Caltrain Business Plan

MAY 2019

QUARTERLY UPDATE
Board Agenda Item#8

May 2, 2019
Starting to Build a Business Case
What is the Caltrain Business Plan?

What
Addresses the future potential of the railroad over the next 20-30 years. It will assess the benefits, impacts, and costs of different service visions, building the case for investment and a plan for implementation.

Why
Allows the community and stakeholders to engage in developing a more certain, achievable, financially feasible future for the railroad based on local, regional, and statewide needs.
What Will the Business Plan Cover?

Technical Tracks

Service
• Number of trains
• Frequency of service
• Number of people riding the trains
• Infrastructure needs to support different service levels

Business Case
• Value from investments (past, present, and future)
• Infrastructure and operating costs
• Potential sources of revenue

Community Interface
• Benefits and impacts to surrounding communities
• Corridor management strategies and consensus building
• Equity considerations

Organization
• Organizational structure of Caltrain including governance and delivery approaches
• Funding mechanisms to support future service
Where Are We in the Process?

2018
- Initial Scoping and Stakeholder Outreach
- Board Adoption of Scope

2019
- Technical Approach Refinement, Partnering, and Contracting
- Stanford Partnership and Technical Team Contracting
- Part 1: Service Vision Development

2020
- Board Adoption of 2040 Service Vision
- Part 2: Business Plan Completion
- Board Adoption of Final Business Plan
- Implementation

We Are Here
2040 Service Scenarios: Different Ways to Grow

- **2018**: Current Operations
- **2022**: Start of Electrified Operations
- **2029**: HSR Valley to Valley & Downtown Extension
- **2033**: High Speed Rail Phase 1
- **2040**: Service Vision

**Baseline Growth**

**High Growth**

**Moderate Growth**
2040 Baseline Growth Scenario (6 Caltrain + 4 HSR)

Features
- Blended service with up to 10 TPH north of Tamien (6 Caltrain + 4 HSR) and up to 10 TPH south of Tamien (2 Caltrain + 8 HSR)
- Three skip stop patterns with 2 TPH – most stations are served by 2 or 4 TPH, with a few receiving 6 TPH
- Some origin-destination pairs are not served at all

Passing Track Needs
- Less than 1 mile of new passing tracks at Millbrae associated with HSR station plus use of existing passing tracks at Bayshore and Lawrence

Options & Considerations
- Service approach is consistent with PCEP and HSR EIRs
- Opportunity to consider alternative service approaches later in Business Plan process
Features

- A majority of stations served by 4 TPH local stop line, but Mid-Peninsula stations are serviced with 2 TPH skip stop pattern
- Express line serving major markets – some stations receive 8 TPH
- Timed local/express transfer at Redwood City

Passing Track Needs

- Up to 4 miles of new 4-track segments and stations: Hayward Park to Hillsdale, at Redwood City, and a 4-track station in northern Santa Clara county (Palo Alto, California Ave, San Antonio or Mountain View. California Ave Shown)

Options & Considerations

- To minimize passing track requirements, each local pattern can only stop twice between San Bruno and Hillsdale - in particular, San Mateo is underserved and lacks direct connection to Millbrae
- Each local pattern can only stop once between Hillsdale and Redwood City
- Atherton, College Park, and San Martin served on an hourly or exception basis
High Growth Scenarios (12 Caltrain + 4 HSR)

Features
- Nearly complete local stop service – almost all stations receiving at least 4 TPH
- Two express lines serving major markets – many stations receive 8 or 12 TPH

Passing Track Needs
- Requires up to 15 miles of new 4 track segments: South San Francisco to Millbrae, Hayward Park to Redwood City, and northern Santa Clara County between Palo Alto and Mountain View stations (shown: California Avenue to north of Mountain View)

Options & Considerations
- SSF-Millbrae passing track enables second express line; this line cannot stop north of Burlingame
- Tradeoff between infrastructure and service along Mid-Peninsula - some flexibility in length of passing tracks versus number and location of stops
- Flexible 5 mile passing track segment somewhere between Palo Alto and Mountain View
- Atherton, College Park, and San Martin served on an hourly or exception basis
Terminal Analysis
San Francisco Terminal

Key Points and Findings

• The Downtown Extension from the existing 4th & King Terminal to the Salesforce Transit Center is planned for operation in 2029 and will allow Caltrain and HSR to directly serve downtown San Francisco.

