To: Muni Metro Capacity Study Community Working Group

From: Liz Brisson, Muni Metro Capacity Study Project Manager

Date: September 12, 2024

Subject: Materials for Working Group Meeting #4 on September 19 at 6pm.

In our next Community Working Group (CWG) meeting, we will discuss the capacity improvement packages the project team has created. We are evaluating the packages according to multiple criteria including your feedback. This memo describes the packages and includes discussion questions. We will also summarize the packages during our meeting.

Where we are in the Study process

At our prior meetings, we introduced the main capacity-improving strategies (e.g. longer trains, route restructuring, transit priority treatments, transit signal pre-emption and crossing gates, etc.) and we talked conceptually about some of the related tradeoffs. Since our last meeting we have developed several packages of capacity improvements that mix and match strategies. Each package will undergo evaluation to understand how well it meets our goals to improve capacity, and how well it performs against our full evaluation framework.

Figure 1 recaps the evaluation framework for the Study that was presented at our November 16, 2023, Community Working Group meeting.

Figure 1 - Muni Capacity Study Evaluation Framework

At our meeting on January 23, 2025, we expect to have full evaluation results which we will use to inform which package or package elements should be recommended in the Study's final report.

Capacity-Improving Packages

There are three components to the packages, summarized in Figure 2 below. This section first explains each package component and then summarizes what each package contains.

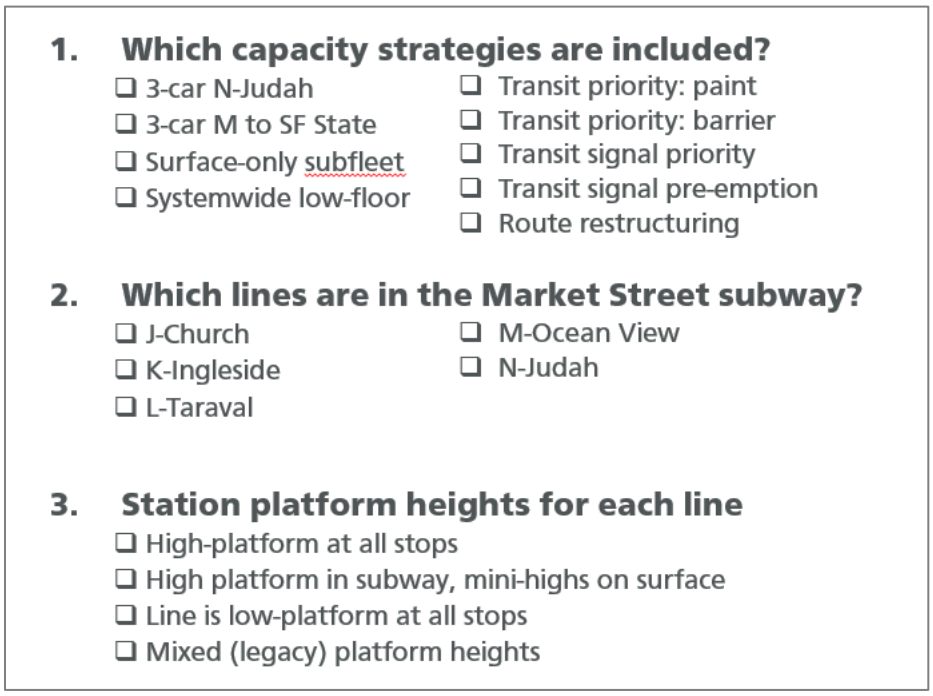


Figure 2 - Package Components

1. Capacity strategies included.

The goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. After the Study is finished, any strategies that advance would be developed with extensive additional outreach and analysis before any project moves forward. The following capacity strategies are included in one or more package:

- **3-car N-Judah:** Upgrade the N Judah to use three-car light rail trains along the whole line between Caltrain and Ocean Beach.
- **3-car M (Downtown to SF State):** Upgrade the M Ocean View to use three-car light rail trains between downtown and SF State (and potentially Parkmerced, pending build-out of the Parkmerced development plan).
- **Surface-only sub-fleet:** Acquire of a separate low-floor fleet for any future surface-only lines (such as possibly the J or L/K)
- **System-wide low floor:** Replace the existing high-floor light-rail fleet with low-floor fleet, which would require re-construction of the Muni Metro subway station platforms and surface high-platform stations.
- **Transit priority: paint:** Paint transit lanes
- **Transit priority: barrier:** Separate transit lanes from other vehicle traffic by raised light-rail tracks, fencing, or raised curbs

- **Transit signal priority:** Upgrade signals to communicate with trains so signal timing can be altered to give priority to the train
- **Transit signal pre-emption:** Upgrade signals to communicate with trains earlier and adjust signal timing proactively so that when trains reach the signal they always have the green light.
- **Route-restructuring:** Reconfigure the routing of Muni Metro services on existing tracks. There are three different route restructuring concepts that are tested in the packages.
    1) ***Surface-only J Church*** either terminating at Church Street and/or continuing downtown along the surface of Market Street
    2) ***Surface-only K/L Ingleside-Taraval*** that would run from the SF Zoo to City College and back, all at street level; and
    3) ***Swapping the J Church and M Ocean View*** so that the M only goes as far as SF State and the J continues past Balboa Park through the Ocean View to Stonestown.

Appendix 1 includes a map of each of these route restructuring concepts.

2. Which lines are in the Market Street subway?
This component of the package incorporates the relevant route restructuring concepts included in the package to understand which lines would be operating in the Market Street subway.

3. Station platform height
A final component of the packages addresses station platform height. At many locations in the current Muni Metro system, stops are either inaccessible to people with wheelchairs, mobility devices or strollers, or a small ramp (sometimes called a "mini-high") makes just one door of the train accessible (see Figure 3). The SFMTA would like to make every stop in the system accessible with at least a small ramp and is also analyzing several "Full Modernization" packages that consider the feasibility of installing boarding platforms (see Figure 4) throughout the entire system so that every light-rail vehicle door is accessible with level boarding. Depending on whether the package assumes low-floor or high-floor light-rail vehicles on that line, the center boarding platform would either be 14 inches off the ground for a low-floor platform or 36 inches off the ground for a high-floor platform.

Figure 3 - Example of boarding at an inaccessible stop (left) and accessible boarding via a small ramp ("mini-high), right.

Figure 4 - Stop with center platform and full level boarding

The Study team has done some initial engineering feasibility analysis of street design options that could accommodate accessible boarding within available street widths. Muni Metro operates on a wide range of street widths. Just over 20% of streets Muni Metro operates on that do not yet have level boarding are less than fifty-five feet wide and street design decisions will be relatively more difficult (see Figure 5). Fortunately, over half of the system operates on streets where widths are greater than 60 feet and street design decisions may be somewhat less difficult. (The remaining approximately 25% of streets are between 55 and 59 feet wide). Figure 6 illustrates four possible options for a street that is

