

UPDATE: Long-term light rail fleet & service challenges

Community Oversight Panel

4/10/24



Why we are here

- Update COP on progress since July 2023
- Next steps



Light rail service and fleet pressures

Respond to evolving conditions & lessons learned

Running times

- Slower operations in some areas requires additional run time throughout the entire system

Spare ratio

- More fleet out of service for daily maintenance to support reliable service

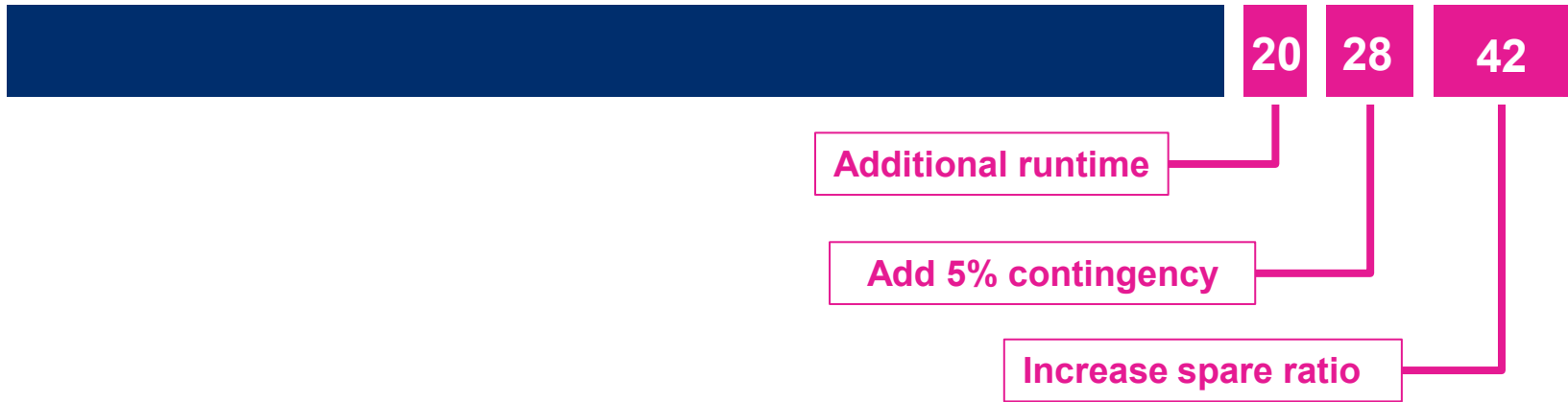
Fleet contingency

- Needed for unpredictable maintenance and unknown future needs, such as accident repair, warranty work, retrofits/upgrades, further system slowing

The big drivers of long-term need

460 vehicles assumed in agency finance plan

550 vehicles now needed to meet planned service level



Key analysis questions

- What service levels can be operated as light rail extensions open?
- What will passenger loading/crowding conditions look like?
 - PM peak hour, when highest demand and service levels occur
- If there are projected overloads, are there mitigation options that could provide more capacity and alleviate crowding?

How we think about crowding

- Link is designed as high-capacity transit to efficiently carry large numbers of riders
- Service levels are designed & evaluated based on riders per LRV

One LRV carries up to **200** riders with about **74** seats and **~120** spaces for standing

Exact total varies based on how close riders stand, luggage, bikes, etc.



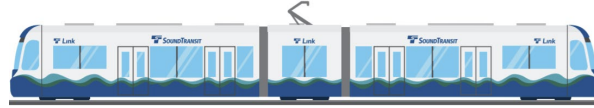
4 car train can carry about **800** riders.

Total capacity determined by number of LRVs per train.

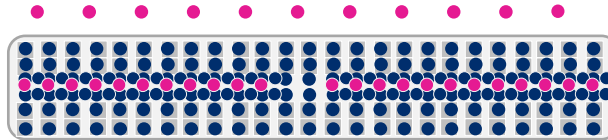
How we think about crowding

At a car-level

● = one rider

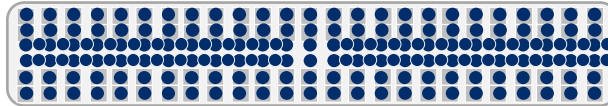


Very crowded, may not be room to board.



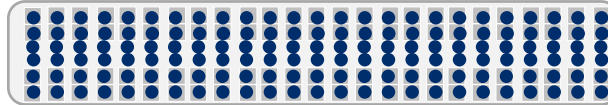
74 seats full + more than 120 riders standing

Challenges getting on and off.



