DIVISION TRANSIT PROJECT: A NEW MULTI-MODAL CORRIDOR WITH NEXT GENERATION TRANSIT SIGNAL PRIORITY

Western ITE TSMO Excellence Project

RANDY JOHNSON, PE, PTOE – DKS ASSOCIATES

MARK HAINES, PE, PTOE - CITY OF PORTLAND TRAFFIC SIGNALS, STREET LIGHTING, AND ITS GROUP

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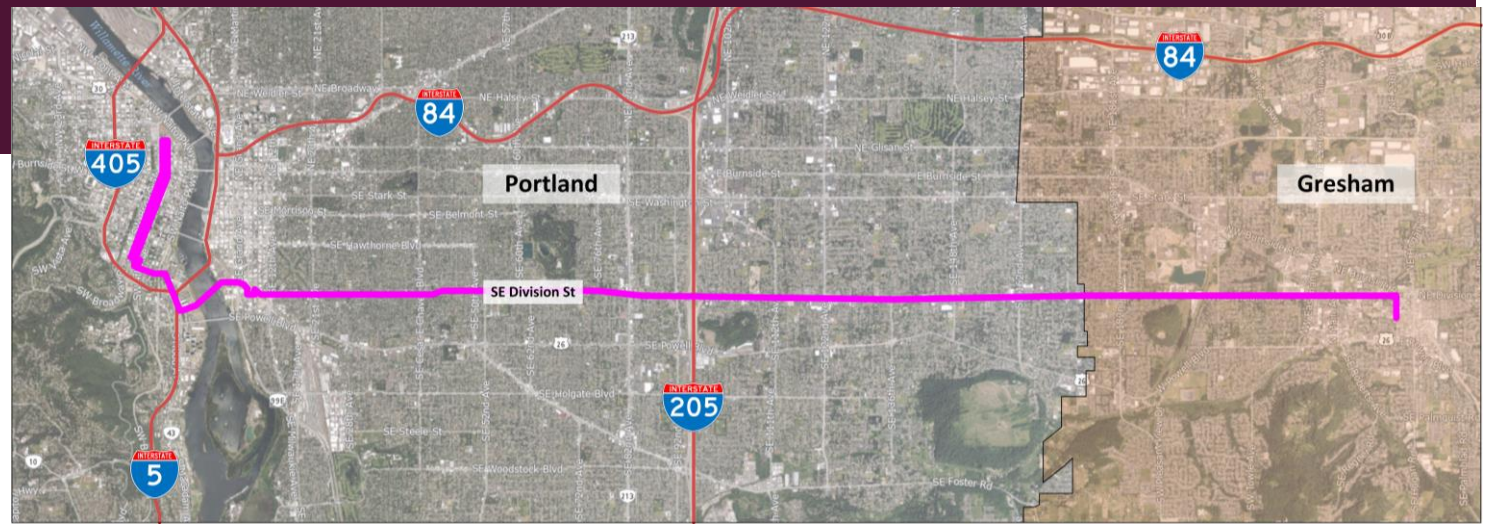
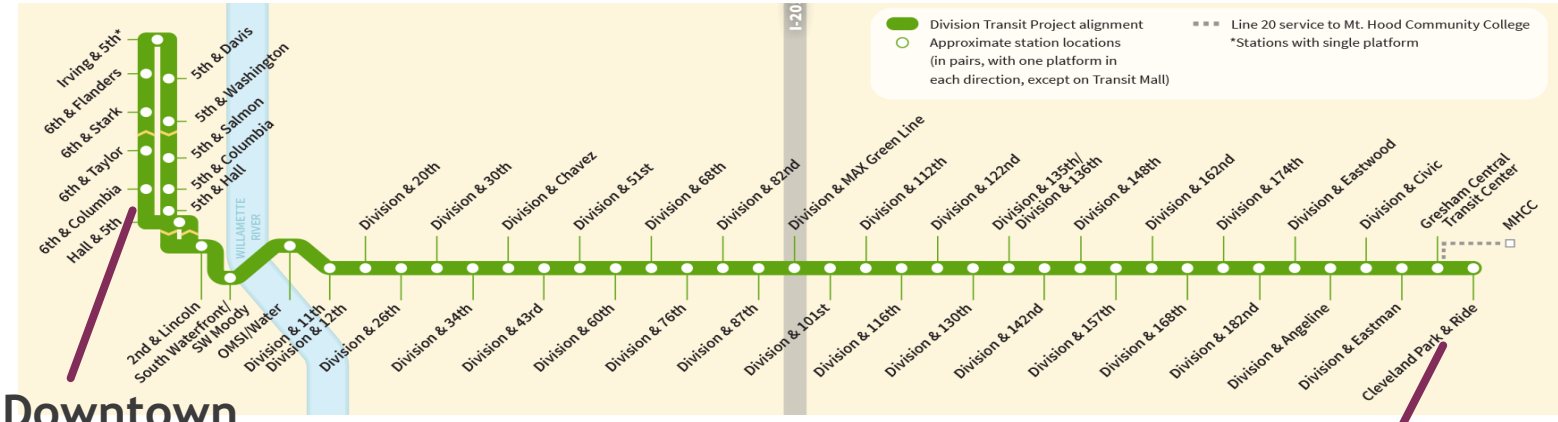
PROJECT FACTS

- Agency/Partner's first BRT project
- Existing bus line over capacity
- High Ridership with transit dependent community
- 15 mile corridor with 40 stations
- 1/3 mile station spacing
- 12-min headways
- Congested traffic corridor
- Constrained right-of-way
- $175M total project cost





Downtown Portland

Gresham

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BEFORE: OUTER DIVISION STREET SE 80TH TO 174TH

- #1 most dangerous corridor for walking and driving
- #2 most dangerous for cycling
- 13 fatalities / 117 serious injurious in past 10 years!
- Emergency order to reduce speed from 35 to 30mph
- Division Transit Project constructed in parallel with Outer Division Multi Modal Safety Project

	ADT
Division @ 87th	23,000
Division @ 116th	35,000
Division @ 152nd	30,000

76ft (23.2m) curb-to-curb

90 ft (27.4m) right-of-way

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NEW ROADWAY DESIGN: MEDIAN + PED CROSSING

Raised Medians with U-turns every 1/4 mile to 1/3 mile

-1.5 min out of direction travel time

Signalized Pedestrian Crossings every 530ft to 800ft

-14 new signalized crossings

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NEW ROADWAY DESIGN: BUS LANES & BIKE LANES

- Business Access Transit (BAT) Lanes
- Bike lanes with raised protection, cross-bike markings and protected bike signal phasing

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NEW BUSES + ENHANCED STATIONS

- Near-Level boarding
- On-board bikes
- On-board fare
- Station amenities
- Weather protection
- Branding

TRIMET FX

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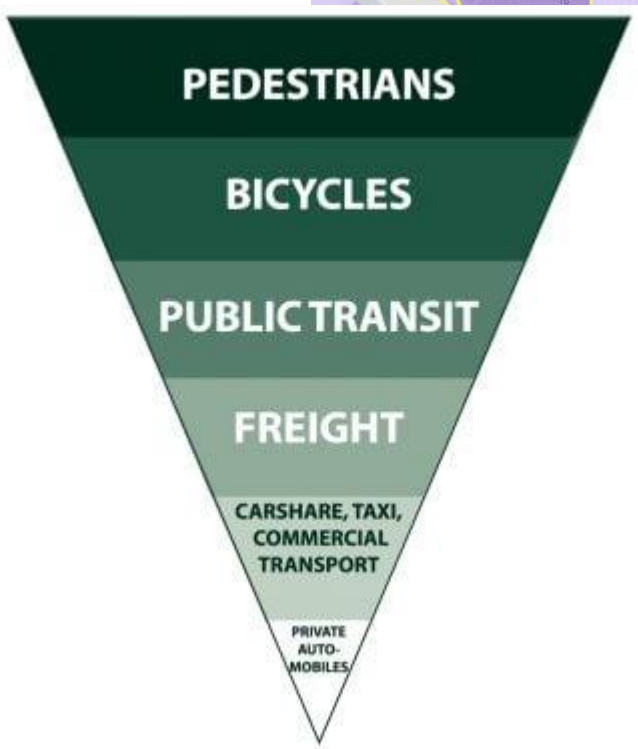
TRANSIT SIGNALS + BIKE SIGNALS

OPERATIONS GOALS



Description	Quantity
New Signal Timing	All 45
Leading Pedestrian Intervals	18
Pedestrian-Only Signals	14
Ped Priority User Logic Routine	All 45
Next Gen TSP	All 45

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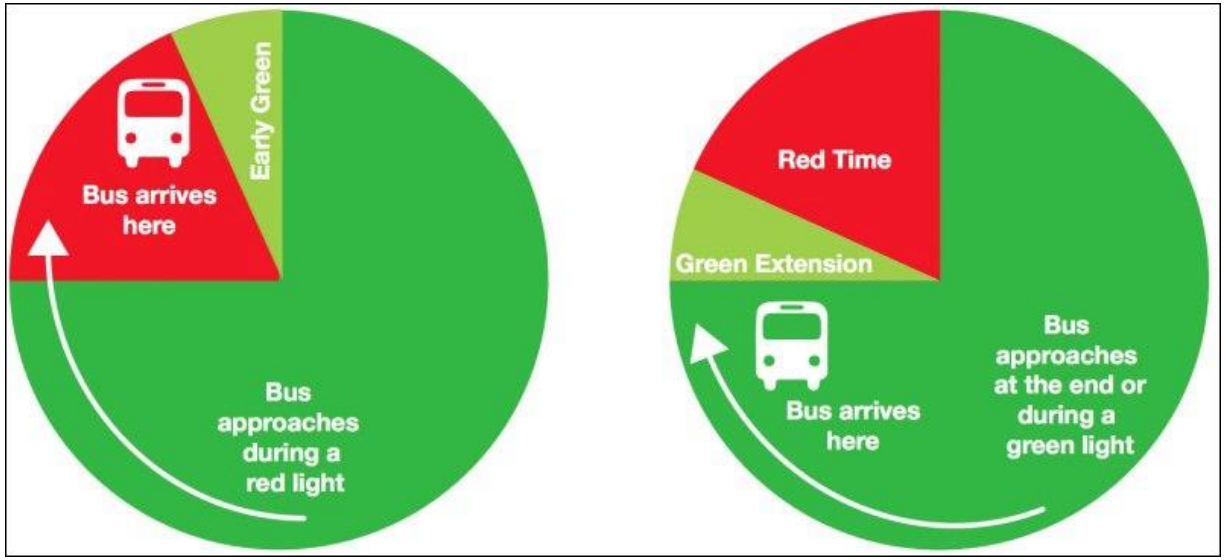
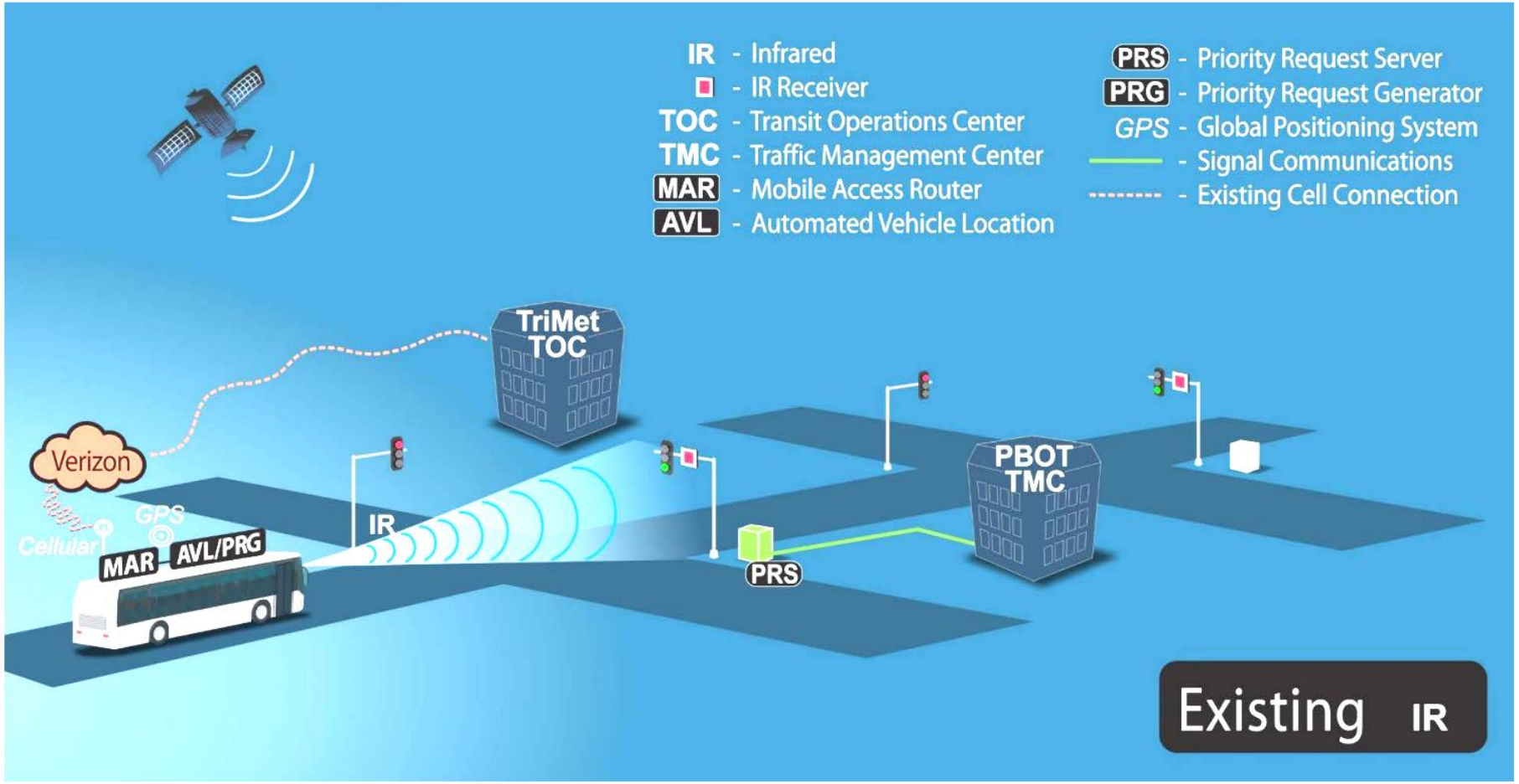
WHY DO WE USE BUS PRIORITY?

OAR 734-020-0310

"Bus priority system…provide buses the capability to modify green intervals but not the display sequence of a traffic control signal



TRANSIT SIGNAL PRIORITY – A BRIEF HISTORY



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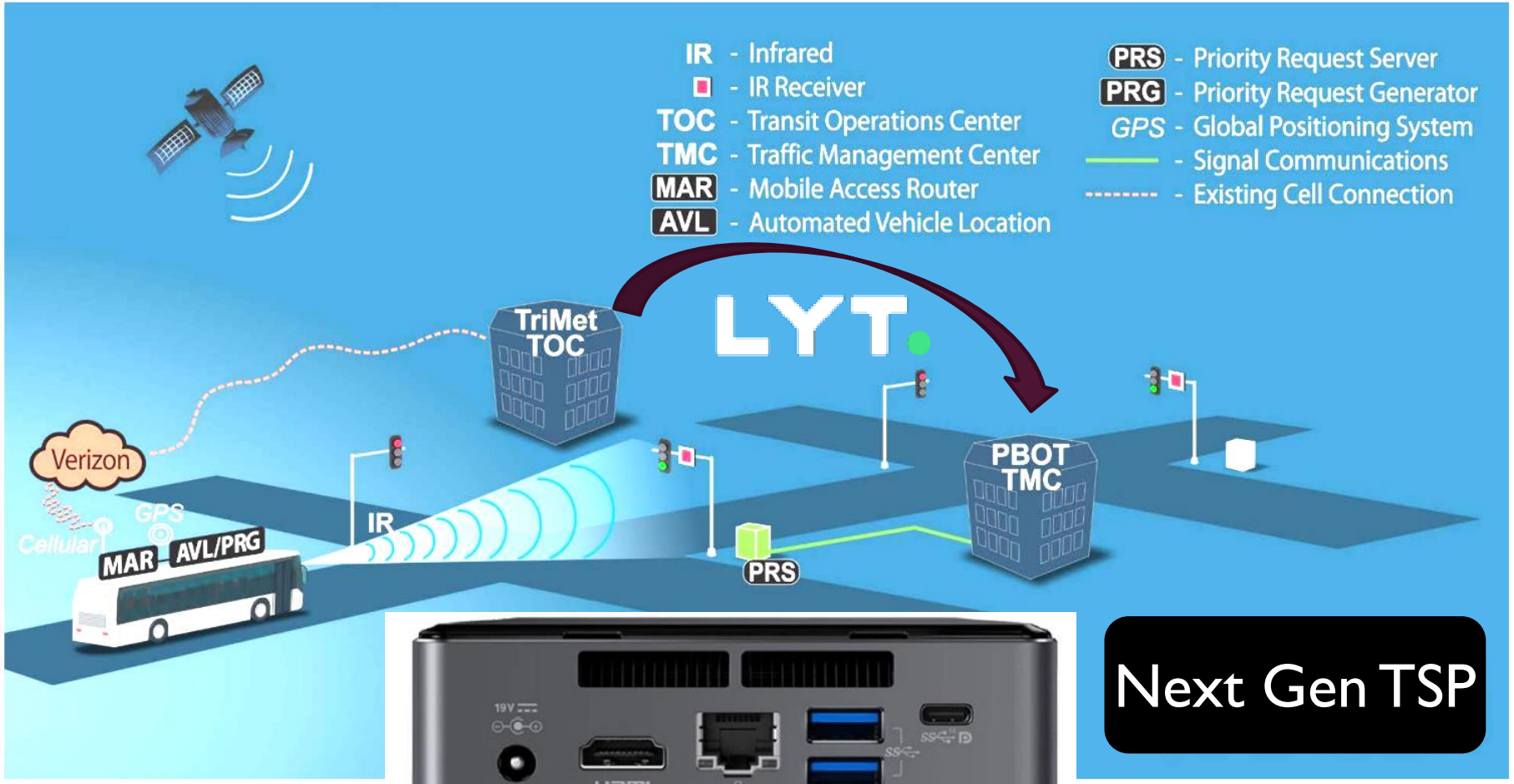
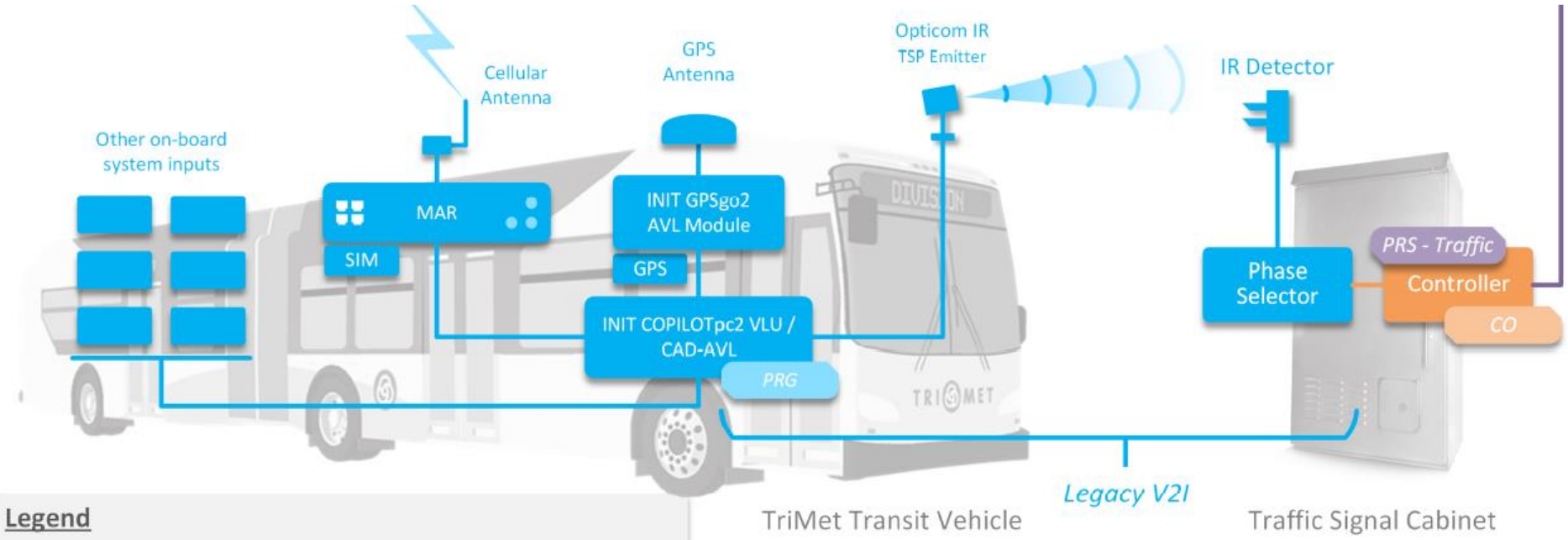
TRANSIT SIGNAL PRIORITY – NEXT GENERATION



Maestro Device



Legend

CAD/AVL	Computer-Aided Dispatch/Automatic Vehicle Location
MAR	Mobile Access Router
CO	Coordinator (*priority implementer*)
PRG	Priority Request Generator *(priority requesting logic)*
PRS	Priority Request Server *(priority granting logic)*
SIM	Subscriber Identity Module

