

Intercity Transit: Planning 101



Rob LaFontaine
Planning Manager
March 15, 2021

Who are the Transit Planners?

- Eric Phillips, AICP, Development Director
 - Rob LaFontaine, MPA, Planning Manager
 - Steve Swan, Senior Planner
 - Mike Burnham, MA/MURP, Associate Planner
 - Brian Nagel, Planning Scheduler
- Everyone has ideas about what *good transit service* looks like
- Everyone's a transit planner!



A Few Fundamentals, “Mode”

- Fixed Route Bus
 - Local service
 - Commuter Bus
 - Bus Rapid Transit (BRT)
- ADA Paratransit [49 CFR Part 37.121]
 - *Dial-A-Lift*
- Other modes
 - Vanpool
 - Rail
 - On-Demand (micro-transit)





Constructing Fixed Route Service

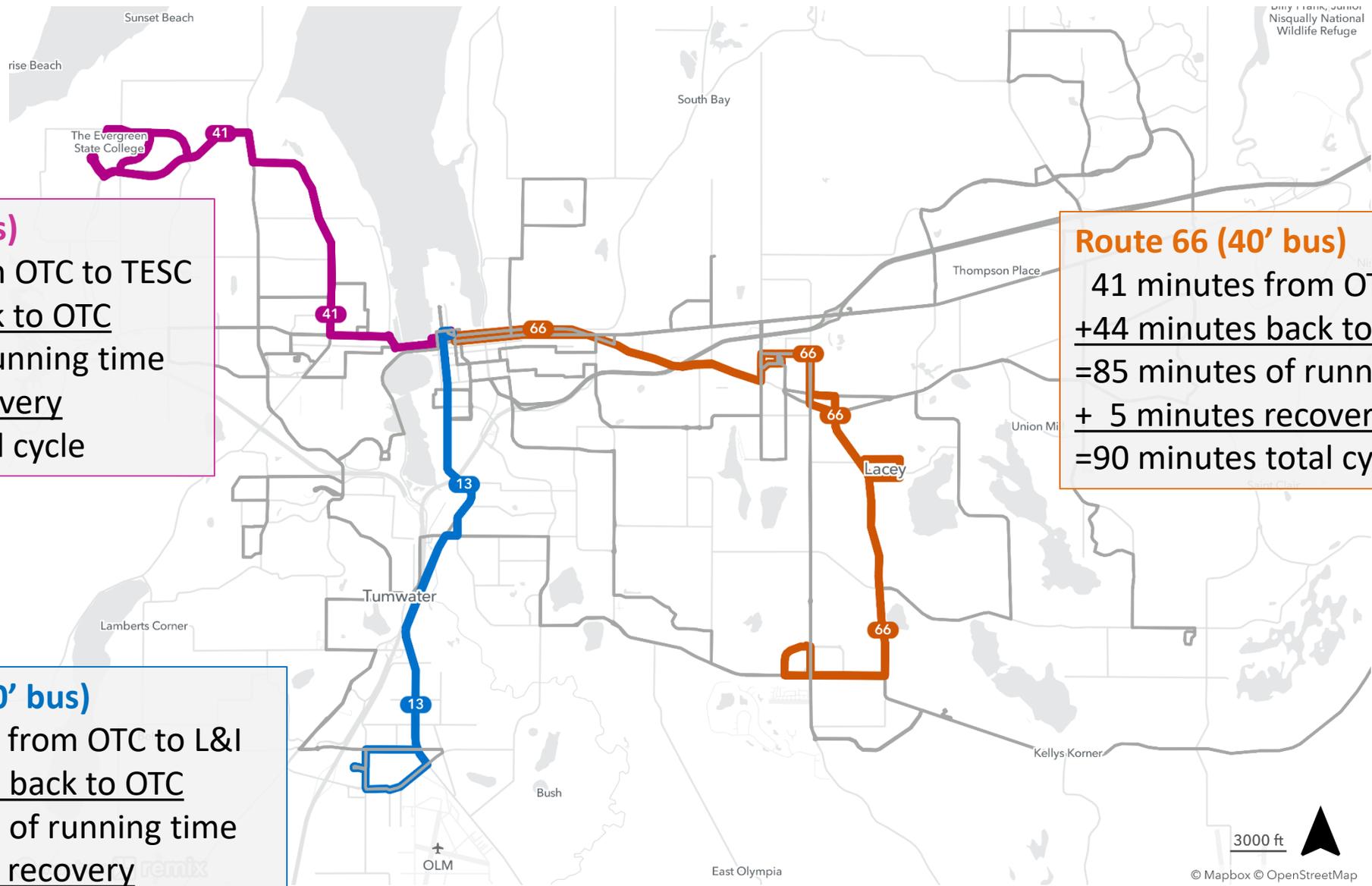
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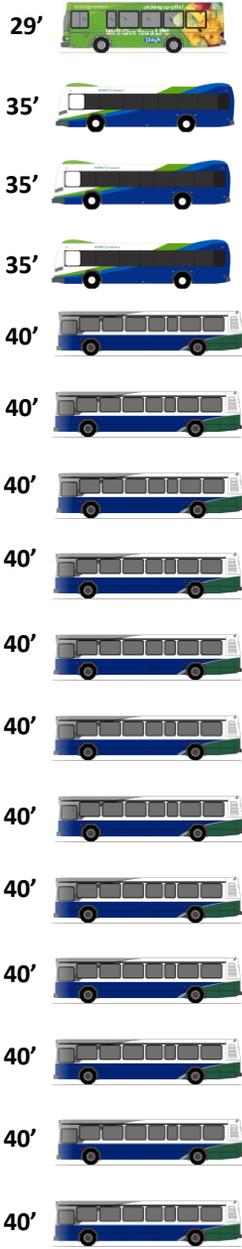
Route 41 (40' bus)
33 minutes from OTC to TESC
+22 minutes back to OTC
=55 minutes of running time
+ 5 minutes recovery
=60 minutes total cycle

Route 66 (40' bus)
41 minutes from OTC to LCC
+44 minutes back to OTC
=85 minutes of running time
+ 5 minutes recovery
=90 minutes total cycle

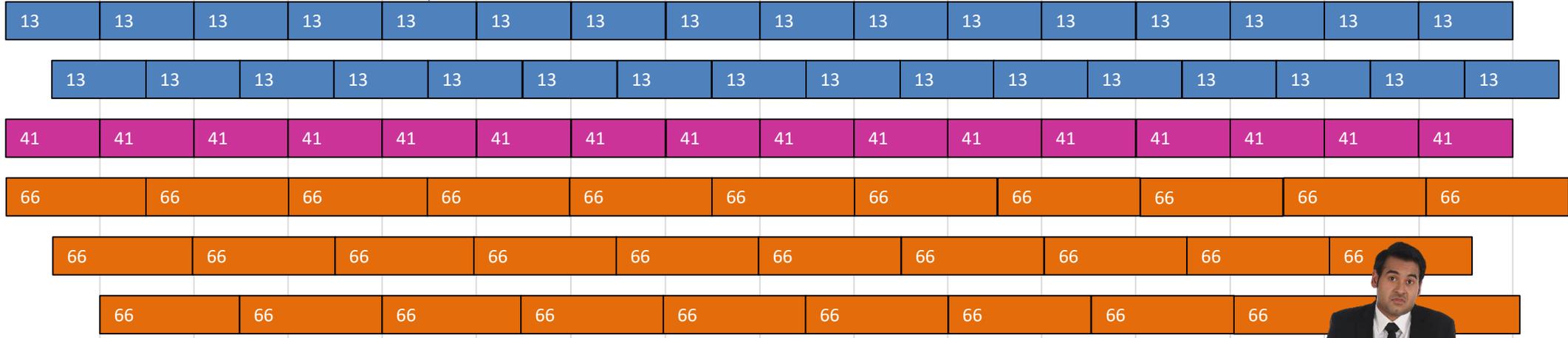
Route 13 (40' bus)
24 minutes from OTC to L&I
+31 minutes back to OTC
=55 minutes of running time
+ 5 minutes recovery
=60 minutes total cycle



6 AM 7 AM 8 AM 9 AM 10 AM 11 AM 12 PM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM



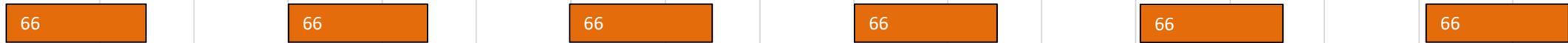
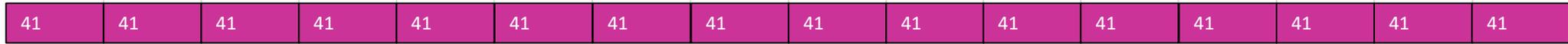
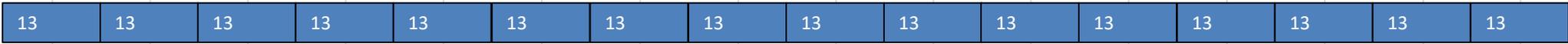
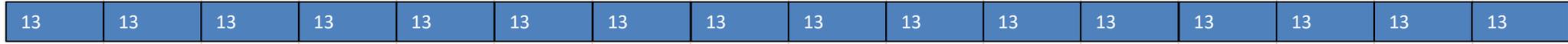
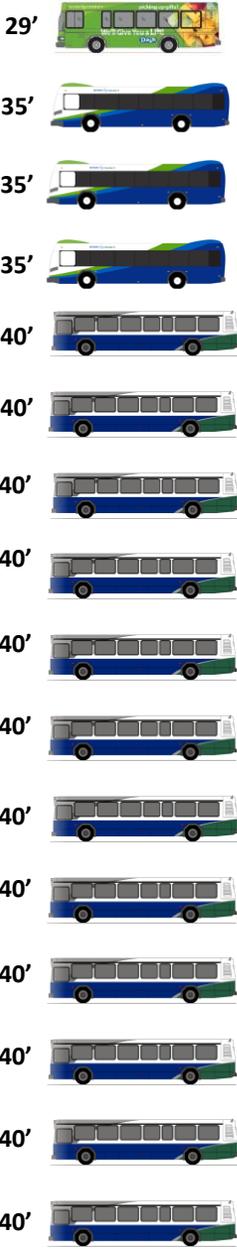
"Trip"
16 outbound trips
16 inbound trips



