

# New Rail Vehicle Program: Board Workshop



January 2013

Operations Planning

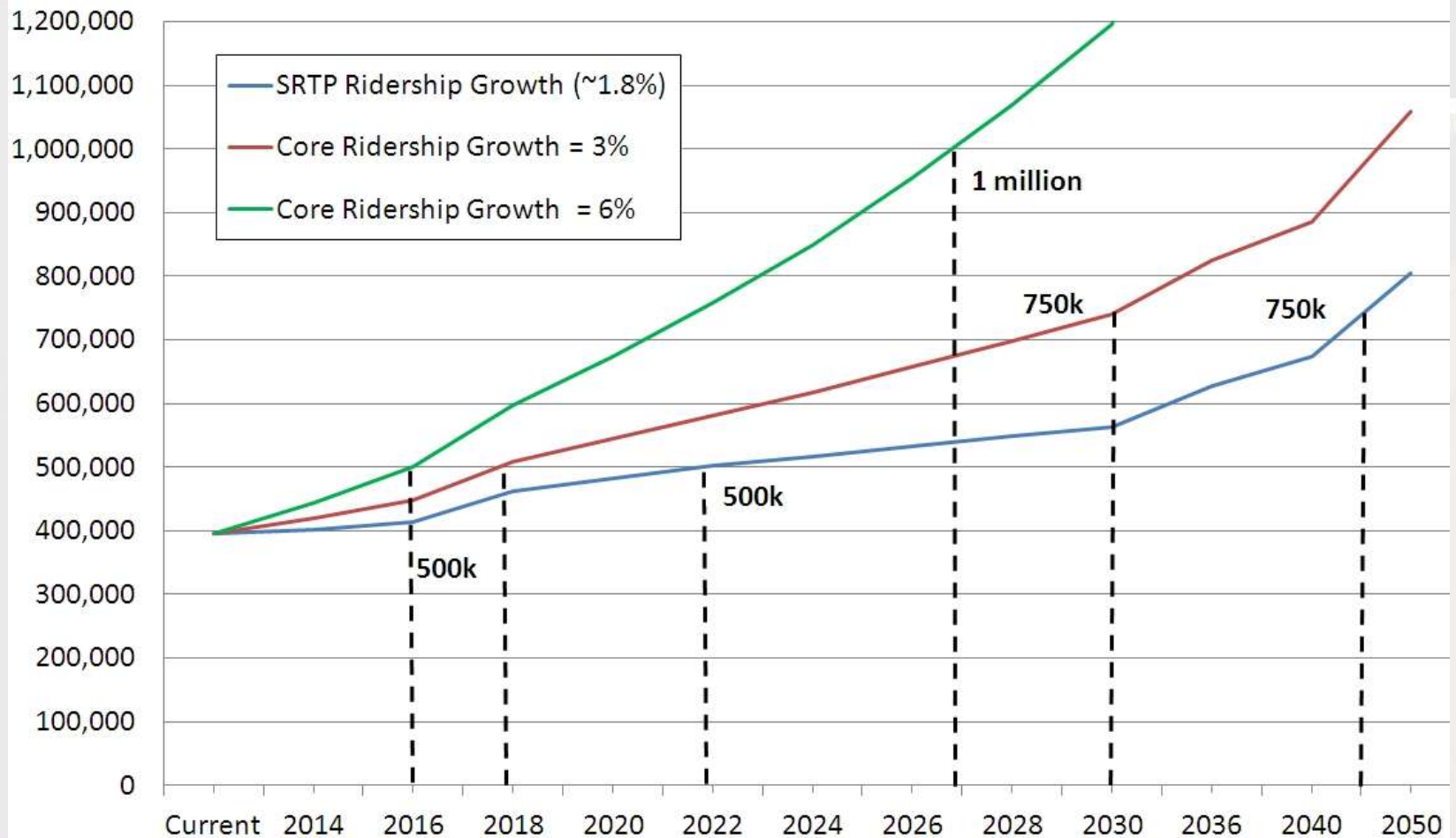
# How Many Cars will BART Need?