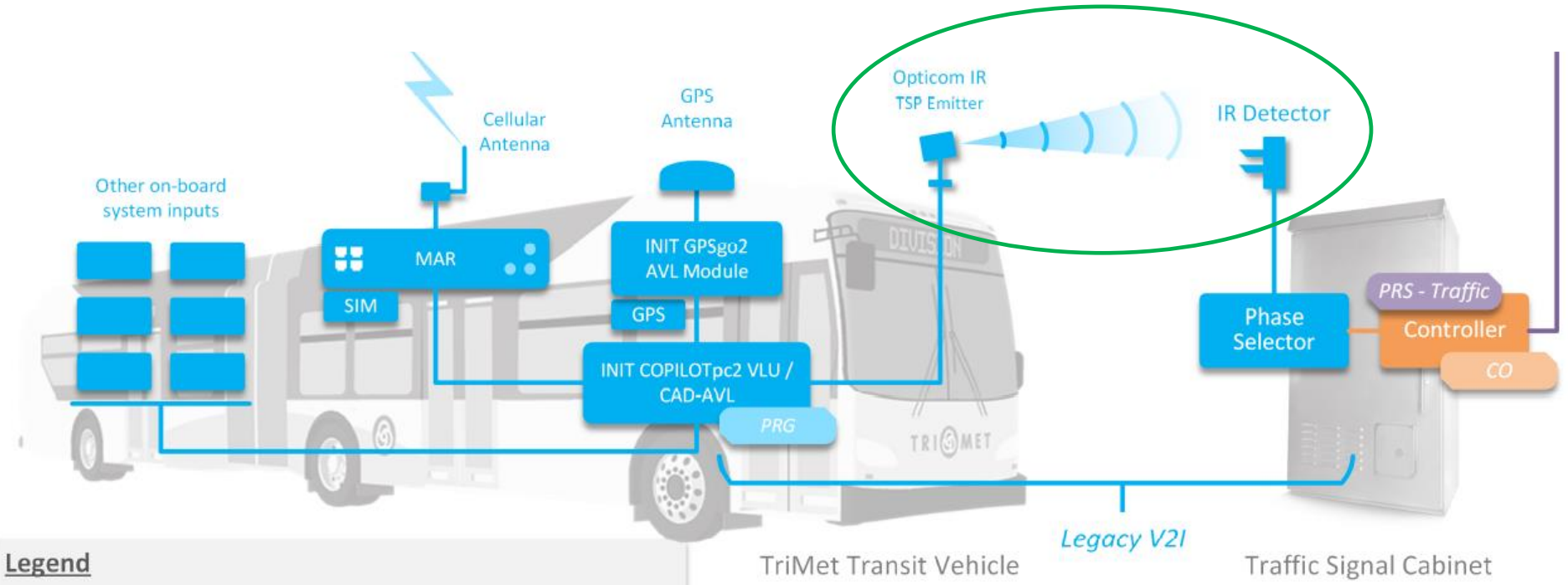
Key

PRG Component

PRS Component

CO Component

PRG Logical Object



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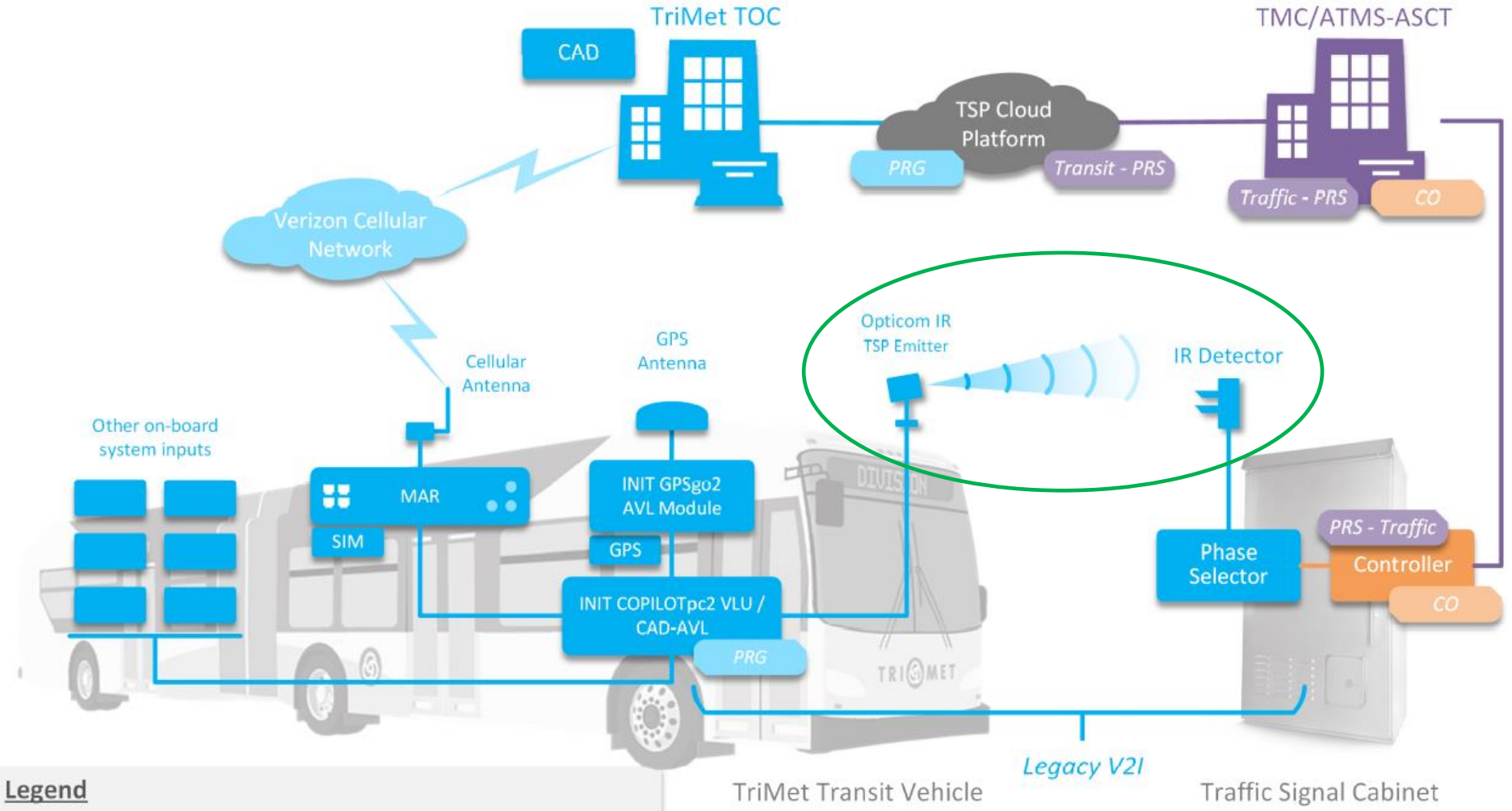

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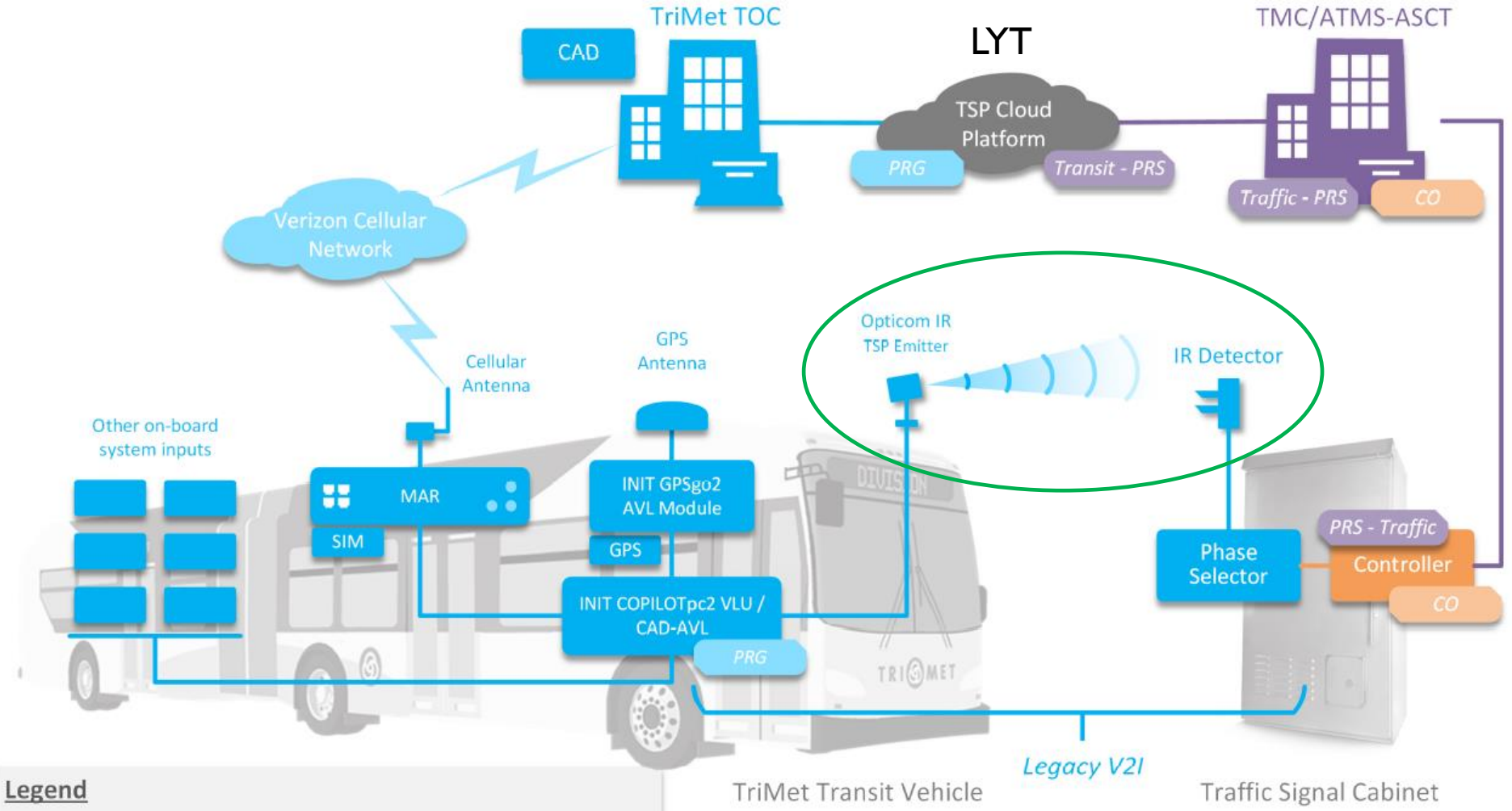

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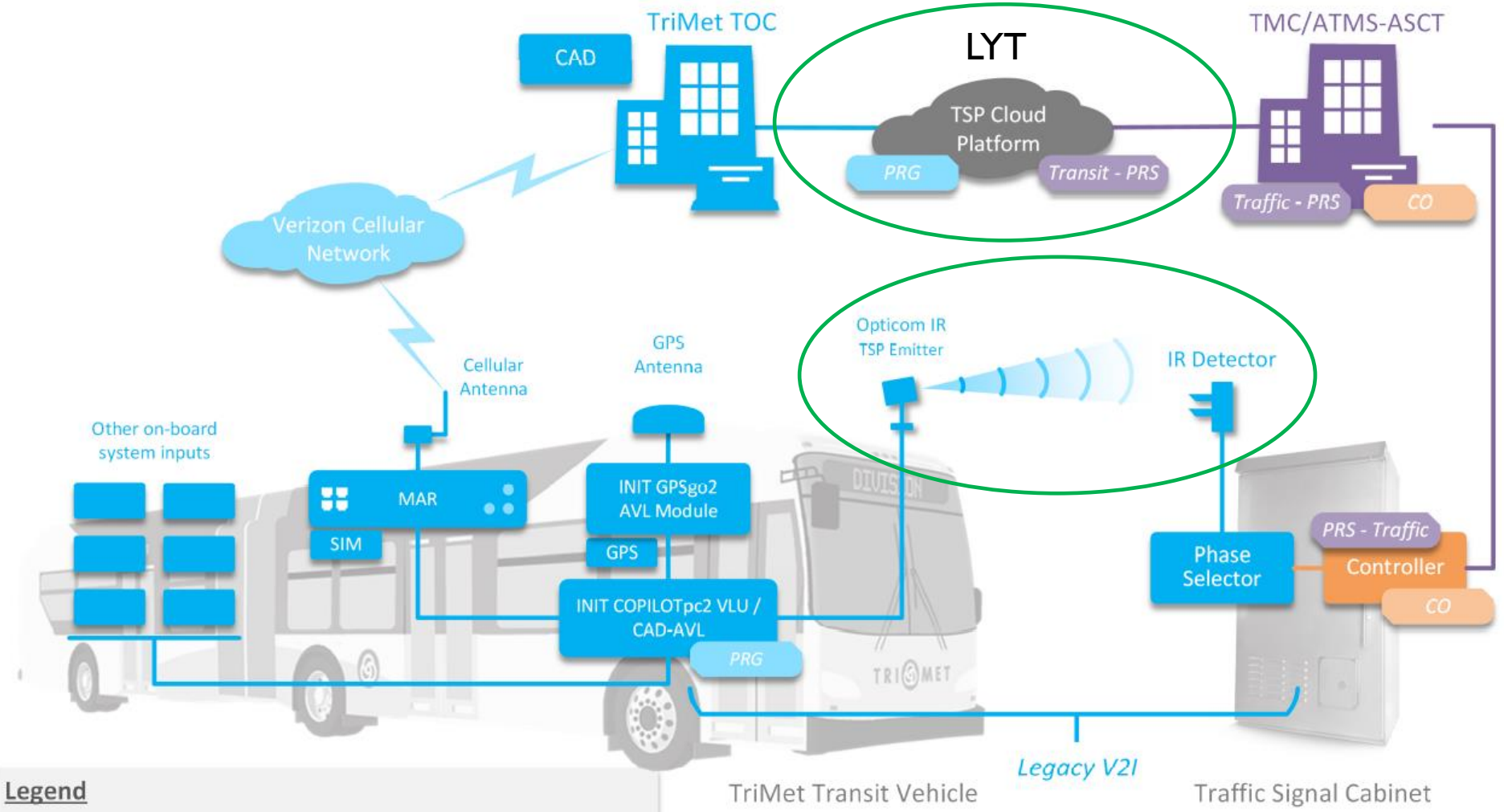

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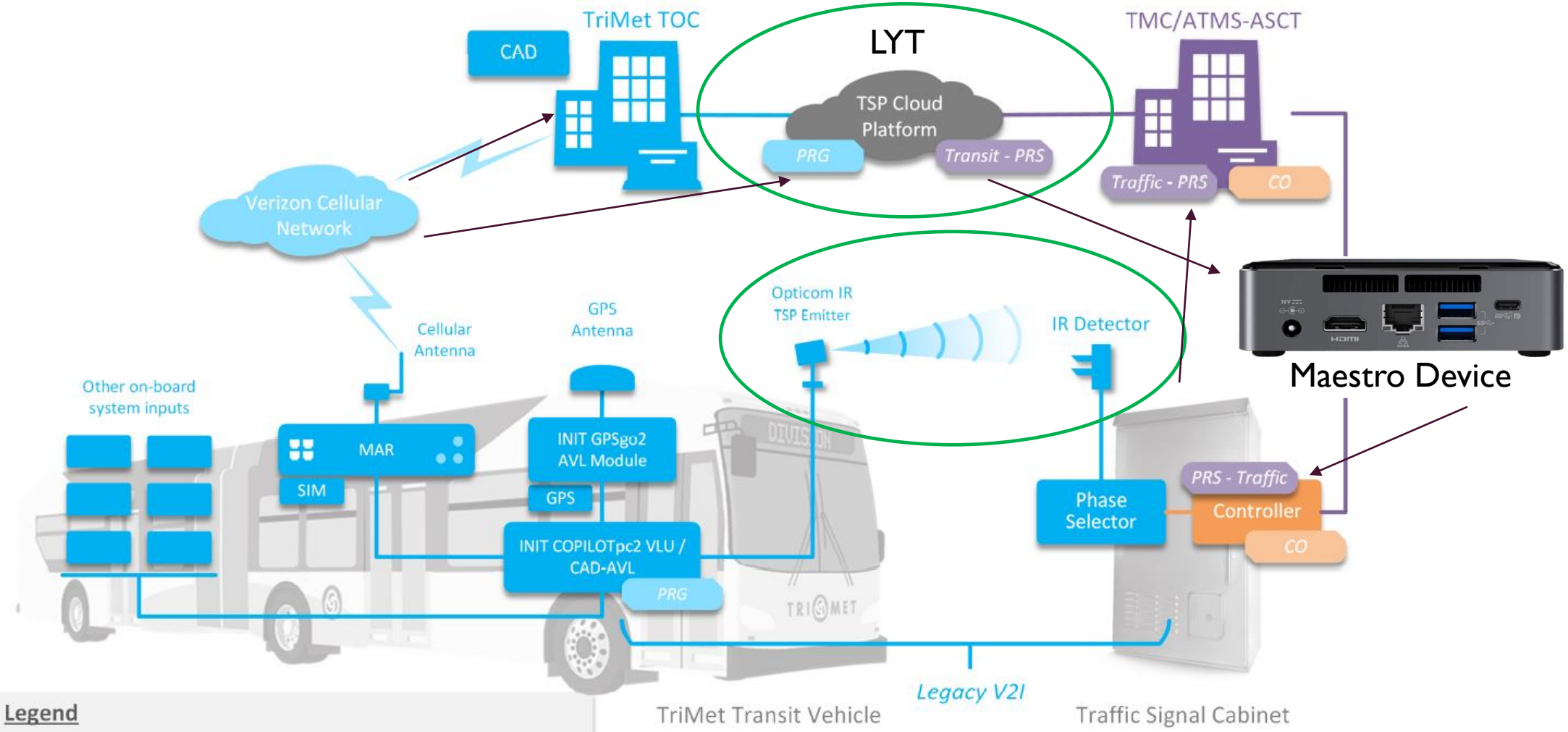

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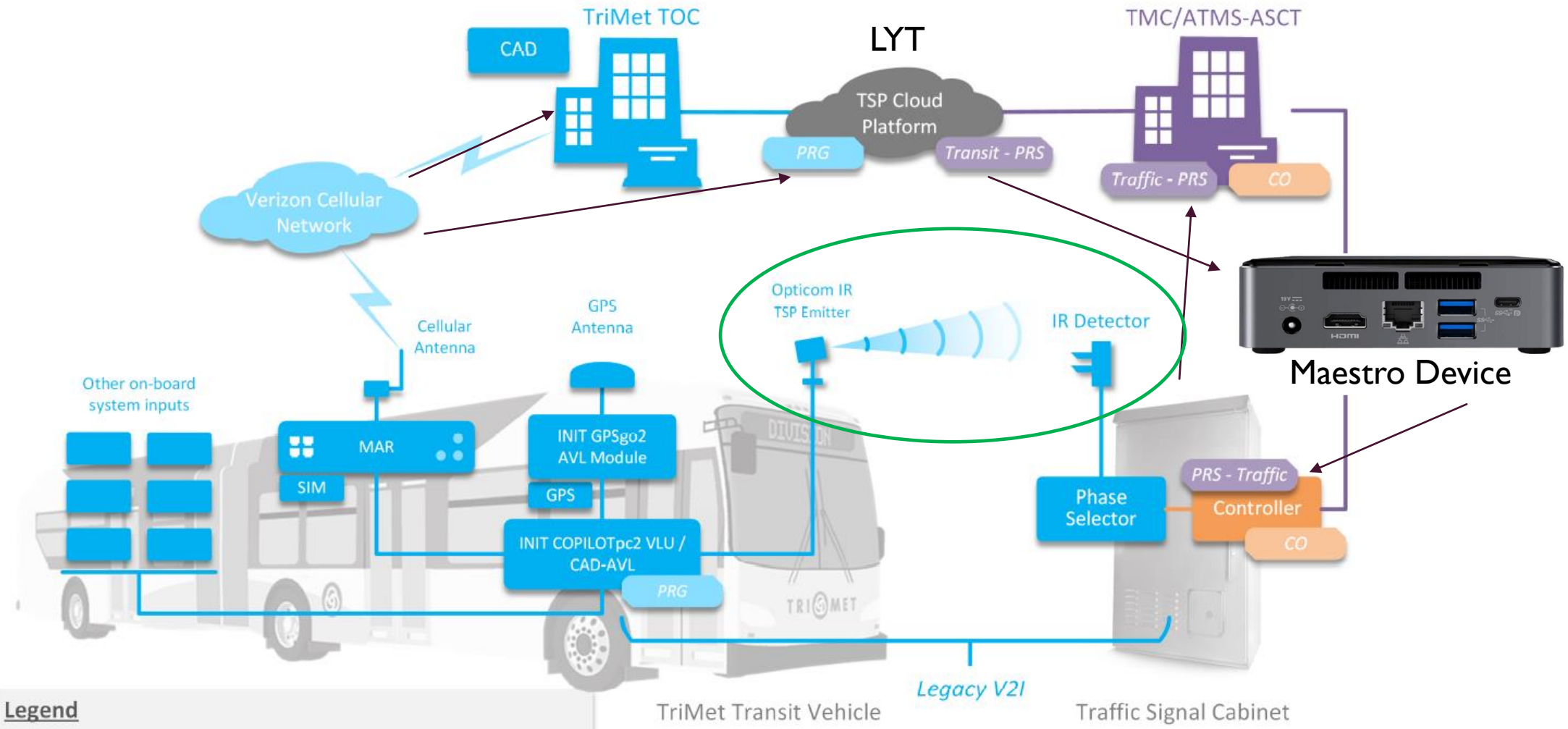
LYT PREDICTIVE MODEL