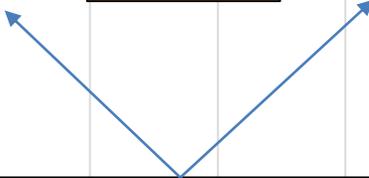
"Block"
All of the *trips*
assigned to a bus



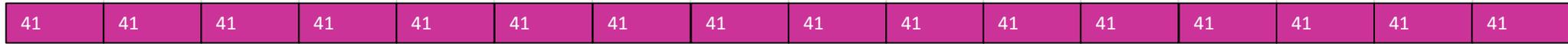
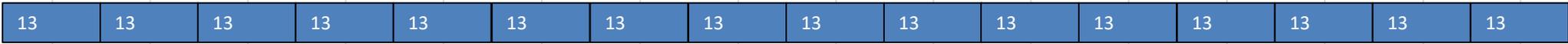
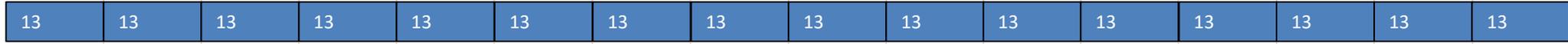
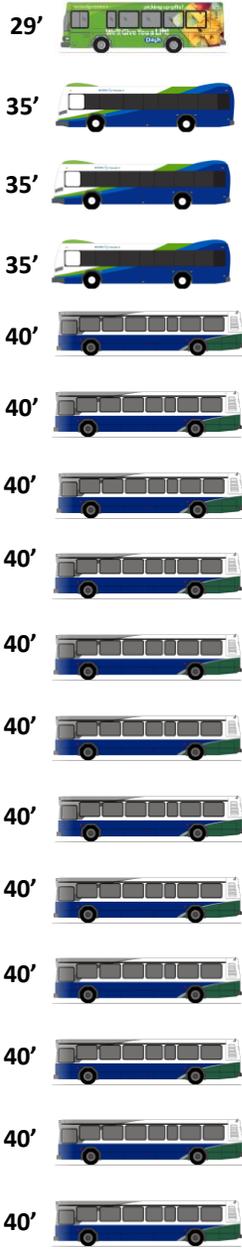
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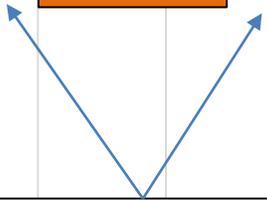
90 minutes

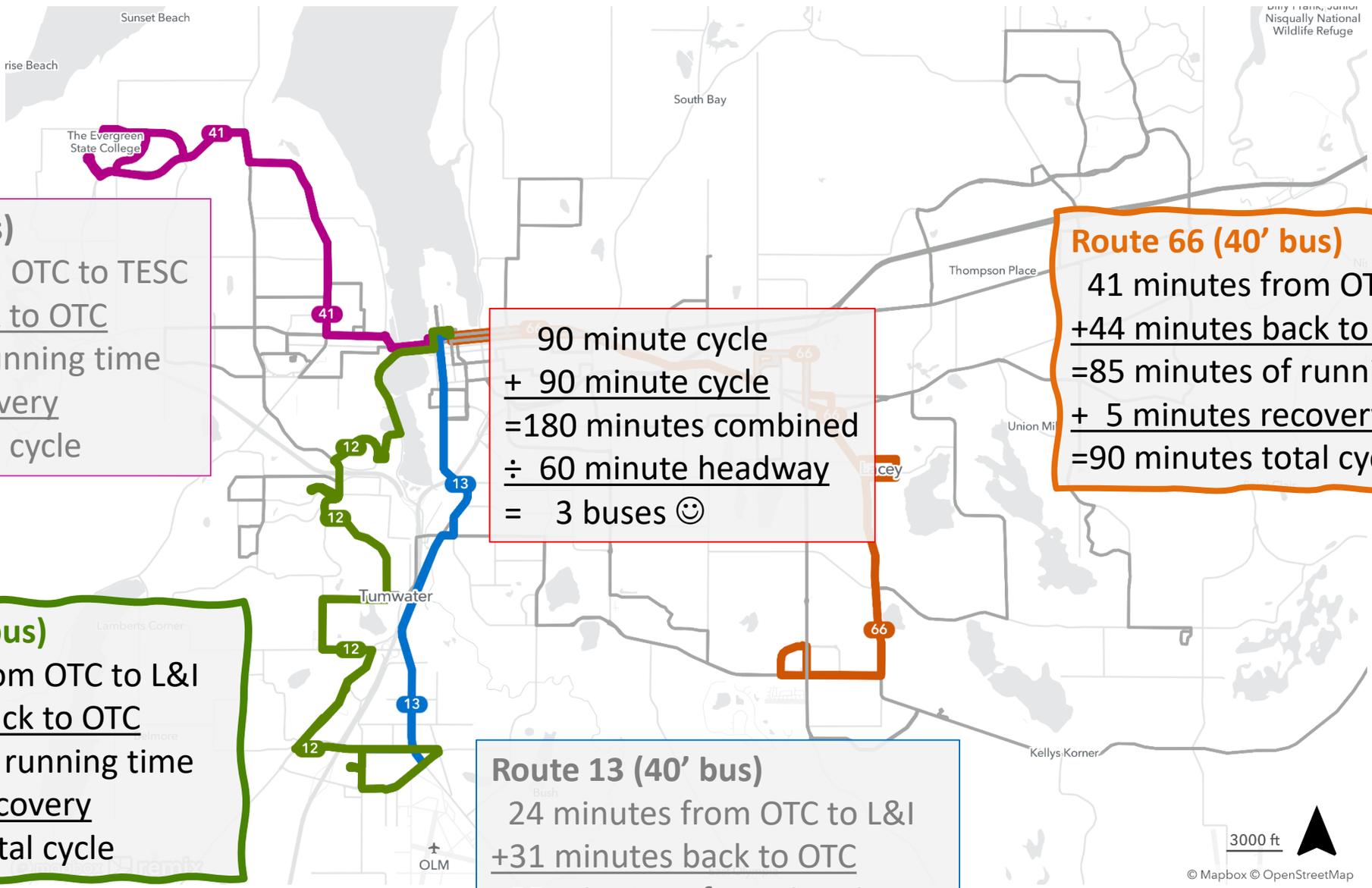


6 AM 7 AM 8 AM 9 AM 10 AM 11 AM 12 PM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM



30 minutes





Route 41 (40' bus)

33 minutes from OTC to TESC
+22 minutes back to OTC
 =55 minutes of running time
 + 5 minutes recovery
 =60 minutes total cycle

90 minute cycle
 + 90 minute cycle
 =180 minutes combined
 ÷ 60 minute headway
 = 3 buses 😊

Route 66 (40' bus)

41 minutes from OTC to L&I
+44 minutes back to OTC
 =85 minutes of running time
 + 5 minutes recovery
 =90 minutes total cycle

Route 12 (40' bus)

39 minutes from OTC to L&I
+46 minutes back to OTC
 =85 minutes of running time
 + 5 minutes recovery
 =90 minutes total cycle

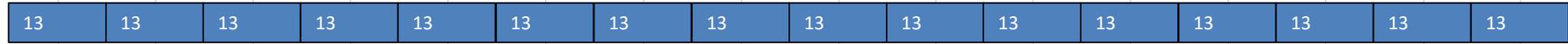
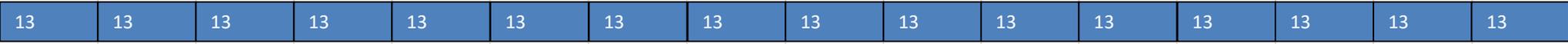
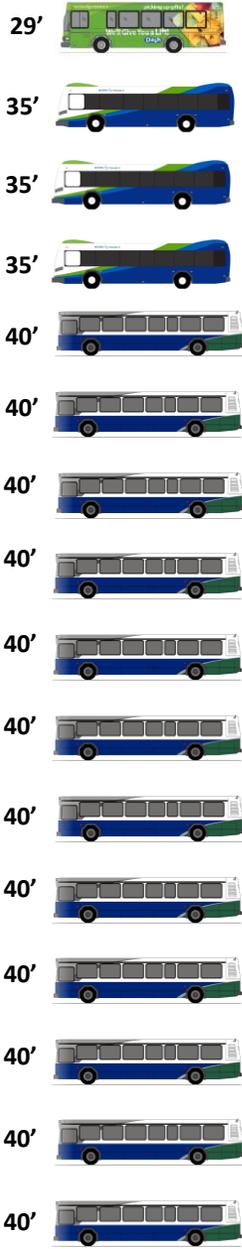
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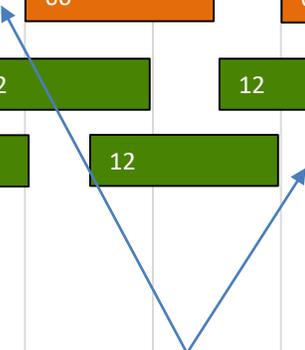


© Mapbox © OpenStreetMap

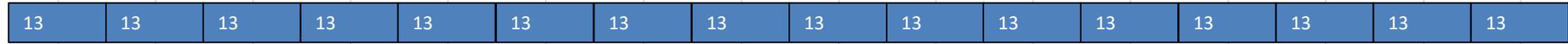
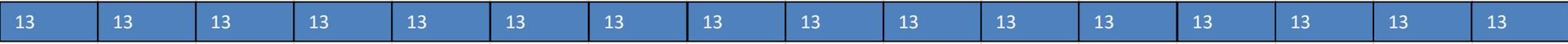
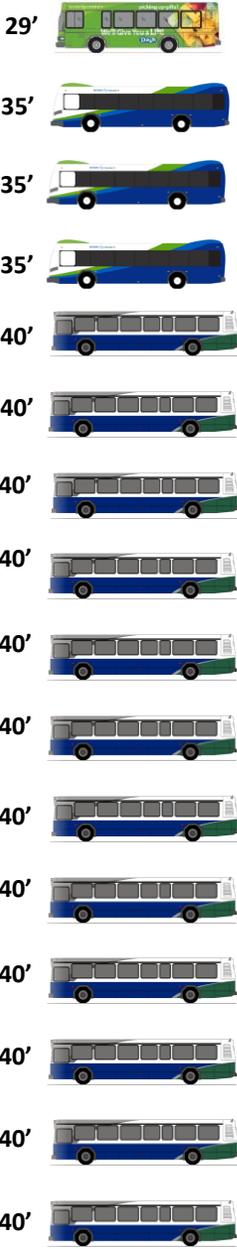
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30 minutes



6 AM 7 AM 8 AM 9 AM 10 AM 11 AM 12 PM 1 PM 2 PM 3 PM 4 PM 5 PM 6 PM 7 PM 8 PM 9 PM 10 PM



Some buses will work on multiple routes throughout their day.