## **BART Fleet Size is a Function of:**

- 1. Peak Ridership Demand Patterns**
- 2. Service Quality (On-Time Performance)**
- 3. Vehicle Load Levels**
- 4. Fleet Availability**
- 5. System Design Constraints**

# Projected BART Weekday Ridership Demand vs. Year



# Weekday Ridership Peakiness



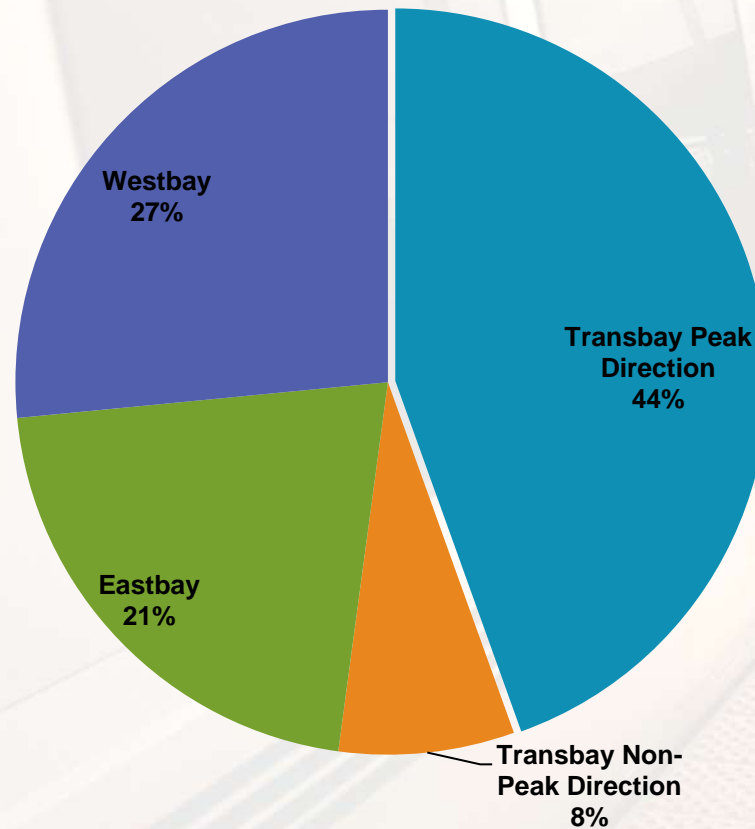
## BART System-Wide Combined Station Entries & Exits in 15 Minute Increments

Sample Date: November 15, 2012



# BART Peak Ridership by Market

Morning Peak Hour November 15, 2012 sample



# The Trade-Off Between Capacity and Service Quality



| <b>Date</b>   | <b>Ridership</b> | <b>Train On Time Performance</b> | <b>Pax On Time Performance</b> |
|---------------|------------------|----------------------------------|--------------------------------|
| 11/03/2010*   | 522,198          | 51.3%                            | 71.7%                          |
| 10/31/2012*   | 568,061          | 69.9%                            | 79.2%                          |
| November 2012 | 393,328          | 94.8%                            | 96.7%                          |

\*2010 and 2012 SF Giants World Series Parade Day



# Current Peak Hour Vehicle Load Levels

Passengers per Car by Line: November/December 2012 sample



| Line   | AM Peak Pax/Car   | PM Peak Pax/Car   |
|--|-------------------|-------------------|
| <b>Green</b> (Fremont to Daly City)          | 113 avg (122 max) | 106 avg (125 max) |
| <b>Orange</b> (Fremont to Richmond)          | 91 (102)          | 89 (98)           |
| <b>Yellow</b> (Pittsburg/Bay Point to SFO)   | 98 (122)          | 108 (122)         |
| <b>Red</b> (Richmond to Millbrae)            | 95 (115)          | 100 (112)         |
| <b>Blue</b> (Dublin/Pleasanton to Daly City) | 110 (113)         | 110 (129)         |
| <b>Average Transbay</b>                      | 102 (118)         | 107 (122)         |

# Peak 15 Minute Vehicle Loading Standards



TRB: Transit Capacity & Quality of Service Manual (2003)

| System (City)        | Passenger Space (Square Feet / Pax) |
|----------------------|-------------------------------------|
| NYCT (New York)      | 4.0                                 |
| CTA (Chicago)        | 7.0                                 |
| SEPTA (Philadelphia) | 8.0                                 |
| MBTA (Boston)        | 5.0                                 |
| BART (San Francisco) | 5.75 - 9.0                          |
| WMATA (Washington)   | 5.0 -12.0                           |
| MARTA (Atlanta)      | 6.75 - 7.5                          |
| TTC( Toronto)        | 4.5 - 6.0                           |
| STM (Montreal)       | 3.4- 4.0                            |