74 seats full + 74 - 120 riders standing

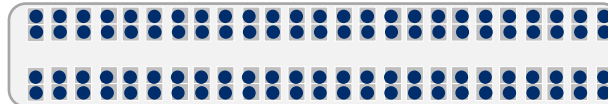
People standing, but you can still get on.



74 seats full + up to 74 riders standing

Board adopted crowding standard

Everyone has a seat.



Less than 74 seats full, few people standing

2024

1 Line Angle Lake to Lynnwood

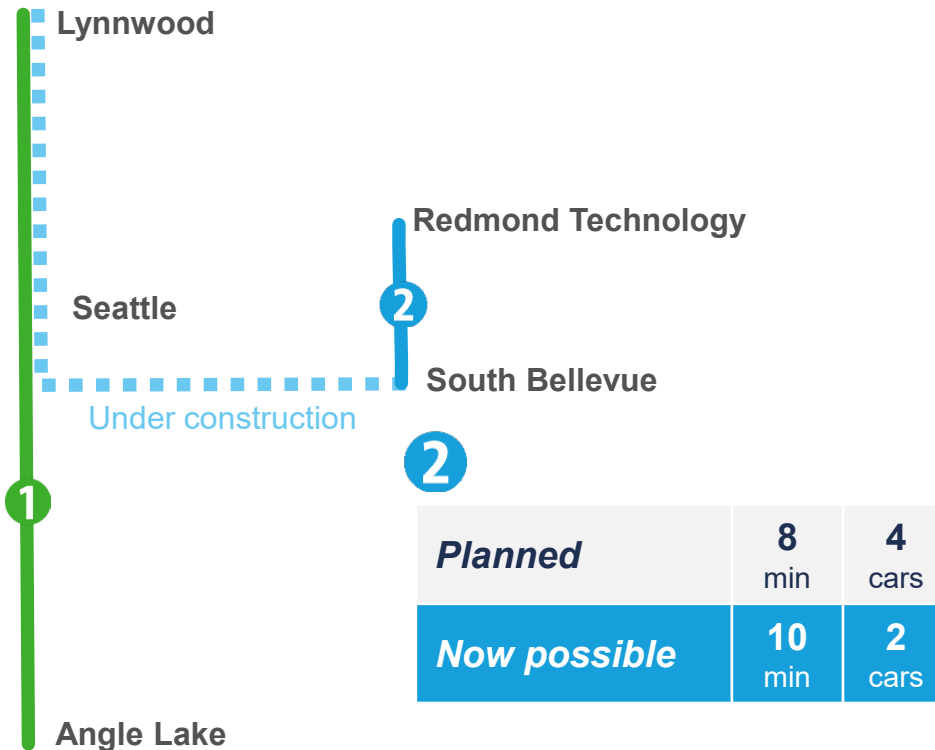
2 Line Downtown Redmond to South Bellevue

2024

Peak service with available fleet

1 Lynnwood to Angle Lake

<i>Planned</i>	8 min	4 cars
<i>Initial assessment</i>	10 min	3-4 cars
<i>Now possible</i>	8 min	4 cars