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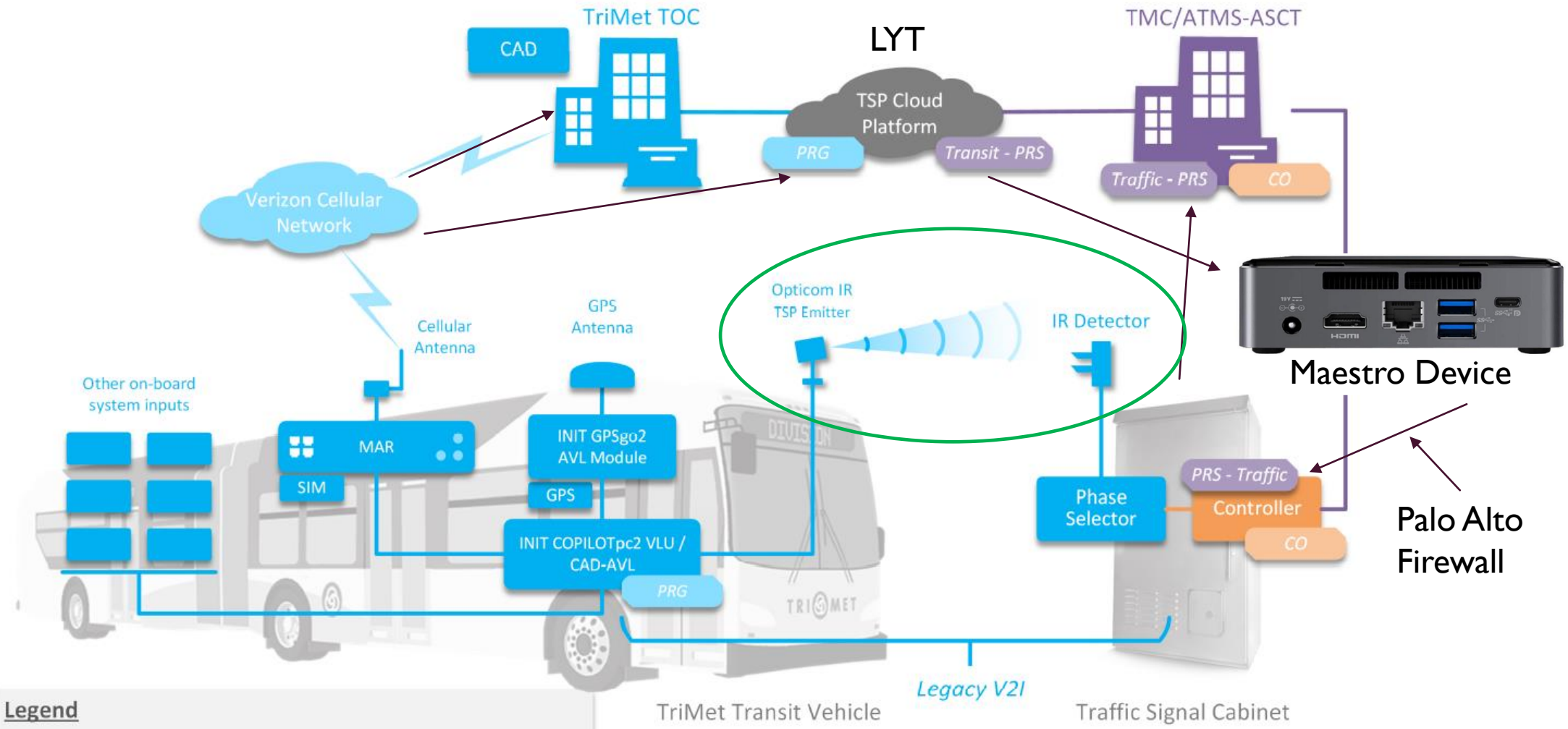

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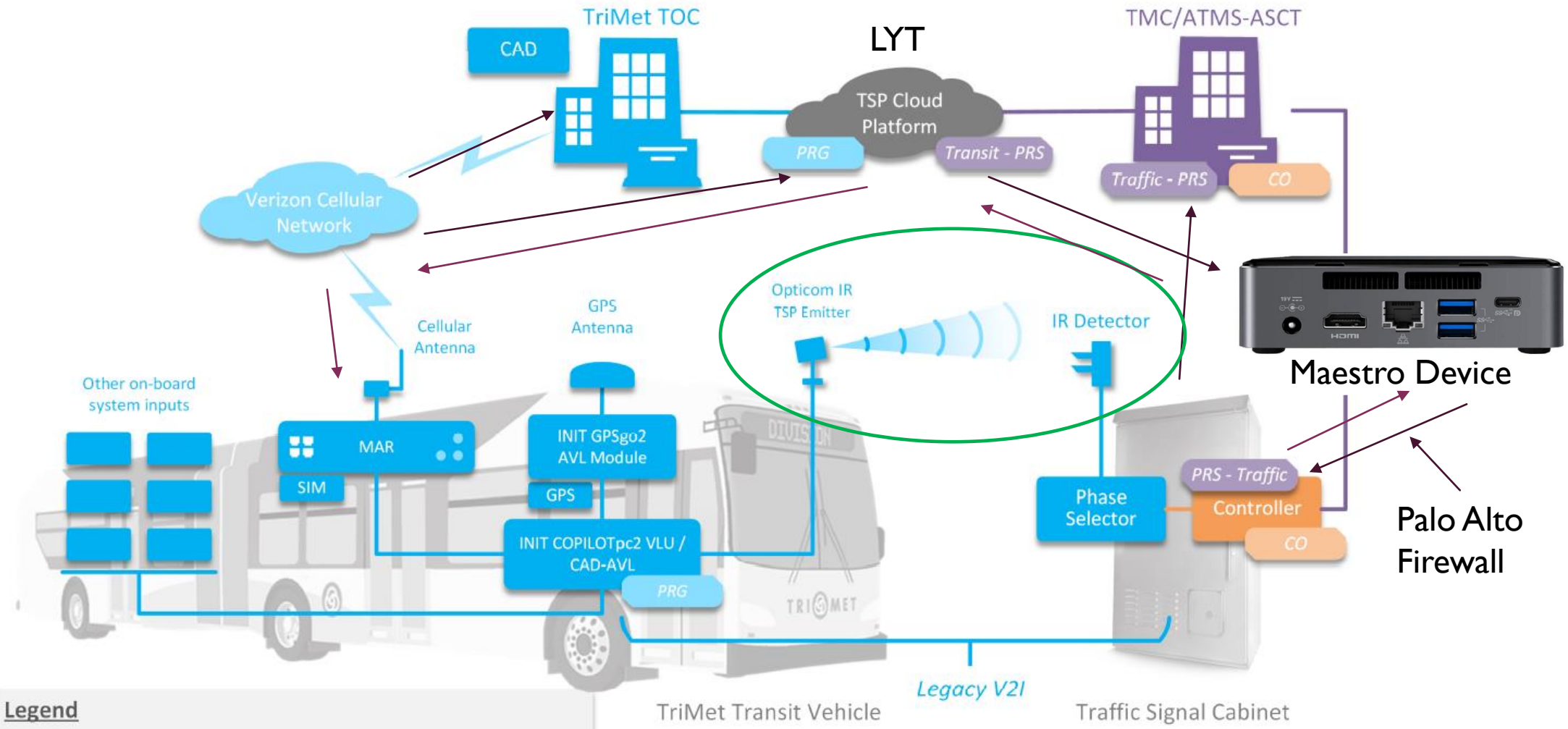

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INTERNAL FEATURES

Prioritor Configuration

Enabled	Lock Out Time	PRS Time to Live
Active	0	20

Prioritor Options

	Prioritor	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
☐	Lockout After First Service	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	Presence Only Check-in	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	Extend Walk Rest	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
☐	Use Phase History	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Prioritor Phase Settings

Show All Prioritors

Prioritor	Enabled	Priority	Priority Phases	Skip Phases	Skip Ped	Delay Time	Arrival Time	Max Presence	Reservice Lockout	Free Pri Min	Free Pri Max
2	Enabled	0	9			0	40	180	0	Min Green	Max Green
6	Enabled	0	6			0	40	180	0	Min Green	Max Green

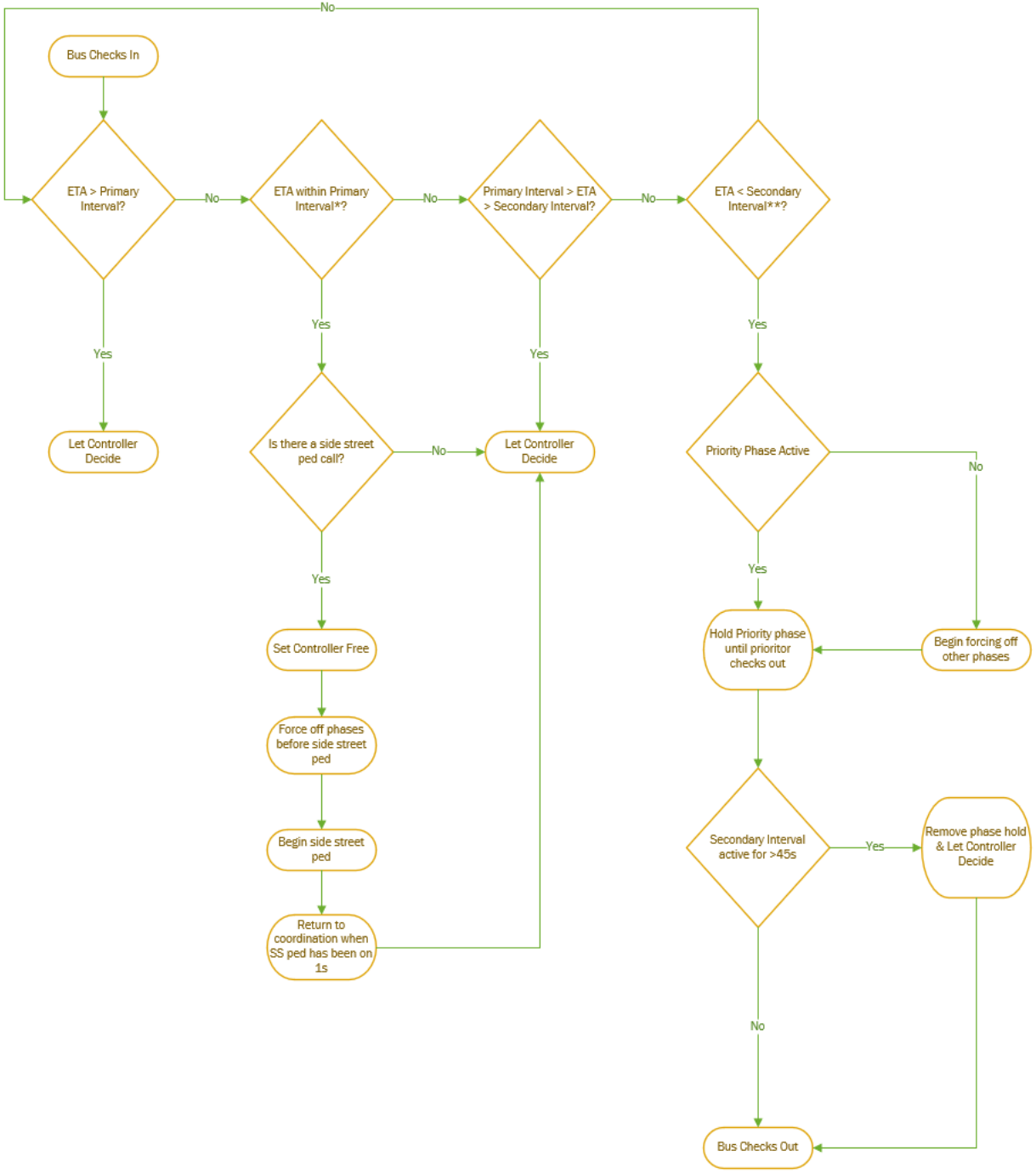
USER PROGRAMS – TSP

Program Statements

Program 4 | Show All Statements

Statement	Result Value	Result	Index	Operation	Parameter A	Index	Parameter B	Index	Delay	Ext.	Description
1	0	Ped Detector Call	4	Result=A	Global Variable	30	None	0	0.0	0.0	Call side street ped during prioritor 2,3,6
2	0	None	0	Result=(A if B)	Ped Call	4	Global Variable	30	0.0	0.0	set controller free if not ph 4 unless ETA is
3	0	Coordination Free Switch	1	Result=Latch(A, B)	Previous Line Result	0	Global Variable	33	0.0	0.0	set controller free if not ph 4 unless ETA is
4	0	Phase Force Off	2	Result=A	Previous Line Result	0	None	0	0.0	0.0	force off phase 2
5	0	Phase Force Off	6	Result=A	Previous Line Result	0	None	0	0.0	0.0	force off phase 6
6	0	Local Variable	14	Result=A	Prioritor Arrival Time	2	None	0	0.0	0.0	LV 14 = Prioritor 2 ETA Timer
7	0	Local Variable	15	Result=(A > B)	Local Variable	14	Number	400	0.0	0.0	LV 15 = True if LV 14 > 40s
8	1	Local Variable	16	Result=(A < B)	Local Variable	14	Number	500	0.0	0.0	LV 16 = True if LV 14 < 50s
9	0	None	0	Result=(A AND B)	Local Variable	16	Prioritor Status	2	0.0	0.0	True if LV 16 true and Prioritor 2 active
10	0	Local Variable	17	Result=(A AND B)	Previous Line Result	0	Local Variable	15	0.0	0.0	LV 17 = ETA of Prioritor 2 between 50s and
11	0	Local Variable	18	Result=A	Prioritor Arrival Time	6	None	0	0.0	0.0	LV 18 = Prioritor 3 ETA Timer
12	0	Local Variable	19	Result=(A > B)	Local Variable	18	Number	400	0.0	0.0	LV 19 = True if LV 18 > 40s
13	1	Local Variable	20	Result=(A < B)	Local Variable	18	Number	500	0.0	0.0	LV 20 = True if LV 18 < 50s
14	0	None	0	Result=(A AND B)	Local Variable	20	Prioritor Status	6	0.0	0.0	True if LV 20 true and Prioritor 3 active
15	0	Local Variable	21	Result=(A AND B)	Previous Line Result	0	Local Variable	19	0.0	0.0	LV 21 = ETA of Prioritor 3 between 50s and
17	0	Global Variable	30	Result=(A OR B)	Local Variable	17	Local Variable	21	0.0	0.0	True if LV 17 or LV 21 true
20	0	None	0	Countdown A seconds if B	Number	3	Phase On	4	0.0	0.0	True 3 seconds into ph 4
21	0	Global Variable	33	Result=Latch(A, B)	Previous Line Result	0	Global Variable	30	0.0	0.0	GV 33 = Latch previous until GV 30 is true

USER PROGRAMS – TSP



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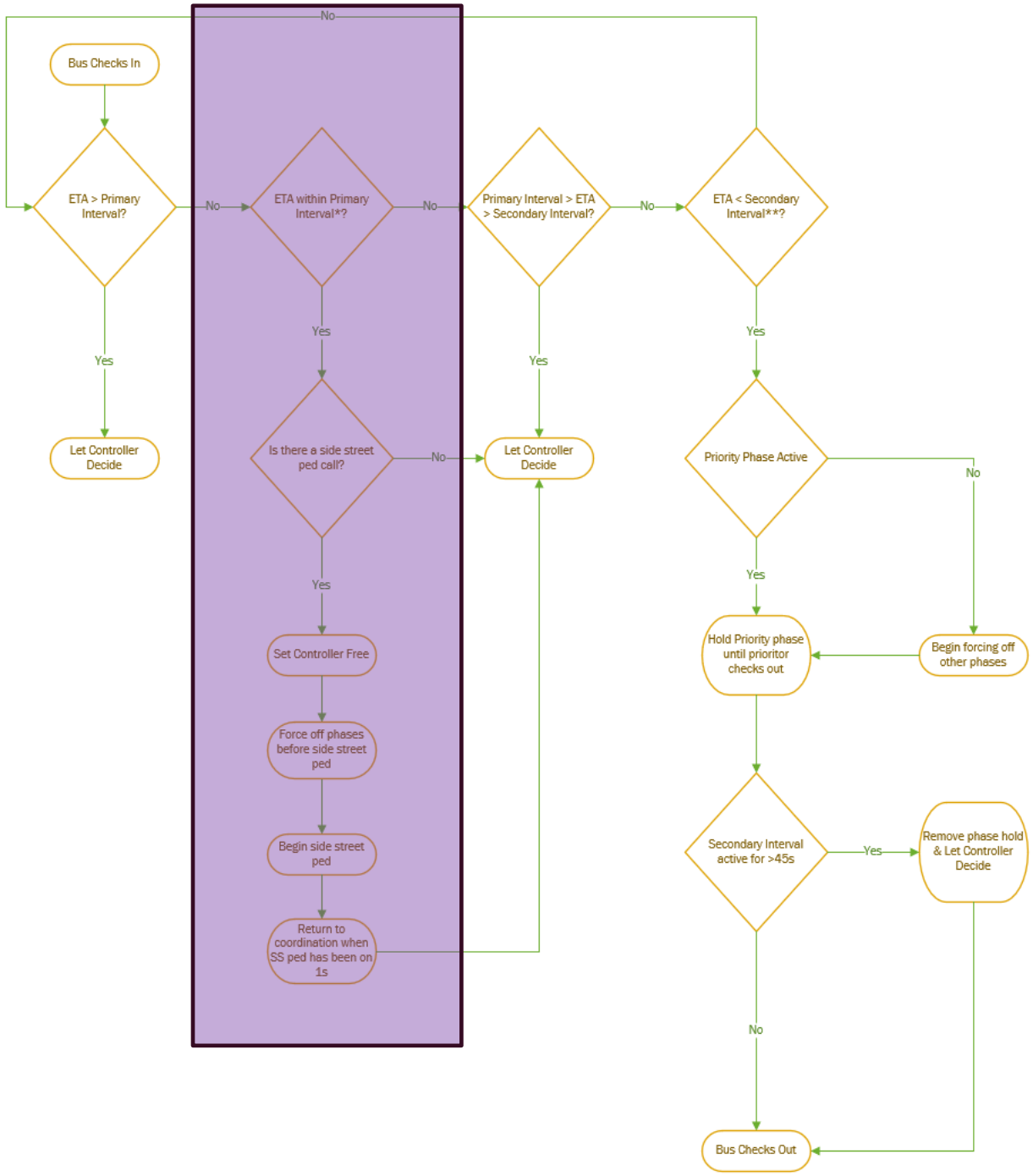

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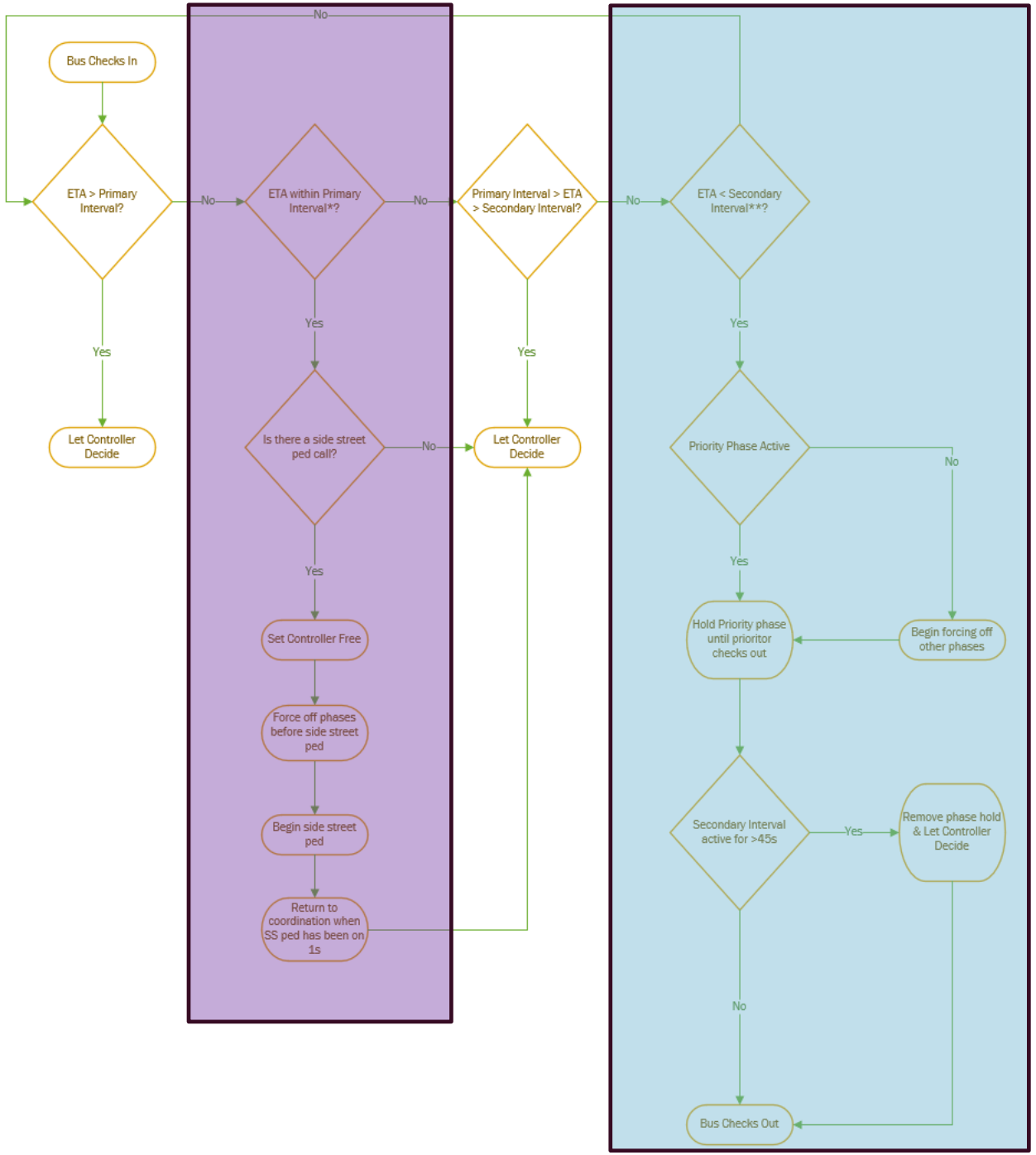
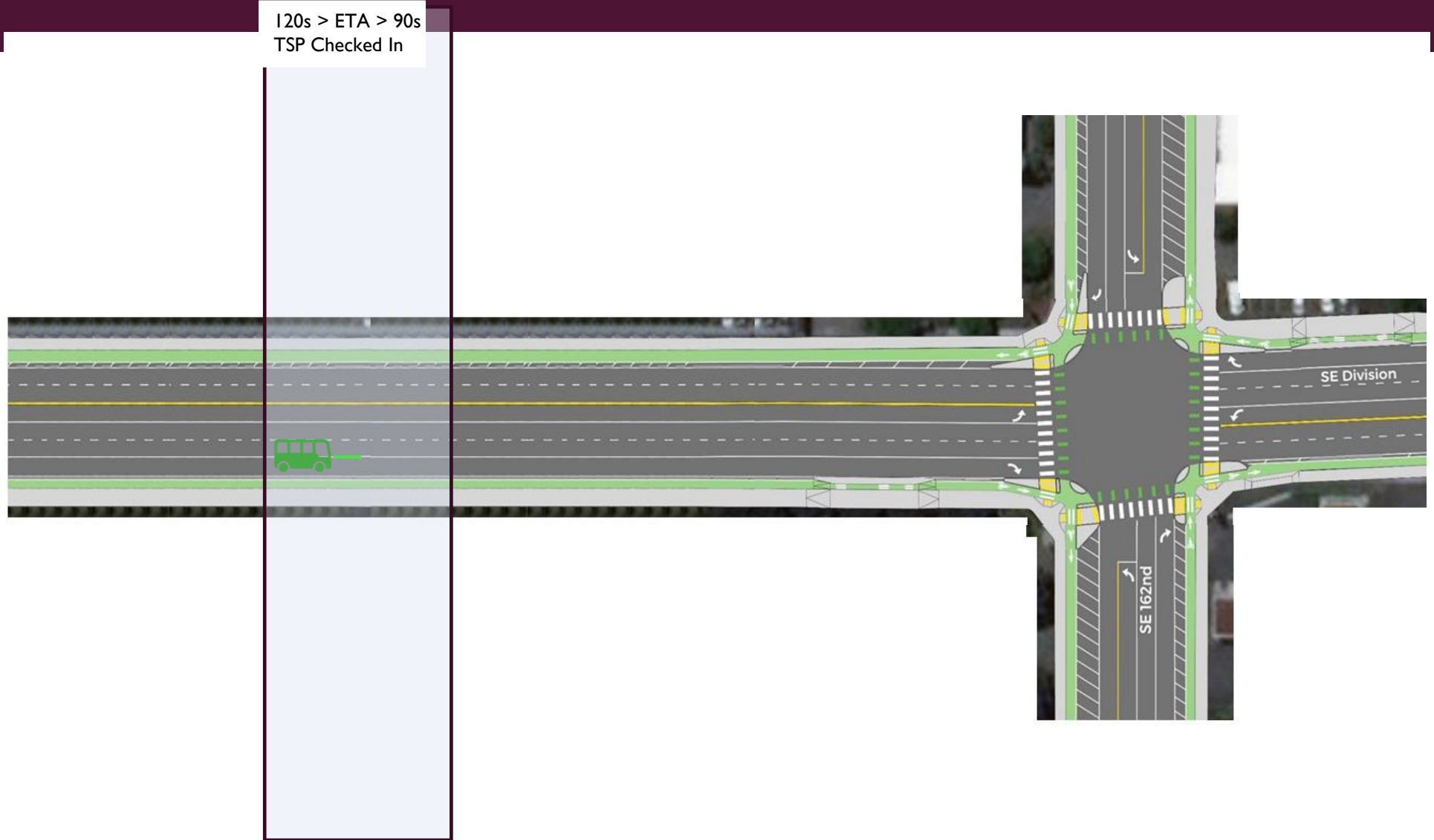


