

CORE CAPACITY TRANSIT STUDY



MEMORANDUM

To: PMT

CC: Matt Maloney, MTC

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Date: August 25, 2016

Title: SF Metro Corridor Problem Statement

1 Introduction

As the San Francisco Bay Area rebounded strongly from the 2008 recession, employment growth in the San Francisco Core led to growth in transit ridership. In the San Francisco (SF) Metro corridor, demand for trips to the Core are provided by three main transit providers: BART rail service, Caltrain rail service, and SFMTA bus and light rail service, who carry between them both intra- and inter-San Francisco trips. Figure 1 shows the SF Metro corridor. Between 2010 and 2015, transit trips to the Core in the AM peak hour increased 26%, or about 7,760 passengers. In 2015, more than 38,100 AM peak hour transit passengers crossed into the SF Metro Core.

Trips to the Core can be made across any of the access points around the Core boundary shown in Figure 1. The type of transit service provided within the different geographic origins across the corridor dictate how trips are made into the Core, creating differences in trip type. For the purposes of this analysis, this study divided the SF Metro corridor into five subareas to provide a better understanding of the differences in the types of trips made into the core. The five subareas are: Northern Neighborhoods, Richmond, Sunset, Mission, and Bayshore. Figure 1 includes the geographic boundaries for each subarea.

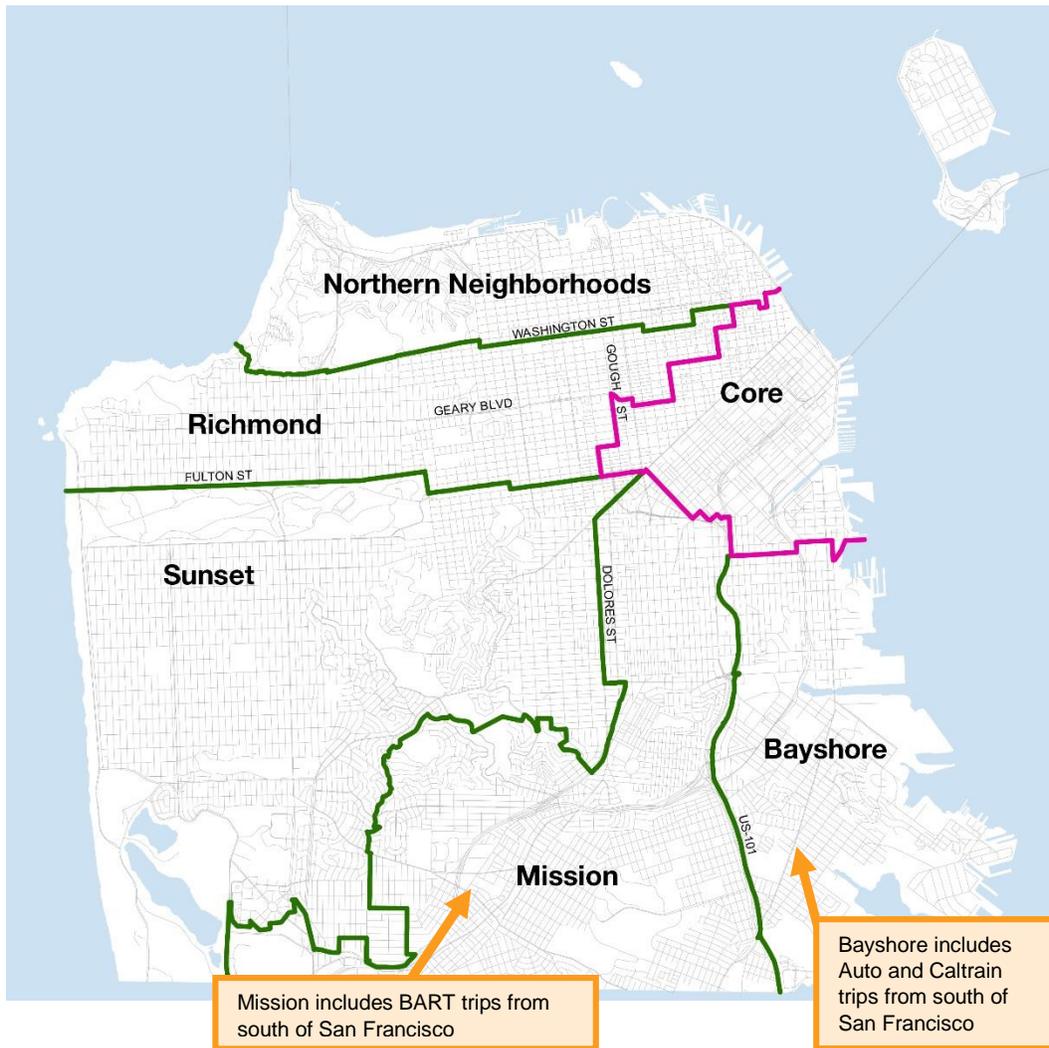
Trips to the Core are not just made from within San Francisco, and inter-city trips are carried by three modes: auto, metro rail service provided by BART, and commuter rail service provided by Caltrain. Auto trips originating south of San Francisco and ending in the Core were assigned to the Bayshore subarea, which includes the catchment along U.S. 101 and I-280 to San Jose. Caltrain trips were also assigned to the Bayshore subarea. Meanwhile, BART trips are captured in the Mission subarea.