The fixed route puzzle

Trips are assigned to “blocks” which means a single bus may spend its day on 1—2—3+ routes!

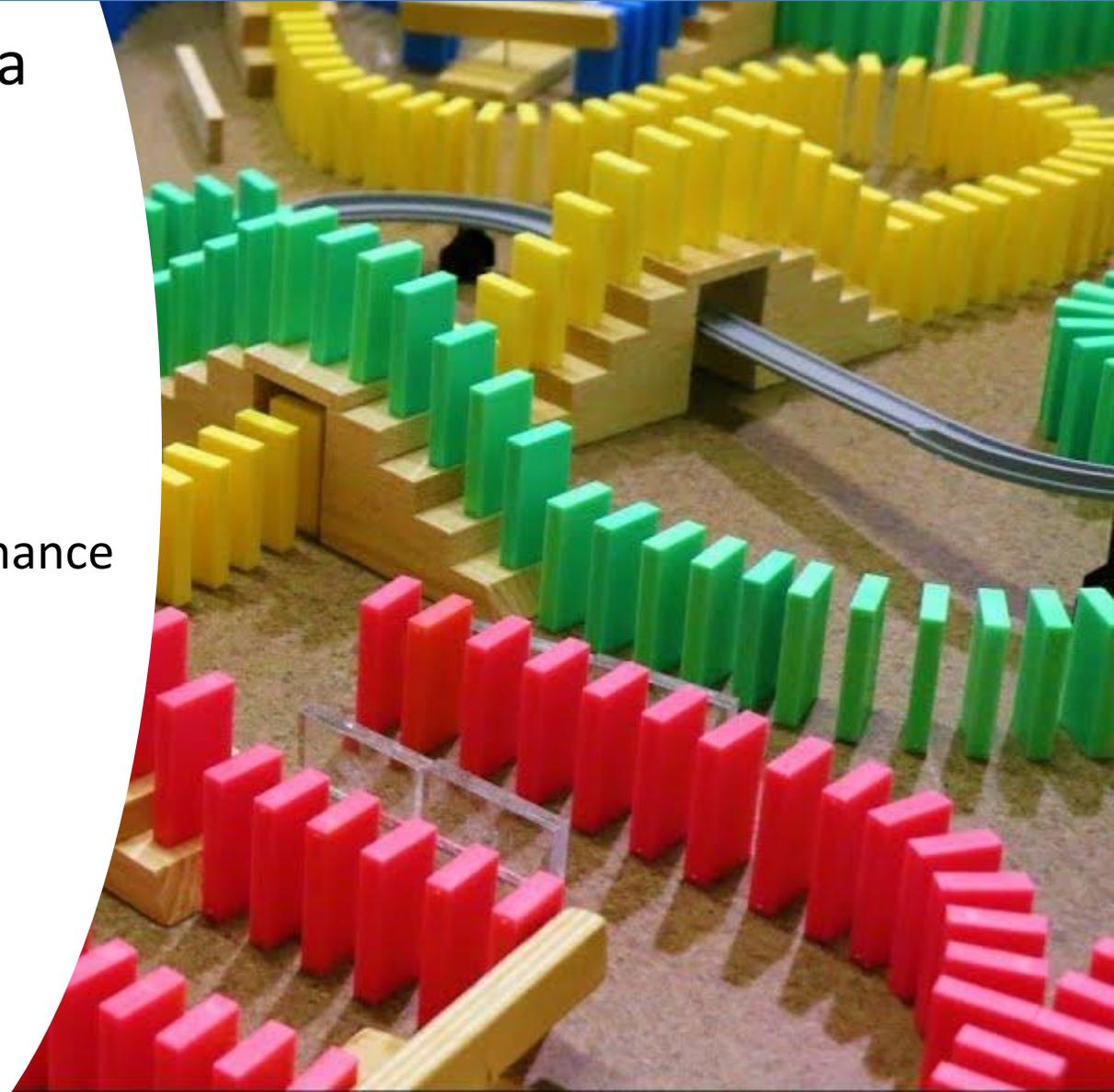
- Trips with varying lengths of time are blocked together to equalize irregular cycles—Math

The Schedule is everything

- Planners measure and monitor on-time performance and consider adjustments to keep buses (and people) moving.

Public outreach & participation

- Planners look for and develop meaningful opportunities for the public to engage in the service design process



Oh, but wait...

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

Varying Route frequencies

- Peak/off-Peak
- Early mornings & late nights

Varying cycles & bus sizes

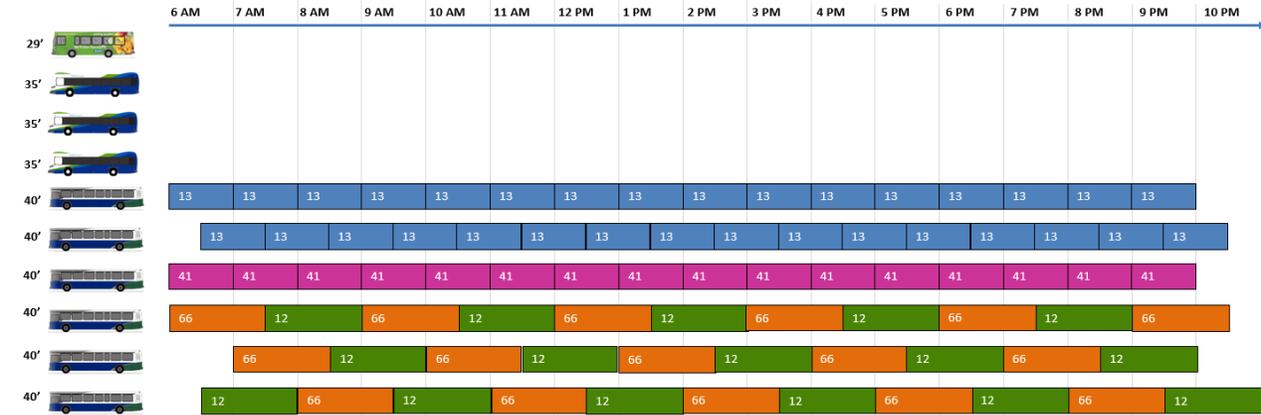
- 62A/B
- Olympia Express

Recognizing and respecting departure times and meaningful connections

- Public engagement
- Familiar with system nuances

Adding it all up

Calculating revenue hours & miles



Helpful Hint

Annualized *Revenue Service Hours* is the primary metric used to measure how much service is delivered by a public transit agency

In 2019 Intercity Transit delivered nearly 236,000 hours of fixed route bus service!

Block #	Pull-out	Start	End	Pull-in	Rev. Hours	Deadhead	Vehicle Hrs.
1301	5:50 AM	6:00 AM	9:55 PM	10:05 PM	15.92	0.33	16.25
1302	6:20 AM	6:30 AM	10:25 PM	10:35 PM	15.92	0.33	16.25
4101	5:50 AM	6:00 AM	9:55 PM	10:05 PM	15.92	0.33	16.25
6601	5:50 AM	6:00 AM	10:25 PM	10:35 PM	16.42	0.33	16.75
6602	6:50 AM	7:00 AM	9:55 PM	10:05 PM	14.92	0.33	15.25
6603	6:20 AM	6:30 AM	10:55 PM	11:05 PM	16.42	0.33	16.75
Daily Total					95.50	2.00	97.50
<i>No. of Occurrences</i>					255	255	255
Annualized					24,352.50	510.00	24,862.50

“Runcutting”