TRANSIT SIGNAL PRIORITY ROUTINE

TRANSIT SIGNAL PRIORITY ROUTINE

ETA > 120s
Signal > 3 ahead
TSP Inactive

TRANSIT SIGNAL PRIORITY ROUTINE



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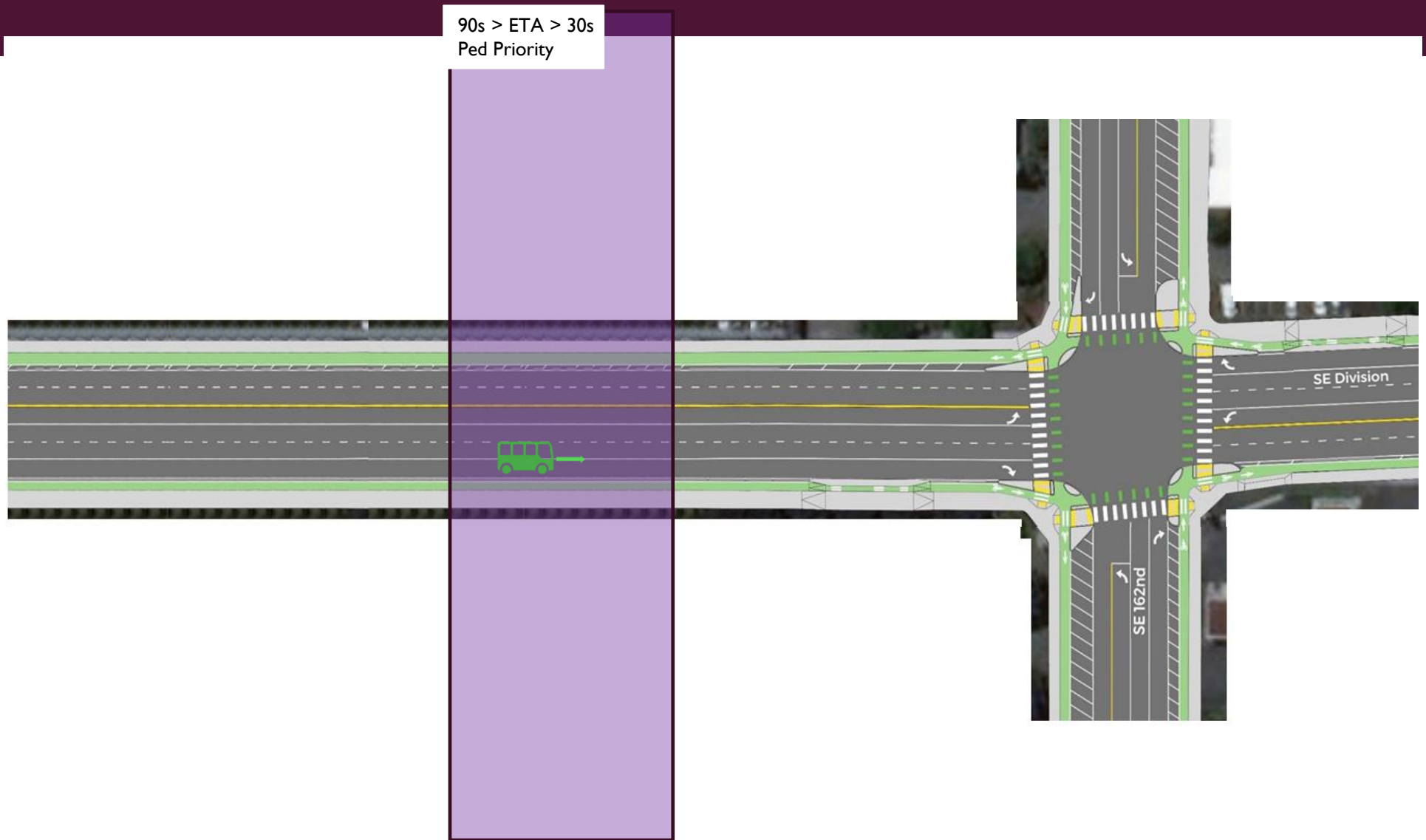

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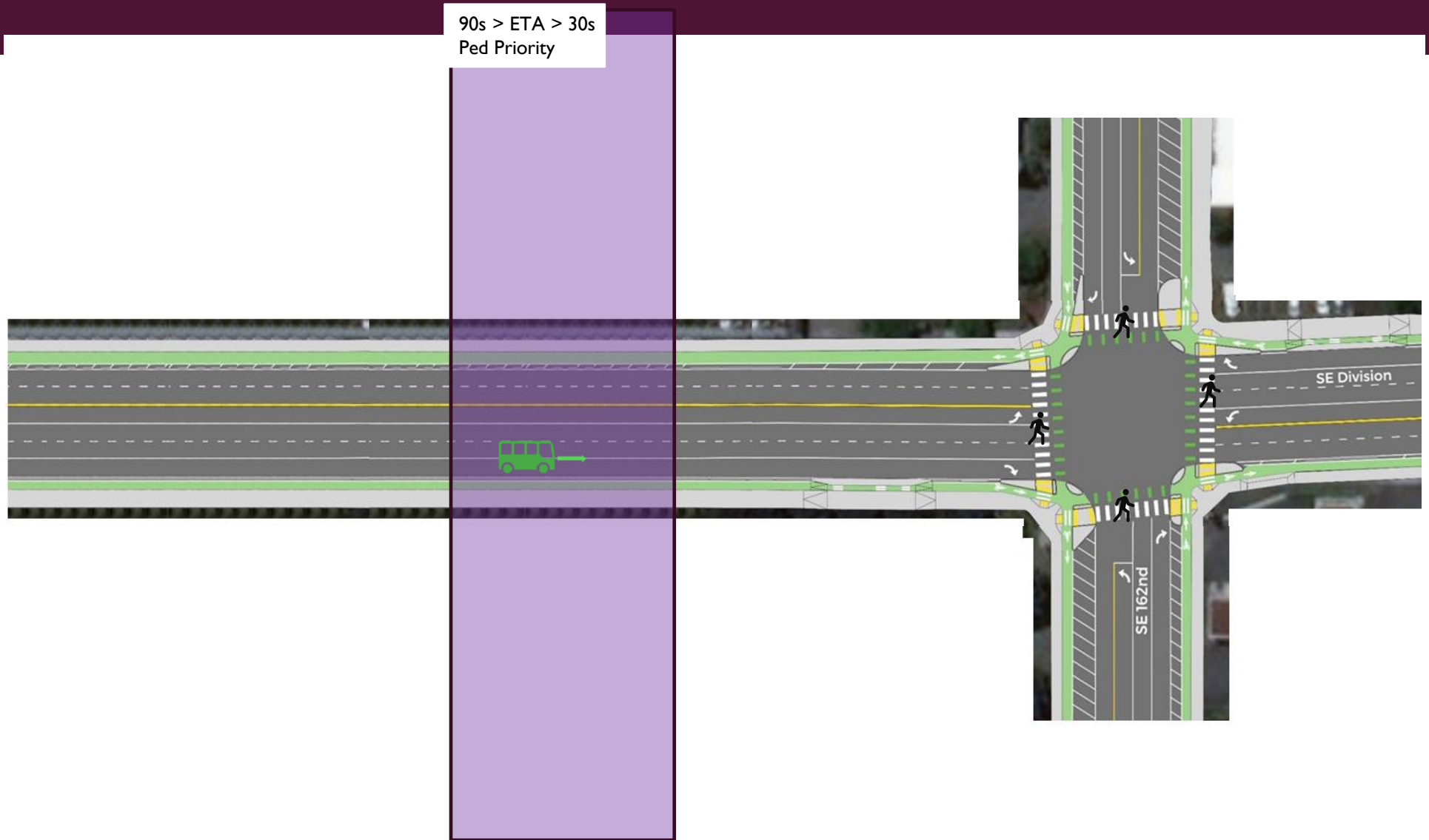

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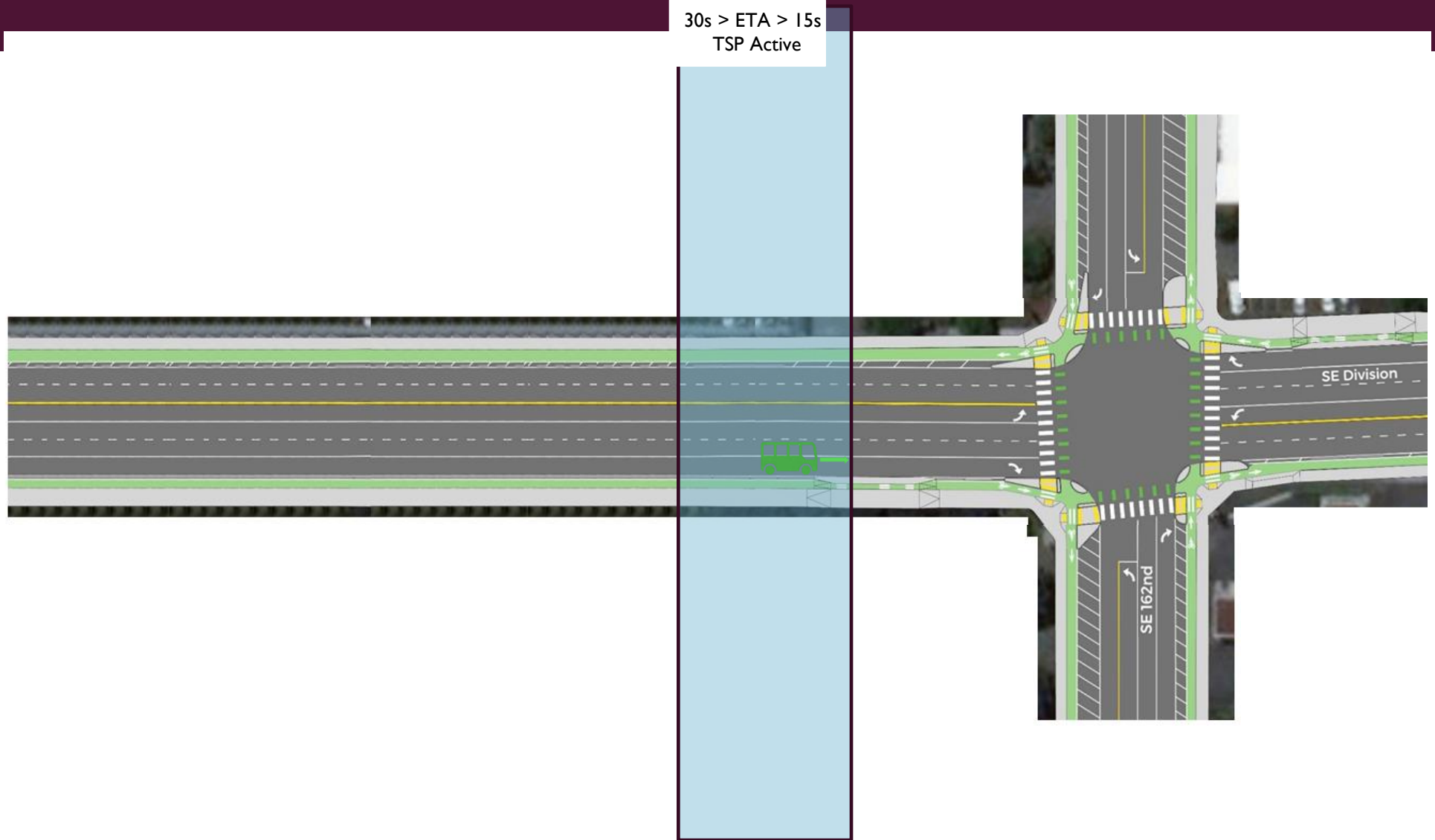

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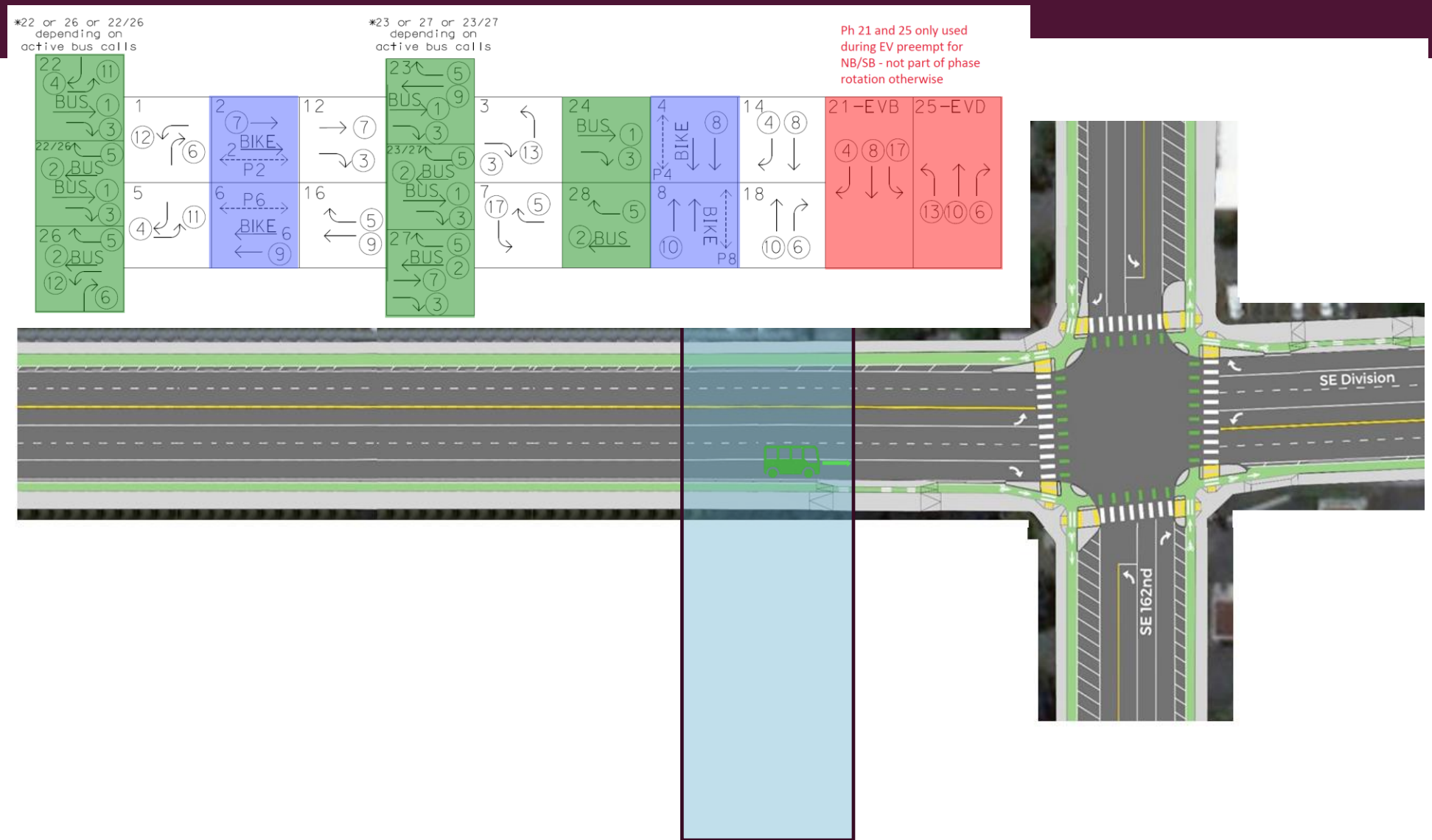

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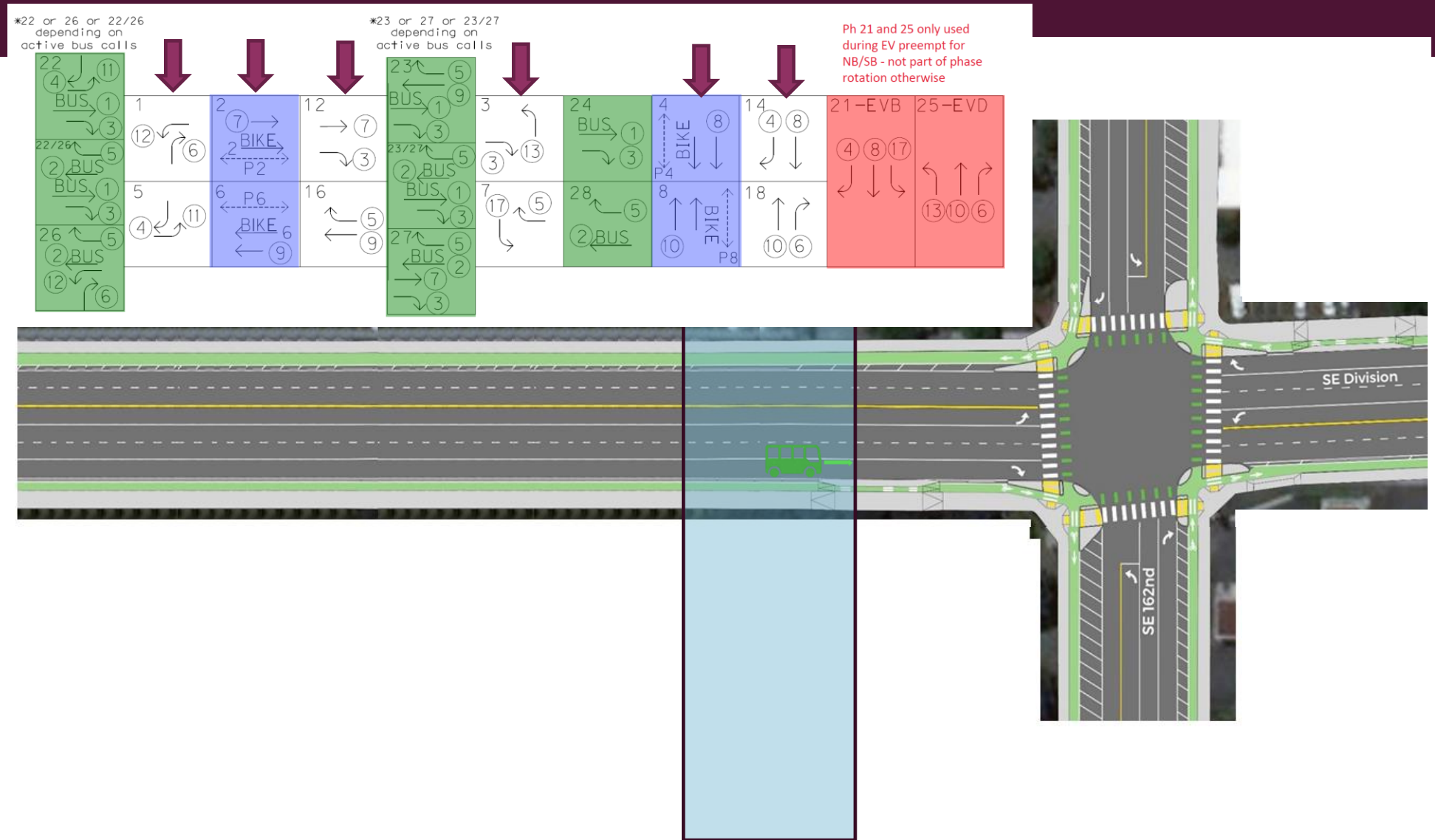