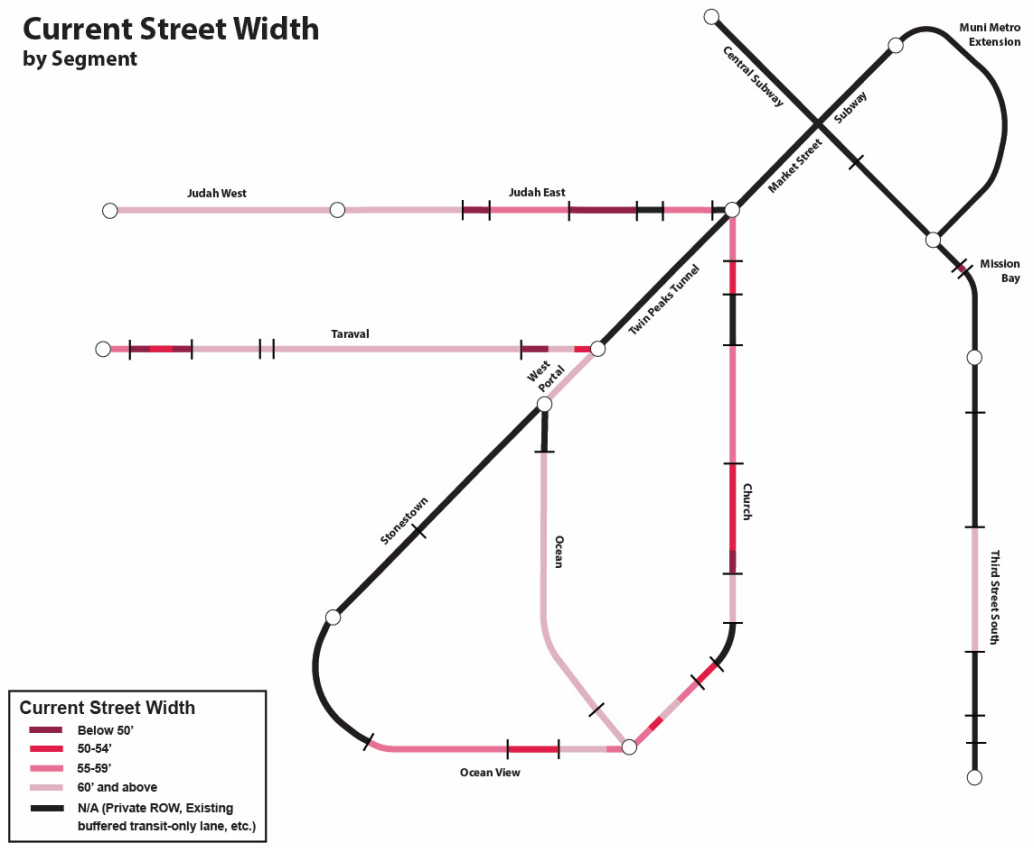


Figure 5 Muni Metro street widths

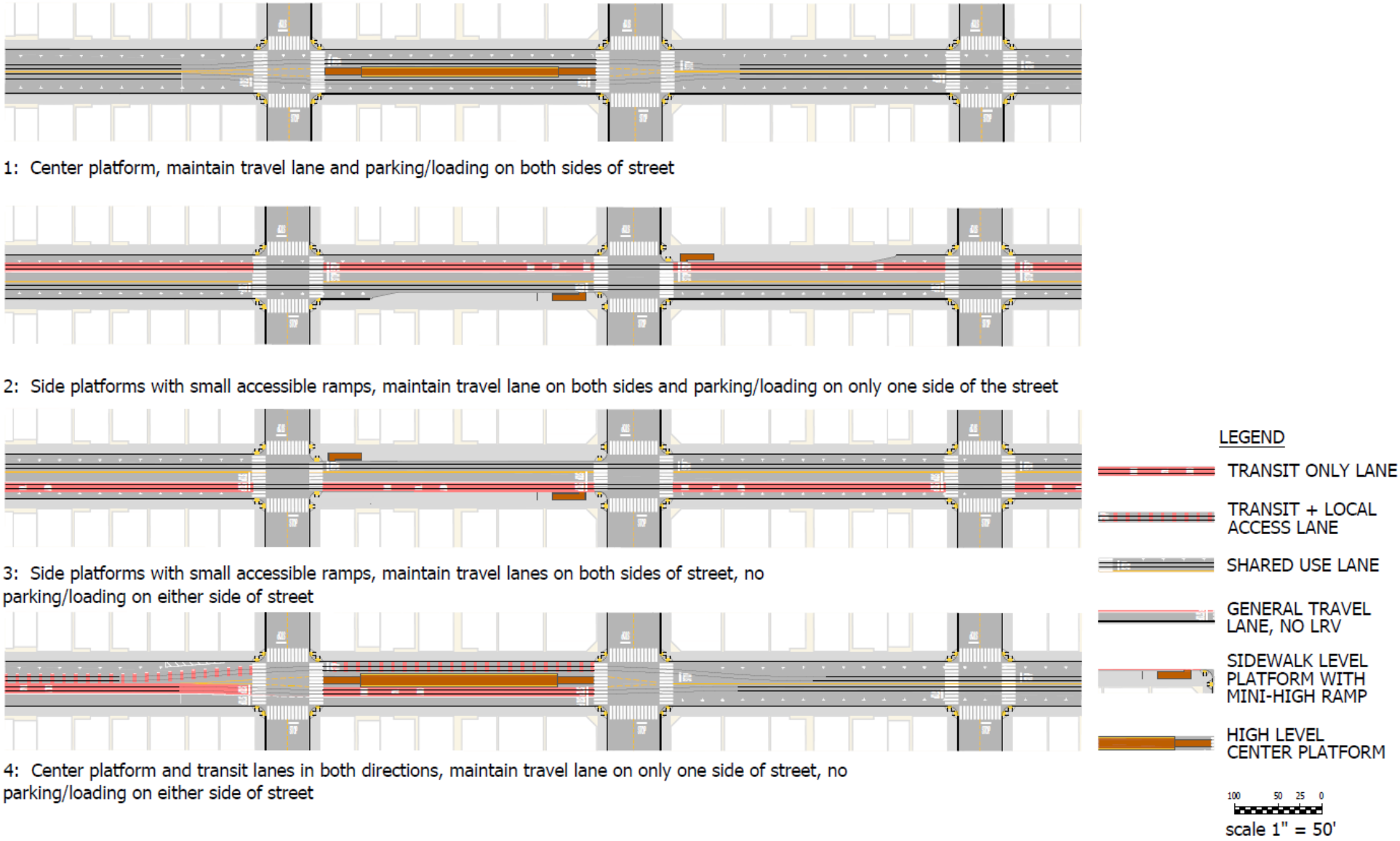


Figure 6 - Street design options that could accommodate accessible boarding within a 50-55 ft. wide street, ordered from smallest to largest change in travel lane and parking/loading.

between fifty and fifty-five feet wide. The four examples are just four out of many possible configurations. They illustrate a range of different options, including those that preserve the most parking, loading, and general travel lanes and those that do the most to improve transit with level boarding and transit lanes. Ultimately, subsequent project planning processes would need to design each station location within the technical constraints and community feedback in that location. However, understanding the high-level benefits and tradeoffs of this representative range of designs is useful to provide guidance to any subsequent planning processes.

Figure 7 and Table 1 both summarize the eight different packages that have been created from the above three package components. Figure 7 summarizes the components in each package, while Table 1 summarizes the general principles for what is included as well as the reason it is being tested. Appendix 2 provides further detail on each package including a schematic map.

H	Line is high-platform at all stops
H*	High platforms in subway; mini-highs on surface
L	Line is low-platform at all stops
M	Mixed (legacy) platform heights along line

Figure 7 - Capacity-Improvement Package Summary

		Capacity Strategies Included											In Market Subway?						Floor/Platform Height					
Package / Theme		1. 3-car N-Judah	2a. 3-car M-Ocean View	3. Surface-Only Subfleet	4. Systemwide Low-Floor	5a. Transit priority: paint	5b. Transit priority: barrier	6a. Transit Signal Priority	6b. Transit Signal Pre-emption	8a. Restructuring: Surface J	8b. Restructuring: K/L	8c. Restructuring: J/M swap	J-Church	K-Ingleside	L-Taraval	M-Ocean View	N-Judah	T-Third	J-Church	K-Ingleside	L-Taraval	M-Ocean View	N-Judah	T-Third
A	Full Modernization: All Low Floor	x	x		x		x	x	x	x		x	N	Y	Y	Y	Y	-	L	L	L	L	L	H
B	Full Modernization: MNT high	x	x	x			x	x	x	x	x	x	N	N	N	Y	Y	-	L	L	L	H	H	H
C	Full Modernization: KLMNT high	x	x	x			x	x	x	x		x	N	Y	Y	Y	Y	-	L	H	H	H	H	H
D	Mid-Range Combination	x	x	x		x	x	x	x	x		x	N	Y	Y	Y	Y	-	L	H*	H*	H*	H*	H
E	Minimalist Approach: Lower Cost	x				x		x		x	x		N	N	N	Y	Y	-	M	M	M	M	M	H
F	Minimalist Approach: Lower Delivery Risk	x	x	x				x		x	x		N	N	N	Y	Y	-	L	L	L	H*	H*	H
G	Minimalist Approach: Limited Passenger & Neighborhood Disruption	x	x			x		x		x		x	N	Y	Y	Y	Y	-	H*	H*	H*	H*	H*	H
H	Retained J Church	x	x	x		x		x	x		x	x	Y	N	N	Y	Y	-	H*	L	L	H*	H*	H

Table 1 - Summary of Capacity-Improving Packages

Package name	What is it	Why test it
A - Full Modernization – All Low Floor	A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Level boarding on each line (except the T) is introduced through low platforms/low-floor vehicles.	To test the impacts of a full suite of modernizing improvements that would be easier to implement on surface segments but require reconstruction in the subway.
B - Full Modernization – MNT High	A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Market Street/Central Subway lines (M, N, T) would have level high platforms/vehicles, while surface-only lines (J, K, L) would have low platforms/vehicles.	To test the impacts of a suite of modernizing improvements that would be easier to implement on in the subway segments but may pose larger challenges on the surface. Relative to Package C, there may be fewer surface challenges, as only three lines (including the T) would have high surface platforms.
C Full Modernization – KLMNT High	A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Market Street/Central Subway lines (all except the J) would have level high platforms/vehicles, while the surface-only line (J) would have low platforms/vehicles.	To test the impacts of a suite of modernizing improvements that would be easier to implement in the subway segments but may pose larger challenges on the surface. Relative to Package B, there may be more surface challenges, as all lines except the J would have high surface platforms.
D Mid-Range Combination	A package with the infrastructure to support longer and faster trains with less intensive platform height work than the Full Modernization packages (mini-high platforms instead of all high platforms).	The uniform platform heights on each line in the full modernization packages may pose substantial challenges (subway reconstruction or difficult design to accommodate driveways) to implementation. This package provides a baseline for understanding the incremental expense/benefits of all-door, level boarding.
E Minimalist Approach: Lower Cost	A package with relatively less expensive components.	To test what can be accomplished when using the least costly modernization options identified while still meeting the capacity need.
F Minimalist Approach: Lower Delivery Risk	A package with components that carry relatively less engineering risk/uncertainty.	To test what can be accomplished when using modernization options that are anticipated to be the most straightforward to implement.
G Minimalist Approach: Limited Passenger/ Neighborhood Disruption	A package with the modernization options that carry lower anticipated impacts to current routing, traffic, and streetscapes.	To test what can be accomplished when using modernization options that are anticipated to carry lower neighborhood, community, and political risks.
H Retained J Church	A package designed to understand what it might take to maintain J service in the Market Street Subway service and achieve future capacity needs.	To test what is necessary to keep in the J as a subway line and the impact on the rest of the Muni Metro system when the J continues operations in the Market Street Subway.