<i>Planned</i>	8 min	4 cars
<i>Now possible</i>	10 min	2 cars

Northbound 1 Line crowding*

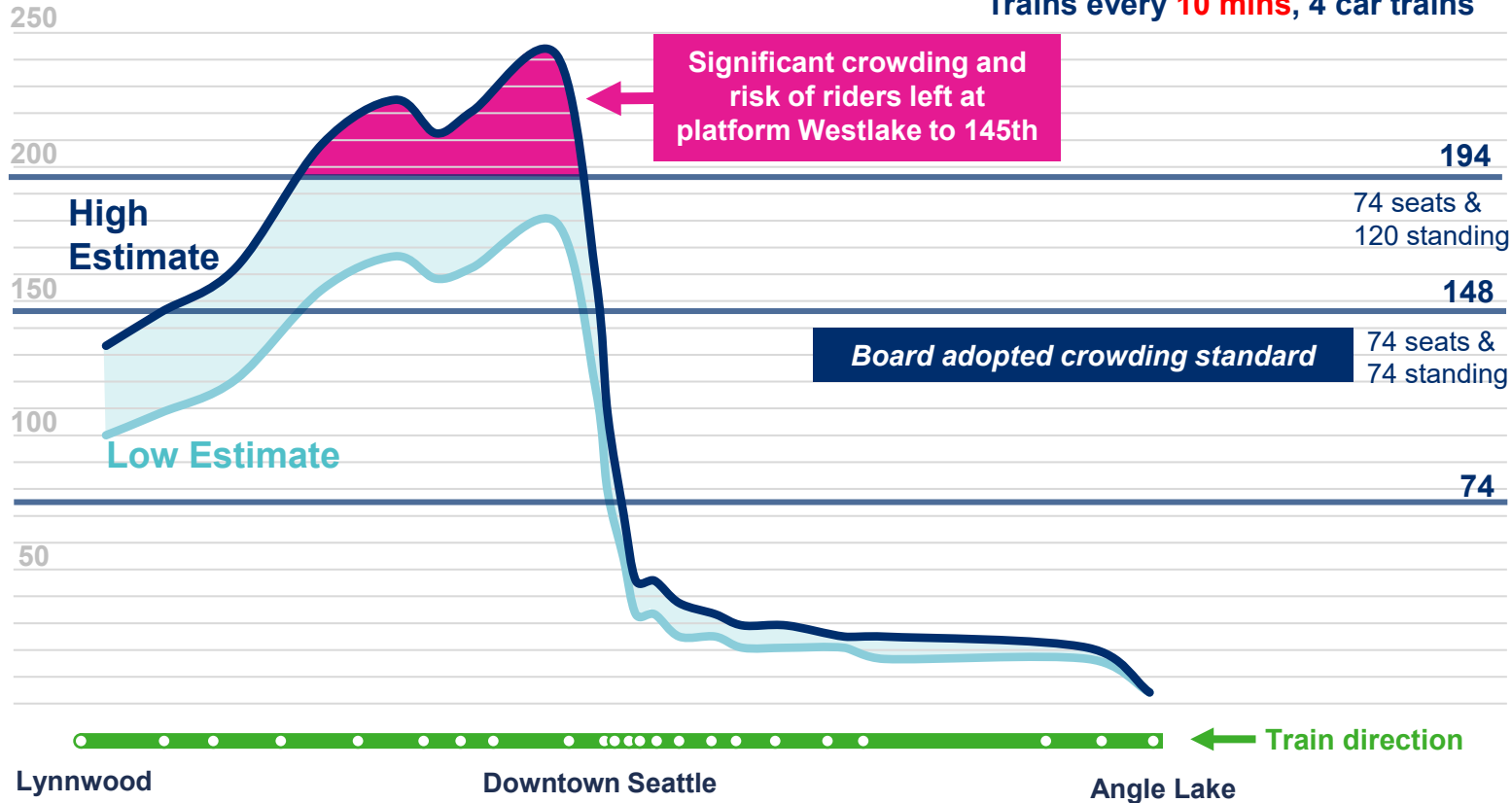
Trains every 10 mins, 4 car trains

Very crowded, may not be room to board

Challenges getting on and off

People standing but you can still get on

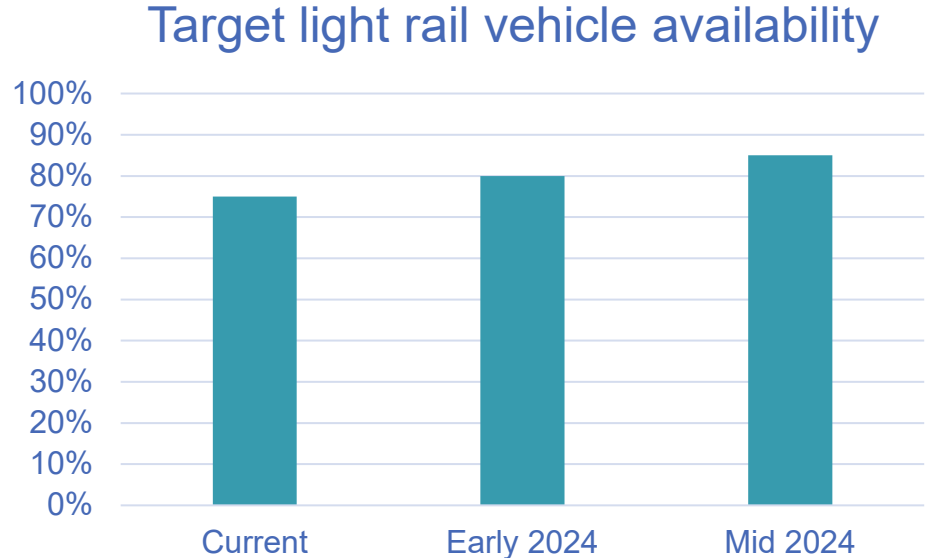
Everyone has a seat



Strategy: Improve fleet availability

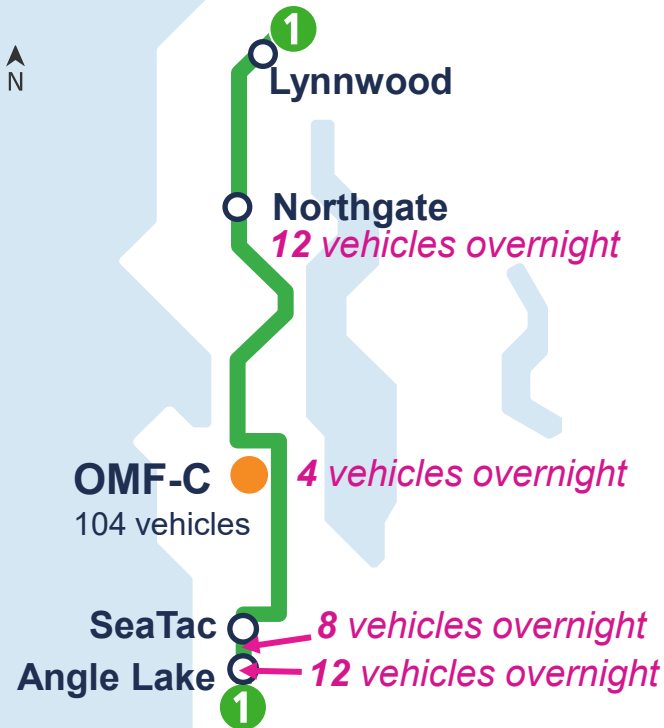
Continue to put more Series 2 LRVs into service

- Series 2 (Siemens) fleet availability below 85% standard
- Working to fix warranty and preventative maintenance issues
- Target 80% everyday availability by Q1 2024, 85% by Q3 2024, ahead of Lynnwood Link opening



Strategy: More vehicle storage

25% more capacity than earlier assumptions, more room on trains



- Sound Transit and Metro staff located **temporary storage sites for 36 light rail vehicles** outside OMF-C along the 1 Line.
- More vehicles can be used to shorten headways and carry more passengers during peak hours.
- When the 1 Line opens to Lynnwood, we are now planning to continue providing **eight-minute peak headways with four-car trains**.
- Additional trains to be deployed during the peak to alleviate crowding.

OMF Central will exceed design capacity by 35%

Off-peak frequency and “service span” reductions are required to meet peak demand

- OMF-C was designed for **104 vehicles**. With the additional storage locations, **140 vehicles** will be assigned to OMF-C.
- Because the OMF only has a certain amount of capacity, maintaining additional vehicles requires us to reduce off-peak service levels.
- Schedule adjustments include **moving from 10-minute to 12-minute headways from 8pm-10pm**.
- Because we are storing trains on the line, we will have to make changes to when early morning service begins and late-night service ends.

Some negative effects for passengers

Passengers may experience variability in train length, timeliness, and cleanliness.

- There may be days when we cannot put all vehicles in service.
- It may take us longer to recover from service disruptions, resulting in uneven headways.
- Since crews prioritize safety-related maintenance, light rail vehicles may not always be cleaned according to schedule.
- Over time, we may adjust the length of some trains to right-size ridership demand with our operational and maintenance pressures.

Strategy: Continue ST Express service

Direct service from Snohomish County until 2 Line is complete

- Add new temporary **Route 515** from Lynnwood, peak direction every 10 minutes.
- Temporarily continue **Route 510** to Downtown Seattle from Everett, every 15 minutes.
- Provides additional travel options to help riders avoid 1 Line crowding.