11 unique runs in this example

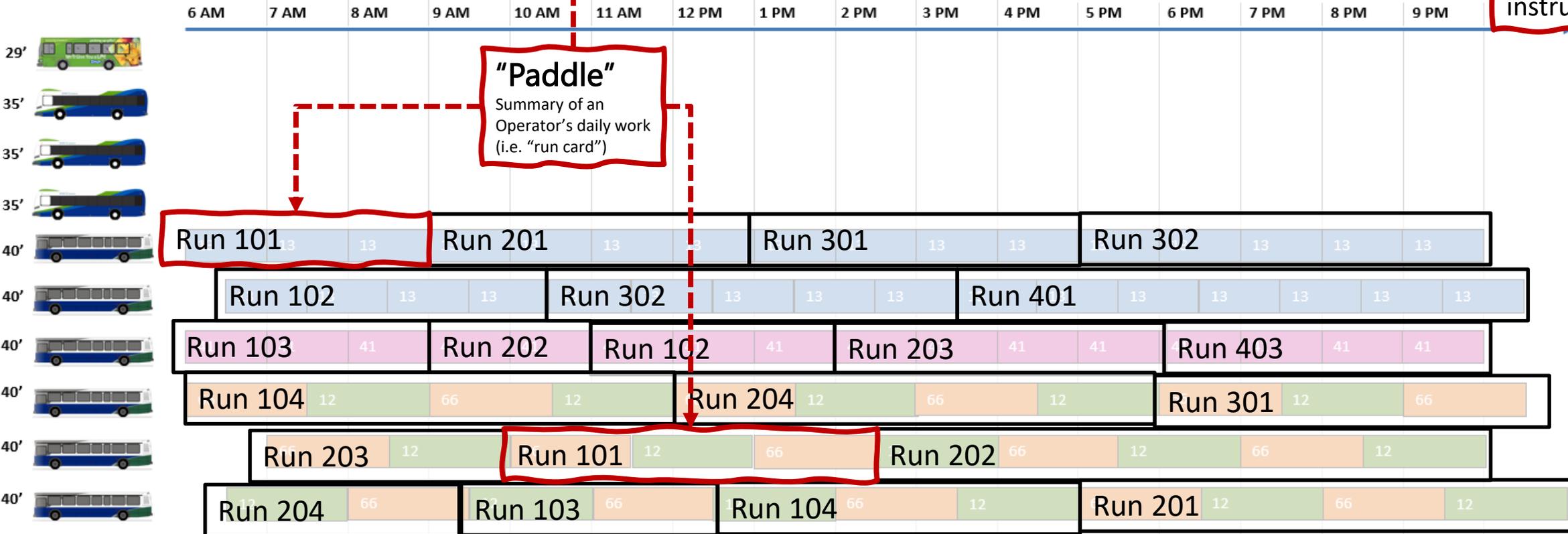
- Each schedule (i.e. Weekday, Weekend, etc.) has a separate run-cut with separate paddles

Run 101 (Paid Hours 8:30)

5:30 AM – Report to Pattison; Coach Checkout
 5:50 AM – Travel to OTC, Bay B
 6:00 AM – Begin Block 1301 (*Route 13*)
 9:00 AM – Start Lunch
 9:50 AM – Take over from Run 203 on Block 6602 (*Routes 66 & 12*)
 2:30 PM – Relieved by Run 202; ride **Route 62B to Pattison**
 2:50 PM – end of day

Rarely an even 8-hour shift; 3 different routes

Travel instructions



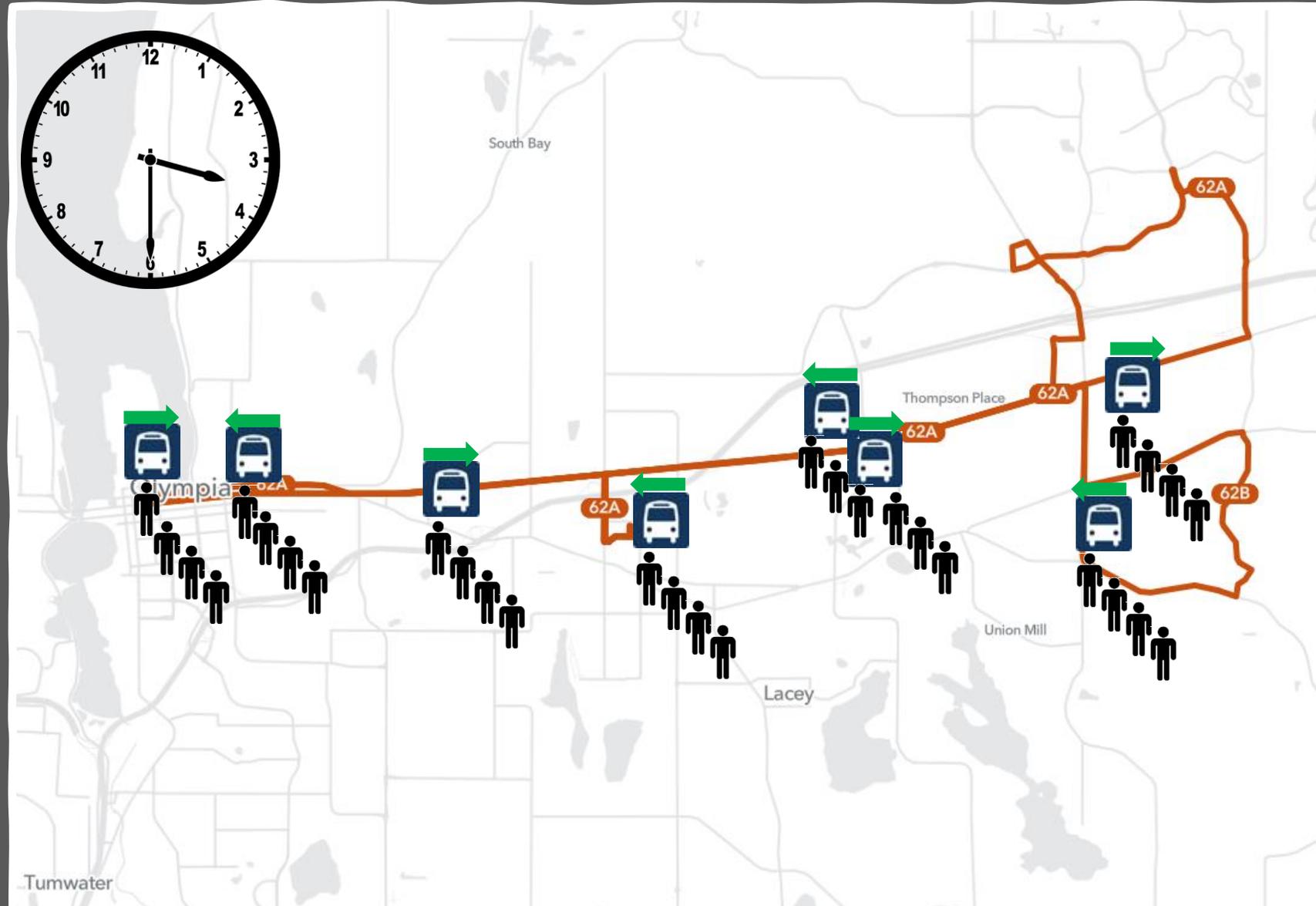
"Paddle"
 Summary of an Operator's daily work (i.e. "run card")

Run 101

Run 101

Frequency & Resources

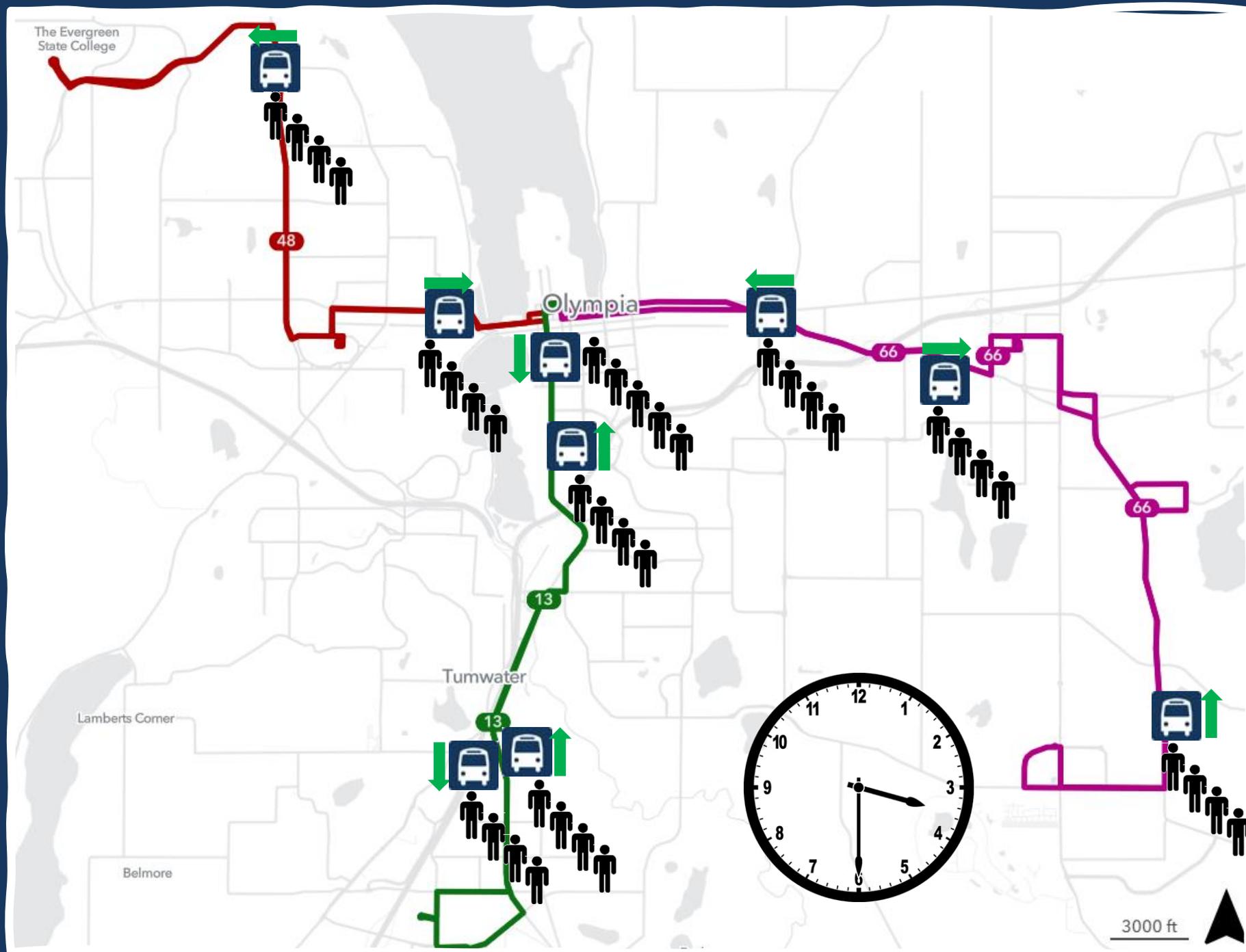
Time + Distance = Buses & Operators



Routes 62A and 62B
15-minute frequency,
or “headway”
= 8 buses (at 3:30 PM)

= 30 Operators (FTEs)

13.4%
daily
service



Routes Blocked Together

Routes 13, 48 & 66

30-min freq. (Rtes. 48 & 66)

15-min freq. (Rte. 13)

= 9 buses (at 3:30 PM)

= 37 Operators (FTEs)

25.8%
daily
service

Study Data,
Public Engagement
& REPEAT!