Discussion Topics for September 19 Community Working Group meeting

The Study staff team is currently evaluating each of these packages to help us decide which package or packages to recommend to the SFMTA Board. Any recommendations the Board approves would move forward as individual projects through full community planning processes. Community Working Group feedback is an important component of our evaluation. To that end, the following questions are intended to prompt discussion among Community Working Group members. We're especially interested in group members deliberating with eachother about the relative benefits and tradeoffs, and work with each other to consider these from multiple perspectives, including perspectives that may not be your own. Table 2 presents a wide range of perspectives that we think should all be considered in the discussion questions.

Table 2 - Possible perspectives to center during discussion

Category	Possible Perspectives
Rider of specific line	J rider, K rider, L rider, M rider, N rider, T rider, etc.
Primary mode(s)	Transit, driving, cycling, walker, scooter, Uber/Lyft etc.
Neighborhood	Outer Sunset, Bayview, Cole Valley, West Portal, Ocean View, SoMa, etc
Occupation/roles	Small business owner, parent of young children, college student
Priority issues	Housing affordability, climate change, economy, urbanism
Demographics	Senior, youth, male, female, non-binary
Other?	

1. **Limited street width/prioritization.** Street space on Metro corridors is limited. We may not be able to accommodate every desired street use.
    - Which of the representative street configurations for a 50-55 foot street width would be most palatable?
    - Are there nuances to where you would swap the priorities? (e.g. commercial vs. residential area)?

2. **Level boarding.** Level boarding on all Metro lines (as envisioned in the "Full Modernization" packages) provides significant accessibility improvements and also improves speed and reliability, but it comes with significant trade-offs as illustrated in the example configurations. Instead, adding "mini-high" accessible ramps would take up less street space.
    - Do you think we should pursue full level boarding or a mix of level boarding and "mini-highs"?

3. **Route restructuring.** Muni Metro is the 3rd busiest light rail in the U.S. and the only one that still merges five lines into one subway tunnel. If current forecasts are realized, we will need to remove one line from the subway at some point in the future.
    - Does this Study finding resonate with you? If not, what else is needed to better make the case?
    - Please deliberate on the benefits and tradeoffs you see with each restructuring concept.

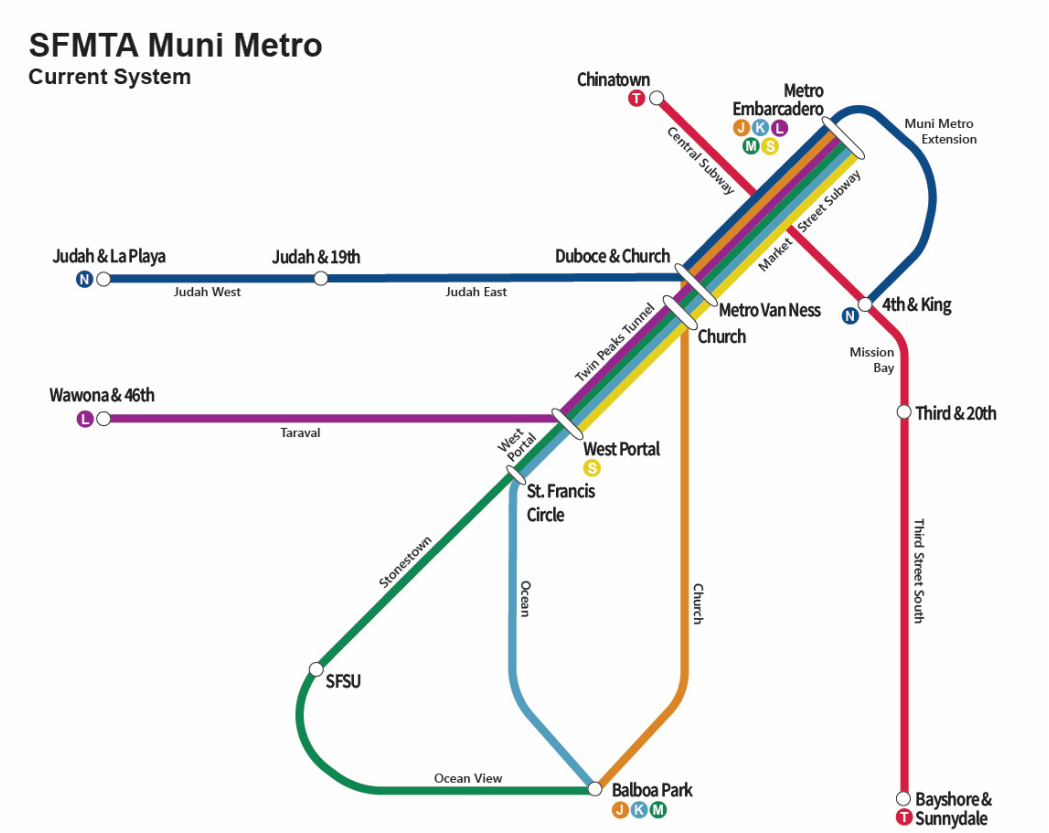
- What can we do to mitigate the tradeoffs for those negatively impacted by each idea?

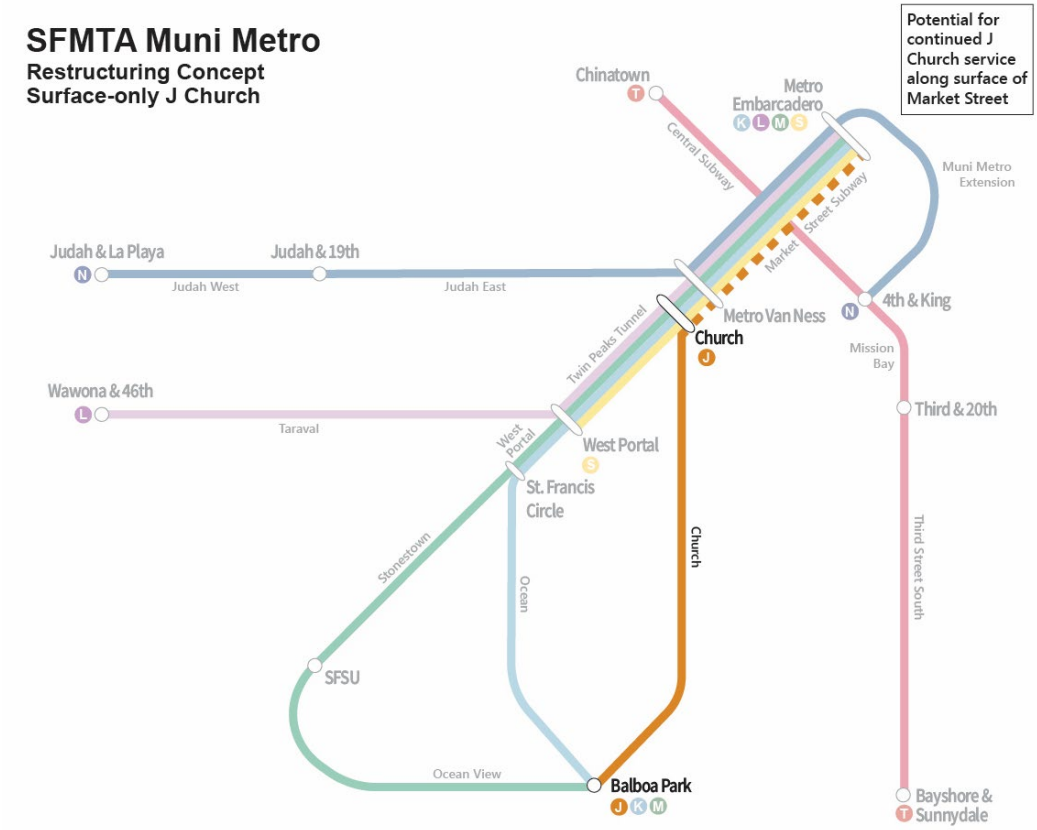
4. **Package preferences.** Based on today's information and discussion, how would you prioritize the different packages?