**93 to 112 pax/car**



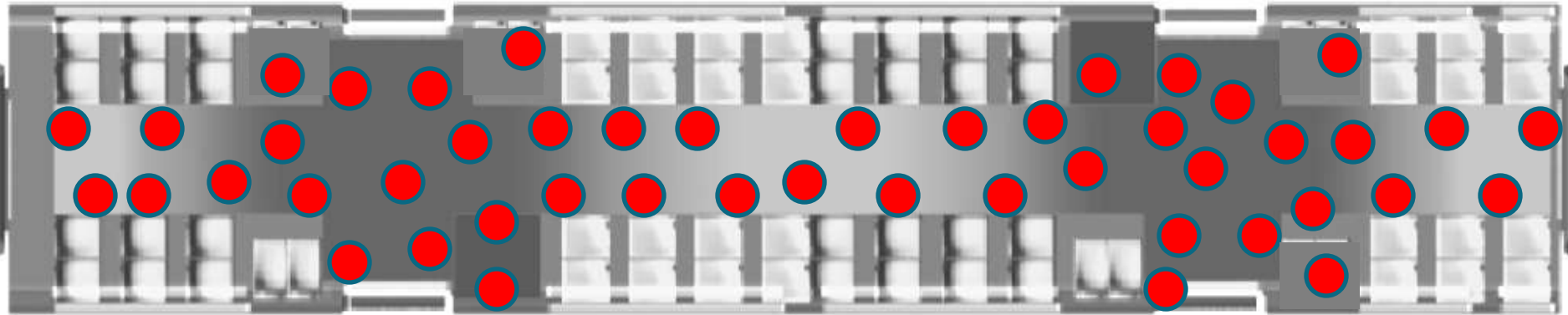
# Current Standard: 107 Passengers

60 Seated plus 47 Standees

*6.4 Square Feet per Standee*



● standing area      ● leg room area      ● ADA compliant areas      ● standing density at peak