The transit operators are actively engaged in addressing transit capacity issues for the SF Metro corridor and its subareas by focusing on capacity-increasing planned improvements in the short and medium term. While some of the planned projects have full funding commitments, others

have not identified funding or may be reliant on discretionary federal, state, or local sources are yet to be committed. Securing the funding and delivering this first round of critical investments should be one of the region's highest priorities.

The planned short and medium term improvements will provide some relief but additional investments are needed to meet future growth. The aim of the Core Capacity Transit Study (CCTS) is to identify the additional investments needed to accommodate this future growth. The study will also provide guidance on how future employment, residential growth, and policy choices can help to prioritize these investments.

Figure 1: SF Metro Corridor and Subareas¹



¹ The CCTS Core boundary is identified in pink.

2 Present Conditions

Since 2010, growth in transit trips is spread among all transit operators and all subareas. Table 1 shows the change in AM peak hour demand to the core by transit operator. Overall transit demand rose 26% between 2010 and 2015. However, this growth is not evenly distributed among the subareas, so it is important to consider trends in each subarea individually.

Table 1: Change in AM Peak Hour Demand by All Transit Operators (2010-2015)

Mode	2010	2015	Change	
	AM Demand	AM Demand	Number	Percent
BART	9,830	13,740	3,910	40%
Caltrain	1,890	2,940	1,040	55%
Muni Metro	6,410	8,550	2,140	33%
Muni Hist. Streetcar	500	780	280	56%
Muni Bus	11,400	11,750	350	3%
SamTrans	350	380	30	9%
Total	30,380	38,140	7,760	26%

Each subarea is served by a different mix of transit modes and providers. The Northern Neighborhoods, Richmond and Sunset subareas are dominated by Muni bus service, serving local San Francisco based origin trips. The Mission/BART subarea contains a mix of local San Francisco based origin trips served by Muni and BART and regional based trips (originating outside of San Francisco) on BART. The Bayshore subarea contains a mix of local San Francisco based origin trips served by Muni and regional based trips originating from San Mateo and Santa Clara counties on Caltrain and SamTrans express buses. Table 2 shows the occupancy levels for all modes for the entire SF Metro corridor². Table 3 and 4 shows the 2015 peak hour change in AM peak hour demand and occupancy by subarea. Table 5 shows the occupancy levels by subarea for transit only. Refer to Figure 1 for the geographic boundaries of each subarea³.

² Transit demand is derived from actual ridership count while auto, bicycle and pedestrian trips are derived from the Plan Bay Area model

³ Although Treasure Island is part of San Francisco, given the redevelopment governance structure, the CCTS does not include Treasure Island in this assessment of transit capacity and demand.

Table 2: SF Metro Corridor 2015 Peak Hour Occupancy Levels by Mode

Mode	2015	2015	2015
	AM Capacity	AM Demand	Occupancy
BART	15,190	13,740	90%
Caltrain	3,250	2,940	90%
Muni Metro	6,880	8,550	124%
Muni Hist. Streetcar	1,200	780	65%
Muni Bus	15,170	11,750	77%
SamTrans	410	380	93%
Auto	23,160	23,160	100%*
Bicycle/Pedestrian	10,540	10,540	100%*
Total	75,800	71,840	95%

* Automobile, bicycle, and pedestrian capacity is assumed to equal the demand for trips using these modes. See the SF Metro Current and Planned Capacity Memo for more information.