5. **Next steps.** We have two options for when we meet again. The content we are sharing is significant and it may be helpful to continue the discussion of the above topics again before we meet in January to review the evaluation results.

    - Would you like to have another meeting before the planned January meeting to continue this discussion?
    - Do you have any feedback on the best way to continue this conversation as we prepare to share out evaluation results?

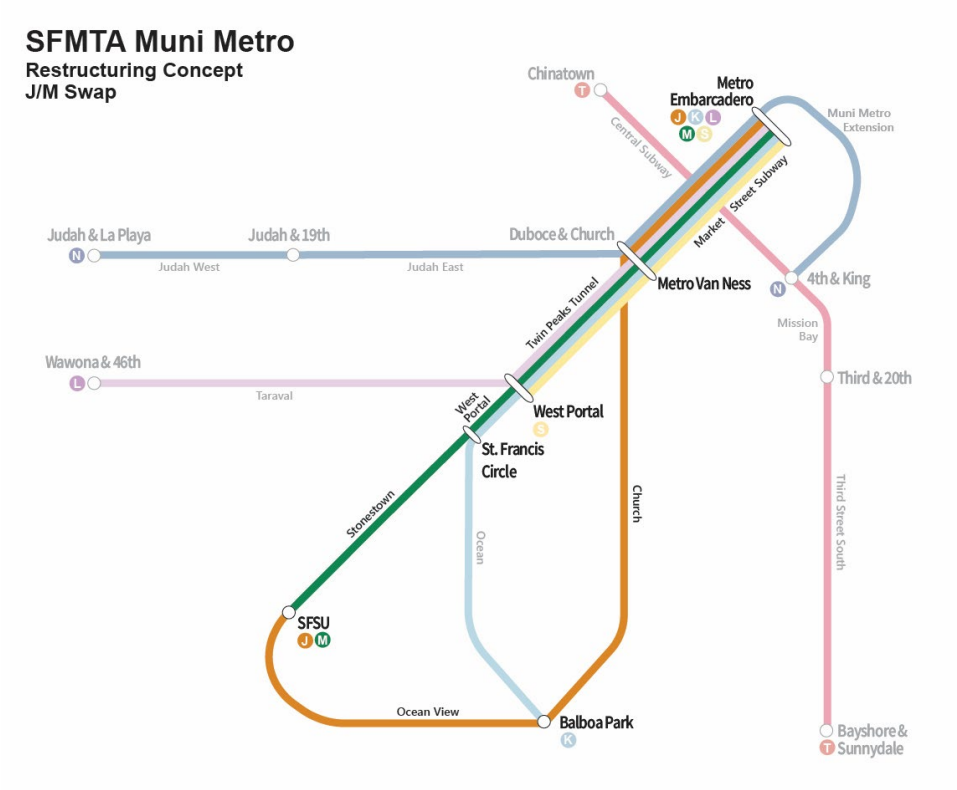
Appendix 1 – Route Restructuring Concepts Under Study

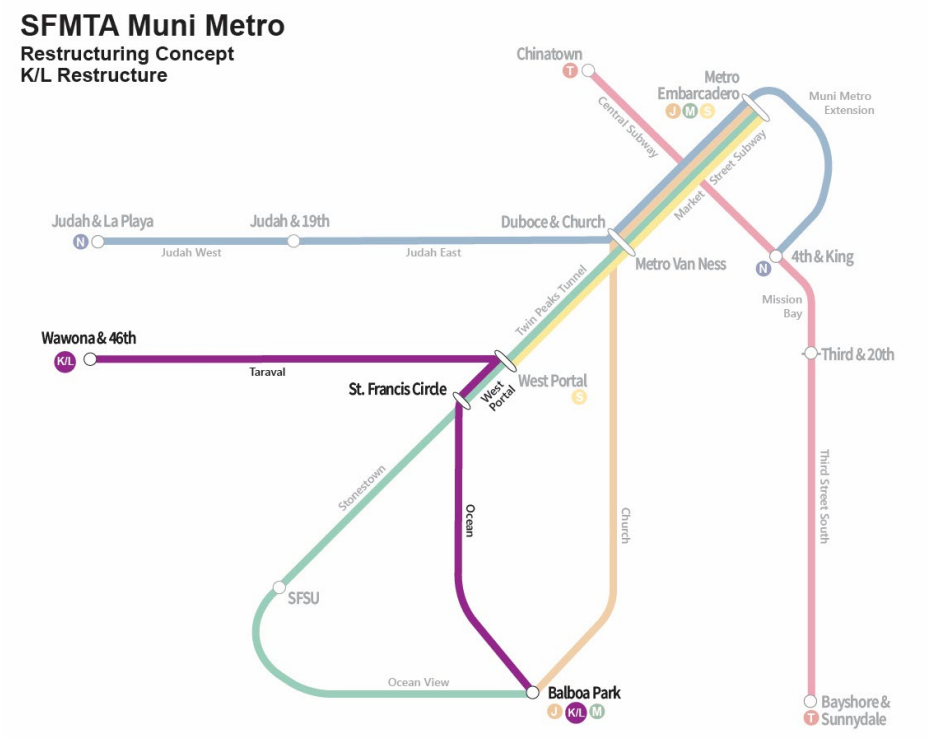




Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Appendix 1 – Route Restructuring Concepts Under Study





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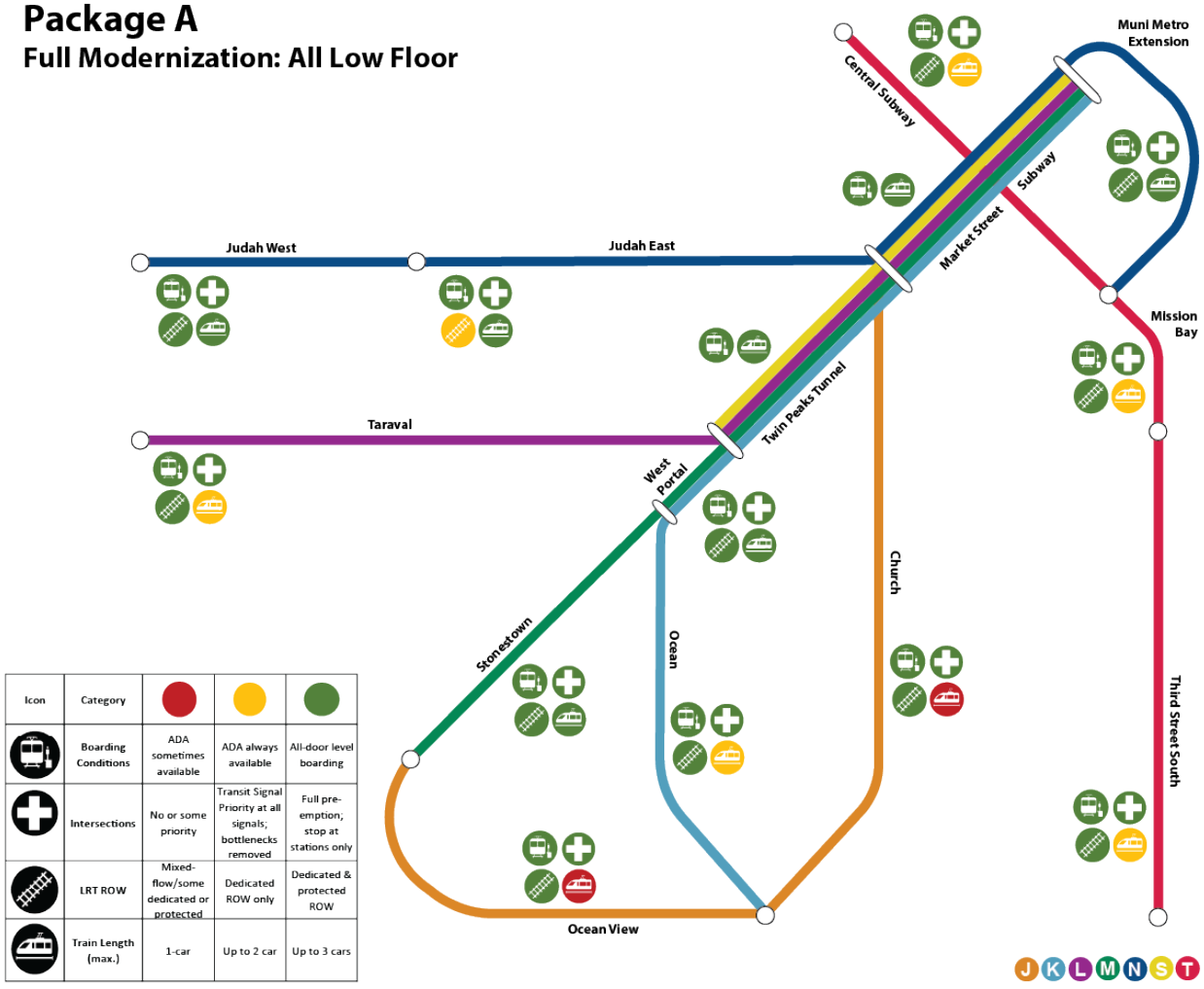
Package A – Full Modernization: All Low Floor

What is it: A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Level boarding on each line (except the T) is introduced through low platforms/low-floor vehicles.