The "Master" Schedule (TMS)
Blocks & Run Cut



Operator Bid (Excel)

Job #	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Total
101	10:00-11:00	10:00-11:00	10:00-11:00	10:00-11:00	10:00-11:00	10:00-11:00	10:00-11:00	7:00
102	11:00-12:00	11:00-12:00	11:00-12:00	11:00-12:00	11:00-12:00	11:00-12:00	11:00-12:00	7:00
103	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	12:00-1:00	7:00
104	1:00-2:00	1:00-2:00	1:00-2:00	1:00-2:00	1:00-2:00	1:00-2:00	1:00-2:00	7:00
105	2:00-3:00	2:00-3:00	2:00-3:00	2:00-3:00	2:00-3:00	2:00-3:00	2:00-3:00	7:00
106	3:00-4:00	3:00-4:00	3:00-4:00	3:00-4:00	3:00-4:00	3:00-4:00	3:00-4:00	7:00
107	4:00-5:00	4:00-5:00	4:00-5:00	4:00-5:00	4:00-5:00	4:00-5:00	4:00-5:00	7:00
108	5:00-6:00	5:00-6:00	5:00-6:00	5:00-6:00	5:00-6:00	5:00-6:00	5:00-6:00	7:00
109	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	6:00-7:00	7:00
110	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00-8:00	7:00

4x
per year

Payroll (Fleet-Net)