Table 3: Change in AM Peak Hour Demand by Subarea (All Modes)

Subarea	2010	2015	Change	
	AM Demand	AM Demand	Number	Percent
Northern Neighborhoods	6,720	6,880	160	2%
Richmond	14,980	15,620	640	4%
Sunset	12,800	14,970	2,170	17%
Mission	19,850	23,340	3,490	18%
Bayshore	9,990	11,020	1,030	10%
Total	64,340	71,830	7,490	12%

Table 4: SF Metro Corridor 2015 Peak Hour Occupancy Levels by Subarea (All Modes)

Subarea	2015		
	AM Capacity	AM Demand	Occupancy
Northern Neighborhoods	7,980	6,880	86%
Richmond	16,520	15,620	95%
Sunset	13,420	14,970	112%
Mission	26,280	23,340	89%
Bayshore	11,600	11,020	95%
Total	75,800	71,830	95%

Table 5: SF Metro Corridor 2015 Peak Hour Occupancy Levels by Subarea (Transit Only)

Subarea	2015		
	AM Capacity	AM Demand	Occupancy
Northern Neighborhoods	3,020	1,920	64%
Richmond	6,720	5,830	87%
Sunset	8,120	9,670	119%
Mission	19,820	16,870	85%
Bayshore	4,420	3,840	87%
Total	42,100	38,130	91%

The CCTS developed a conservative estimate of future occupancy by making assumptions about bicycle/pedestrian and auto trips in each corridor. Automobile capacity and non-motorized trips (i.e. bicycles and pedestrians) in the SF Metro Corridor is assumed to be equal to the demand for trips using these modes. The roadway network is assumed to be at capacity for automobiles, and there is no stated policy capacity for bicycle and pedestrian trips. Although there is likely additional capacity to accommodate greater bicycle and pedestrian volumes, for the purposes of this study, capacity and demand for these modes are considered equal, respectively, in order to understand where growth will require new transit improvements.

3 Forecasted Future Conditions

3.1 Future Growth Projections

The CCTS uses two projections to capture a range of future travel demand through 2040 in the AM peak hour for the SF Metro corridor. The projection used forecasts established by Plan Bay Area (PBA) in 2010, the most recent long range plan for the region. The second method used an adjusted Plan Bay Area forecast called the Adjusted Growth Forecast (AG), developed as part of the CCTS market assessment. The Plan Bay Area forecast estimates a 0.95% average annual growth in demand, while the Adjusted Growth Forecast estimates 1.12% average annual growth. Table 6 provides the average annual growth rates for each corridor subarea. Although the AG Forecast estimates a higher growth rate for the entire corridor, in some subareas the PBA Forecast growth rate is higher. Thus, the “low” and “high” columns in Table 6 do not equate to one particular forecast.

Table 6: Low and High Average Annual Growth Rates by Subarea

Subarea	Low Growth	High Growth
Northern Neighborhoods	0.89%	0.91%
Richmond	0.71%	0.75%
Sunset	0.68%	0.74%
Mission	1.00%	1.32%
Bayshore	1.10%	1.32%
Entire SF Metro Corridor	0.95%	1.12%

3.1.1 Subarea Future Growth

Table 6 highlights how closely the two growth scenarios track against one another. When considering future growth to 2040, the estimates of total trips produced by each forecast are very similar. For this reason, the CCTS will only consider the high growth projection for each subarea. This growth projection will be referenced as the SF Metro demand growth projection.

It should be noted that demand to the Core from trips originating south of San Francisco was generated from growth projections prepared for Plan Bay Area 2010. Origin locations were organized by travel analysis zones and the study established a boundary line in Santa Clara County to differentiate trips that travel to the core via the peninsula or via the Bay Bridge. The CCTS determined that all trips to the core originating south of San Francisco would be captured within the Bayshore subarea.