Why it is being considered: To test the impacts of a full suite of modernizing improvements that would be easier to implement on surface segments but require reconstruction in the subway.

- 3-Car: M and N
  - Purchase sufficient light rail vehicles to accommodate systemwide low-floor operations plus lengthening M and N operations from 2 to 3 cars
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: All low-floor light rail vehicles (except the T)
  - Replace all existing high-floor light rail vehicles (except for the T) with low-floor light rail vehicles
  - Modify stops to:
    - Market Street Subway and Twin Peaks Tunnel: Convert existing high platforms to low
    - Surface segments: Raise platforms from sidewalk level to low-floor height
- Right of Way: Barriers on surface
  - Protected dedicated light rail lanes on all surface segments– protection provided by raising light rail tracks, fencing, or raised curbs
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting in no parking)
- Intersections: 50% hard pre-emption
  - All 4-way stop intersections converted to signals
  - Hard pre-emption at 50% of signalized intersections
    - Transit signal priority at all other intersections
- Route Re-Structuring
  - M to terminate at SFSU station; the J to extend to serve the prior M segment between Balboa Park and SFSU;
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - J to terminate at Church and Market Street, with improved surface-to-underground ADA transfer to Church Street Station

Package A
Full Modernization: All Low Floor



Icon	Category			
	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Package B – Full Modernization: MNT High

What it is: A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Market Street/Central Subway lines (M, N, T) would have level high platforms/vehicles, while surface-only lines (J, K, L) would have low platforms/vehicles.

Why it is being considered: To test the impacts of a suite of modernizing improvements that would be easier to implement on in the subway segments but may pose larger challenges on the surface. Relative to Package C, there may be fewer surface challenges, as only three lines (including the T) would have high surface platforms.

- 3-Car: M and N
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
    - *Note: Pending timing, high-floor cars previously used by the J, K, and L may fit this need*
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: All high on subway lines (M, N, T); all-low on surface lines (J, K, L)
  - Acquire surface-only low-floor subfleet
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Modify stops to:
    - J, K, and L: Raise platforms from sidewalk level to low-floor height
    - M and N (surface segments): Raise platforms to high-floor height
- Right of Way: Barriers on surface
  - Protected dedicated light rail lanes on all surface segments– protection provided by raising light rail tracks, fencing, or raised curbs
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting in no parking)
- Intersections: 50% hard pre-emption
  - All 4-way stop intersections converted to signals
  - Hard pre-emption at 50% of signalized intersections
    - Transit signal priority at all other intersections
- Route Re-Structuring
  - M to terminate at SFSU station; J to extend to serve prior M segment between Balboa Park and SFSU
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - J to terminate at Church and Market Street, with an improved surface-to-underground ADA transfer to Church Street Station
  - L/K to run as a combined surface-only route, with a transfer to subway service at West Portal
  - Maintenance – May be possible to have:
    - Green to serve as dedicated low-floor facility
    - Muni Metro East to serve as dedicated high-floor facility

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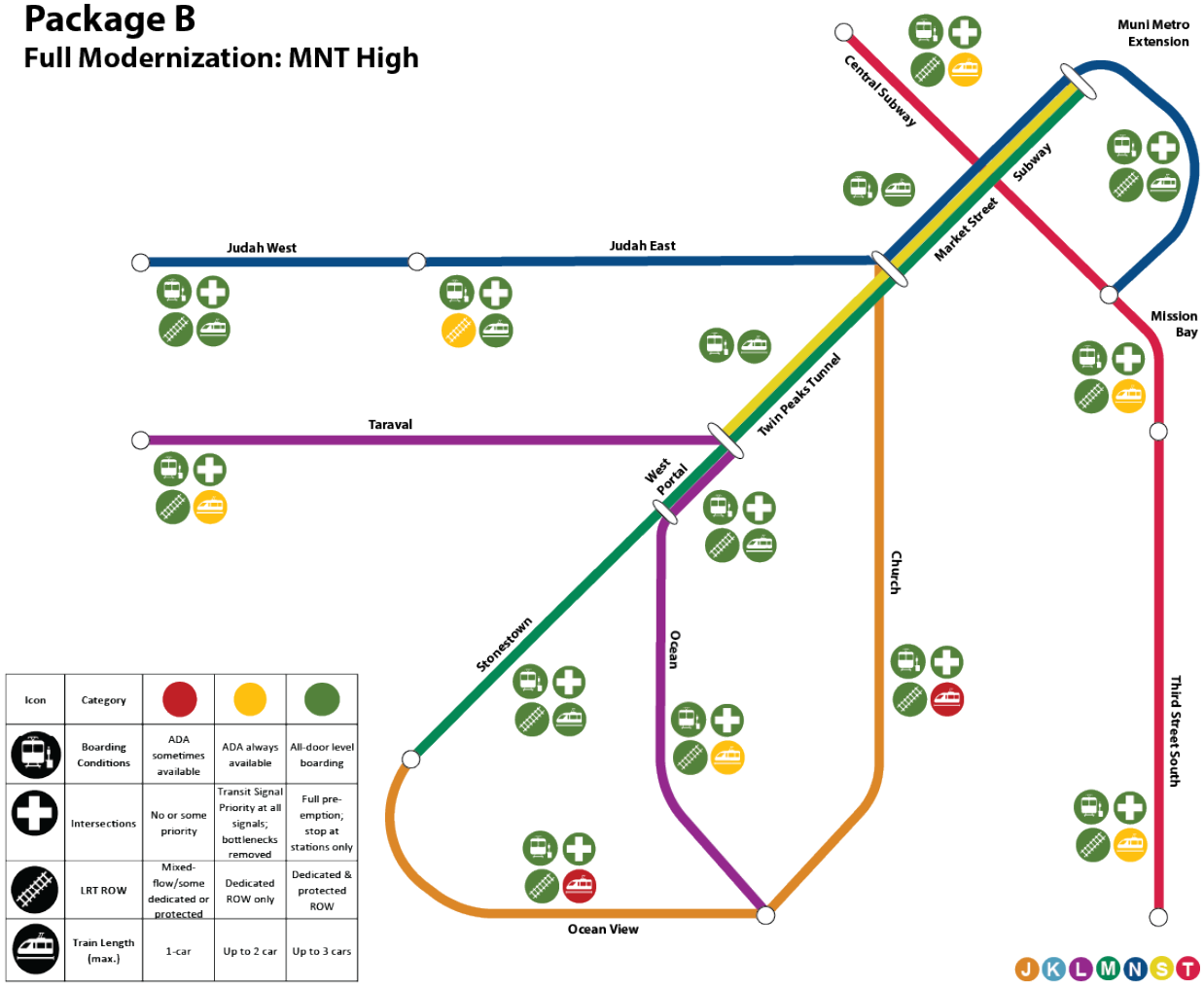
Package B
Full Modernization: MNT High