# Standee Area Grows as Crowding Grows

## Morning Standee Limits Noted In Purple

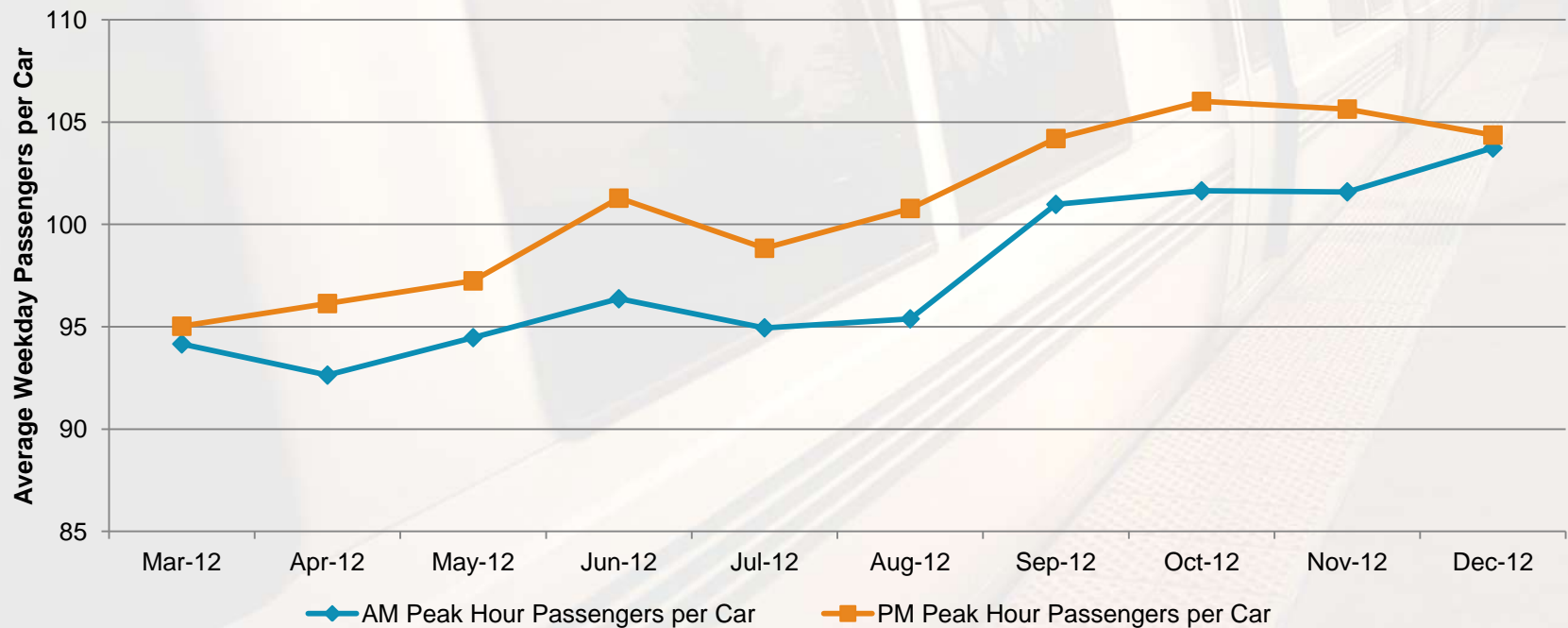


Travel time to Embarcadero (in minutes)

# Vehicle Loading Levels: Recent Trends



## Transbay Peak Hour & Direction Passengers per Car *Average Weekday excluding Fridays*



# Fleet Availability



- Out of a Current Fleet of 669 cars, BART's peak fleet vehicle requirement (PVR) is 573 cars
- The balance of cars, 96 per day, are in maintenance, yielding a Fleet Availability of 85.7%
- Despite having one of the oldest fleets in the industry, BART's Fleet Availability requirement is one of the highest
- BART also has the highest annual miles per car (95,000) in the industry. Peers range from PATH (36,000) to WMATA (61,000)  
*Source: FY11 FTA NTD data.*
- High availability requirements + highest miles per car + oldest cars =  
*"a fleet under stress"*

# System Design Constraints



Our Current Single Transbay Tube System has several major choke points which limit our peak period peak direction throughput to 24 trains per hour. These include:

- *The Oakland Wye*
- *Transbay Tube*
- *Market Street Corridor*

Train Control System Modernization Project could increase this throughput to 30 trains per hour