2026

1 Line Lynnwood to Federal Way

2 Line Downtown Redmond to Lynnwood

ST2 light rail extensions complete

2026

Peak service with available fleet

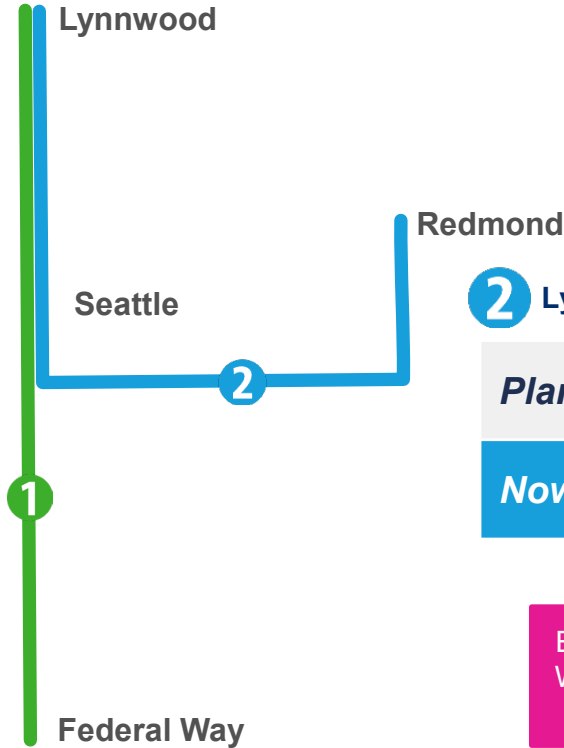
1 & 2

Combined service
Lynnwood to IDS

<i>Planned</i>	4 min	4 cars
<i>Now possible</i>	4-5 min	3-4 cars

1 Lynnwood to Federal Way

<i>Planned</i>	8 min	4 cars
<i>Now possible</i>	8-10 min	4 cars



2 Lynnwood to Downtown Redmond

<i>Planned</i>	8 min	4 cars
<i>Now possible</i>	8-10 min	3 cars

Extending 1 Line to Federal Way requires limiting 2 Line to 3 car trains

Strategy: Northgate peak turnback

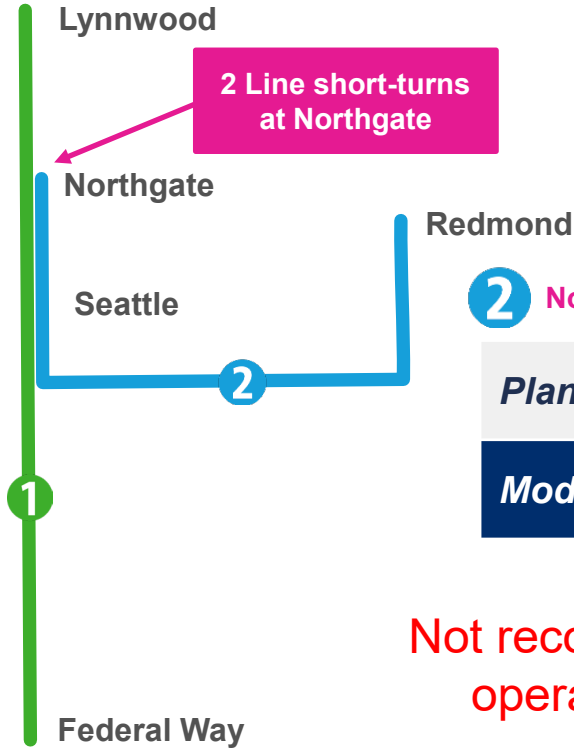
1 & 2

Combined service
Northgate to IDS

<i>Planned</i>	4 min	4 cars
<i>Modified</i>	5 min	4 cars

1 Lynnwood to Federal Way

<i>Planned</i>	8 min	4 cars
<i>Modified</i>	10 min	4 cars