Icon	Category			
	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

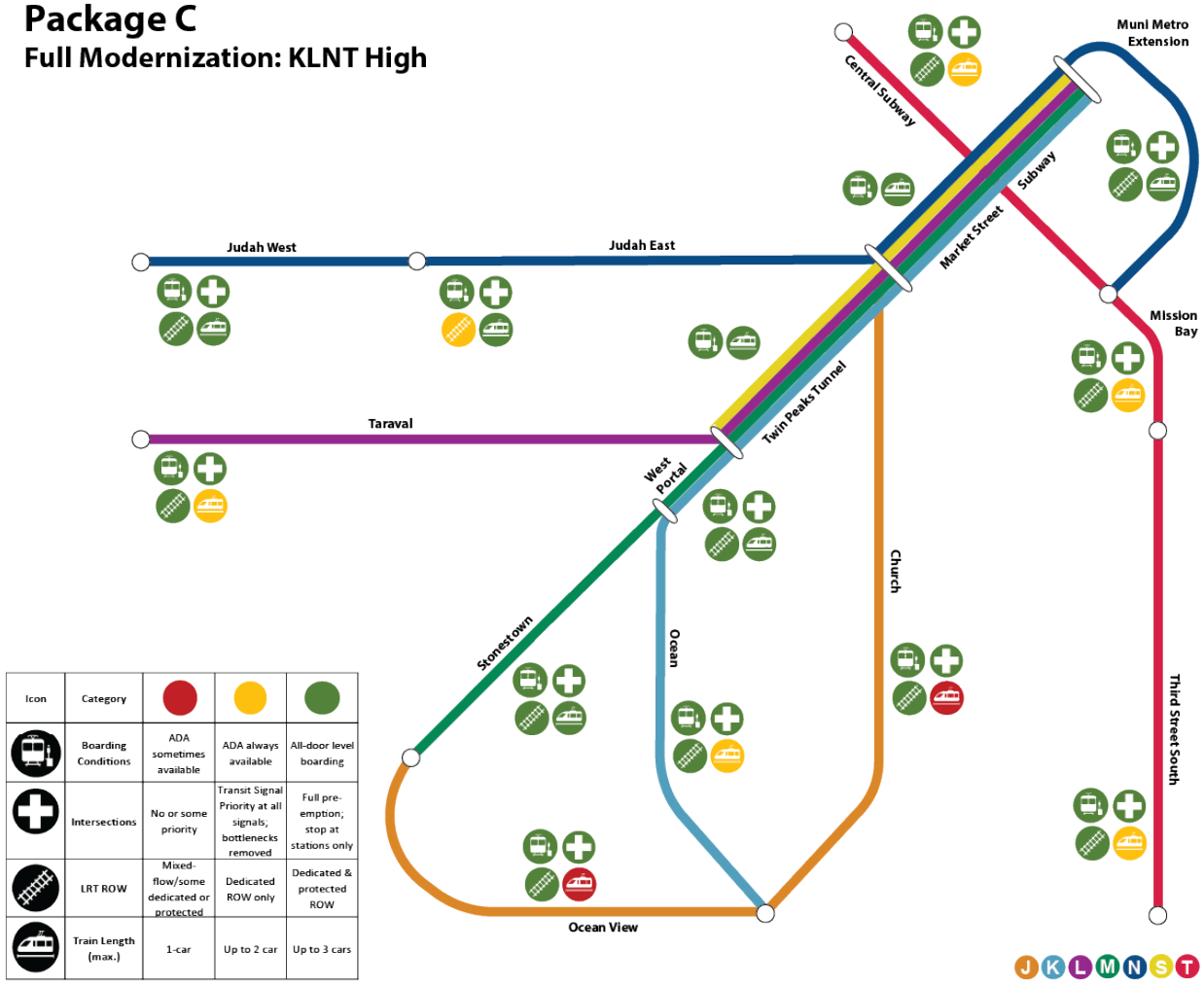
Package C – Full Modernization: KLMNT High

What it is: A package with the right-of-way and intersection improvements that are most associated with enhanced light rail performance. Market Street/Central Subway lines (all except the J) would have level high platforms/vehicles, while the surface-only line (J) would have low platforms/vehicles.

Why it is being considered: To test the impacts of a suite of modernizing improvements that would be easier to implement in the subway segments but may pose larger challenges on the surface. Relative to Package B, there may be more surface challenges, as all lines except the J would have high surface platforms.

- 3-Car: M and N
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
    - *Note: Pending timing, high-floor cars previously used by the J may fit this need*
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: All high on all subway lines (all except the J)
  - Acquire surface-only low-floor subfleet for the J
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Modify stops a to:
    - K, L, M, N (surface segments): Raise platforms from sidewalk level to high-floor height
    - J: Raise platforms to low-floor height
- Right of Way: Barriers on surface
  - Protected dedicated light rail lanes on all surface segments– protection provided by raising light rail tracks, fencing, or raised curbs
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting in no parking)
- Intersections: 50% hard pre-emption
  - All 4-way stop intersections converted to signals
  - Hard pre-emption at 50% of signalized intersections
    - Transit signal priority at all other intersections
- Route Re-Structuring
  - M to terminate at SFSU station; J to extend to serve prior M segment between Balboa Park and SFSU
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - J to terminate at Church and Market Street, with an improved surface-to-underground ADA transfer to Church Street Station

Package C
Full Modernization: KLNT High



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	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

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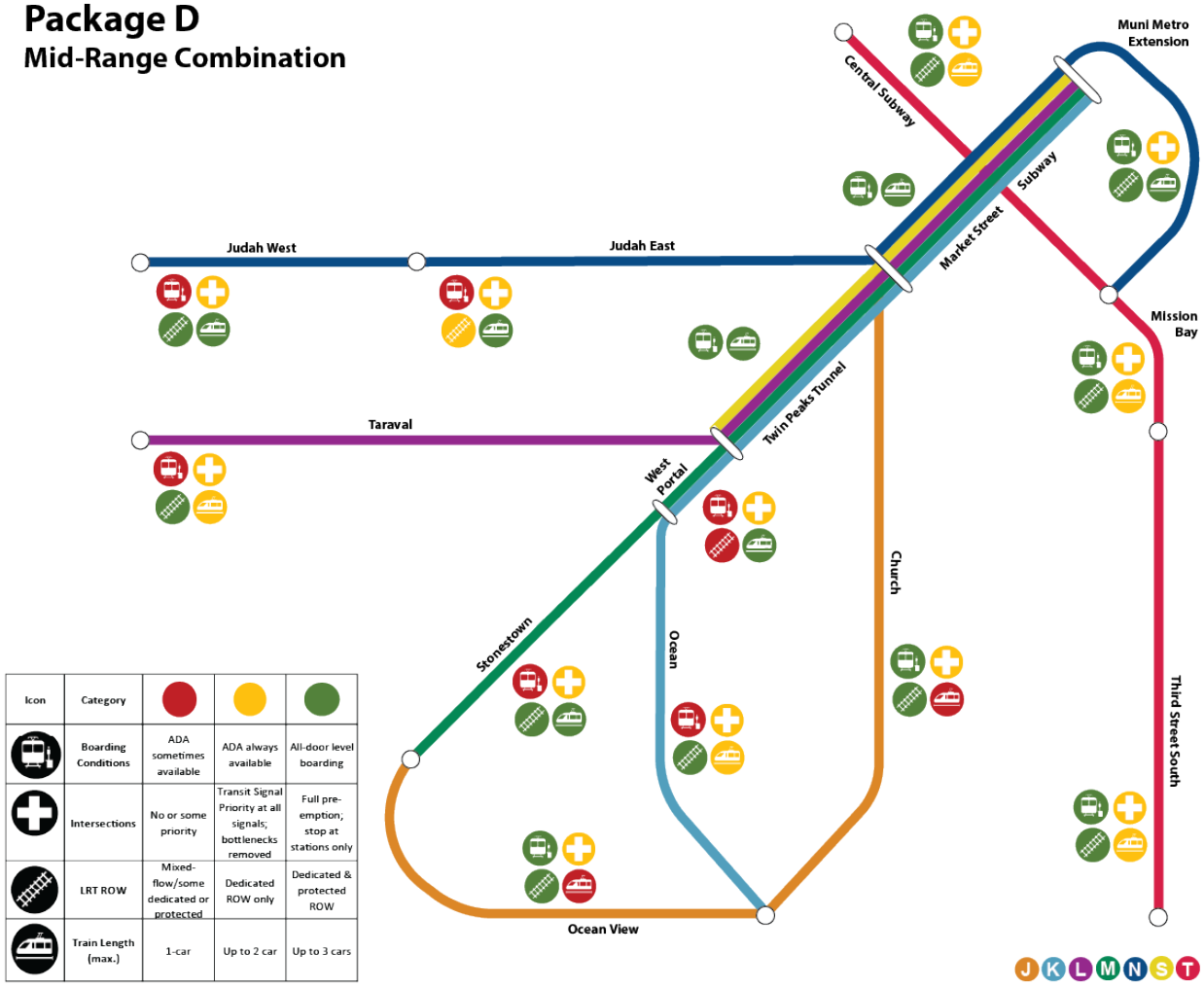
Package D – Mid-Range Combination

What it is: A package with the infrastructure to support longer and faster trains with less intensive platform height work than the Full Modernization packages (mini-high platforms instead of all high platforms).

Why it is being considered: The uniform platform heights on each line in the full modernization packages may pose substantial challenges (subway reconstruction or difficult design to accommodate driveways) to implementation. This package provides a baseline for understanding the incremental expense/benefits of all-door, level boarding.