• Under the Baseline Scenario all 10 trains can serve the Sales Force Transit Center.

• Under the Moderate Scenario all 12 trains can serve the Salesforce Transit Center.

• Under the High Growth Scenario, 12 trains can serve the Salesforce Transit Center and the remaining 4 trains would terminate at 4th & King.

• All findings will be further tested and evaluated through simulation analysis.
San Francisco Terminal Area
Planned Track Layout
Key Points and Findings

- Work developed in conjunction with Diridon Integrated Station Concept (DISC) Plan - some analysis is still ongoing
- All three Growth Scenarios work within concepts being considered in DISC process
- For Caltrain, the ability to “turn” trains south of Diridon is important and will require investments
- Analysis of “diesel” system including freight and intercity operators (Amtrak, ACE, and CCJPA) is ongoing
- All findings will be further tested and evaluated through simulation analysis
San Jose Terminal Area

Existing Infrastructure
San Jose Terminal Area

Potential Future Infrastructure (Includes changes related to HSR, Diridon Concepts + Potential infrastructure related to Business Plan)
Next Steps: Simulation

Process

• The primary objective for the simulation analysis is to determine whether the simulation model indicates a stable rush-hour operation absent any major disruptions (e.g. track outages or disabled trains) for the three growth scenarios subject to analysis.

• Of particular concern is the extent to which the variability of dwells at intermediate stations will affect the ability to deliver the proposed timetables within reasonable on-time performance parameters.
Next Steps: Storage & Maintenance Analysis

Process

• Analyze fleet, storage and maintenance needs associated with the fleet requirements for each of the growth scenarios considered

• Understand when and where new investments in storage and maintenance facilities may be required and analyze how these may impact or benefit overall system operations
Next Steps: Explorations

Examples:
- Stopping pattern options and tradeoffs
- Dumbarton service connection in Redwood City
- East Bay run-through service via second Transbay Tube
Ridership Forecasts
Ridership Model Structure

Modeling Process

1. VTA-C/CAG Travel Model
2. Caltrain Ridership Model
3. HSR Ridership Adjustment
4. Crowding-Constrained Forecasts

Regional Context
Station Area Context
+ HSR Access Trips
- HSR Overlap Trips

Demand Forecasts

Caltrain Service Plans

Caltrain Ridership Forecasts

Modeling Objectives

1. Forecast for changes in regional travel behavior over time
2. Refine Caltrain regional distribution & account for micro travel behavior related to Caltrain
3. Account for HSR influence on Caltrain ridership
4. Constrain capacity to a comfortable crowding load of 1.35 at each segment

- Net Effect: adjusts ridership by station and reduces overall ridership forecast
+ Net Effect: Subtracts riders on HSR ODs; adds riders as HSR access mode
- Net Effect: Decrease overall Caltrain ridership for baseline and moderate growth scenarios
On its current, baseline path, Caltrain would experience demand of 161,000 daily riders by 2040. The Moderate and High Growth scenarios would increase demand to 185,000 and 207,000 riders, respectively.
Caltrain’s 2040 ridership demand is more balanced (directionally and geographically) than peer corridors

<table>
<thead>
<tr>
<th>System</th>
<th>Daily</th>
<th>Peak Hour, Max Load Point</th>
<th>Peak % - Reverse Peak %</th>
<th>Peak Hour, Peak Direction Max Load Point</th>
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<tr>
<td>Existing</td>
<td>62,000</td>
<td>6,500</td>
<td>60% - 40%</td>
<td>3,900</td>
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<td>Caltrain</td>
<td>161,000*</td>
<td>15,300*</td>
<td>57% - 43%*</td>
<td>8,700</td>
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<td>2040 Baseline</td>
<td>185,000*</td>
<td>17,700*</td>
<td>56% - 44%*</td>
<td>9,900</td>
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<tr>
<td>2040 Moderate</td>
<td>207,000</td>
<td>20,600</td>
<td>56% - 44%</td>
<td>11,500</td>
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<tr>
<td>BART (All Lines)</td>
<td>414,000</td>
<td>28,400</td>
<td>88% - 12%</td>
<td>24,900</td>
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<tr>
<td>Metro North (Harlem &amp; New Haven Lines)</td>
<td>176,000</td>
<td>27,900</td>
<td>94% - 6%</td>
<td>26,200</td>
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<tr>
<td>Long Island Railroad (All Lines)</td>
<td>350,000</td>
<td>35,900</td>
<td>94% - 6%</td>
<td>33,700</td>
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</table>

*Excludes capacity constraining for Baseline and Moderate
Crowding

How crowded will trains be? Will they still be a competitive choice? Will they be able to serve their full potential market demand?