# Peak Hour Vehicle Load Levels with 775 Cars

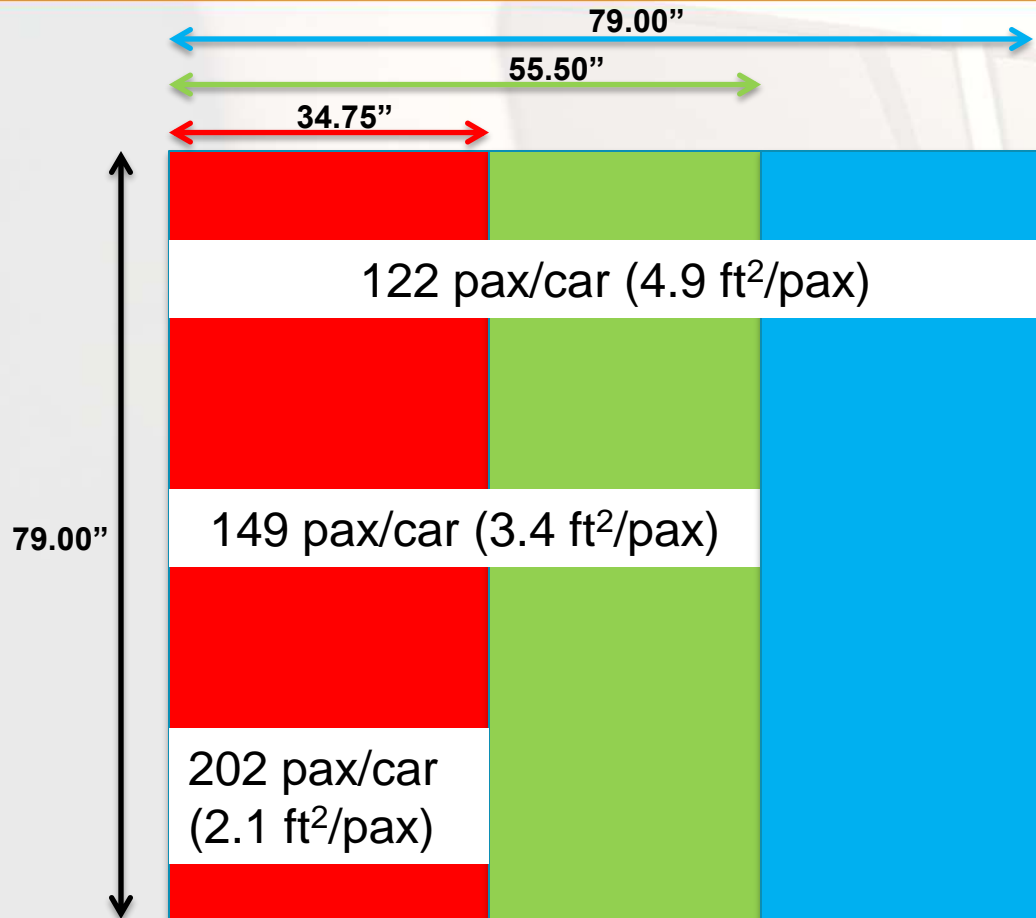


Compared to current standard of 107 avg (122 max)

| <b>Plan Year</b> | <b>SRTP Ridership<br/>Growth ~1.8% yr</b> | <b>Core Ridership<br/>Growth = 3% yr</b> |
|------------------|---|--|
| 2020             | 115 avg (132 max)                         | 130 avg (149 max)                        |
| 2030             | 134 (154)                                 | 177 (202)                                |



# Most Crowded Trains Simulation: Nine Volunteers Required



## Notes:

- Average loading for each Transbay line's most crowded PM peak hour train
- 60 seat car
- 300 ft<sup>2</sup> of standee space per car
- Simulation is only a few minutes, many riders are standing for well over 30 minutes



# Fleet Sizes Needed to Achieve Vehicle Load Target of 107 Per Car



| <b>Plan Year</b> | <b>SRTP Ridership Growth ~1.8% yr</b> | <b>Core Ridership Growth = 3% yr</b> |
|------------------|---------------------------------------|--------------------------------------|
| 2020             | 880 cars                              | 1,000 cars*                          |
| 2030             | 1,020 cars*                           | 1,070 cars*                          |

\* Assumes Train Control System Modernization Project @ 30 peak trains/ hour

# Conclusions



To provide comfortable loading levels and reasonable standee distances, BART will need to have approximately 1,000 cars by:

- Year 2020 under a 3.0% annual ridership growth scenario
- Year 2030 under a 1.8% annual ridership growth scenario

# BART Share of Funding

(\$ Millions)



|  | Base +<br>Option 1<br>(410 Cars) | Remaining<br>Options<br>(365 Cars) | Change*<br>Order<br>(225 Cars) | Total<br>(1,000 Cars) |
|--|----------------------------------|------------------------------------|--------------------------------|-----------------------|
| <b>BART Banked</b>   | \$22.4                           | ----                               |                                | \$22.4                |
| <b>FY13 Budget</b>   | \$45.7                           | ----                               |                                | \$45.7                |
| <b>Proposed Annual Operating<br/>to Capital Allocation or<br/>New Revenue (45m/yr)</b> | \$231.0<br>(5.1 yrs)             | \$289.0<br>(6.4 yrs)               | \$249.0                        | \$769.0               |
| <b>Total</b>   | <b>\$299.1</b>                   | <b>\$289.0</b>                     | <b>\$249.0</b>                 | <b>\$837.1</b>        |

\* Assumes 25% BART Share

# New Vehicle Procurement Milestones



| Milestone                                    | Date             |
|--|------------------|
| Award of Contract                            | May 2012         |
| Complete Final Design Phase                  | December 2013    |
| Complete Pilot Car Delivery                  | July 2015        |
| BART Original Fleet 45 Years Old             | 2016             |
| Delivery of First Production Vehicle         | December 2016    |
| <b>775 Car Contractual Option Deadline</b>   | <b>June 2017</b> |
| <b>1000 Car FTA Change Order Deadline</b>    | <b>May 2019</b>  |
| Complete Delivery 410 <sup>th</sup> Vehicle  | August 2019      |
| BART Original Fleet 50 Years Old             | 2021             |
| Complete Delivery 775 <sup>th</sup> Vehicle  | October 2021     |
| Complete Delivery 1000 <sup>th</sup> Vehicle | February 2023    |