- 3-Car: M and N
  - Purchase sufficient high-floor light rail vehicles (with moveable stairs) to lengthen existing trains from 2 to 3 cars
    - *Note: Pending timing, high-floor cars previously used by the J may fit this need*
  - Modify tracks as needed to accommodate Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: High on the T; mixed in lines using the Market Street Subway; low on surface-only lines
  - Acquire surface-only low-floor subfleet
  - Maintain high platforms where they exist currently: T, Market Street Subway, Twin Peaks Tunnel
  - Modify stops to:
    - K, L, M, and N (surface segments): Mini-high platforms at all stops
    - J: Pending feasibility analysis, entire line will either: (1) raise platforms from sidewalk level to low-floor height or (2) leave at sidewalk height and add mini-low
- Right of Way: Transit preferential streets
  - Protected dedicated light rail lanes on surface segments with 2+ travel lanes per direction – protection provided by raising light rail tracks, fencing, or raised curbs
  - Painted transit-only lanes (no protection barriers) on surface segments with 1 travel lane per direction
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting in no parking)
- Intersections: 25% hard preemption
  - All 4-way stop intersections (without near-side platforms) converted to signals
  - Hard preemption at 25% of signaled intersections
  - Transit signal priority at all other signaled intersections
- Route Re-Structuring
  - M to terminate at SFSU station; J to extend to serve prior M segment between Balboa Park and SFSU
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - J to terminate at Church and Market Street, with an improved surface-to-underground ADA transfer to Church Street Station

Package D
Mid-Range Combination



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	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Package E: Minimalist Approach: Lower Cost

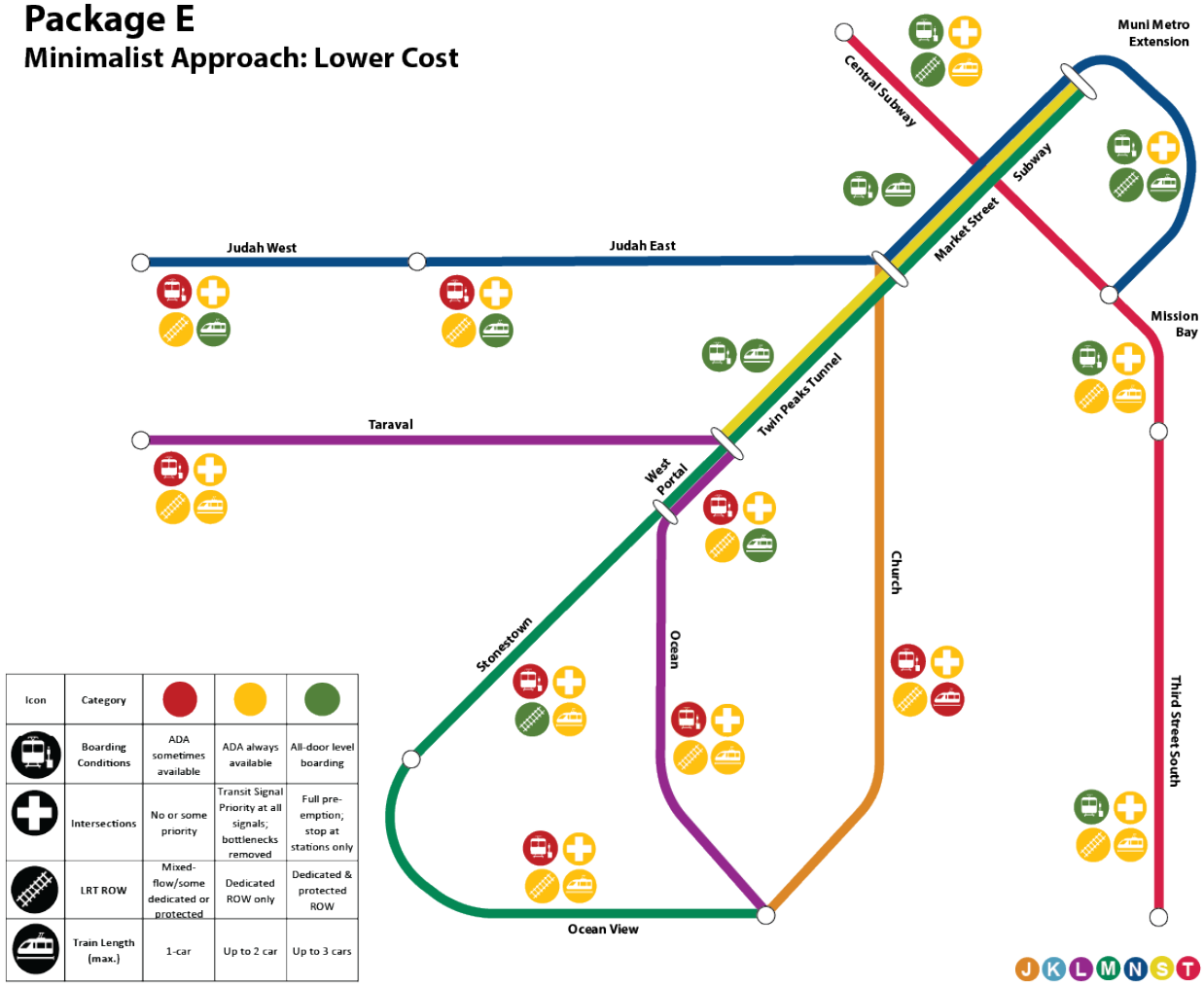
What it is: A package with relatively less expensive components.

Why it is being considered: To test what can be accomplished when using the least costly modernization options identified while still meeting the capacity need.

- 3-Car: N (M if necessary for capacity)
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: Mixed boarding (with high preferred) on all lines except the T
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Maintain future baseline platform conditions on the J, K, L, M, and N
- Right of Way: Paint only
  - Painted transit-only lanes (no protection barriers) on surface segments
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting no parking)
    - Existing barriers stay in place
- Intersections: Transit signal priority
  - All 4-way stop intersections (without near-side platforms) converted to signals
  - Transit signal priority at all signaled intersections
- Route Re-Structuring
  - J to terminate at Church and Market Street, with an improved surface-to-underground ADA transfer to Church Street Station
  - L/K to run as a combined surface-only route, with a transfer to subway service at West Portal

Package E

Minimalist Approach: Lower Cost



Icon	Category			
	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Package F – Minimalist Approach: Lower Delivery Risk

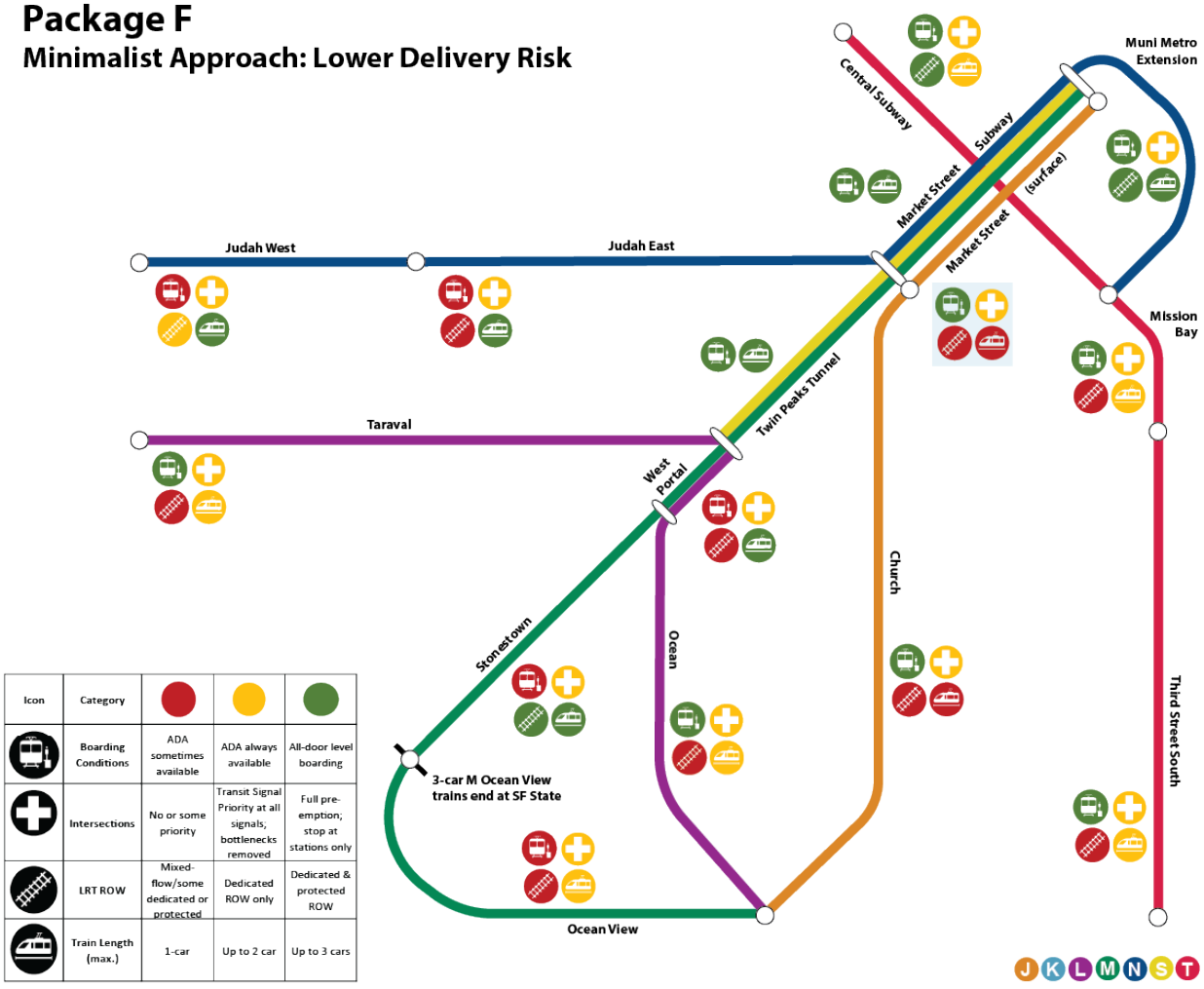
What it is: A package with components that carry relatively less engineering risk/uncertainty.