The
Service Change
Cycle

Destination Signs
Bus Stop Annunciator
CAD/AVL

Facilities
Transit Guide
on-street schedules
Website & GTFS

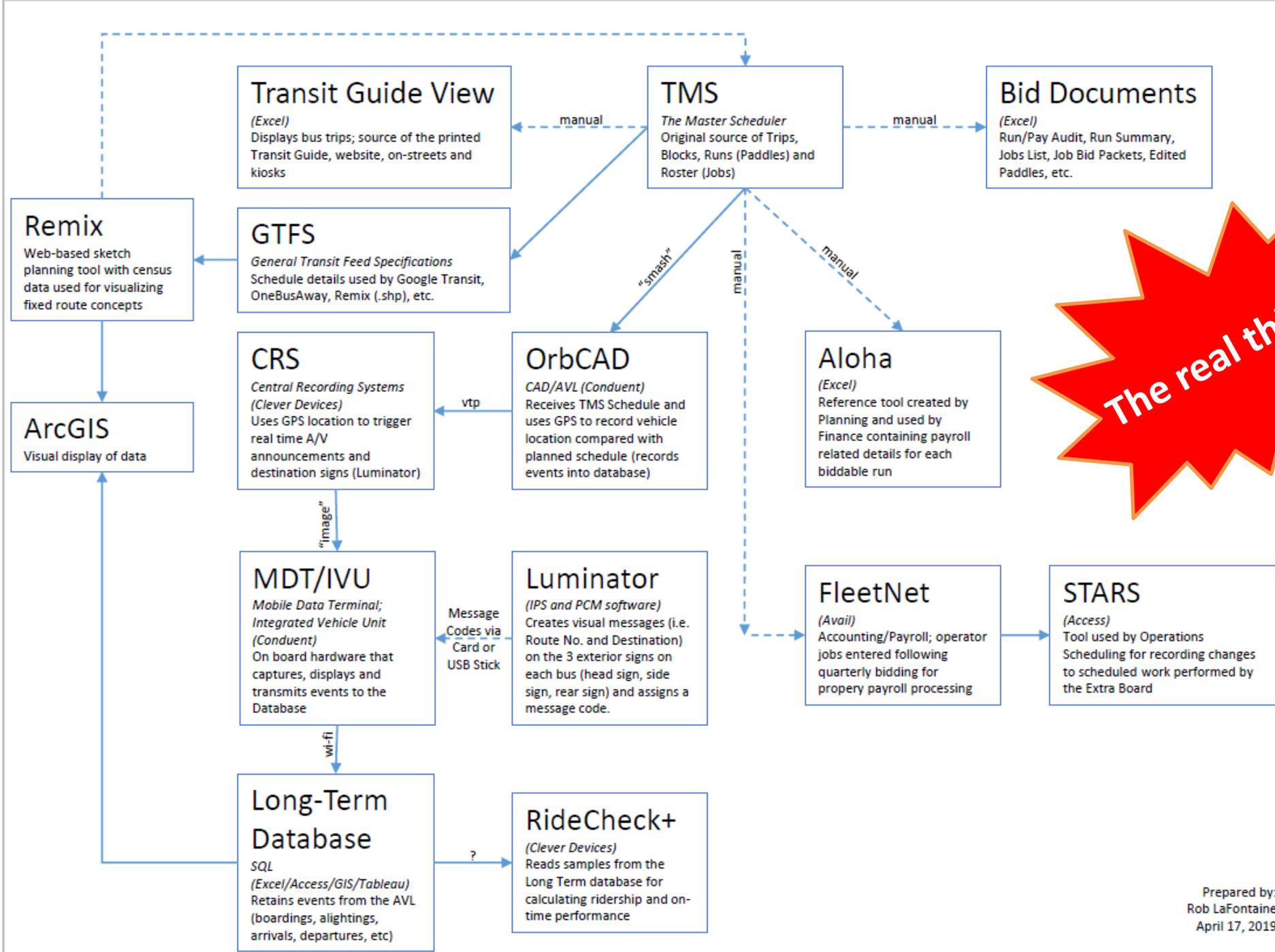
Effective Date



2x
per year



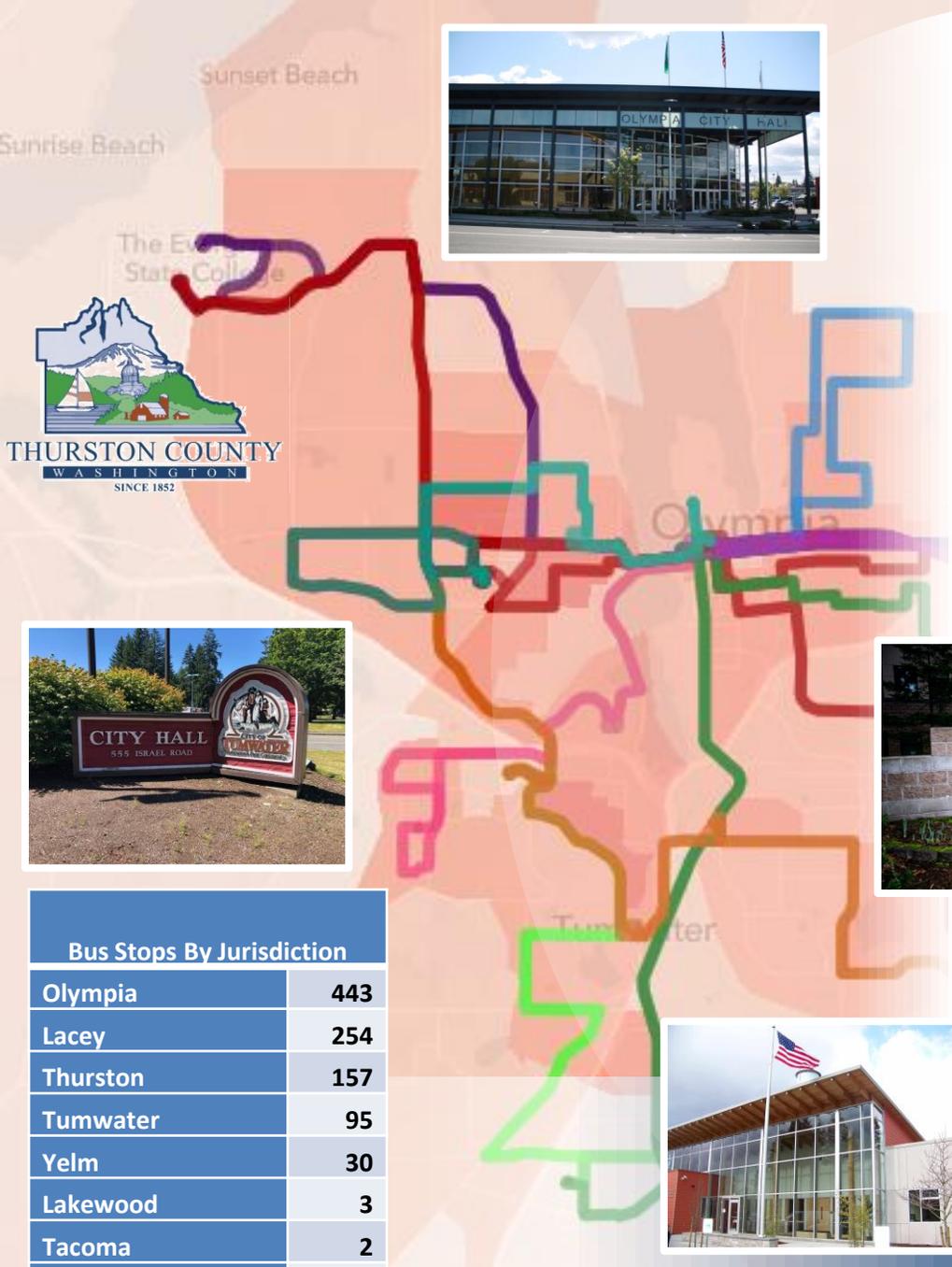
INTERcity
TRANSIT



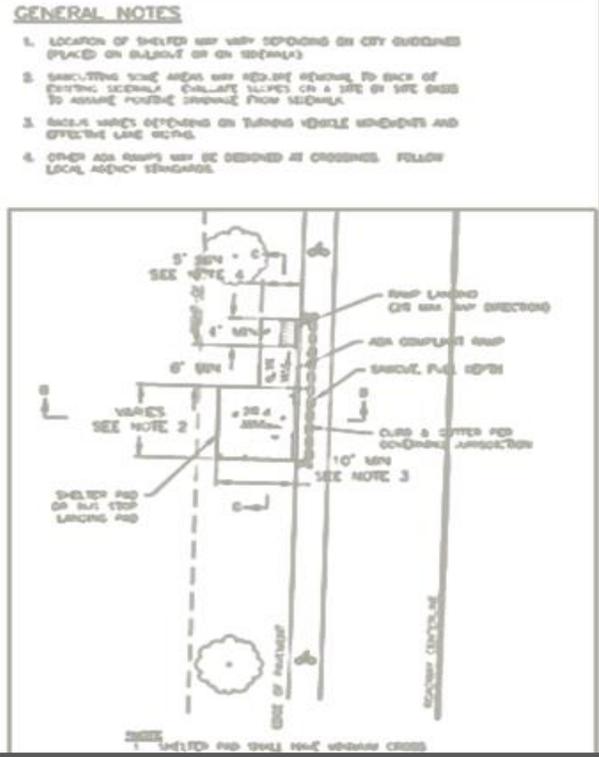
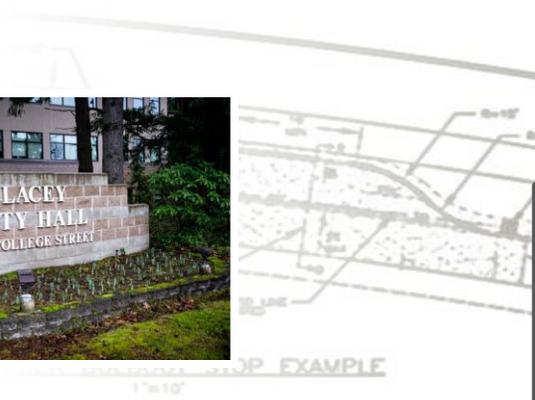
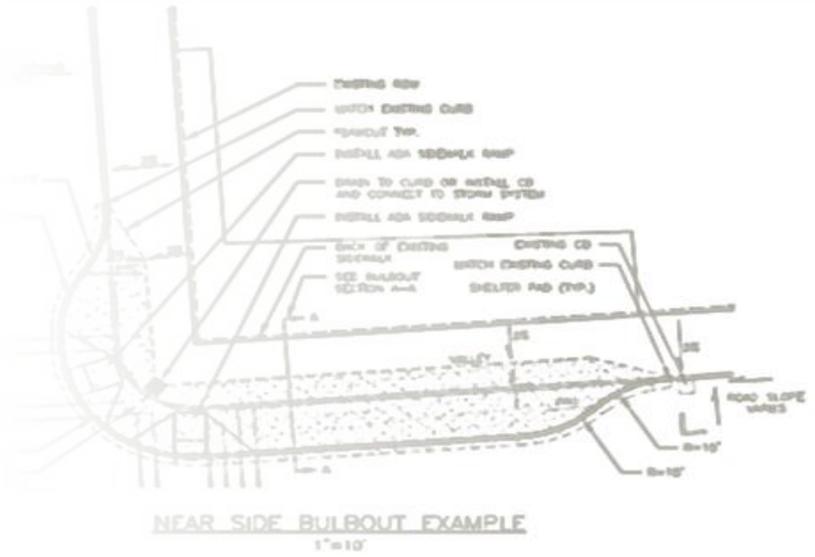
Other Planning Responsibilities

Mike Burnham, Associate Planner
Rob LaFontaine, Planning Manager





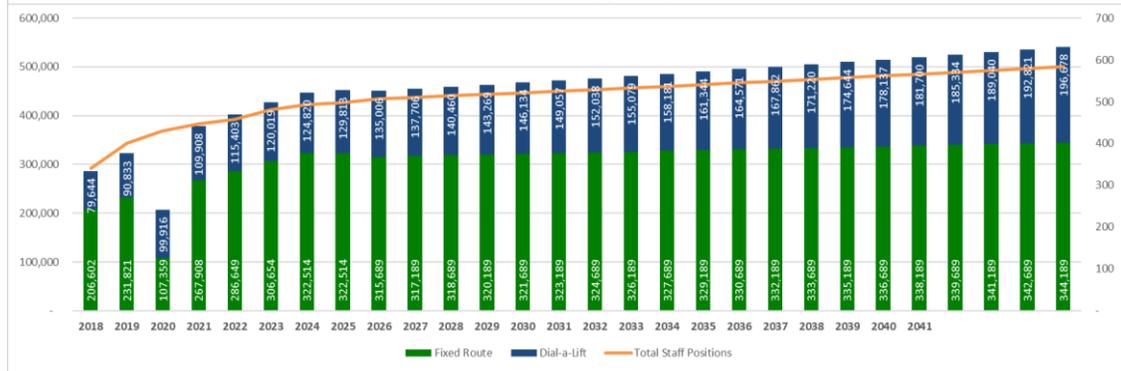
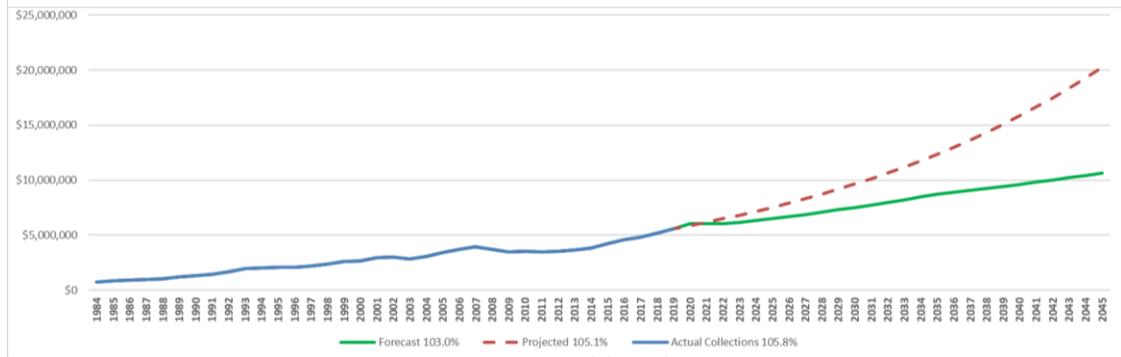
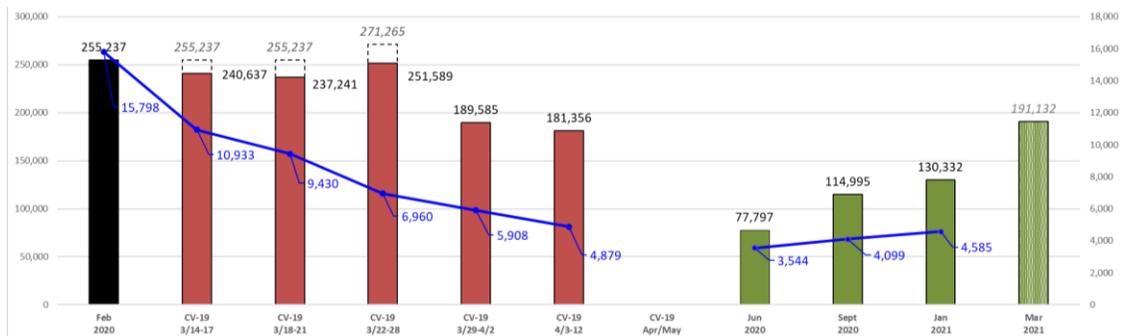
Bus Stops By Jurisdiction	
Olympia	443
Lacey	254
Thurston	157
Tumwater	95
Yelm	30
Lakewood	3
Tacoma	2
TOTAL	984



- GIS & Mapping
- Bus Stop development (standards)
- Community Development engagement
- Regular updates with Planning Commissions
- Temporary Bus Stops & Detours
- Events & Special Events

Development Coordination

Forecasts & Reports



- Cost per Route (or Mode)
 - Tracking service [annual budget]
 - Grant Reimbursements
 - National Transit Database (NTD)
- Long-range Financial Modeling
 - “Mock Blocks”
 - Scenario Planning
- Annual Reporting (State & Fed)

Transit Planning Basics

What is “good” transit planning?

Answer: *it depends...*

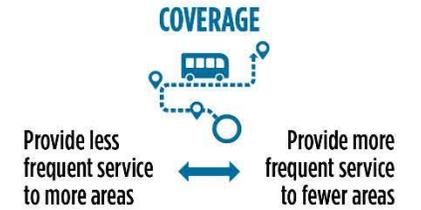
Think from the passenger’s perspective

How does the total travel time compare to riding a bike or using a car?

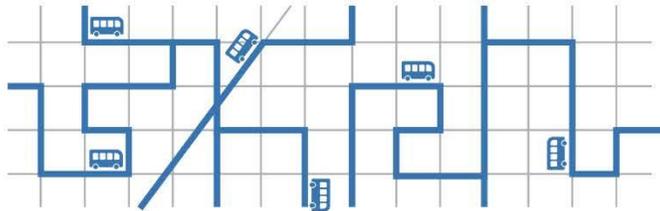
Service policy decisions (*Coverage vs. Frequency*)

- So which is “better”?
 - Answer: it depends on who the community is trying to serve and what the community is trying to achieve
- How will success be measured?
 - Ridership?
 - Greater access?