3.2 Proposed transit improvements and investments

3.2.1 Prerequisite Projects

Transit providers are actively planning for improvements in capacity and operations. Some projects have achieved full funding commitments and are in stages of final design, construction and implementation in the short term (Tier 1 projects). Others projects have varying levels of funding commitments but are not yet fully funded (Tier 2 projects). **An underlying assumption of the CCTS – as a first step in addressing the capacity needs in the corridor – is that the region will commit full funding for all Tier 1 and Tier 2 projects.** Not all Tier 1 and 2 projects add capacity; some are complementary projects to support delivery of capacity increasing projects, so are included within the list. Table 6 details the specific projects within the Tier 1 and 2 classification.

Table 6: Prerequisite Tier 1 and 2 SF Metro Projects

Tier	Timeframe	Sponsor	Project	Project Details
1	Short Term	SFMTA	SFMTA Central Subway	Extends the Third Street Light Rail line 1.7 mi, entering a new Central Subway and running underground. New underground stations located at 4th & Brannan, Yerba Buena/Moscone Center, Union Square/Market Street, and Chinatown.
1	Short Term	SFMTA	SFMTA Candlestick and Hunters Point Express Bus Service	Bus service from Candlestick Point and Hunters Point Shipyard to Transbay Terminal.
1	Short Term	SFMTA	SFMTA Muni Forward Phase 1	Transit priority improvements, service increases, transfer and terminal investments, overhead wire changes, and street improvements in support of Vision Zero.
1	Short Term	SFMTA	SFMTA Van Ness Avenue Bus Rapid Transit	Dedicated lane for BRT buses in each direction between Mission and Lombard Streets. There will be nine BRT stations, along the corridor.

1	Short Term	SFMTA	SFMTA SFgo	Program to identify signalized and non-signalized intersections and prioritize them for ITS upgrades
1	Short Term	SFMTA	SFMTA T-Third Mission Bay Loop	Connect the rail turnouts from the existing tracks on Third Street at 18th and 19th Streets with additional rail and overhead contact wire system on 18th, Illinois and 19th Streets.
1	Short Term	SFMTA	SFMTA 16th Street Corridor Transit Priority	Transit priority treatments for the 22-Fillmore route along 16th Street between the intersection of Church and Market Streets and a new terminal in Mission Bay.
2	Short Term	BART	BART Hayward Maintenance Complex, Phase 1	Includes acquisition and use of four warehouses outside of the current west boundary of the yard. Enlarged vehicle inspection area and additional connecting track, track crossovers, and switches.
2	Short Term	SFMTA	SF Better Market Street	May include changes to surface transit, including extended transit-only lanes and new stop locations, spacing and boarding islands; and changes to roadway configuration.
2	Short Term	SFMTA	SFMTA Fleet Expansion (light rail and bus)	<ul style="list-style-type: none"> • Expands Muni's light rail vehicle fleet to provide increased capacity on existing lines and service on new Central Subway service • Expands Muni's bus fleet for 60' articulated buses, purchases larger buses for existing 40' bus routes
2	Short Term	SFMTA	SFMTA Muni Forward Phase 2	Transit priority improvements, transfer and terminal investments, overhead wire changes, and street improvements in support of Vision Zero.
2	Medium Term	BART	BART Additional Railcars – Core Capacity	Core Capacity expansion of BART's railcar fleet, including: <ul style="list-style-type: none"> • Expansion fleet for train length (75 cars) • Expansion fleet (231 cars) for more frequent headways
2	Medium ⁴ Term	BART	BART Metro Program	Increased service: 12-minute peak period headways, express trains between Daly City and SFO Infrastructure: Glen Park turnback, Richmond crossover, Bayfair connector, Daly City track improvements
2	Medium Term	BART	BART Traction Power System	Upgrade traction power system to support 30 trains per hour capability through Transbay Tube.
2	Medium Term	BART	BART Train Control System	New train control system to provide 30 TPH capability through Transbay Tube. .