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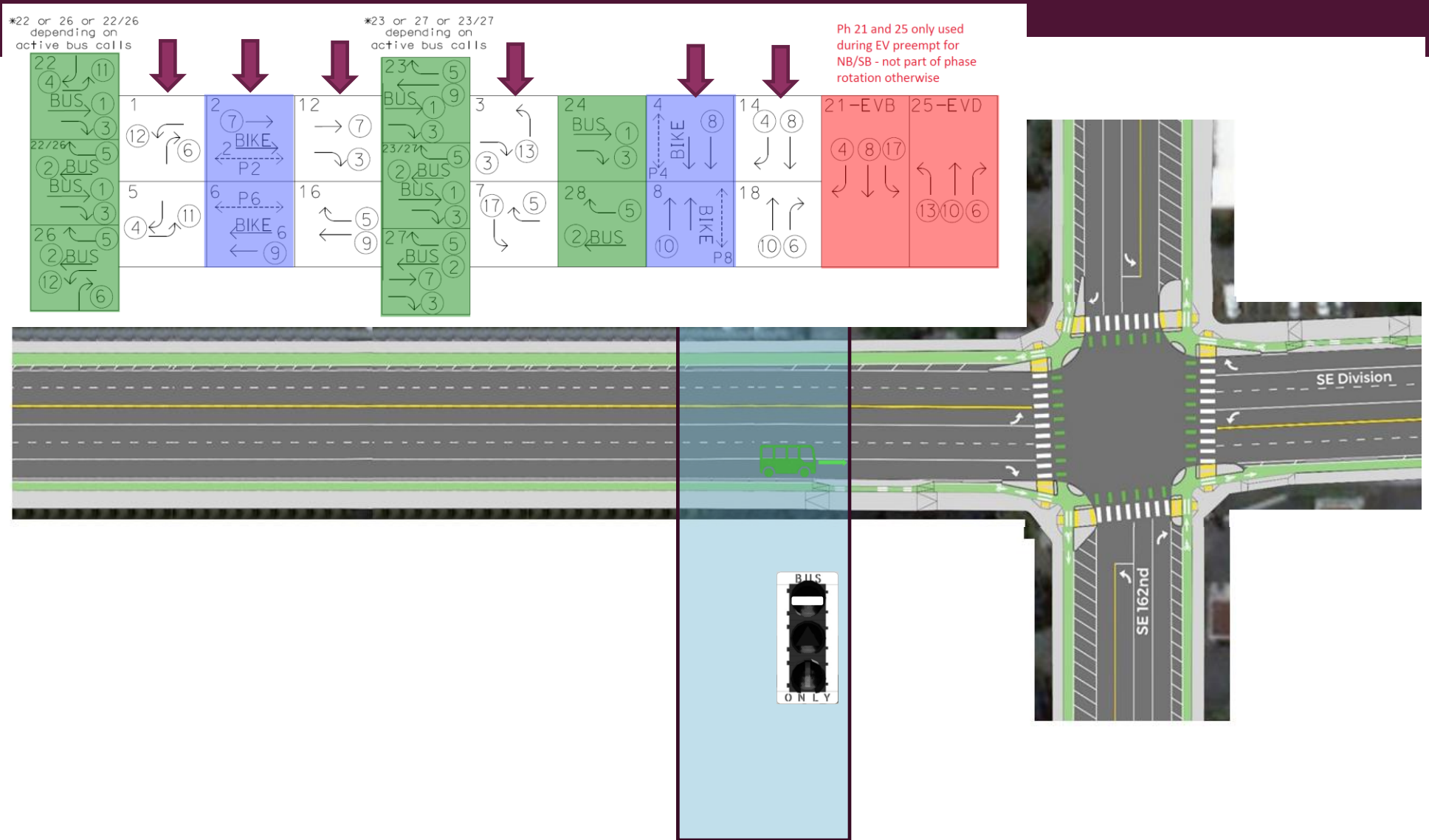

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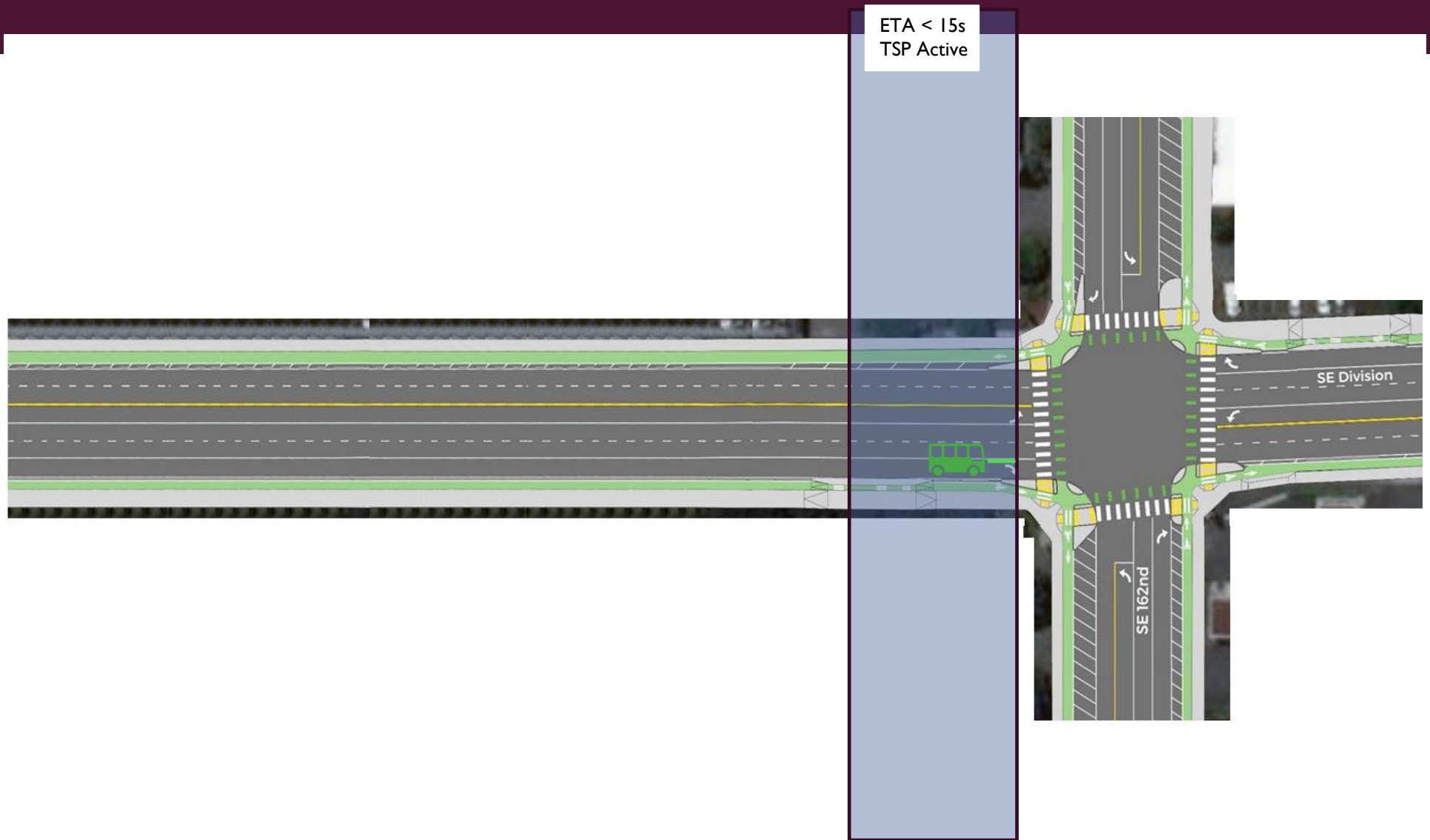

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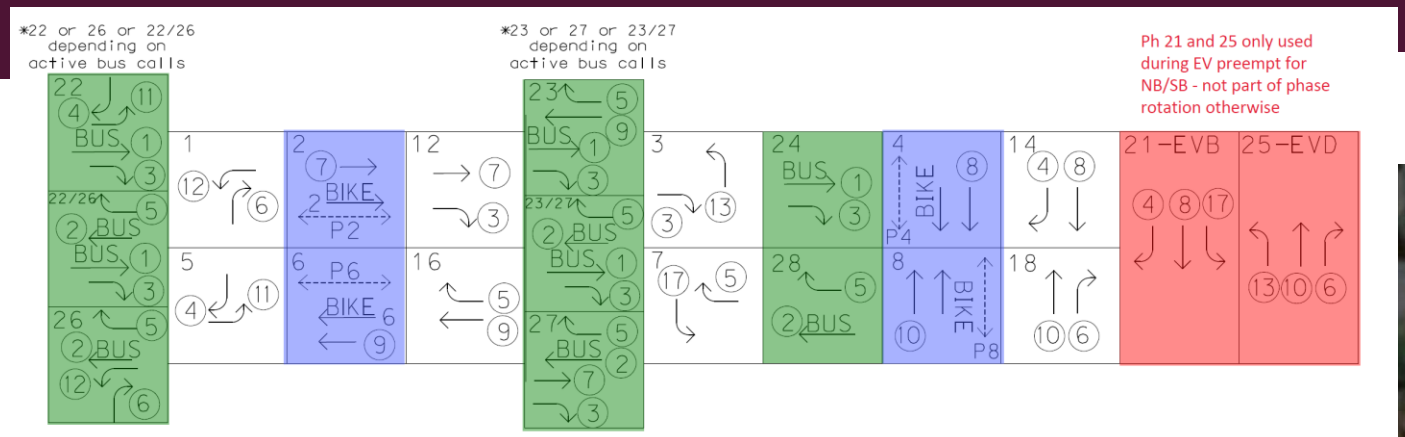

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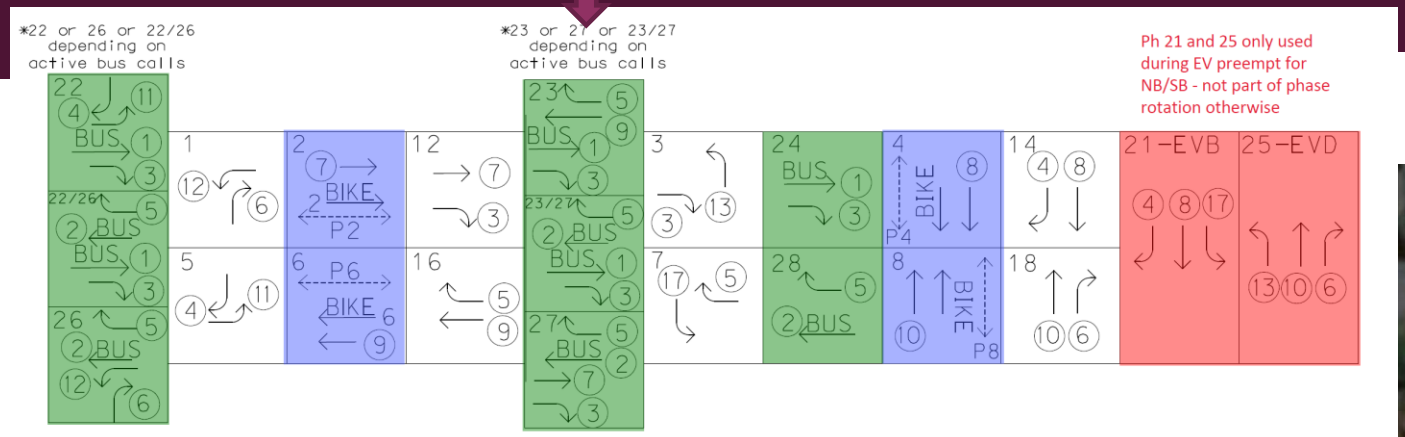

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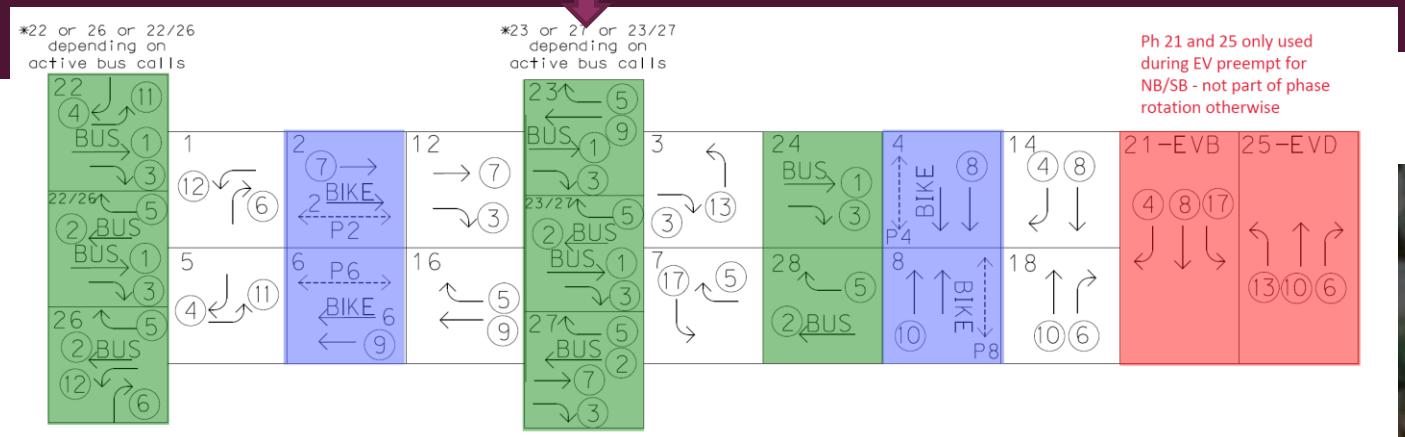

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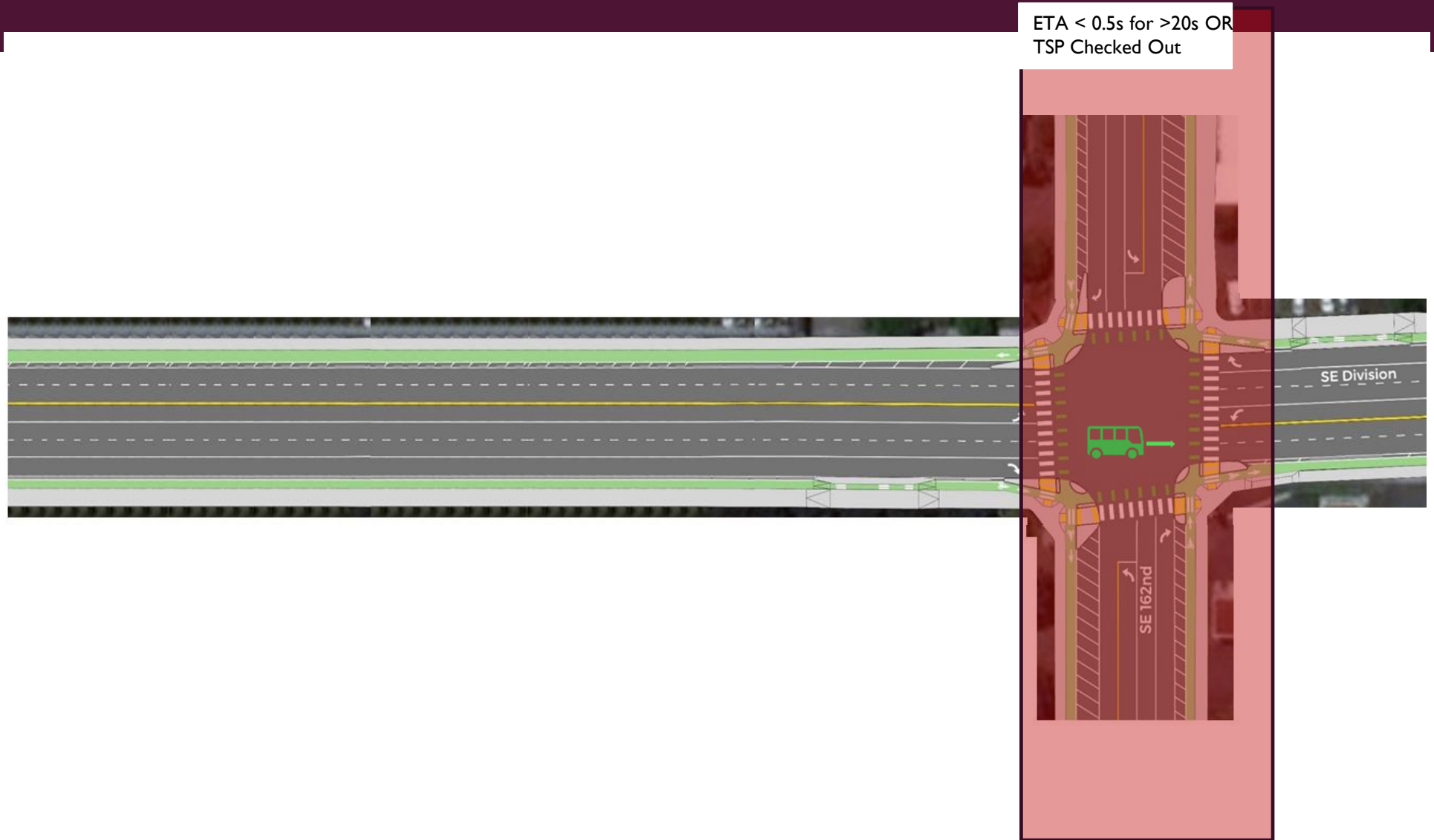

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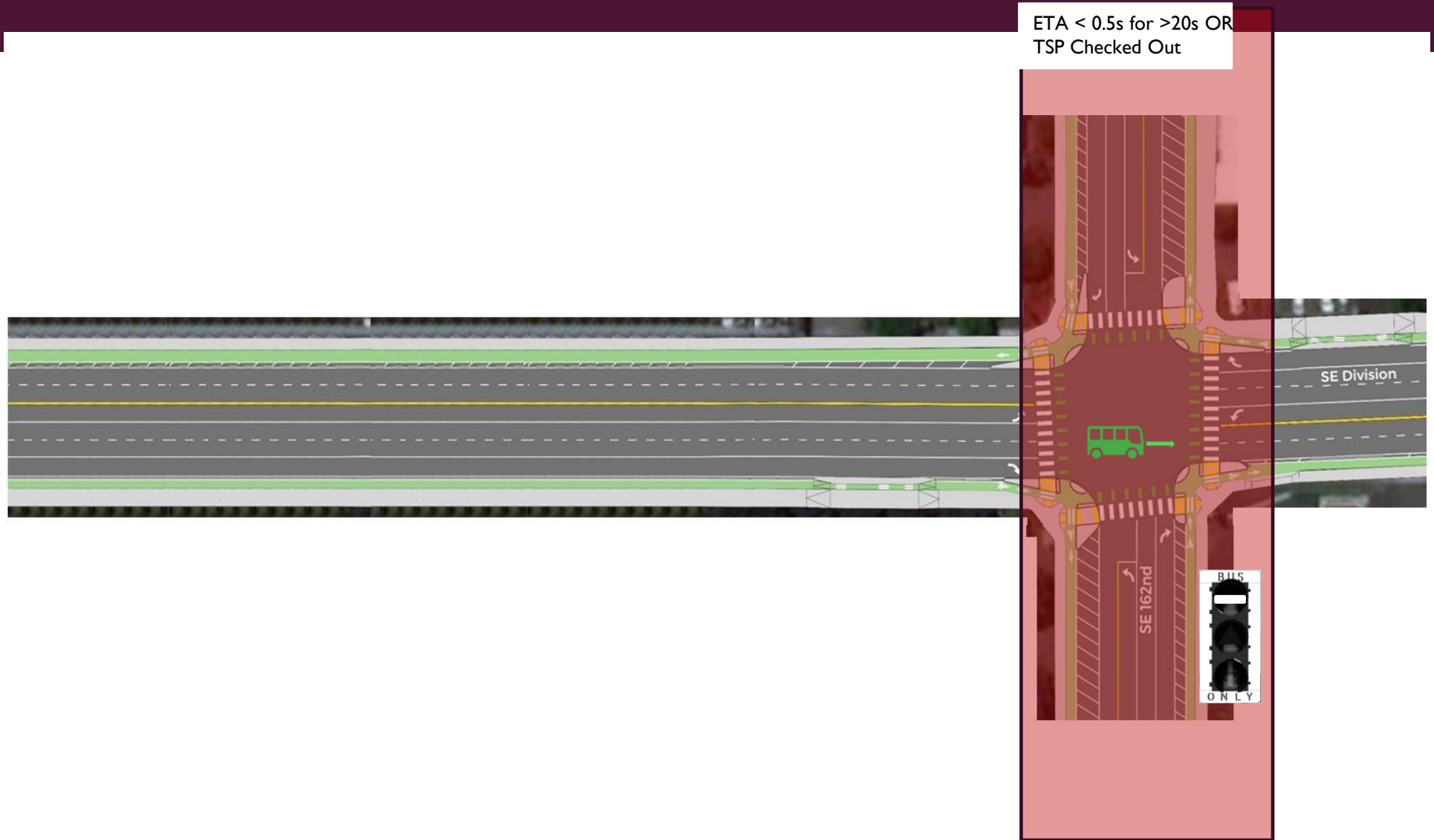


TRANSIT SIGNAL PRIORITY ROUTINE

TSP
Inactive

TRANSIT SIGNAL PRIORITY ROUTINE

TSP
Inactive

TESTING…

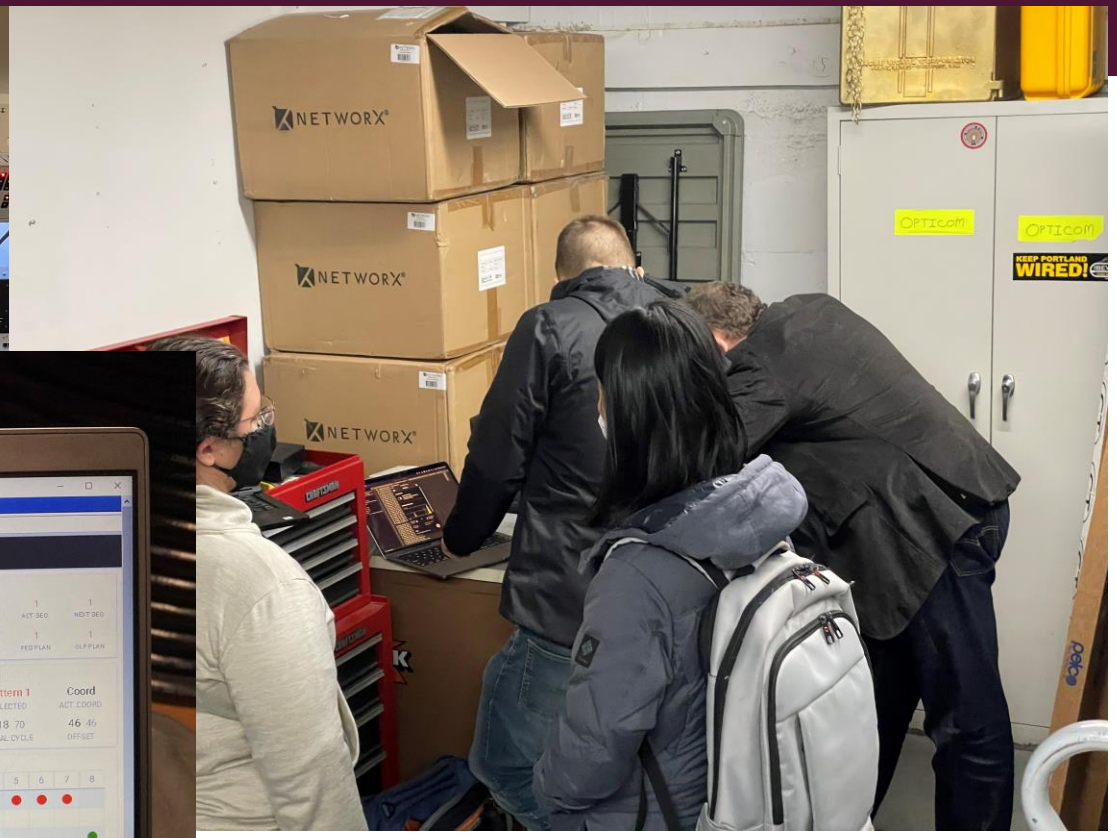
TESTING…


%1515
Bin:
T02B
WARNING


NETWORX
NETWORX
NETWORX
OPTICOM
OPTICOM
KEEP PORTLAND
WIRED!