2 Northgate to Downtown Redmond

<i>Planned</i>	8 min	4 cars
<i>Modified</i>	10 min	4 cars

Not recommended due to operational impacts

Strategy: Purchase 10 more Series 2 LRVs

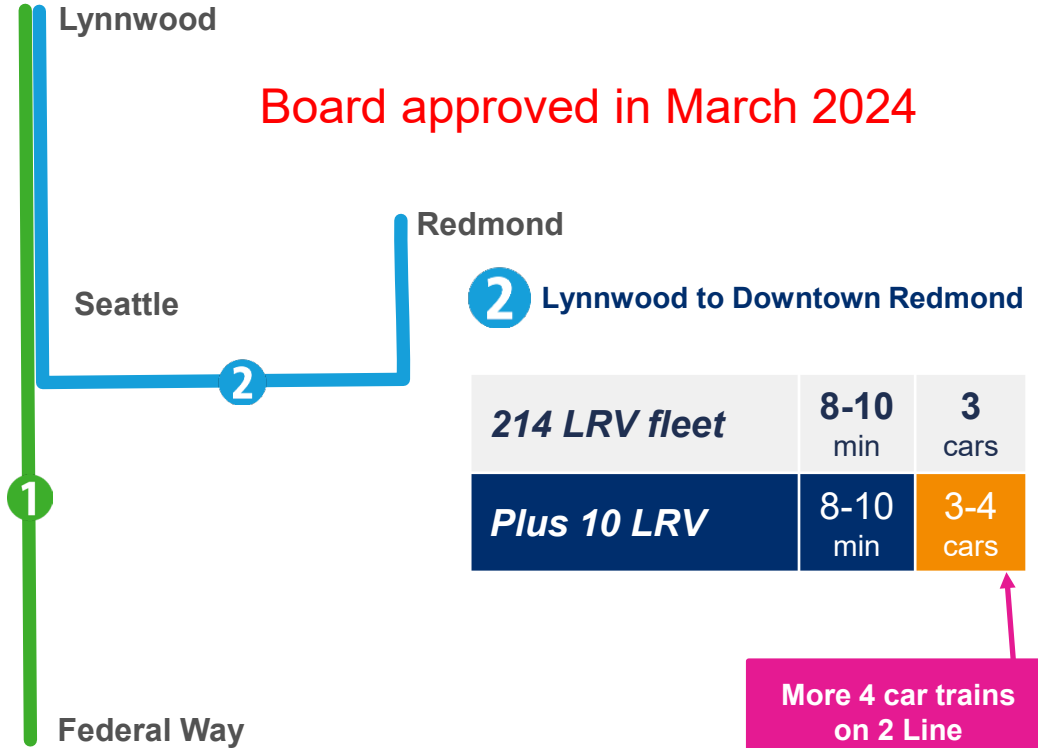
1 & 2 Combined service
Lynnwood to IDS

214 LRV fleet	4-5 min	3-4 cars
Plus 10 LRV	4-5 min	3-4 cars

1 Lynnwood to Federal Way

214 LRV fleet	8-10 min	4 cars
Plus 10 LRV	8-10 min	4 cars

Board approved in March 2024



2 Lynnwood to Downtown Redmond

214 LRV fleet	8-10 min	3 cars
Plus 10 LRV	8-10 min	3-4 cars

More 4 car trains
on 2 Line

2045

1 Line Ballard to Tacoma Dome

2 Line Mariner to Redmond

3 Line Everett to West Seattle

4 Line South Kirkland to Issaquah

ST3 light rail extensions complete

- ① Ballard–Tacoma
- ② Mariner–Redmond
- ③ Everett–West Seattle
- ④ Kirkland–Issaquah
- OMF