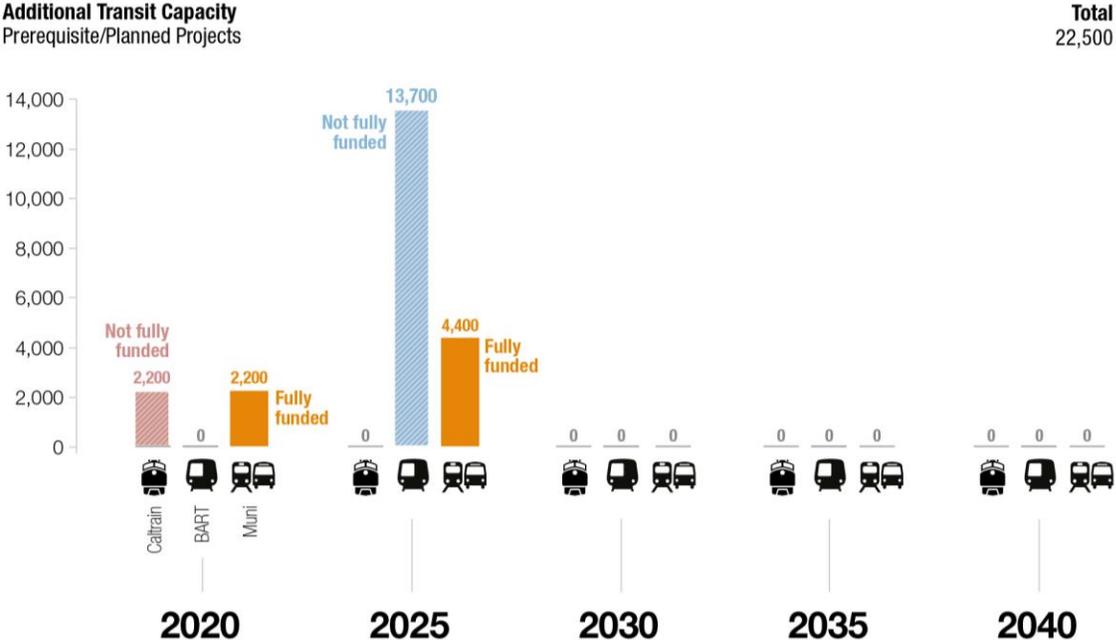
⁴ Medium term is defined in the CCTS as the period from 2020-2030

2	Medium Term	BART	Hayward Maintenance Complex Phase 2	Construct new eastside train storage facilities for the additional railcars purchased for capacity expansion.
2	Medium Term	Caltrain	Caltrain Electrification	Provide for operation of up to 6 Caltrain trains per peak hour per direction (increased from 5 trains).
2	Medium Term	Caltrain	Caltrain CalMod 2.0	Improve performance, reduce pollutants, improve operations, capacity, service and reduce dwell time, -Full EMU Conversion, - Longer EMUs (8-car), Longer platforms, Level boarding
2	Medium Term	Caltrain	Caltrain Operations Improvements – North Terminal	Improve capacity and operational efficiency of Caltrain’s northern terminal and station at 4 th & King.
2	Medium Term	SFMTA	SFMTA Transit Facilities Improvements	Proposed improvements to Muni Metro East (MME) Maintenance Facility, Burke Central Parts Warehouse, and Woods Maintenance.
2	Medium Term	TJPA	Downtown Extension	Extend Caltrain from 4th & King St to Transbay Terminal, underground existing 4th & King to 2nd, under 2nd to Transbay, and with electrification.

3.2.2 Projected Growth by Subarea

Prerequisite project capacity increases are focused within specific subareas. Figure 2 illustrates the expected prerequisite project capacity increases by tier and by operator.

Figure 2: Tier 1 and Tier 2 Prerequisite Projects by Operator



The expected Muni increases will be spread across all of the subareas, while the Caltrain and BART increases are limited to the Bayshore and Mission subareas, respectively. BART is anticipated to experience a significant increase in capacity following implementation of the BART Traction Power and Train Control system projects. The improvements will increase the number of trains in the peak hour from 16 to 27. In addition, it should be noted that improvements to regional transit capacity may not be interchangeable with local transit capacity. This is indicative of the blend of transit services captured within the Bayshore subarea, where Caltrain capacity increases may not necessarily benefit transit riders who use Muni for a local transit trip to the core.

Overall, the anticipated capacity increases from the prerequisite projects combined with the demand growth projection for each subarea results in an estimate of future demand in 2040 and anticipated occupancy levels. Table 7 shows the growth projection for each subarea using the high growth rate and the expected occupancy levels in 2040.

Table 7: Projected Growth by Subarea in 2040

	Demand Growth	2040	2040	Occupancy
Subarea	Rate	AM Capacity	AM Demand	Percent
Northern Neighborhoods	0.91%	8,950	8,650	97%
Richmond	0.75%	16,600	18,800	113%
Sunset	0.74%	14,250	18,000	126%
Mission	1.32%	40,300	32,400	80%
Bayshore	1.32%	18,200	15,300	84%

Even with prerequisite project capacity increases, the Richmond and Sunset subareas will likely continue to experience significant overcrowding. The other three subareas are projected to operate below policy stated capacity levels.

