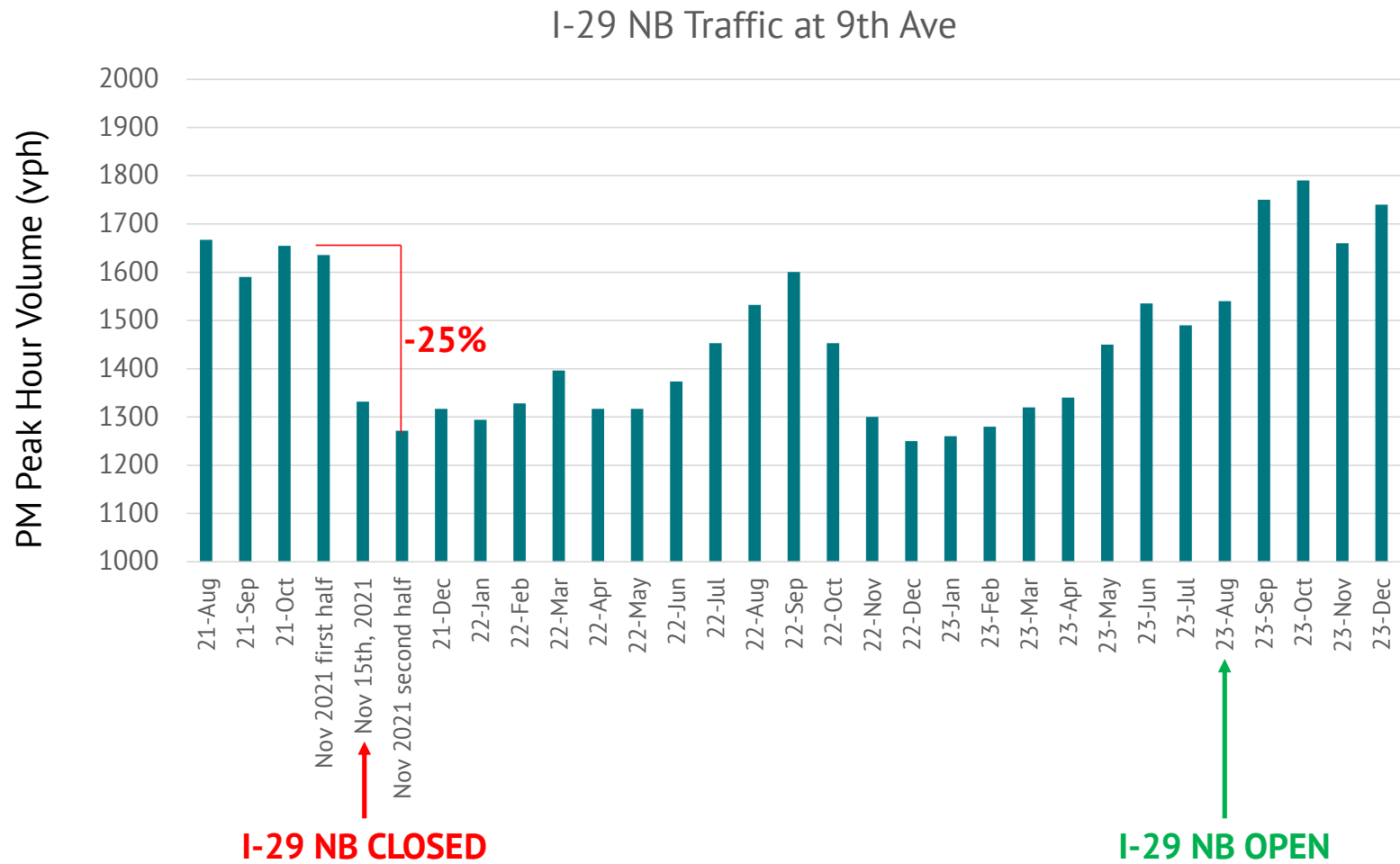


11/15/2021



10/16/2023

ADAPTING TO DEMAND CHANGES



Issues Along the Way

9TH AVE INTERCHANGE

I-29 Closure at 9th Ave (looking north)