- The underlying ridership model projects demand based on land use and service levels—it does not take comfort and crowding into account.
- If Caltrain is highly crowded and uncomfortable will it still be a competitive mode? Is there a portion of future demand that we may not capture if the trains are uncomfortably full?

For the purposes of Business Planning, Caltrain is assuming that it can competitively serve passenger loads of up to 135% of seated capacity during regular service. At higher levels of crowding the service may not be competitive for choice riders and Caltrain may not be able to fully capture potential demand.
Train Capacity and Crowding

135% Occupancy – Most are seated and everyone else can stand comfortably

This level of occupancy roughly equates to the planning standard used for commuter rail lines into London and on S-Bahn (commuter) trains in Germany. Depending on the specific train design this level of occupancy generally equates to less than two standees per square meter of space.
## System Forecasts - Constrained for Crowding

### Systemwide Boardings: Weekday Ridership

<table>
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<tr>
<th>Model Year</th>
<th>Service Plan</th>
<th>Demand</th>
<th>Capacity Constrained</th>
<th>Notes</th>
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<tr>
<td>2017</td>
<td>5 TPH</td>
<td>62,100</td>
<td>62,100</td>
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<td>2022</td>
<td>5 TPH</td>
<td>69,700</td>
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<td></td>
<td>6 TPH</td>
<td>85,000</td>
<td>85,000</td>
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</tr>
<tr>
<td>2029</td>
<td>6 TPH</td>
<td>103,100</td>
<td>103,100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 TPH (+ DTX)</td>
<td>130,600</td>
<td>124,900</td>
<td>Electrification increases service and capacity. Combined with the Central Subway, significant latent demand is unlocked within the system. After the completion of DTX, peak Caltrain ridership demand would exceed capacity. Ridership continues to grow during shoulder peak and off-peak periods.</td>
</tr>
<tr>
<td></td>
<td>6 TPH (+ DTX and 2 HSR)</td>
<td>132,900</td>
<td>128,900</td>
<td></td>
</tr>
<tr>
<td>2033</td>
<td>6 TPH (+ 2 HSR)</td>
<td>141,700</td>
<td>135,700</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 TPH (+ 4 HSR)</td>
<td>143,800</td>
<td>137,600</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>Baseline 6 TPH (+ 4 HSR)</td>
<td>161,200</td>
<td>151,700</td>
<td>Demand for express trains would exceed a comfortable crowding level. While local trains could serve some excess capacity, some riders would choose other modes in lieu of a longer local travel time.</td>
</tr>
<tr>
<td>2040</td>
<td>Moderate 8 TPH (+ 4 HSR)</td>
<td>184,800</td>
<td>177,200</td>
<td></td>
</tr>
<tr>
<td>2040</td>
<td>High 12 TPH (+ 4 HSR)</td>
<td>207,300</td>
<td>207,300</td>
<td>Sufficient peak capacity and more connected local service serving off-peak and weekend demand.</td>
</tr>
</tbody>
</table>
Baseline & Moderate scenarios exceed comfortable crowding level during peak hours.
Rider Throughput as Freeway Lanes

Caltrain’s peak load point occurs around the mid-Peninsula. Today, Caltrain serves about 3,900 riders per direction during its busiest hour at this peak load point. This is equivalent to 2.5 lanes of freeway traffic.

The **Baseline Growth Scenario** increases peak hour ridership to about 6,400 riders at the peak load point – equivalent to widening US-101 by 2 lanes. Peak hour demand exceeds capacity by about 40%.