Although the Richmond and Sunset have similar current and projected future demand, the two subareas are served by different modes. The Sunset is served primarily by light rail, while the Richmond is served exclusively by bus. Bus vehicles have less passenger carrying capacity than light rail vehicles, so service in the Richmond is limited by the capacity constraints of the mode used even when service improvements are implemented. It is likely that latent demand exists within the Richmond subarea that currently does not utilize transit under current conditions. As the Richmond subarea is expected to experience increased demand, it should be noted that current projections may not accurately reflect demand for service as transit frequencies improve.

3.3 Summary Demand and Capacity Conditions

The SF Metro Corridor is made up of five distinct subareas that function differently from one another based on a number of factors including:

- Type of transit service and/or mode provided,
- Type of trip made (intra-city vs. inter-city), and
- The amount of capacity increases expected from prerequisite projects.

Key findings by subarea include:

- The Sunset and Richmond corridors are forecast to be over-capacity in the future and the Northern Neighborhoods corridor is forecast to be nearing capacity. Planners suspect that in all three of these corridors, there is latent demand for transit, which means investments that improve travel time and reliability or add capacity are likely to attract substantial additional ridership
- The Northern Neighborhoods and Richmond corridors are currently served exclusively by bus lines. In San Francisco, buses generally deliver far less capacity on a line-by-line basis than light rail, even when buses can use transit-only lanes, transit signal priority, and other bus rapid transit treatments.
- In the Mission corridor, BART and Muni buses are projected to provide plenty of planned capacity to handle projected demand
- In the Bayshore corridor, the T-Third is projected to provide ample capacity once the increased service associated with the Central Subway comes online. Though Caltrain also provides significant capacity in the corridor, the line's limited number of stops in San Francisco mean that travelers within the City rely on Muni for trips in this corridor

Based on the demand growth projection and expected prerequisite capacity increases, the Richmond and Sunset subareas will experience over-capacity conditions by 2040.

Figures 3 and 4 illustrate the anticipated growth in demand versus capacity in these two subareas. As noted, future demand in the Richmond subarea may not capture any latent demand for transit, which is likely constrained by modal capacity limitations resulting from the fact that transit service in that area is limited to buses only.

In addition to the conditions anticipated for the Richmond and Sunset subareas, the following points should be noted:

- The need to fund and implement the Tier 1 and Tier 2 prerequisite projects prior to 2030
- The need for additional short, medium and long-term investments in projects, programs and policies to address increasingly significant shortfalls in capacity in the Richmond and Sunset subareas
- Capacity increases are not necessarily spread evenly within the corridor as a whole and each subarea should be monitored independently as each functions differently
- Capacity increases are not necessarily interchangeable for all trip types to the core (intra-city vs. inter-city trips in the Bayshore subarea)
- With auto trips held constant at current levels, all future forecast increases in auto trips are assumed to be served by transit