PRODUCTIVITY VS. COVERAGE TRADEOFF



COVERAGE

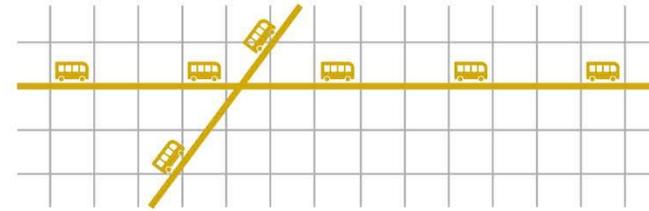


More people have **some** transit access

Ridership is **lower**...

... but really **important** for those who use it

FREQUENCY



More **trips** on transit!

Ridership is **higher**...

... but **no service** in many places

IMPORTANCE OF FREQUENCY

FREQUENCY AND SPAN



Provide more frequent service for a shorter time



Provide less frequent service for a longer time

- Wait less, travel conveniently
- Make connections **easily**
 - When the network is frequent, benefits are multiplied
- Trip security
 - Another bus is coming soon

Imagine if ...



You showed up for work, but the elevator only came every 60 minutes

IMPORTANCE OF SPAN OF SERVICE

FREQUENCY AND SPAN



Provide more frequent service for a shorter time



Provide less frequent service for a longer time

- Job market has expanded beyond standard 9 to 5 times
- Discretionary / non-work related trips are most often during non-peak times
- Longer span of service allows for more trip types to be served

Imagine if ...



You showed up for work, but the elevator only operated between 6 to 9 a.m. and 3 to 6 p.m.

Transit Service Objective:

Design direct & *frequent* routes through the more-dense areas

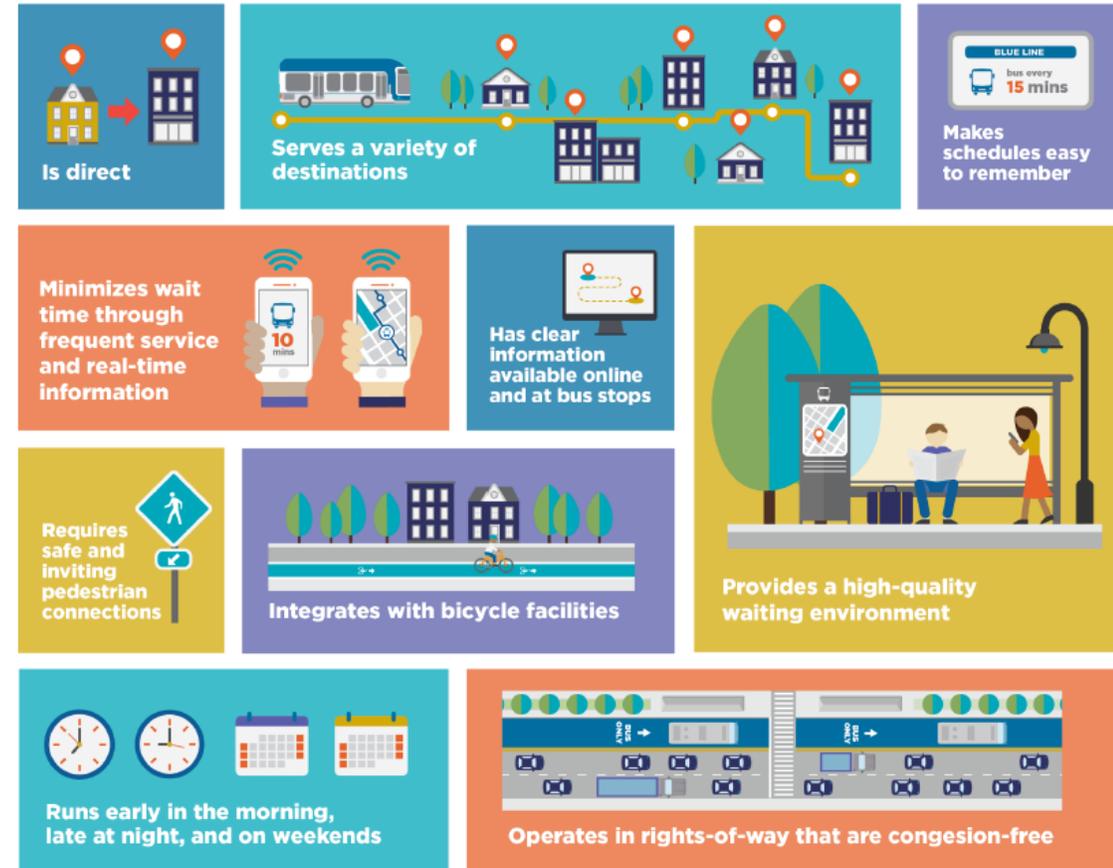
Location. Location. Location.

Transit routes aim to serve areas, not specific properties

- High-density residential
- Central business districts, medical districts & shopping centers
- Colleges & Universities
MS/HS do not generate very high ridership
- Employers of significance (i.e. State Capitol)

Consider the directness of travel

- Avoid *circuitous* route alignments and loops
- Integration with bike/pedestrian amenities

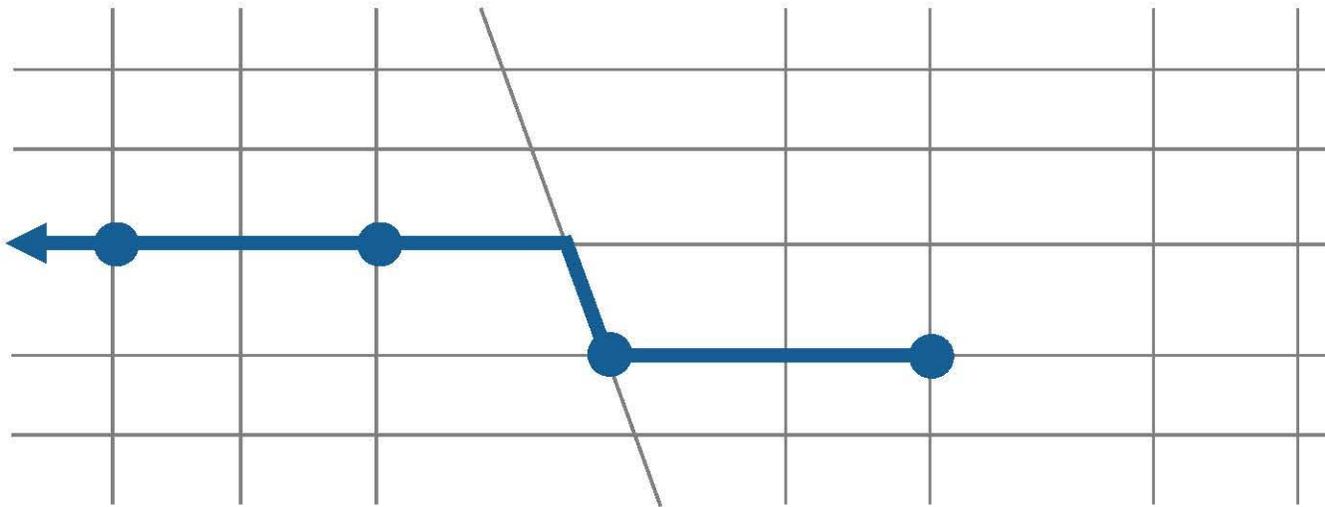


RESPONDING TO REQUESTS FOR SERVICE CAN HAVE UNINTENDED CONSEQUENCES

*Source:
Nelson/Nygaard Consulting Services*

THE EVOLUTION OF A BUS ROUTE

In the beginning, there was a well designed route that was direct, had well spaced stops, and performed well...

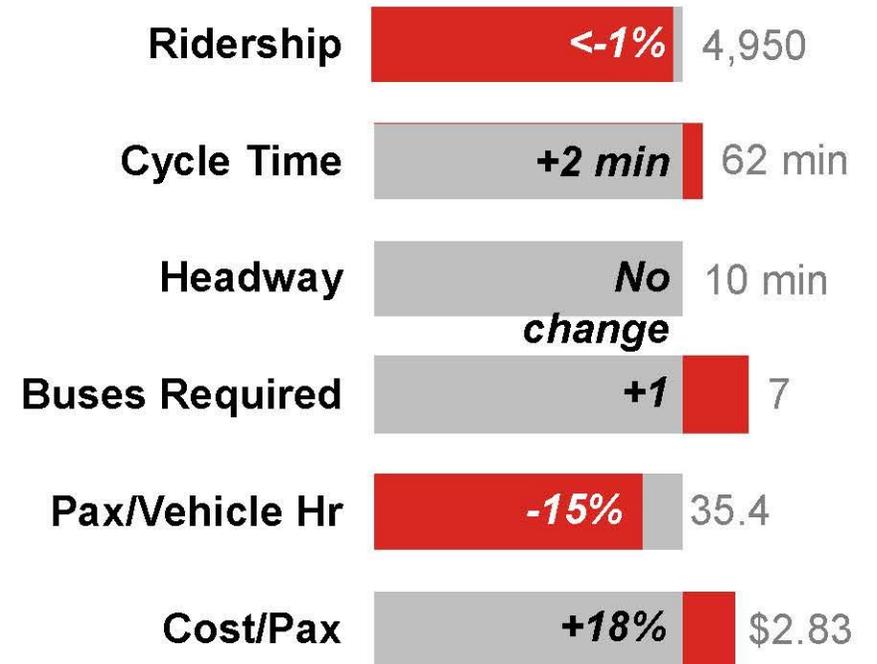
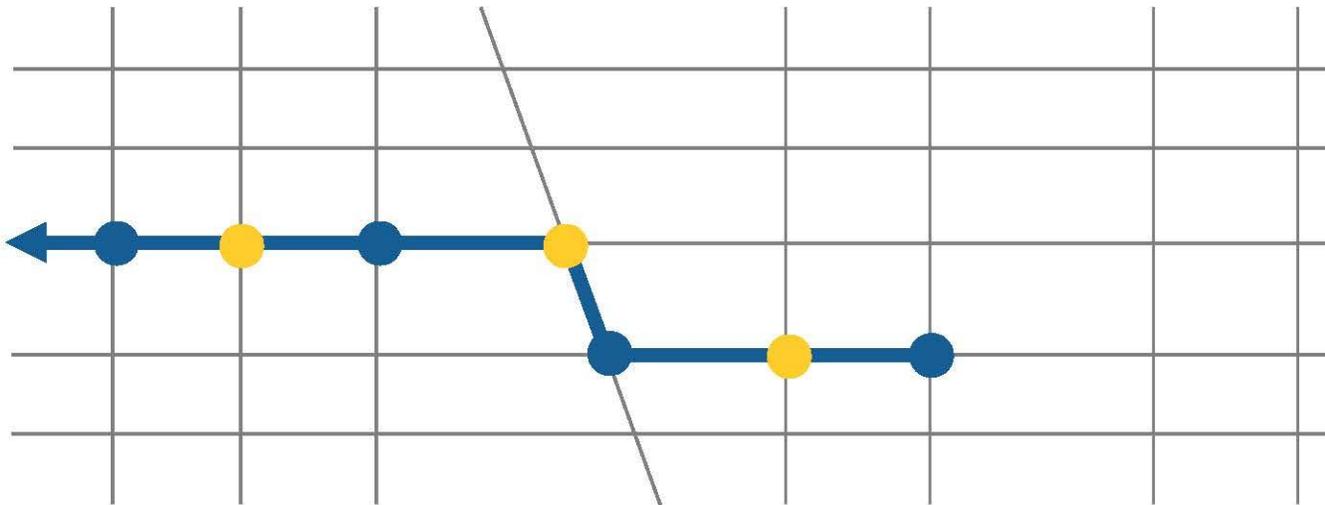