TESTING…


%1515
Bin:
T02B


NETWORX
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OPTICOM
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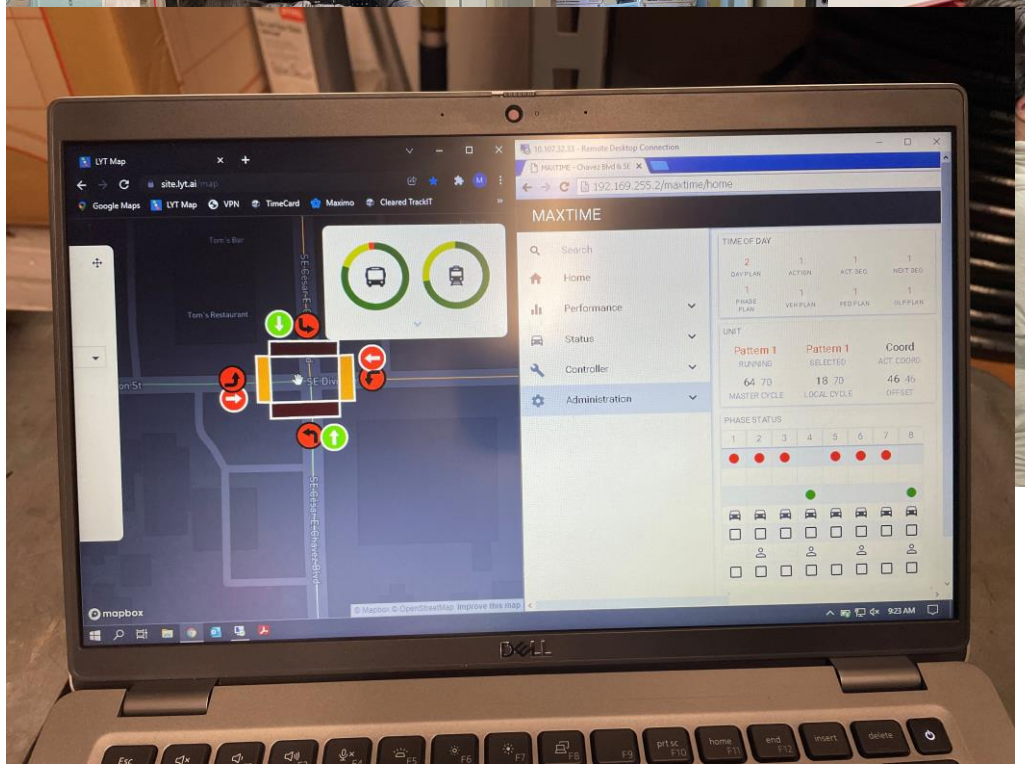
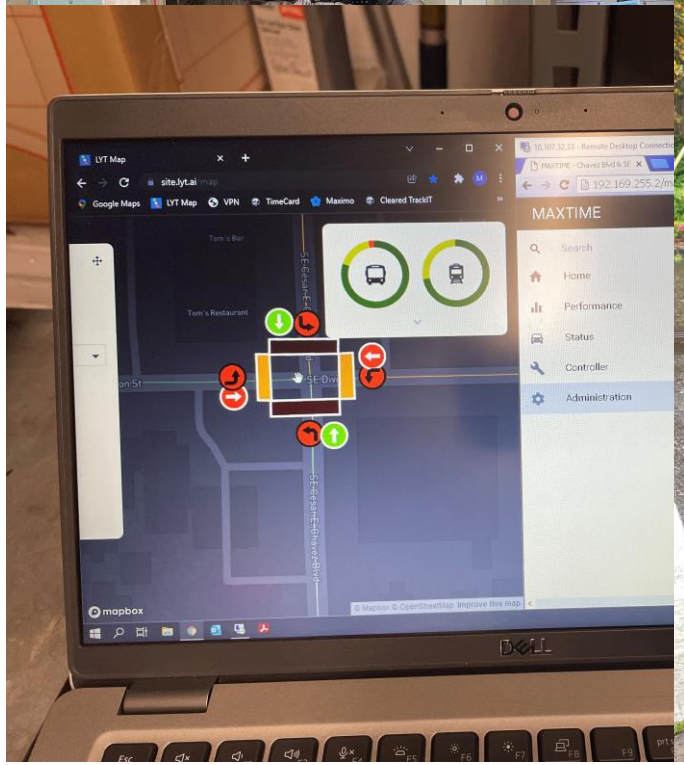

LYT Map
site.lyt.ai
Google Maps
LYT Map
VPN
TimeCard
Maximo
Cleared TrackIT
192.169.255.2/maxtime/home
MAXTIME
Search
Home
Performance
Status
Controller
Administration
TIME OF DAY
UNIT
Pattern 1
Pattern 1
Coord
PHASE STATUS
mapbox
DELL

TESTING…

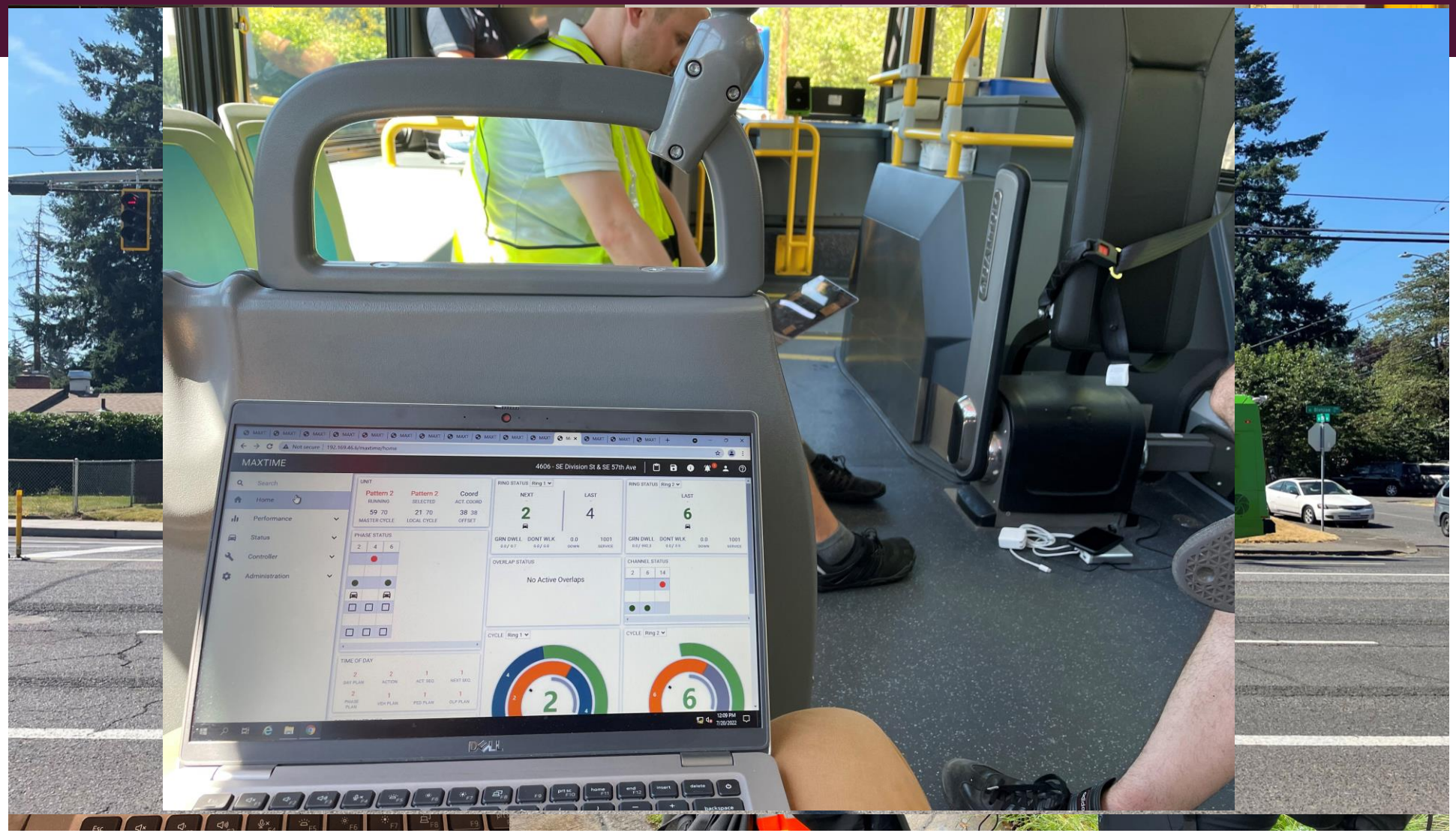

%1515
Bin:
T02B


NETWORX


LYT Map
site.lyt.ai
Google Maps
LYT Map
VPN
TimeCard
Maximo
Cleared TrackIT
MAXTIME
Search
Home
Performance
Status
Controller
Administration
mapbox
DELL

TESTING…

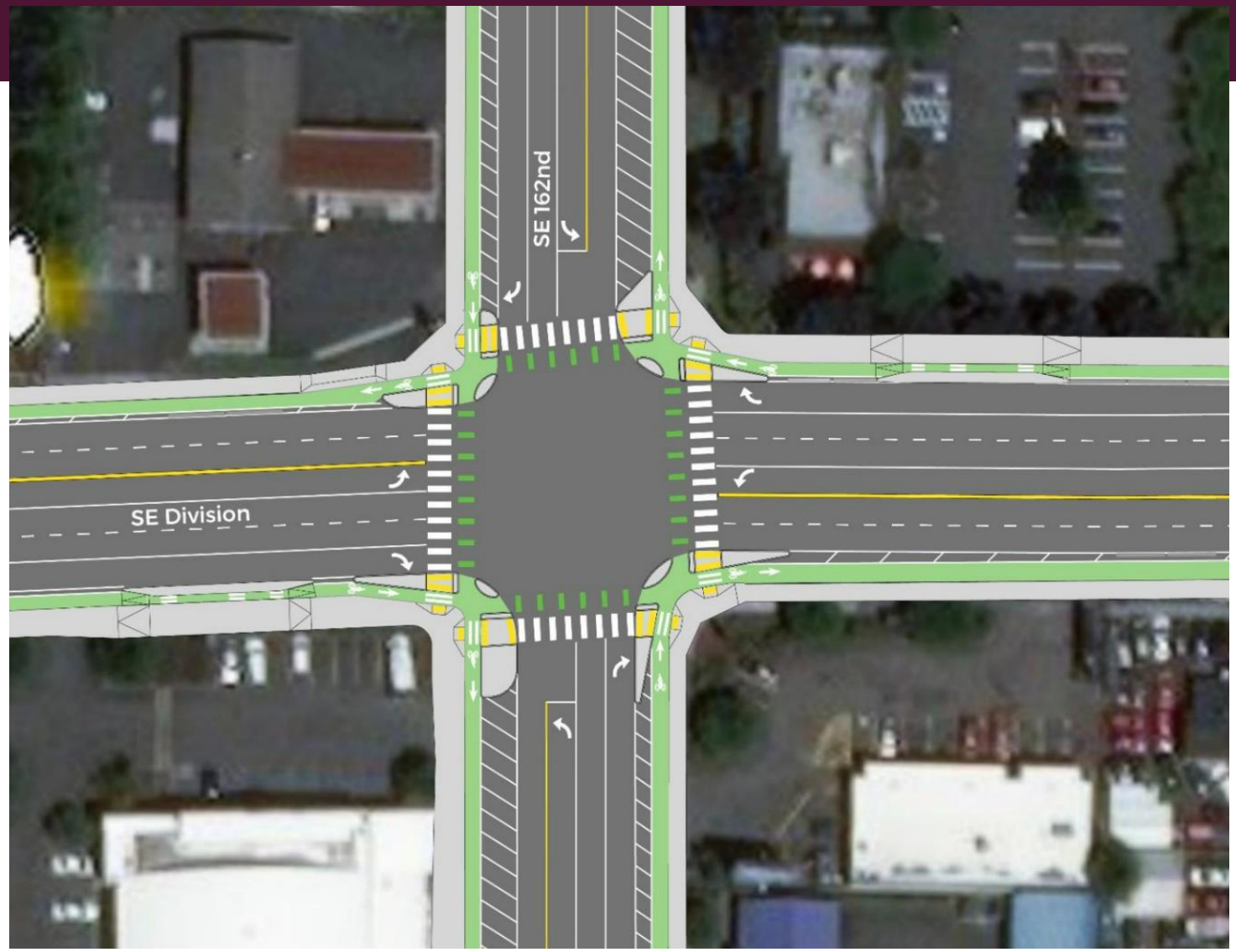
TESTING…


MAXTIME
4606 - SE Division St & SE 57th Ave
Search
Home
Performance
Status
Controller
Administration
Pattern 2
Pattern 2
Coord
No Active Overlaps
DELL

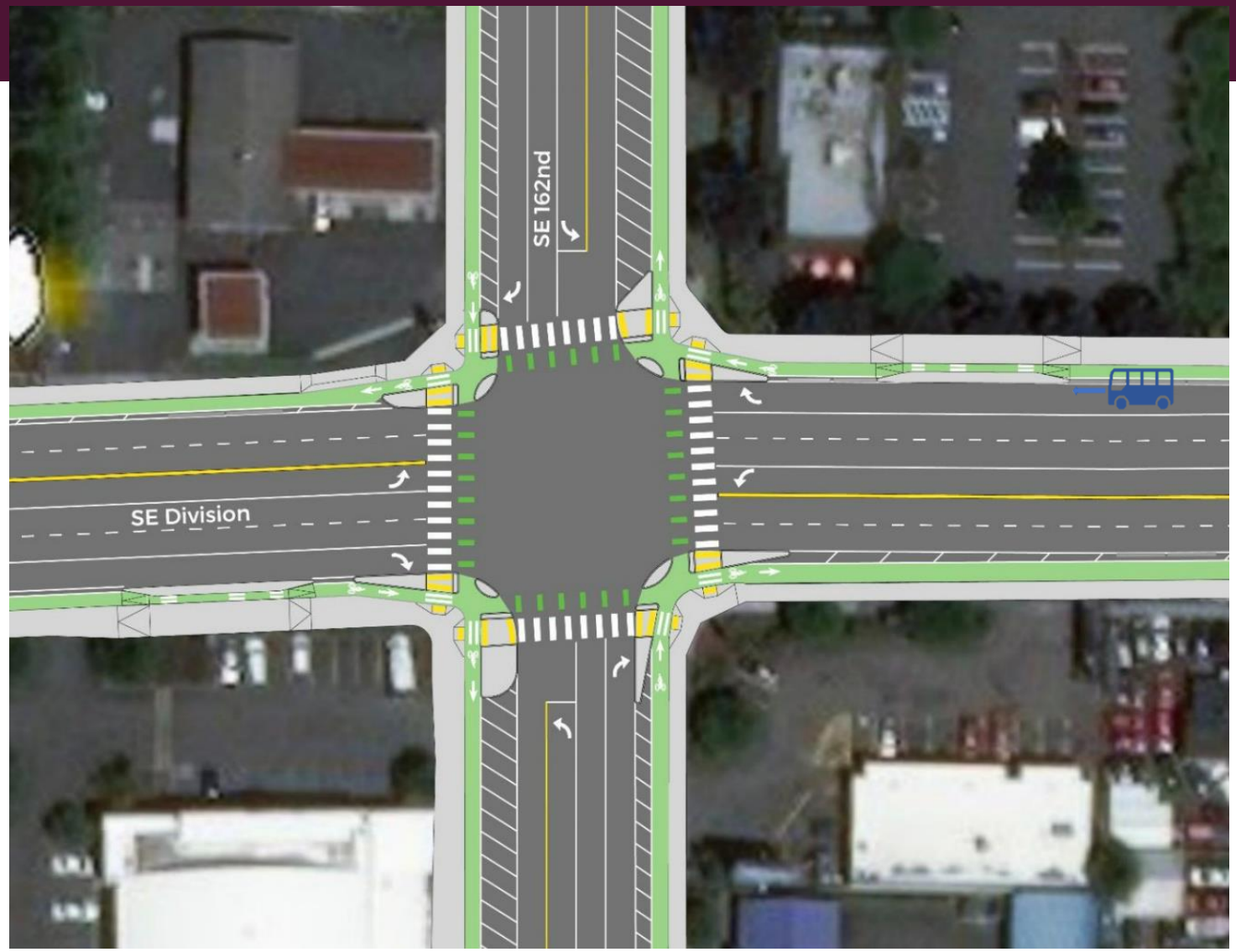
TESTING…

BUS SIGNAL

TWO BUSES – ONE PASSING



TWO BUSES – ONE PASSING



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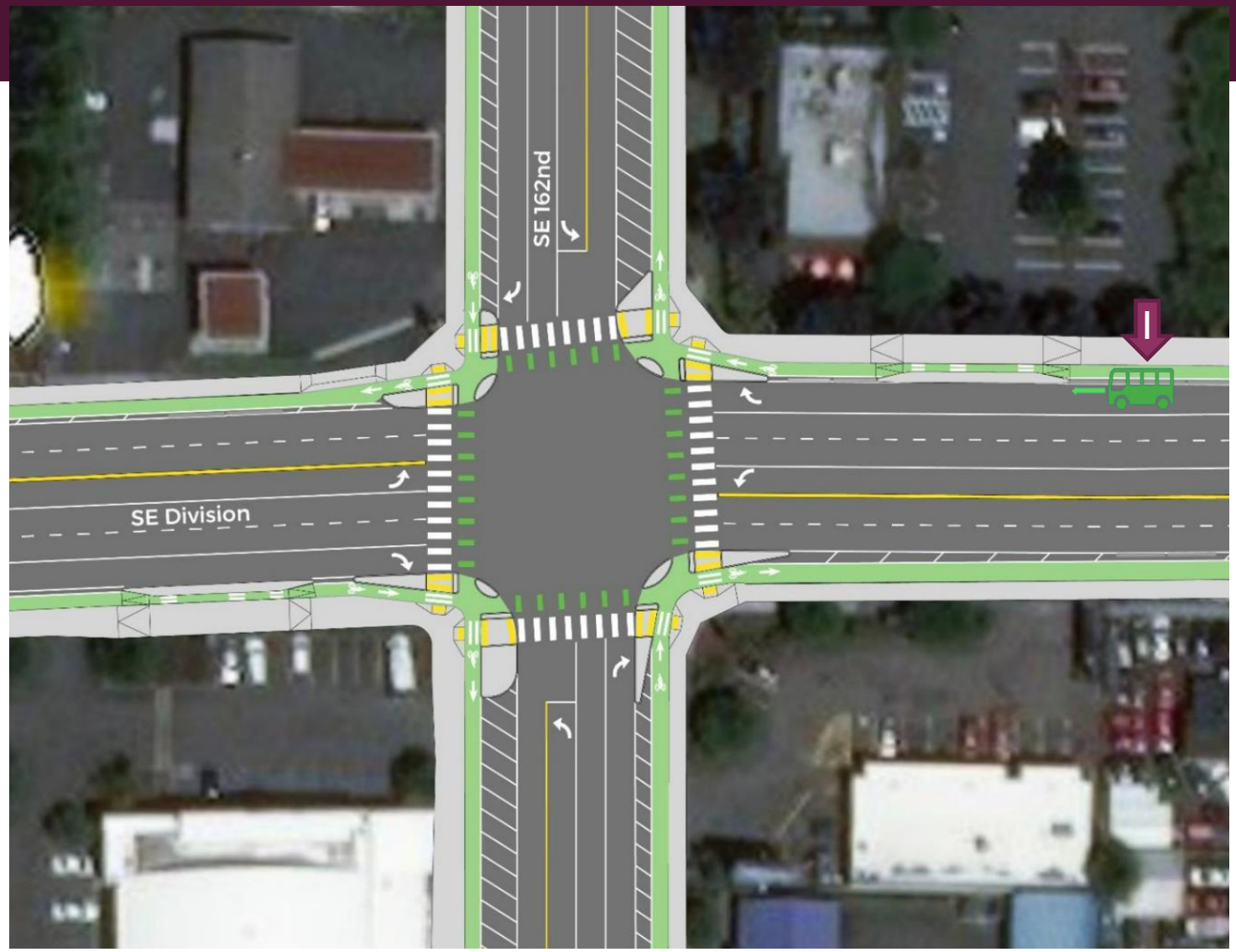