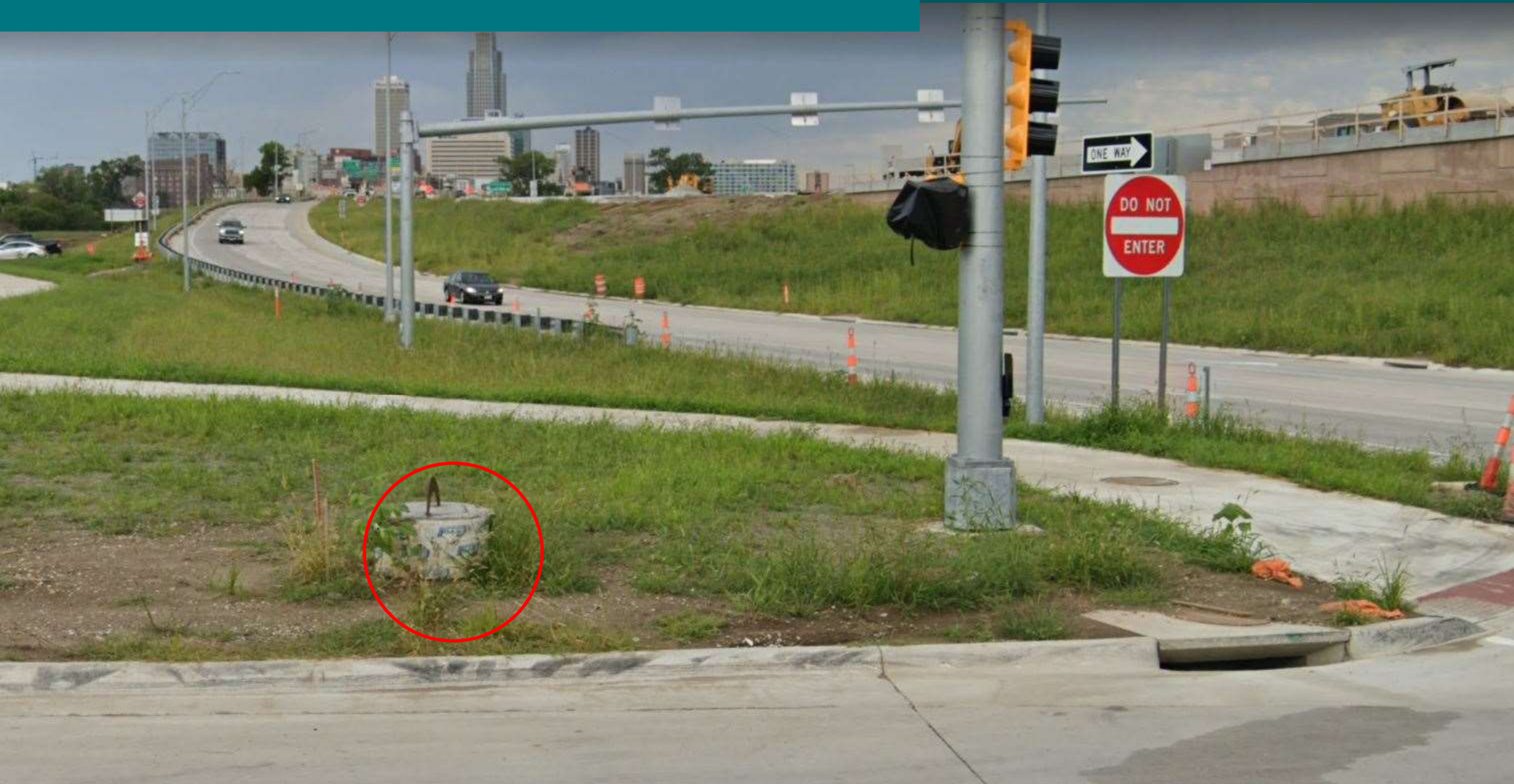
9th Ave DMS (CBTV69) 03/15/2022 17:00:00