Light rail service in 2048

Uses all **460** LRVs in the Finance Plan

All ST3 light rail extensions open
All ST3 LRVs available
All OMFs in operation

① Ballard to Tacoma Dome

<i>Planned</i>	6 min	4 cars
<i>Now possible</i>	6 min	4 cars

② Mariner to Downtown Redmond

<i>Planned</i>	6 min	4 cars
<i>Now possible</i>	8 min	4 cars

③ Everett to West Seattle

<i>Planned</i>	6 min	4 cars
<i>Now possible</i>	8 min	4 cars

④ South Kirkland to Issaquah

<i>Planned</i>	6 min	* cars
<i>Now possible</i>	10 min	3 cars

2048

Southbound 1 Line*

Service Level Now Possible

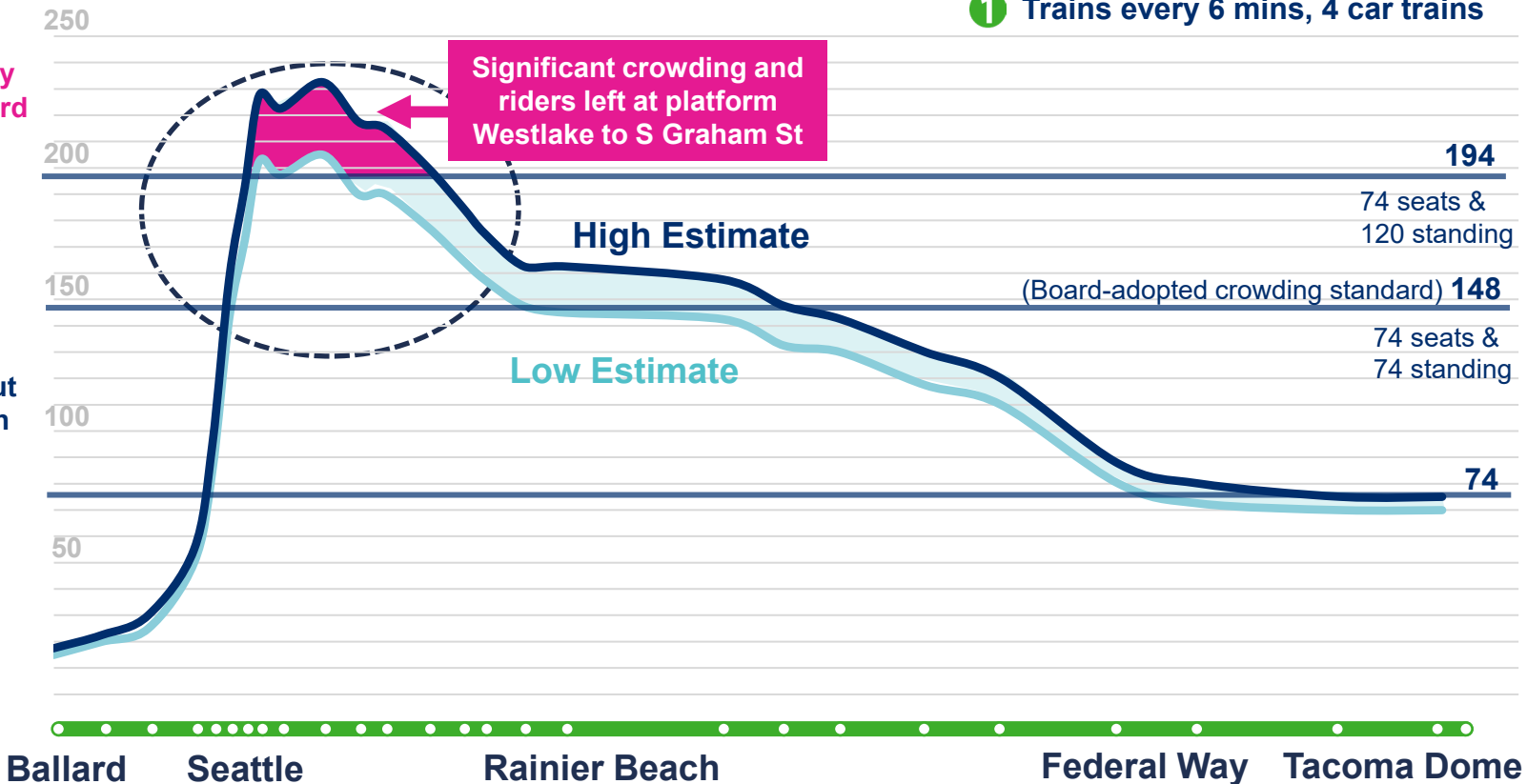
1 Trains every 6 mins, 4 car trains

Very crowded, may not be room to board

Challenges getting on and off

People standing but you can still get on

Everyone has a seat



Efficiencies common to all approaches

Reduce run times

- Enhance operator training; upgrade signal system; add crossing gates; study future grade-separation of at-grade segments

Reduce fleet spare ratio

- Increase staffing; complete warranty work; expand overnight maintenance window

Accelerate future LRV purchases

- Increase Series 3 order or start future procurements earlier; advance 10 Series 3 LRVs to Series 2; match delivery to OMF availability

Increase LRV capacity

- Relax crowding standard; configure future LRVs for more capacity; ask riders to spread out; remove seats; restrict bikes/luggage



Approach 1: Service Focus

Tailor peak service to demand

- 1 Line: 5-minutes with 4-car trains
- 2 & 3 Lines: 8-minutes with 4-car trains
 - 4-minutes combined from Chinatown/Int'l District to Mariner
- 4 Line: 16-minutes with 2-car trains

Continues to provide frequent service
Addresses most forecast crowding
No increase in fleet or OMFs

- Possible exception: 8-minute service on the 4-Line would require ~12 more LRVS @ \$90 - \$110M, but no OMF expansion