The **Moderate Growth Scenario** increases peak hour ridership to about 7,500 riders at the peak load point – equivalent to widening US-101 by 2.5 lanes. Peak hour demand exceeds effective capacity by about 35% due to higher demand for express trains.

The **High Growth Scenario** increases peak hour ridership to over 11,000 at the peak load point – equivalent to widening US-101 by 5.5 lanes. All ridership demand is served.

*Assumes 135% max occupancy load*
Grade Crossings & Grade Separations
Background

Context

• 42 at-grade crossings on the corridor Caltrain owns between San Francisco and San Jose
• 28 additional at-grade crossings on the UP-owned corridor south of Tamien

At-Grade Crossing by County in Caltrain Territory

• San Francisco: 2 at-grade crossings
• San Mateo: 30 at-grade crossings
• Santa Clara: 10 at grade crossings (with 28 additional crossings on the UP-owned corridor)

Most of the data shown in this presentation pertains to the Caltrain-owned corridor north of Tamien Station
Today, 71 of 113 crossings along the Caltrain corridor have already been separated (63%) and 12 of 30 crossings along the UP corridor have been separated (29%).

The grade separations have been constructed (and reconstructed) at various points during the corridor’s 150-year history.

Planning for, funding, and constructing grade separations has been a decades-long challenge for the Caltrain corridor.

Bayshore Tunnels under construction, 1907
Background

History

The following grade separation projects have been completed since the JPB assumed ownership of the Caltrain Service in 1992:

• Millbrae: Millbrae Ave (1990s)
• North Fair Oaks: 5th Ave (1990s)
• Redwood City: Jefferson Ave (1990s)
• Belmont: Ralston, Harbor (1990s)
• San Carlos: Holly, Britain Howard (1990s)
• San Bruno: San Bruno, San Mateo, Angus (2014)

There is one grade separation project under construction:

• San Mateo: 25th Avenue (estimated 2021 completion)

Funding for Grade Separation provided through San Mateo County’s “Measure A” sales tax (1988, 2004) has been instrumental in completing these projects, while dedicated funding has previously not been available in San Francisco or Santa Clara Counties.
Caltrain understands that the requirement for grade separation set by the current regulatory framework may be out of pace with the ongoing plans and desires of many communities on the corridor. The 2040 “Vision” will consider substantially expanded investment in grade crossing improvements and separations.

When is Grade Separation or Closure of a Crossing Required?

Grade crossings are regulated by the Federal Railroad Administration (FRA) and, in California, by the California Public Utilities Commission.

Under current regulations, the separation or closure of an at-grade crossing is required in the following circumstances:

- When maximum train speeds exceed 125 mph (FRA regulation)
- When the crossing spans 4 or more tracks (CPUC guidance interpreted into Caltrain Standards)
Background
Safety

Over 80 collisions occurred at Caltrain’s grade crossings in the 10 years from 2009-2018. More than 30 of these collisions involved a fatality

- 11 crossings had 0 collisions
- 8 crossings had 4 or more collisions
- 21 crossings had 1 or more fatalities

Data presented for Caltrain-owned corridor Only. Collision data from FRA reports.
Today, during a typical weekday, Caltrain’s at-grade crossings are traversed by approximately 400,000 cars. This is equivalent to the combined traffic volumes on the Bay Bridge and San Mateo Bridge.

The 10 busiest at-grade crossings account for half of all traffic volumes.

Data presented for Caltrain-owned corridor only. Data reflects 2016 ADT.
Existing Gate Downtimes

Today, Caltrain’s crossing gates are down for an average of about 11 minutes during the peak weekday commute hour. Gate down times range from 6 minutes up to nearly 17 minutes.

Note: Gate downtimes shown reflect the average time crossing gates are down only. Depending on individual crossing and roadway configuration traffic signals may stay red for longer and auto users may experience longer delays.

Data presented for Caltrain-owned corridor only.
2040 Gate Downtimes

In 2040, projected crossing gate down times vary by scenario. This evaluation does not take into consideration planned or potential grade separations.