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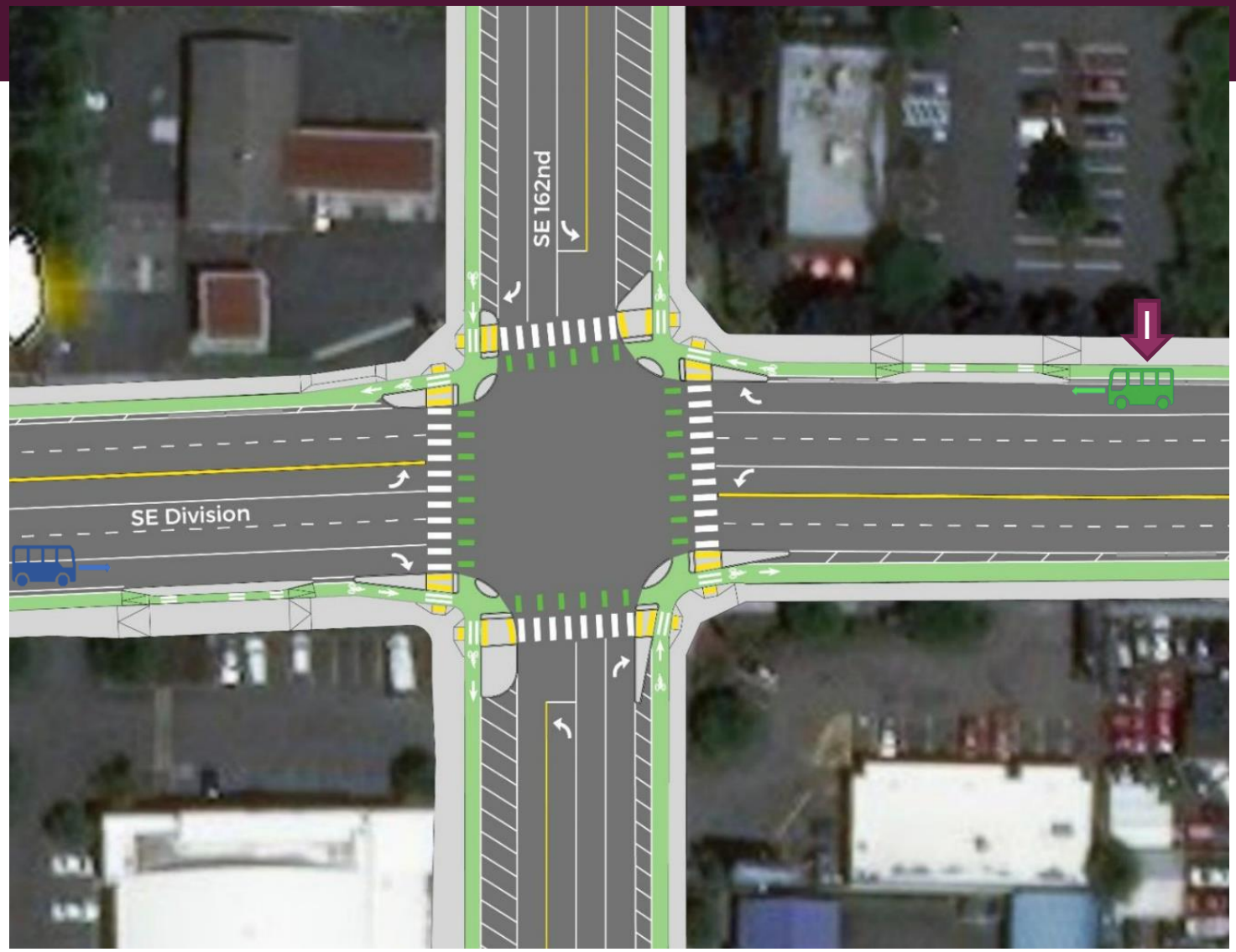

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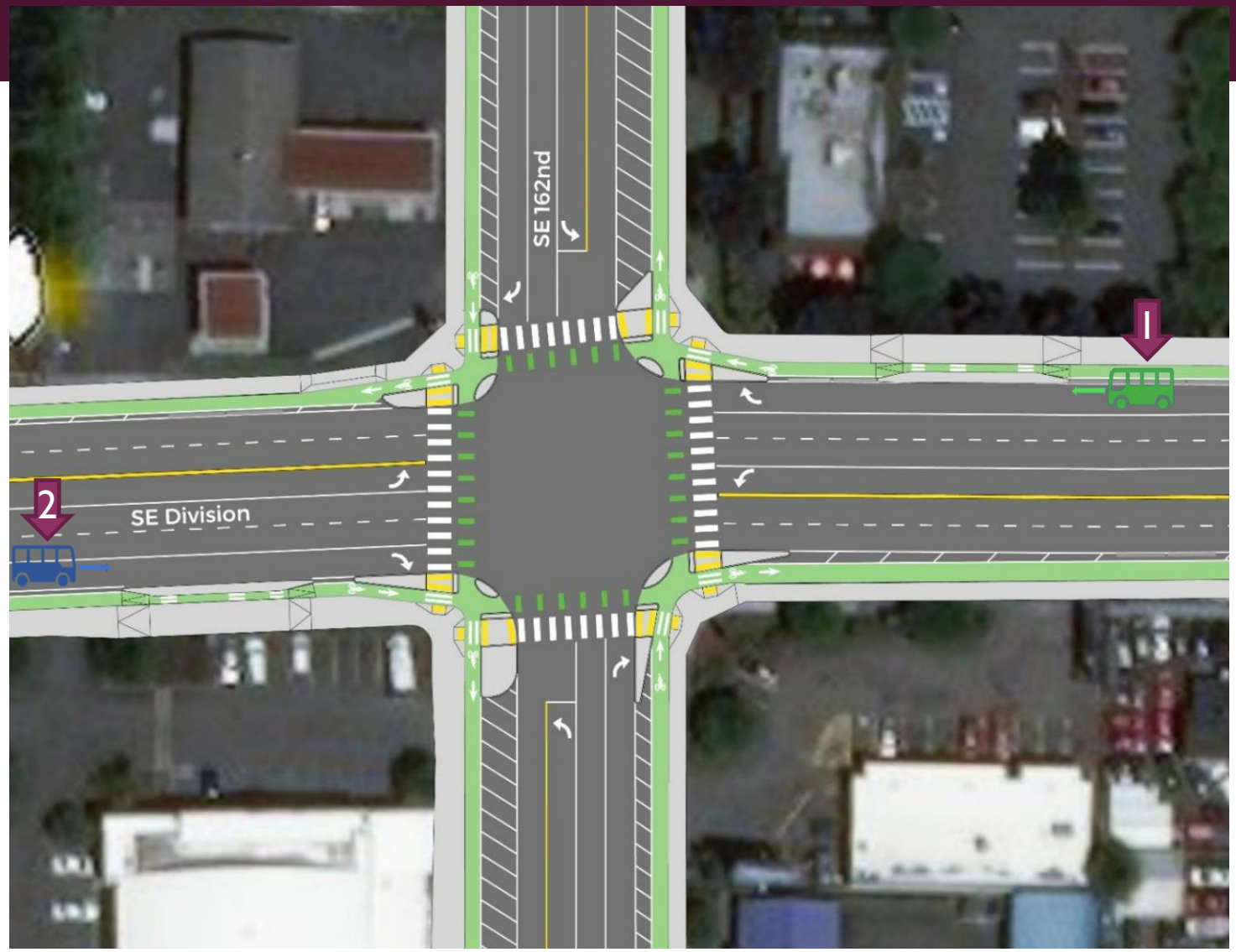

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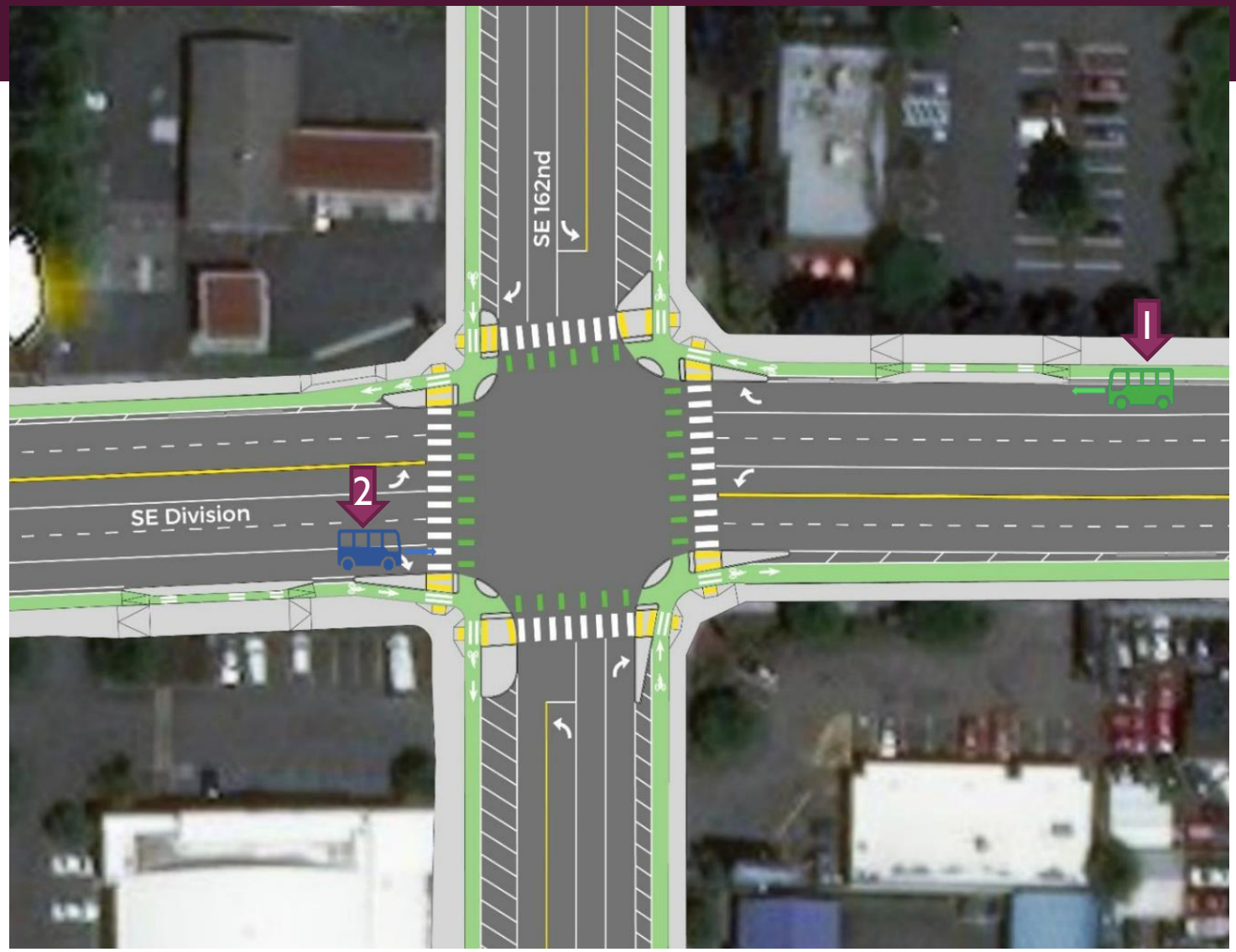

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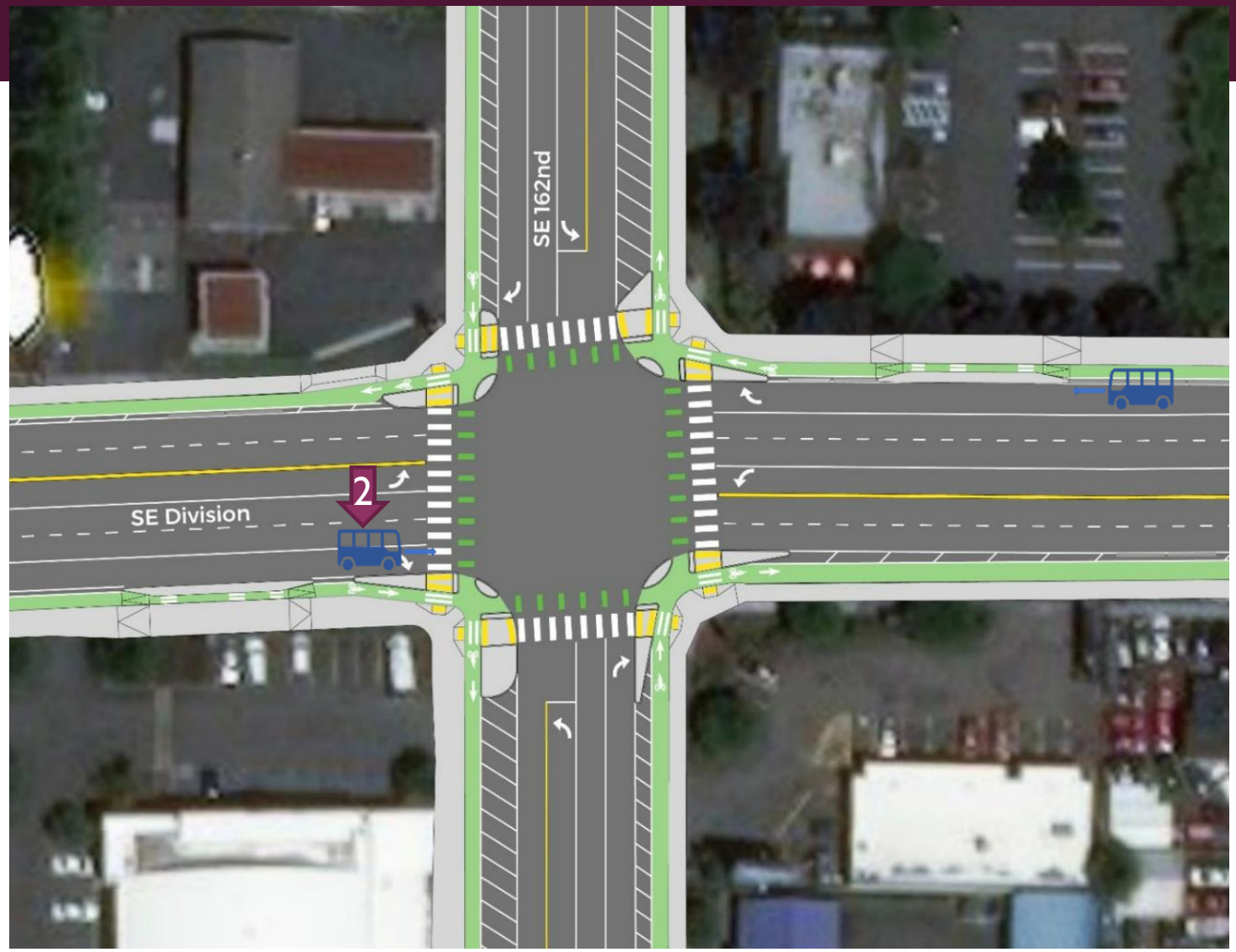

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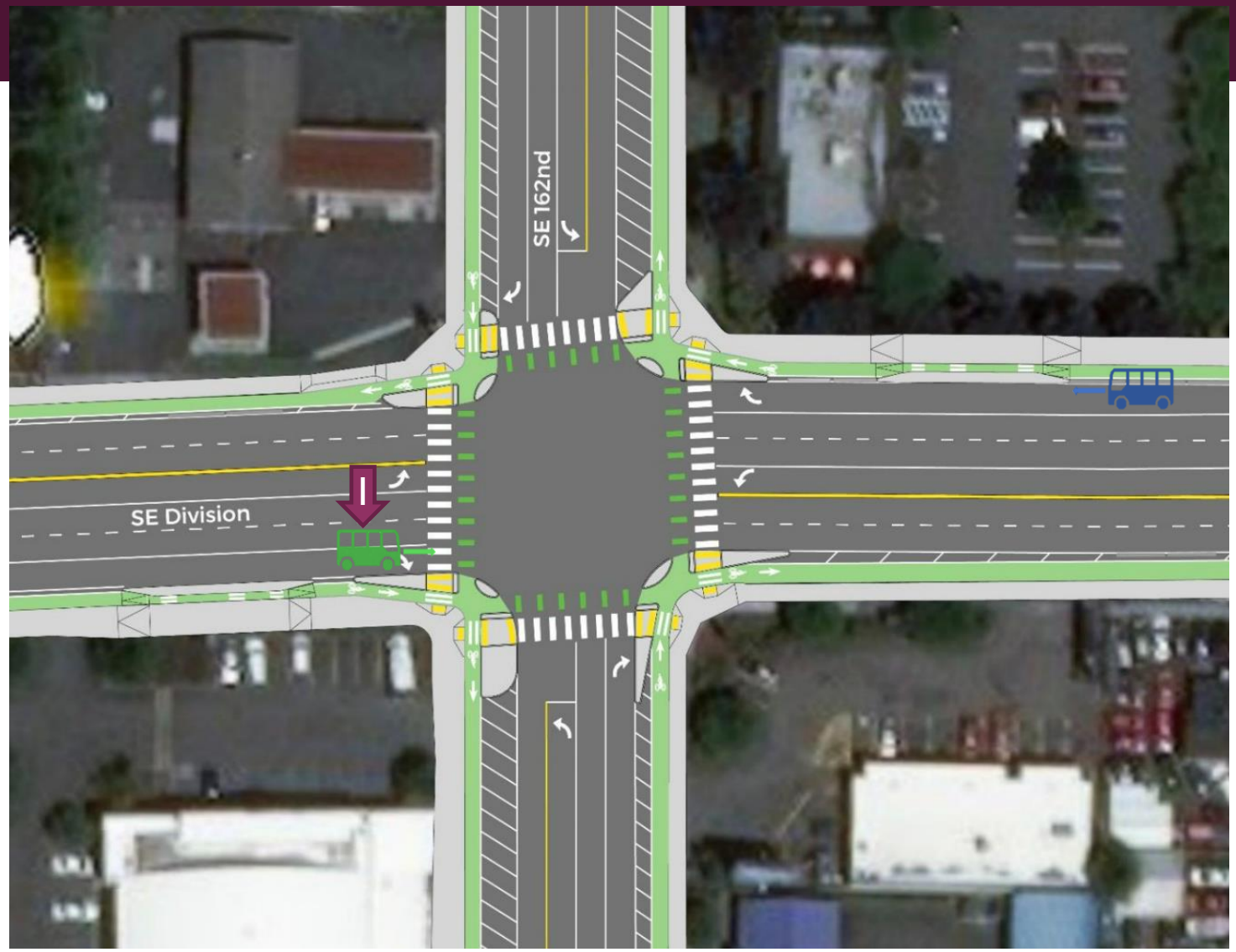

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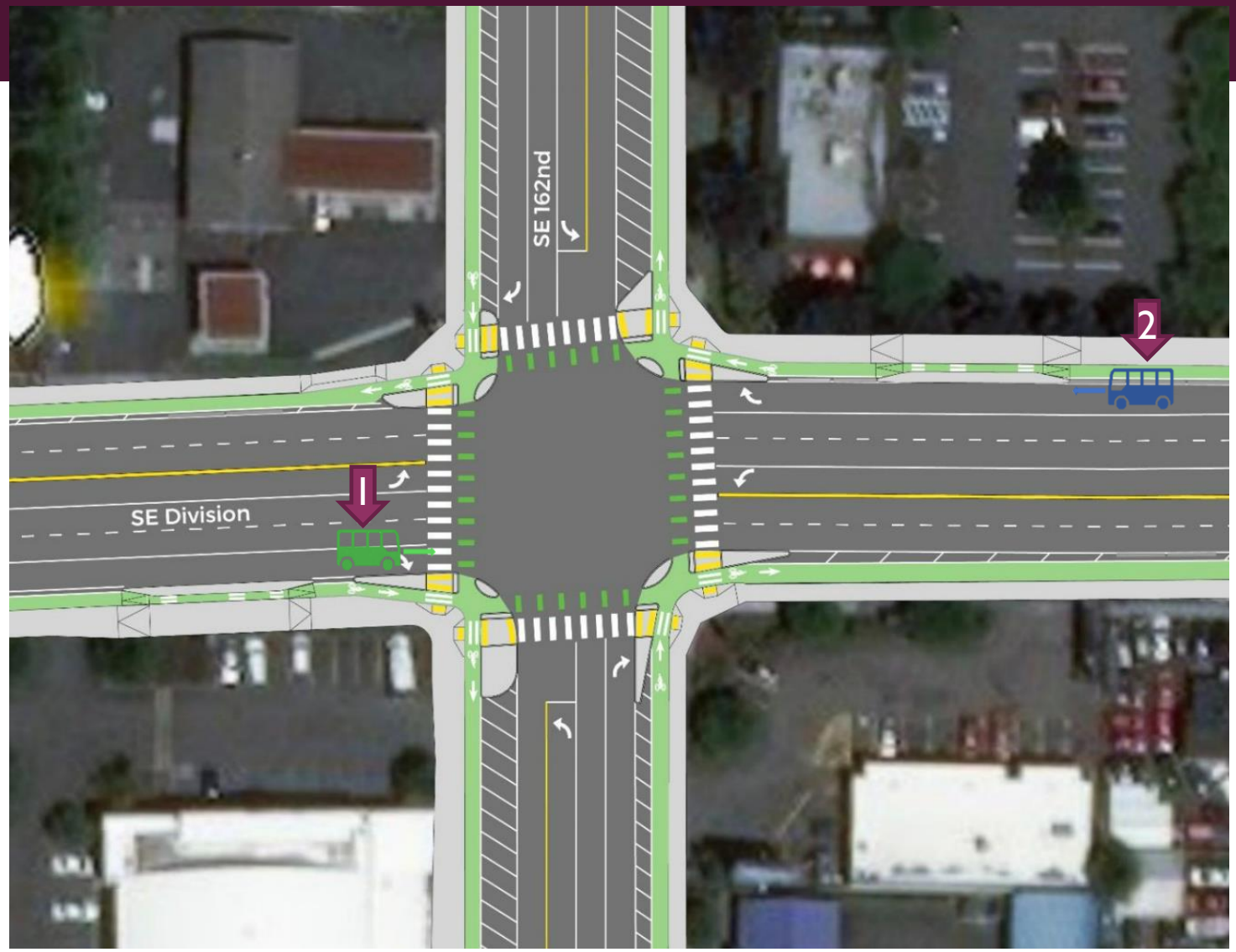