Why it is being considered: To test what can be accomplished when using modernization options that are anticipated to be the most straightforward to implement.

- 3-car: M and N
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
    - *Note: Pending timing, high-floor cars previously used by the J, K, and L may fit this need*
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: Mixed on Market Street lines (M and N), low on surface-only lines (J, K, L); high on the T
  - Acquire surface-only low-floor subfleet
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Modify stops to:
    - J, K, and L: Raise platforms from sidewalk level to low-floor height
    - M and N (surface segments): Mini-high segments at all stops
- Right of Way: Baseline conditions
- Intersections: Transit signal priority
  - All 4-way stop intersections (without near-side platforms) converted to signals
  - Transit signal priority at all signaled intersections
- Route Re-Structuring
  - J to operate on the surface along Market Street
  - L/K to run as a combined surface-only route, with a transfer to subway service at West Portal
  - Because the M cannot accommodate 3-car trains beyond SFSU, some 2-car trains would still be operated on this line and continue all of the way to Balboa Park

Package F

Minimalist Approach: Lower Delivery Risk



Icon	Category			
	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Package G – Minimalist Approach: Limited Passenger and Neighborhood Disruption

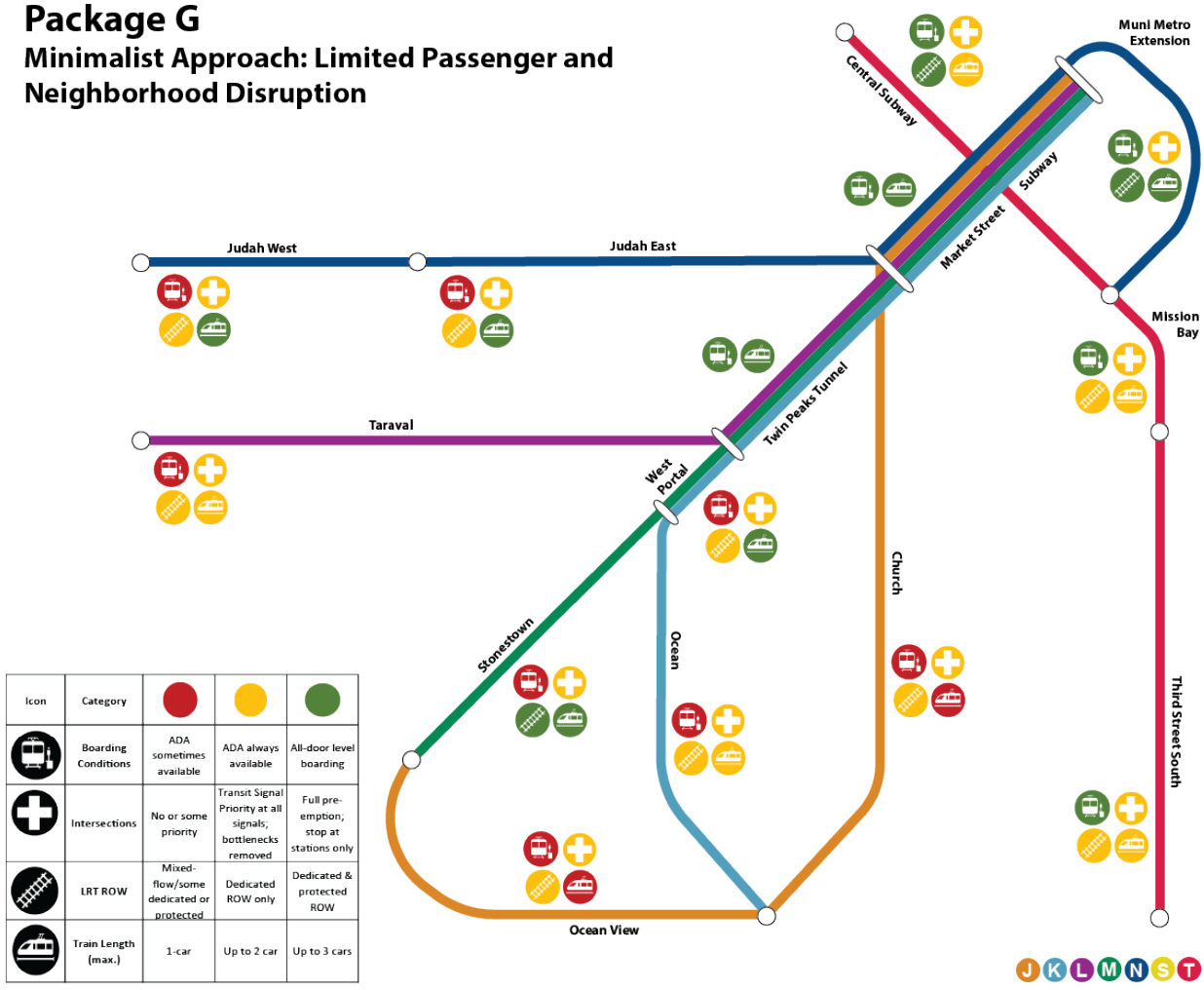
What it is: A package with the modernization options that carry lower anticipated impacts to current routing, traffic, and streetscapes.

Why it is being considered: To test what can be accomplished when using modernization options that are anticipated to carry lower neighborhood, community, and political risks.

- 3-Car: M and N
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: Mixed boarding (with high preferred) on all lines except the T
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Modify J, K, L, M, and N stops: Mini-highs at all stops
- Right of Way: Limited paint only
  - Painted transit-only lanes (no protection barriers) on surface segments with 2+ travel lanes per direction
    - Existing barriers remain in place
- Intersections: Transit signal priority
  - All 4-way stop intersections (without near-side platforms) converted to signals
  - Transit signal priority at all signaled intersections
- Route Re-Structuring
  - M to terminate at SFSU station; J to extend to serve prior M segment between Balboa Park and SFSU
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - If necessary for capacity, J operates as surface-only, terminating at Church and Market Street, with an improved surface-to-underground ADA transfer to Church Street Station

Package G

Minimalist Approach: Limited Passenger and Neighborhood Disruption



Icon	Category			
	Boarding Conditions	ADA sometimes available	ADA always available	All-door level boarding
	Intersections	No or some priority	Transit Signal Priority at all signals; bottlenecks removed	Full pre-emption; stop at stations only
	LRT ROW	Mixed-flow/some dedicated or protected	Dedicated ROW only	Dedicated & protected ROW
	Train Length (max.)	1-car	Up to 2 car	Up to 3 cars

Note that the goal of the Metro Capacity Study is to provide options to address 20+ year future Metro capacity needs. Following completion of this Study, any strategies that are advanced would be developed with additional extensive outreach and analysis before any project approval decisions.

Package H – Retained J Church

What it is: A package designed to maintain J service in the Market Street Subway service.

Why it is being considered: To test what is necessary to keep in the J as a subway line and the impact on the rest of the Muni Metro system when the J continues operations in the Market Street Subway.

- 3-Car: M and N
  - Purchase sufficient high-floor light rail vehicles to lengthen existing trains from 2 to 3 cars
    - *Note: Pending timing, high-floor cars previously used by the K, and L may fit this need*
  - Modify tracks as needed to accommodate
  - Modify intersections (turn restrictions) as needed to accommodate
  - Modify stops (lengthen platforms) as needed to accommodate
- Boarding: Mixed boarding on Market Street Lines; low on surface-only; high on the T
  - Acquire surface-only low-floor subfleet
  - Maintain high platforms in Twin Peaks Tunnel, Market Street Subway, and on the T
  - Modify stops as needed to:
    - J, M, and N: Mini highs at all stops
    - K and L: Raise platforms from sidewalk level to low-floor height
- Right of Way: Paint only
  - Painted transit-only lanes (no protection barriers) on all surface segments
    - In places where there is only one travel lane (mixed-flow) in each direction today, the existing parking lanes would be converted into travel lanes (resulting no parking)
    - Existing barriers remain in place
- Intersections: 25% hard preemption on Market Street lines
  - All 4-way stop intersections (without near-side platforms) converted to signals
  - Hard preemption at 25% of signaled intersections on lines serving the Market Street Subway
  - Transit signal priority at all other signaled intersections
- Route Re-Structuring
  - M to terminate at SFSU station; J to extend to serve prior M segment between Balboa Park and SFSU
    - Add pocket/turnback tracks near the SFSU station to turn M and J trains
  - L/K to run as a combined surface-only route, with a transfer to subway service at West Portal