Figure 3: Demand and Capacity Conditions for the Sunset Subarea

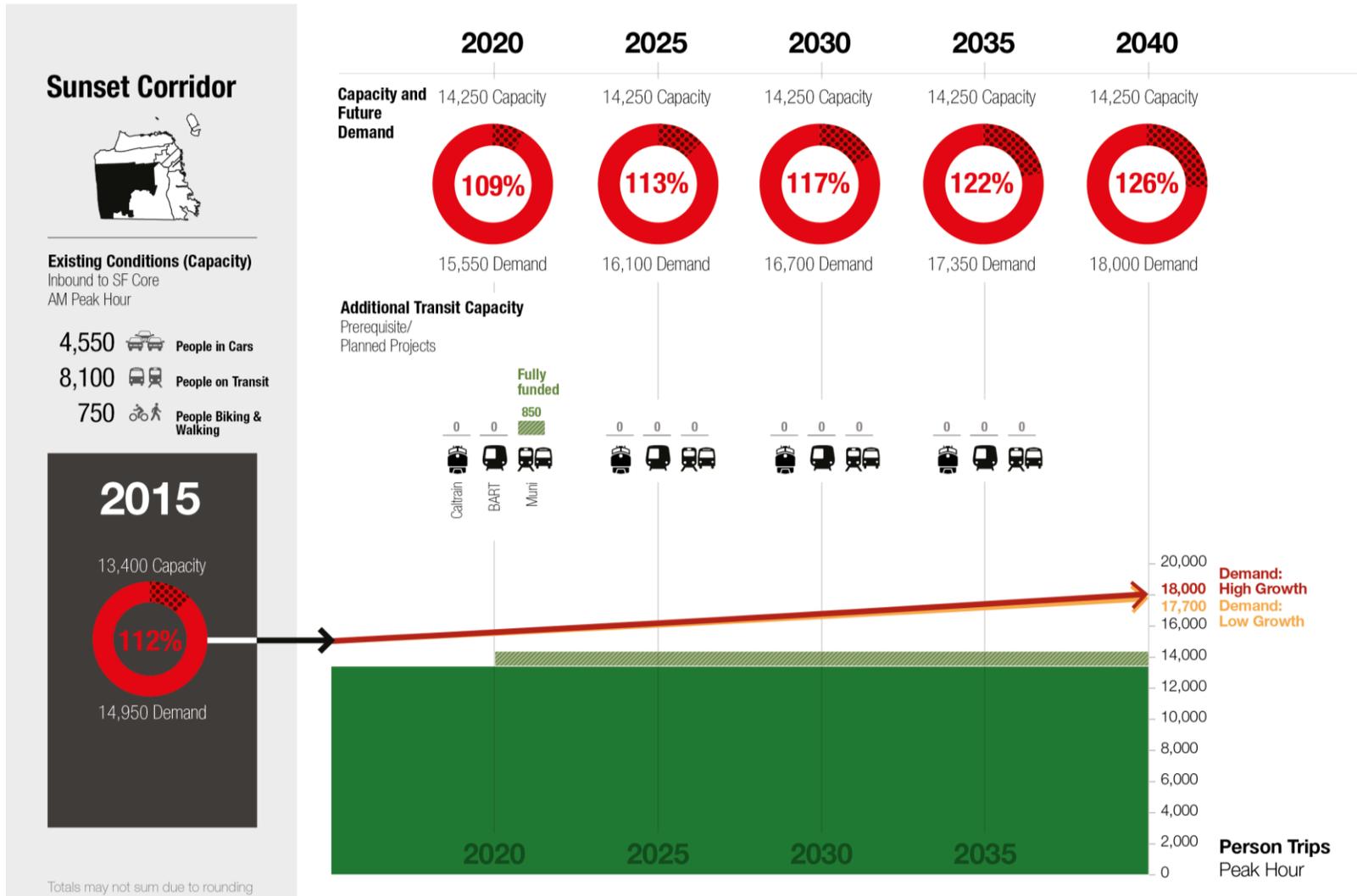
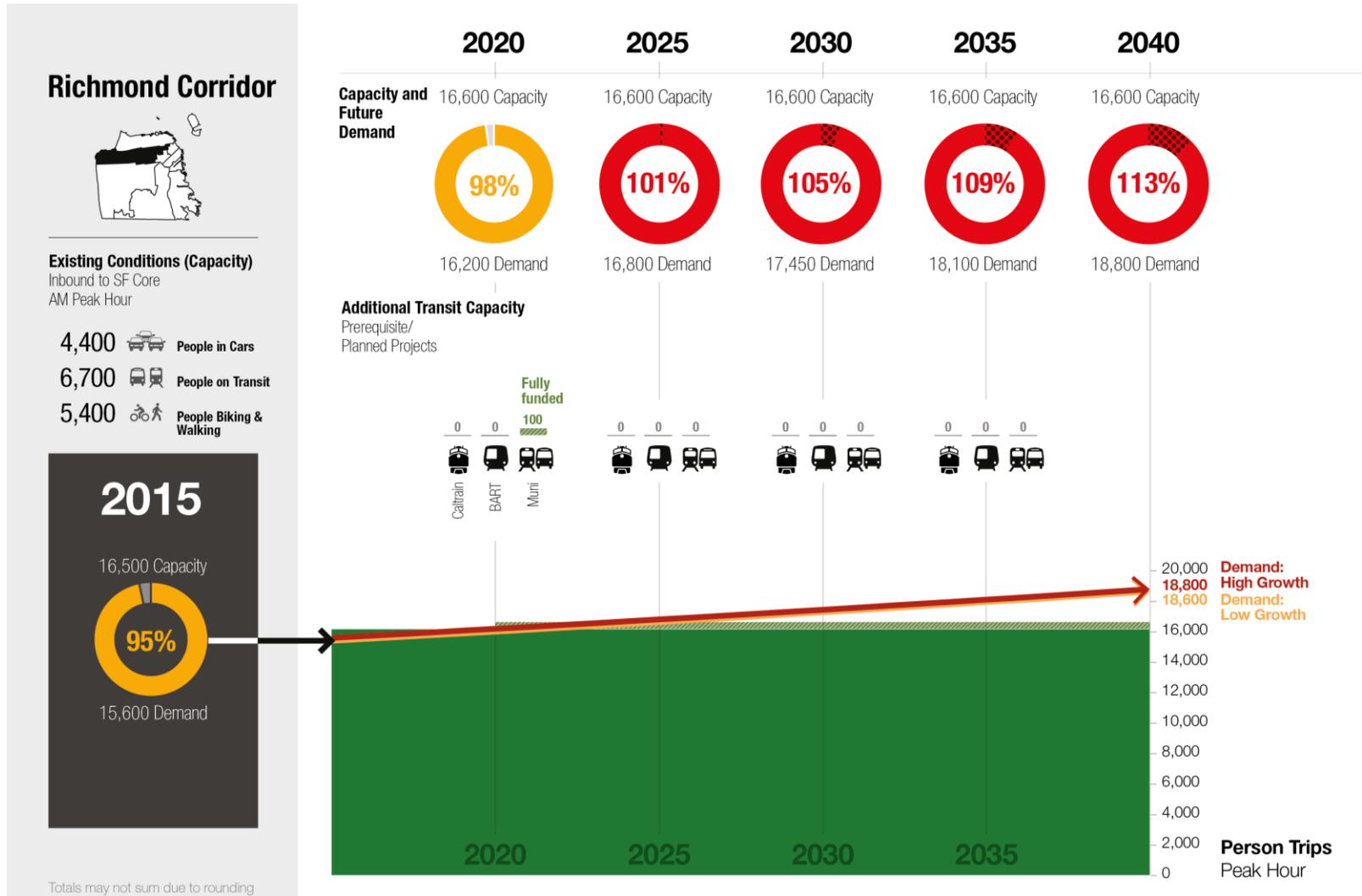