### Gate Down Time by Scenario

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Shortest</th>
<th>Average</th>
<th>Maximum</th>
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<tbody>
<tr>
<td>Baseline</td>
<td>11</td>
<td>17</td>
<td>28</td>
</tr>
<tr>
<td>Moderate</td>
<td>14</td>
<td>20</td>
<td>31</td>
</tr>
<tr>
<td>High</td>
<td>18</td>
<td>25</td>
<td>39</td>
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</table>

Note: Gate downtimes shown reflect the average time crossing gates are down only. Depending on individual crossing and roadway configuration traffic signals may stay red for longer and auto users may experience longer delays.

Estimated Gate Down Time: 2040 (Minutes per Peak Hour)

Data presented for Caltrain-owned corridor only.
What Total Investment is Needed in Grade Separations?

The purpose of this analysis is to generate a defensible estimate of the overall financial investment in grade separations that might be needed to support different levels of future train service in the corridor.

Understanding the total financial need is an essential part of developing a “business case” for increased Caltrain service – it is required to fairly represent and align the potential costs of new service with the benefits claimed.

This work is not an attempt to redefine standards for grade separation nor is it intended to prescribe individual treatments or outcomes at specific crossings.
Weighing the Cost of Grade Crossing Improvements

Purpose

• Ensure that the overall capital costs developed for each service scenario include a reasonable level of total, corridor wide investment in grade separations and grade-crossing improvements.

Overall Methodology

• Review and utilize and City-led plans for each grade separations or closures.
• Develop generic investment types and costs for crossings where no plans are currently contemplated.
• Develop ranges of potential investment costs varied by:
  • Service Scenario
  • Intensity of investment (low, medium, high)
• Many cities along the corridor are actively planning or considering grade separations
• Each of these represents a major community effort to plan a significant and impactful project
• These projects, including their estimated and potential costs (as available), have been incorporated into the Business Plan
Building Ranges of Investment

Variation by Service Scenario

The potential need and desire for grade separations and grade crossing improvements is significant across all scenarios.

The details of potential investments will vary between scenarios based on the location and extent of 4-track segments as well as the amount of gate downtime projected.

Key Variables between Scenarios

Estimated Number of Crossings in 4-Track Segments*

- Baseline: 0
- Moderate: 2
- High: 12

Estimated Gate Downtime Ranges

- Baseline: 11 – 28 Minutes per Peak Hour
- Moderate: 14 – 31
- High: 18 – 39

*A range of options are discussed for potential 4-track segments within the Moderate and High Growth service scenarios. Number of crossings impacted by 4-track segments are indicative estimates only and subject to variation based on more detailed design and feasibility studies.
Union Pacific Corridor (Tamien to Gilroy)

Caltrain does not own the Union Pacific Corridor

Plans for expanded service on this corridor are relatively new and still in flux. HSR will be the predominate user of the corridor and the details of potential future train volumes are highly dependent on HSR’s future plans.

For Business Planning purposes, Caltrain has proposed carrying a single general allocation cost to capture the need for grade crossing improvements on this corridor. This allocation assumes estimated costs for City-planned separations in San Jose as well as potential additional investments throughout the UP corridor.

Legal Minimum
- Quad gates at all crossings
- Total costs = approx. $28M

Recommended Approach for Business Planning
- City planned separations at Skyway Dr, Branham Ln, and Chynoweth Ave
- Two additional separations
- 3 mitigated closures
- Quad gates at remaining crossings
- Total cost = approx. $1.4B

This estimate of need can be updated in conjunction with VTA and corridor cities as HSR’s plans for the corridor are further solidified.
## Potential Planning Level Grade Crossing Cost Estimates: Low

<table>
<thead>
<tr>
<th>Type</th>
<th>Baseline Growth</th>
<th>Moderate Growth</th>
<th>High Growth</th>
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<tr>
<td><strong>Total Corridor Wide Cost Estimate for Crossings</strong></td>
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<tr>
<td>Auto</td>
<td>$8.4B</td>
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<td>Bike / Ped</td>
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<td>$140M</td>
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<td><strong>$8.7B</strong></td>
<td><strong>$9.7B</strong></td>
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<th>Investments on JPB-owned Corridor</th>
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<tr>
<td>Quad Gates &amp; Safety Improvements</td>
<td>14</td>
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<td>Mitigated Closure</td>
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<td>6</td>
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<tr>
<td>Grade Separation</td>
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<td>24</td>
<td>25</td>
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<table>
<thead>
<tr>
<th>Investments on UP-owned Corridor</th>
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<tr>
<td>Quad Gates &amp; Safety Improvements</td>
<td>20</td>
<td>20</td>
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<td>Mitigated Closure</td>
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<td>Grade Separation</td>
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*Builds on and accounts for costs associated with all City-led separation and closure plans*
## Potential Planning Level Grade Crossing Cost Estimates: Medium