idge (CBTV68) 03/15/2022 17:00:00



THEFT



DRIVERS



21:26:28

CONTRACTOR PARKING IN DETECTION ZONES



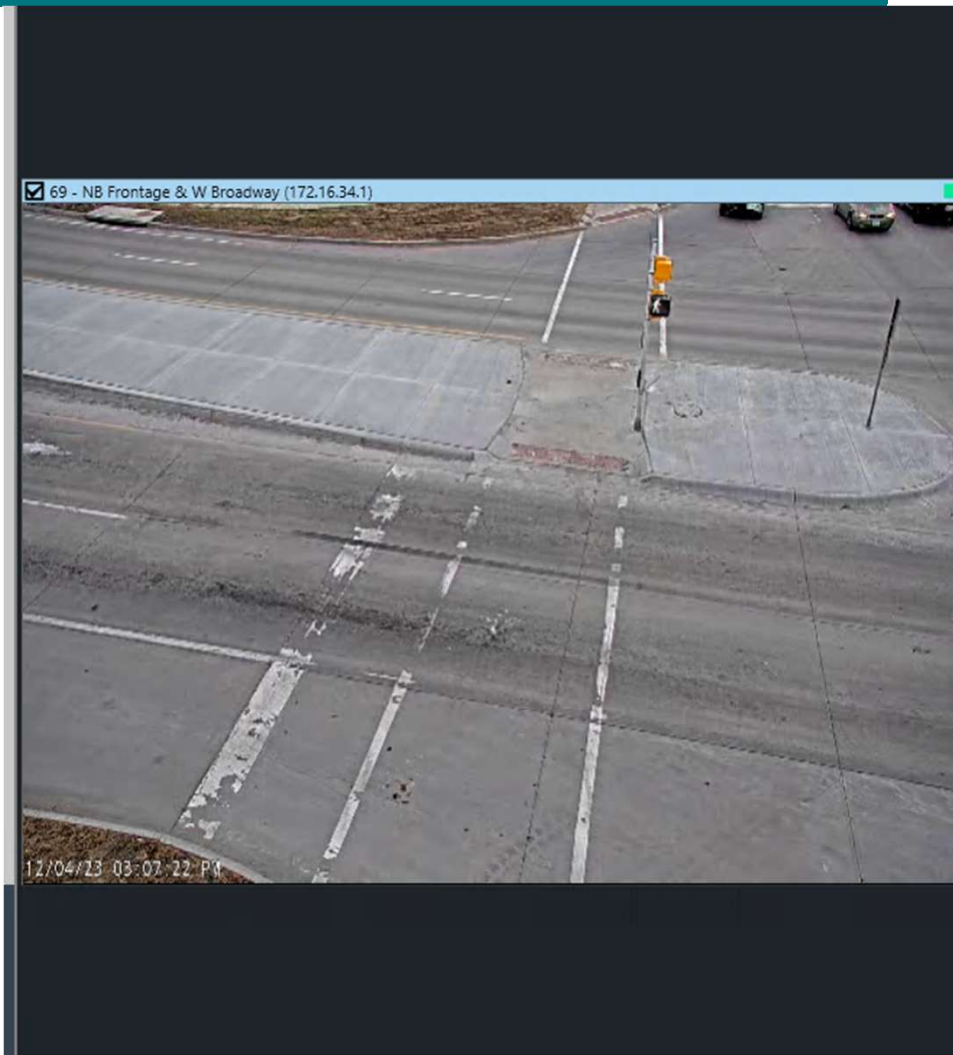
10/18/23 08:43:10 AM

5G CELL TOWER INTERFERENCE

NB Frontage and Broadway (looking east)



5G CELL TOWER INTERFERENCE



ID	Name	Pat	Dbase	Last Status	Mess
153C	40th St @ EB Broadway/Ramp B	23	3	15:01 (26)	Controller not r

Sensor Setup

1-Lanes & Stop Bars **2** **3**

Grn Util 3 7 7 4 0 10 2 8



Questions

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Nick.Johnson@hdrinc.com