Figure 4: Demand and Capacity Conditions for the Richmond Subarea



4 Conclusion

Over the past five years, the SF Metro Corridor has seen growth across all five subareas, with significant growth in the Sunset and Richmond subareas, reflecting an uneven distribution of demand not only by subarea but also by trip type. The three main transit providers – BART, Caltrain, and SFMTA – experienced 26% increases in demand, or about 7,760 new peak-hour transit riders. In 2015, travel in the corridor’s peak hour reached 91% of the intended overall transit capacity, and exceeded capacity in the Sunset/Metro subarea.

Transit operators are sponsoring projects to address capacity shortfalls over the next 5-10 years, and it is critical these “prerequisite” projects be supported and advanced. Operational changes – most notably on the Muni Metro rail system – are also key to getting the most for the existing infrastructure. Effective management of the SFMTA Muni Metro subway can increase overall capacity and car-throughput and improve operational reliability, leading to more passengers able to use the system.

Today, passengers are experiencing crowding, diminished reliability, and limited travel flexibility in the corridor. The transportation system struggles to resiliently withstand service disruptions, both man-made and natural. Even with the implementation of the prerequisite projects, demand is significantly likely to outpace capacity in the Richmond and Sunset subarea without additional short, medium, and long-term transit investments. To maintain corridor transportation capacity enough to meet demands in the future, the region must begin planning a coordinated path forward today.

This study will identify additional cost-effective transit investments and transportation policies that can address anticipated future growth beyond the capacity increases of the prerequisite Tier 1 and Tier 2 projects. The CCTS will also consider factors such as project timing and how transportation investment can support regional land use goals. The CCTS will help focus the regional discussion of these issues, by advancing concepts, informing policies, and analyzing tradeoffs between different priorities.