Ridership		5,000
Cycle Time		60 min
Headway		10 min
Buses Required		6
Pax/Vehicle Hr		41.7
Cost/Pax		\$2.40

Source:
Nelson/Nygaard Consulting Services

THE EVOLUTION OF A BUS ROUTE

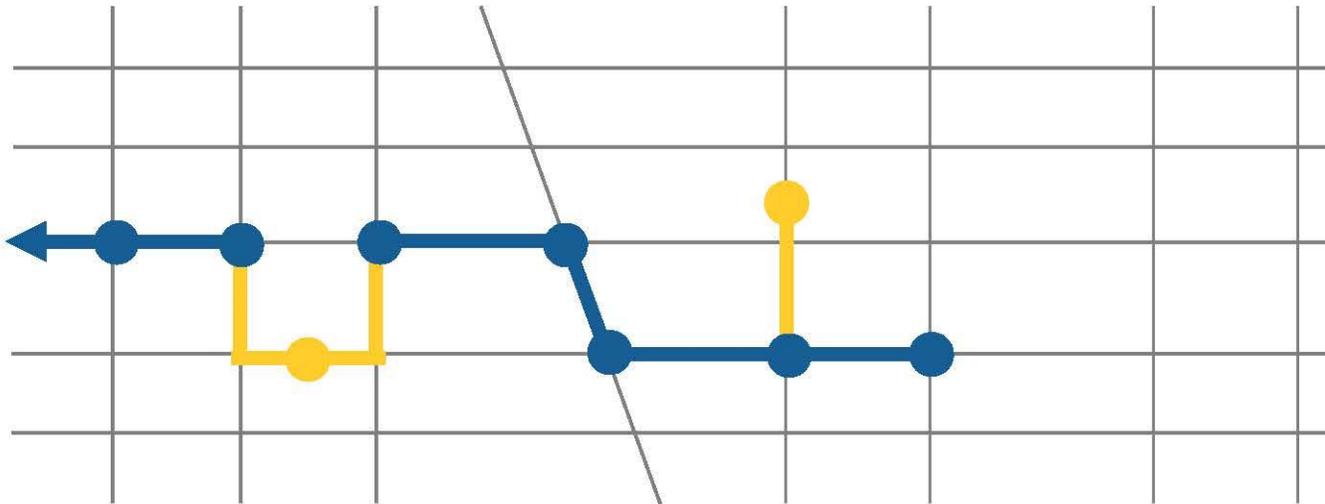
Over time, some passengers asked that stops be added so that they didn't have to walk as far. The transit agency, being responsive, added them.



Source:
Nelson/Nygaard Consulting Services

THE EVOLUTION OF A BUS ROUTE

Then, two new apartment complexes opened near the route. So that residents didn't have to walk to the bus, the bus went to them.

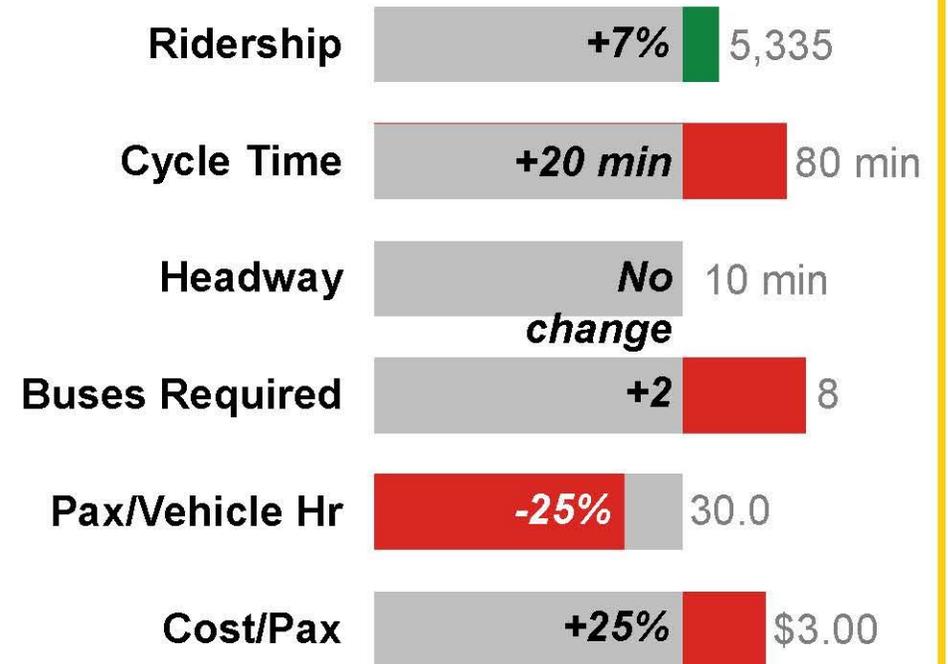
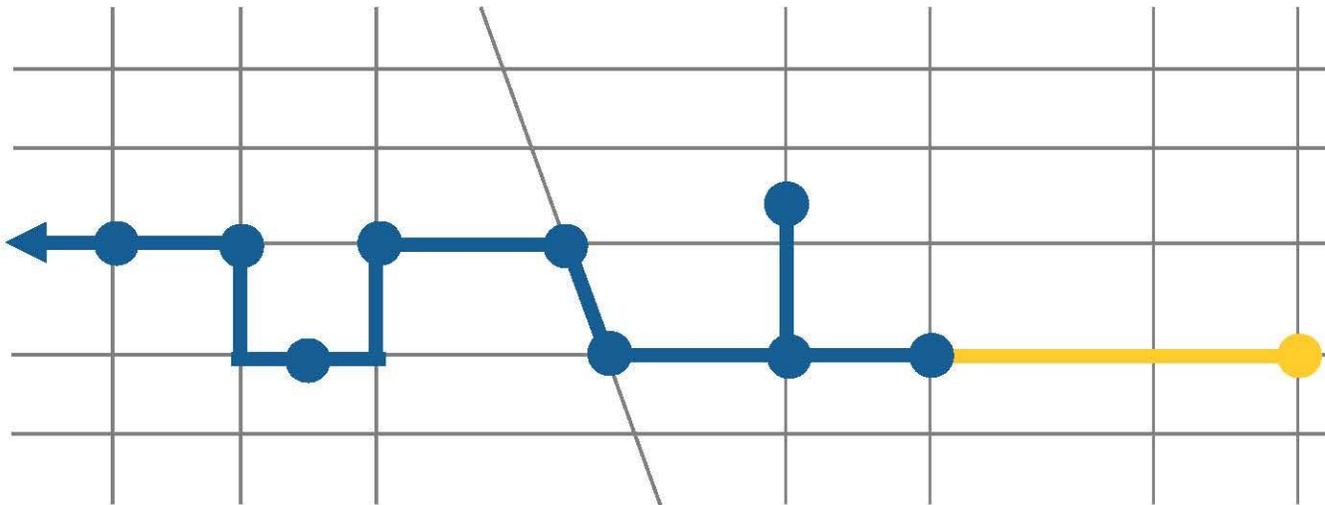


Ridership	-2%	4,850
Cycle Time	+6 min	66 min
Headway	No change	10 min
Buses Required	+1	7
Pax/Vehicle Hr	-17%	34.6
Cost/Pax	+17%	\$2.89

Source:
Nelson/Nygaard Consulting Services

THE EVOLUTION OF A BUS ROUTE

Next, a new big box store opened beyond the end of the route, and the route was extended to serve it.



Source:
Nelson/Nygaard Consulting Services

Our Road Ahead

Considerations for effective transit service

Land Use

Regional Plans; corridor strategies; coordinated public investments
Population density to support transit

Passenger Needs

Accessibility: sidewalks, bike lanes, shoulders, lighting
Connectivity & directness
First & last mile connections/access
Dial-A-Lift implications: New eligible areas?

Operational Considerations

Turns, signals, traffic control/calming, speed limits, sight distance, etc. limitations: foul weather, detours/deteriorated conditions, vulnerability, parked cars, emergency service vehicles, etc.

Resources

Operating Costs
Fleet/Facility requirements



Questions?

Rob LaFontaine
Planning Manager
March 15, 2021