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<th>Type</th>
<th>Baseline Growth</th>
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<td>Auto</td>
<td>$8.7B</td>
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<td>Bike / Ped</td>
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<td><strong>Total</strong></td>
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### Investments on JPB-owned Corridor

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### Investments on UP-owned Corridor

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*Builds on and accounts for costs associated with all City-led separation and closure plans*
# Potential Planning Level Grade Crossing Cost Estimates: High

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<td>$8.9B</td>
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<td><strong>Total</strong></td>
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<td>Mitigated Closure</td>
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<tr>
<td>Grade Separation</td>
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*Builds on and accounts for costs associated with all City-led separation and closure plans*
Next Steps on Grade Separations

There is a significant body of work remaining to address the issue of at grade crossings in the Caltrain corridor.

Caltrain plans to continue advancing a corridor wide conversation regarding the construction, funding and design of grade separations while continuing to support the advancement of individual city-led projects.

Within the Business Plan
- Incorporate grade crossing investment estimates into overall corridor costing and business case analysis
- Continue peer review of corridor wide grade separation case studies and examples

Beyond the Business Plan
- Develop corridor wide grade separation strategy, potentially addressing:
  - Risk assessment and prioritization factors
  - Construction standards and methods
  - Project coordination and sequencing
  - Community resourcing and organizing
  - Funding analysis and strategy

For individual City projects
- Continue working with cities and county partners to support advancement of individual grade separation plans and projects
## Outreach Activities to Date

**July 2018 – April 2019 Timeline**

<table>
<thead>
<tr>
<th>Activity</th>
<th>2018 July</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>2019 Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
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<tr>
<td>Local Policy Maker Group</td>
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<tr>
<td>City/County Staff Coordinating Group</td>
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<td>Project Partner Committee</td>
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<td>Community Jurisdiction Meetings</td>
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<td>(One Per Jurisdiction)</td>
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<td>Partner General Manager</td>
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<tr>
<td>Website &amp; Survey Launch</td>
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<tr>
<td>Community Meetings (SPUR SJ &amp; SF, Friends of Caltrain, Reddit TownHall)</td>
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<td>Sister Agency Presentations (SFCTA, SF Capital Planning, TJPA, SamTrans, SMCTA, CCAG, VTA, MTC)</td>
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Outreach Activities to Date
July 2018 – April 2019 by the Numbers

Stakeholders Engaged

<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
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<tbody>
<tr>
<td>Jurisdictions</td>
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<tr>
<td>Public Agencies</td>
<td>26</td>
</tr>
<tr>
<td>Stakeholder Meetings</td>
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<td>Organizations in Stakeholder Advisory Group</td>
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Public Outreach

<table>
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<tr>
<th>Category</th>
<th>Number</th>
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<tr>
<td>Public Meetings and Presentations</td>
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<tr>
<td>Survey Responses</td>
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<tr>
<td>Website Hits</td>
<td>8,500+</td>
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<tr>
<td>Social Media Engagements</td>
<td>27,000</td>
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</table>
Engagement with Local Jurisdictions
Individual Meetings and Individualized Materials for 21 Local Jurisdictions
Next Steps
Next Steps

Over the next two months the Business Plan team is working to complete a full set of draft materials to support Board consideration and adoption of a 2040 Service Vision.

Following Board designation of a long range “Service Vision” staff will work to complete a full Business Plan document by the end of 2019.

Ongoing Analysis
- Capital costing and Operations and Maintenance Analysis
- Economic analysis and benefits calculations
- Organizational assessment
- Community Interface documentation and peer case studies

Upcoming Milestones
- Major Board Workshop in July to review expanded set of materials and discuss recommended “Service Vision”
- Subsequent adoption of Service Vision in August timeframe pending Board discussion and stakeholder feedback
FOR MORE INFORMATION
WWW.CALTRAIN.COM