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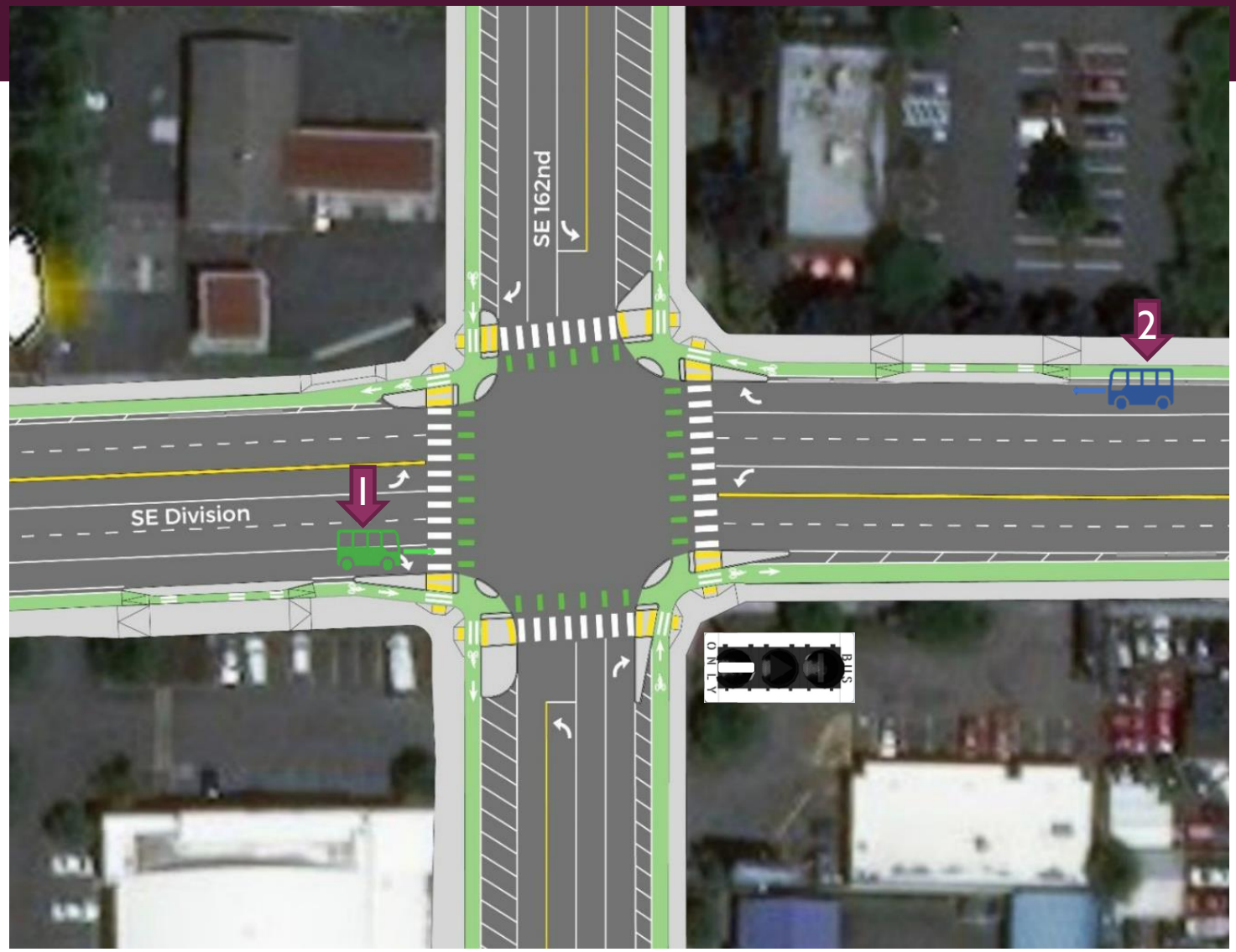

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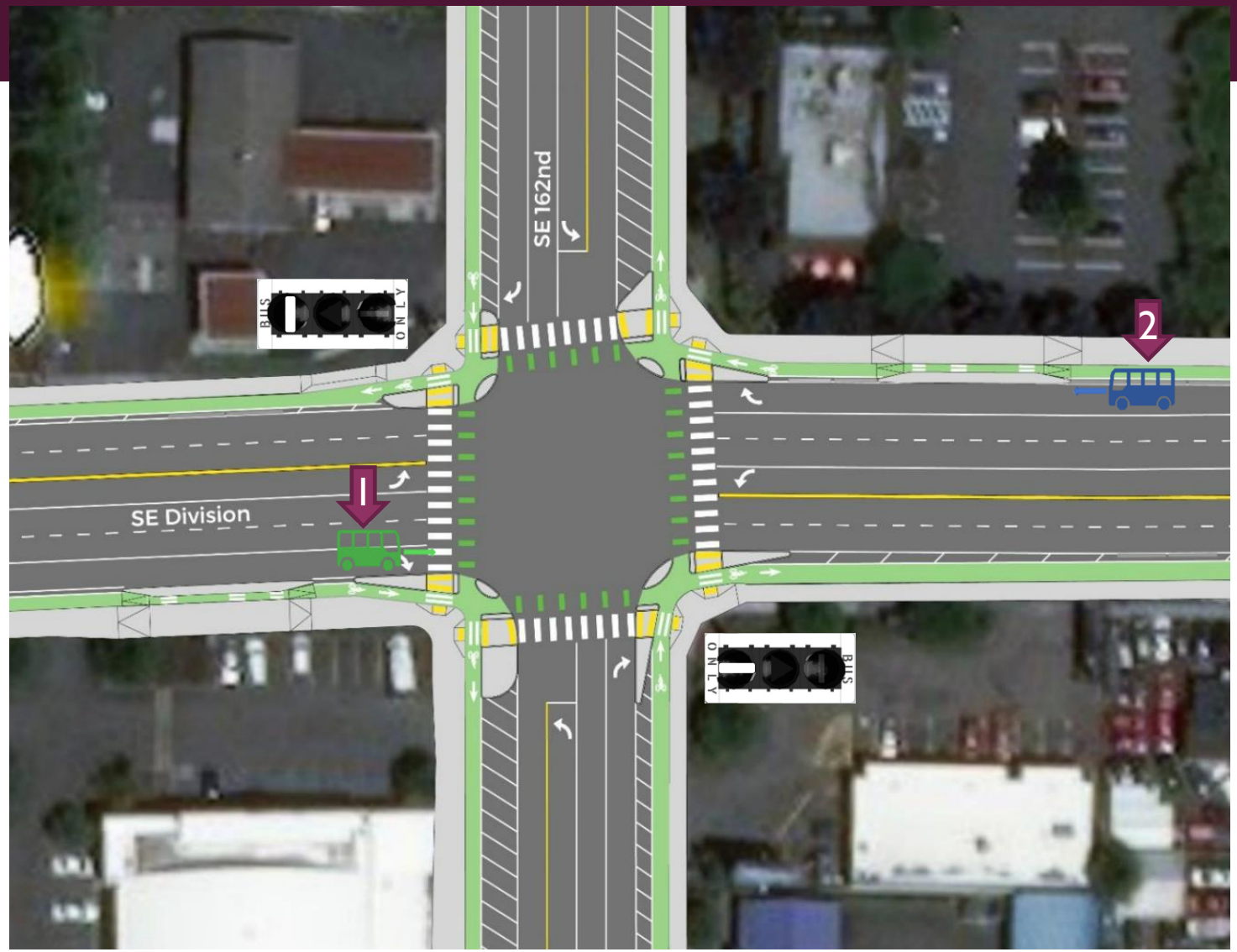

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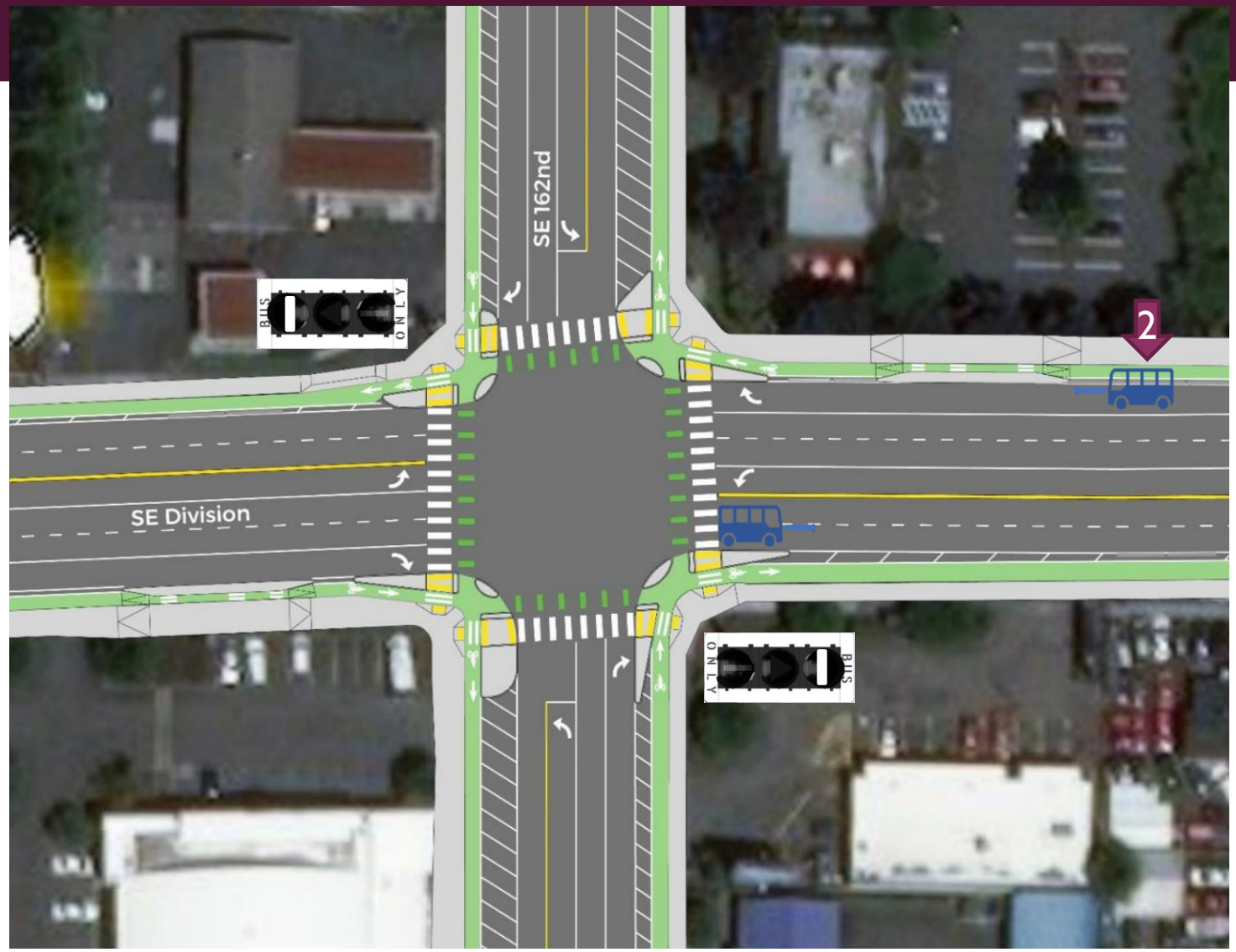

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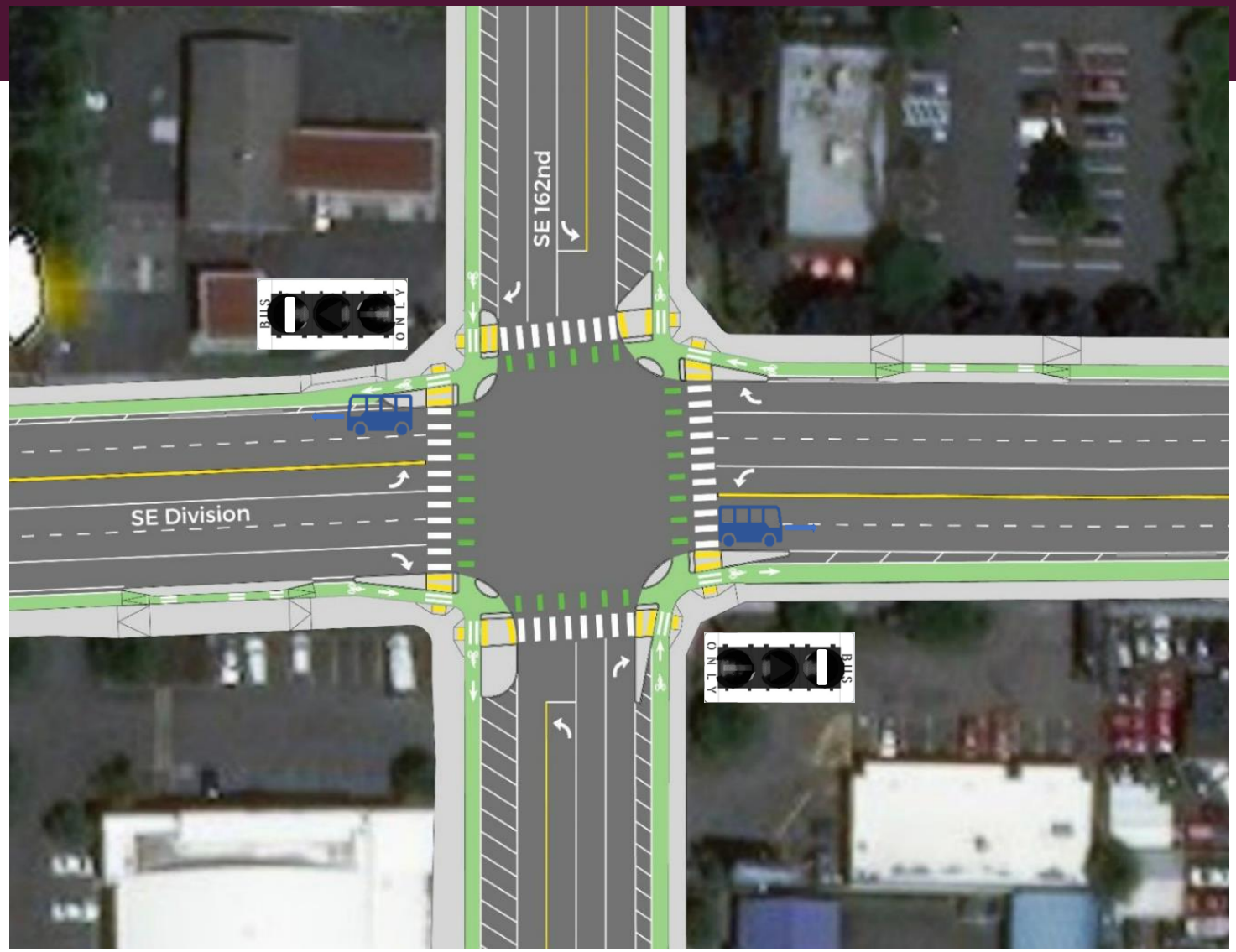
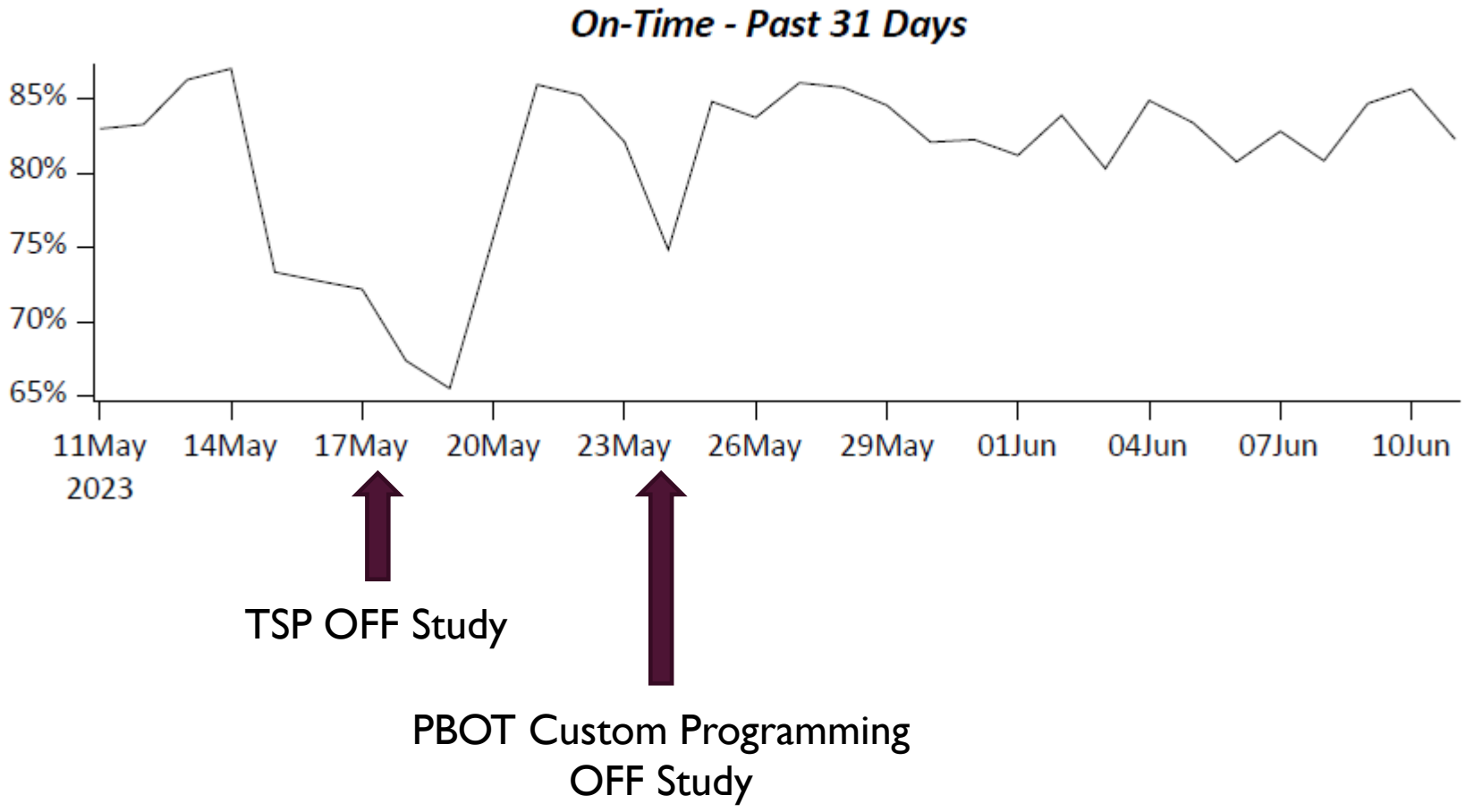
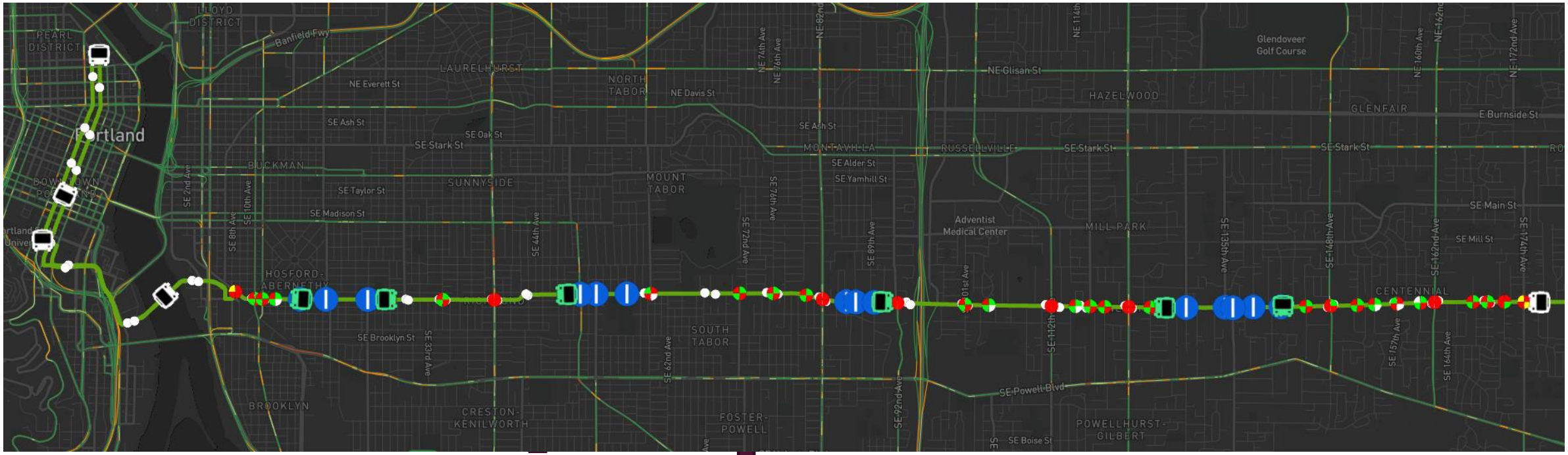


RESULTS AND WHOLE SYSTEM VIEW



RESULTS AND WHOLE SYSTEM VIEW



TSP OFF Study

PBOT Custom Programming OFF Study

RESULTS


Average Red Light Delay Over Time
Line 2 Service
Division FX-2 Opens
TSP AI Learning Period
TSP Equilibrium
60' Bus Recall
Snow days
TSP Off Study
FX-2 Average Delay
10.0 mins
9.0 mins
8.0 mins
7.0 mins
6.0 mins
5.0 mins
4.0 mins
3.0 mins
2.0 mins
1.0 mins
0.0 mins
06/14/2022
08/13
09/12
10/12
11/12
12/12
01/11
02/10
03/12
04/11
05/11
Reset
To Gresham Transit Center
To Portland City Center
Average Green Light Success Rate Over Time
FX-2 Average Success Rate
100 %
75.0 %
50.0 %
06/14/2022
08/13
09/12
10/12
11/12
12/12
01/11
02/10
03/12
04/11
05/11
Reset
To Gresham Transit Center
To Portland City Center

QUESTIONS?

Randy Johnson, PE, PTOE

DKS Associates

Randy.johnson@dksassociates.com

Mark Haines, PE, PTOE

City of Portland Traffic Signals, Street Lighting, and ITS Group

mark.haines@portlandoregon.gov

PBOT PORTLAND BUREAU OF TRANSPORTATION

DKS