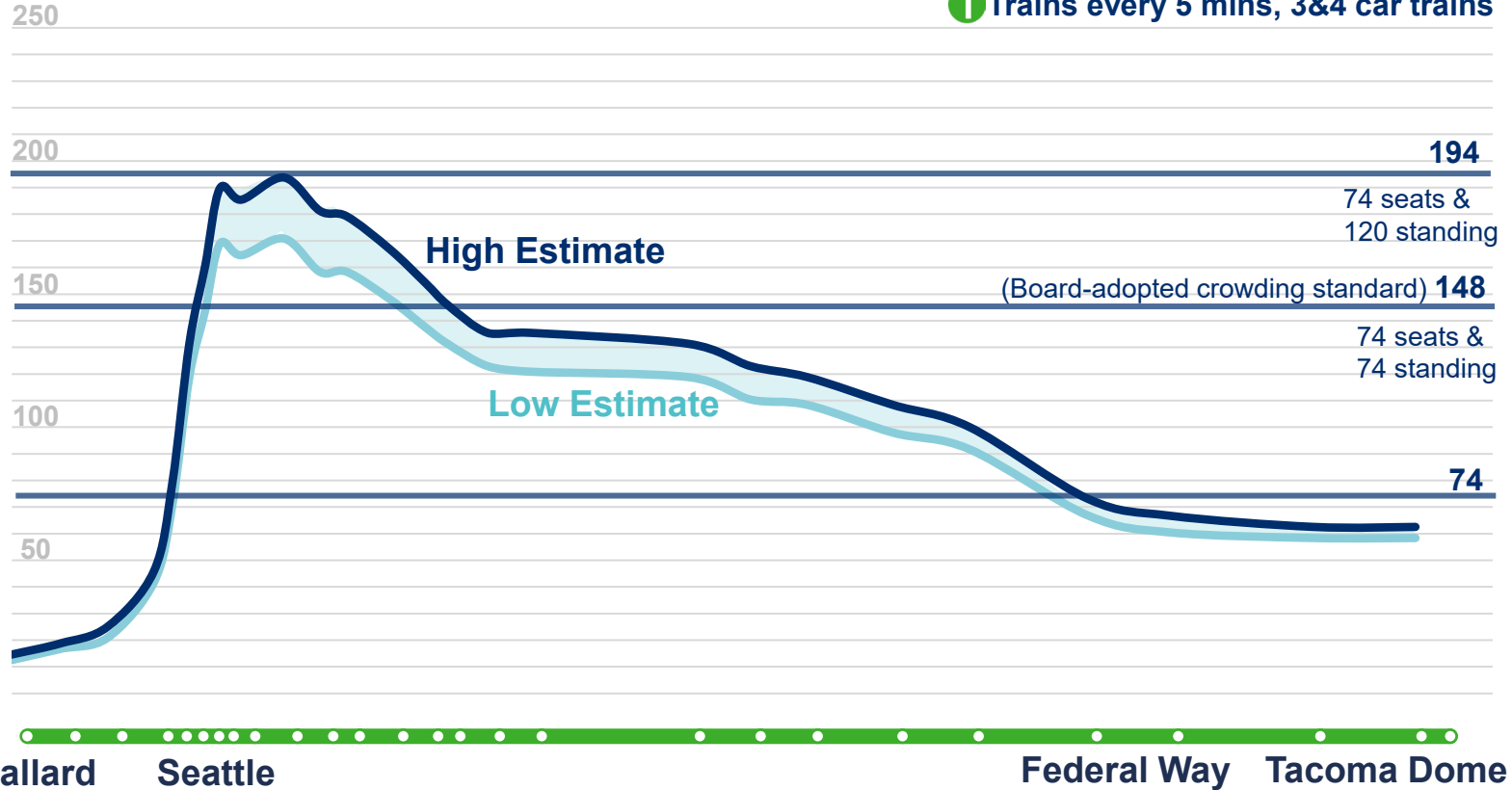
① Trains every 5 mins, 3&4 car trains

Very crowded, may not be room to board

Challenges getting on and off

People standing but you can still get on

Everyone has a seat



Approach 2: Capital Focus

Buy more LRVs and increase OMF capacity to achieve 6-minute peak service on all lines assumed in ST3

Cost element	Rough Cost (2024\$)
90 additional LRVs	~\$900M
OMF expansion for 50-60 LRVs	~ \$1B
Added O&M cost through 2046	\$300 - \$350
Total	\$2B +

- Planned ST3 service would now require 550 LRVs and additional OMF capacity
- Financial Plan includes funding for 460 LRVs and OMFs to accommodate 496

Recommendation: Hybrid Approach

Pursue the most promising efficiencies

Tailor planned peak service to demand

- 1 Line @ 5-minutes, 2 & 3 Lines @ 8-minutes with 4-car trains
 - 4-minutes combined from Chinatown/Int'l District to Mariner
- 4 Line @ 16-minutes with 2-car trains

Remain flexible as new extensions open

- Monitor demand
- Include options for additional vehicles in Series 3 procurement
- Include option for additional capacity at OMF-South in procurement
- Assess expansion options at other OMF locations
- Explore alternate service patterns that might reduce vehicle needs

Thank you.



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