



# California High-Speed Train System



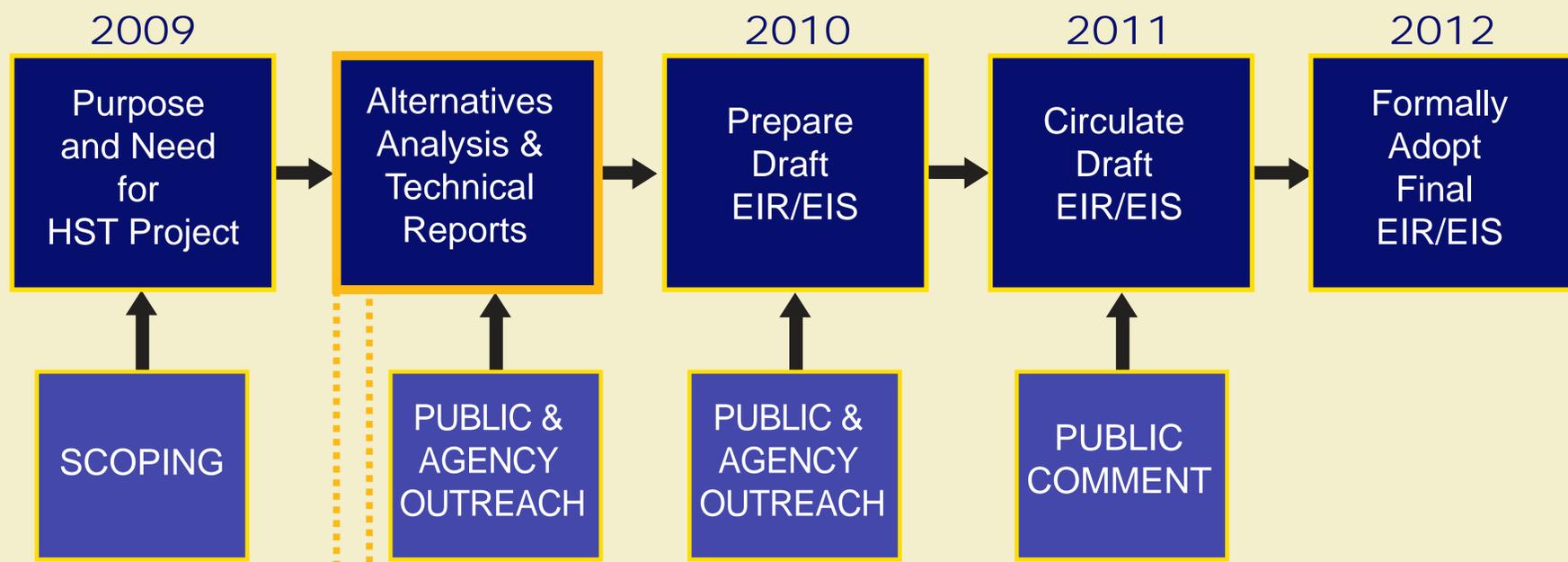
- Provide a new mode of high-speed intercity travel to link major metropolitan areas
- Forecasted to carry as many as 100 million passengers annually by the year 2035
- 800-mile system with stations built to allow for express service
- Service linking the San Francisco Bay Area, Central Valley and Southern California
- 100% clean electric power
- Estimated travel time from San Francisco to Los Angeles: less than 2 hours 40 minutes



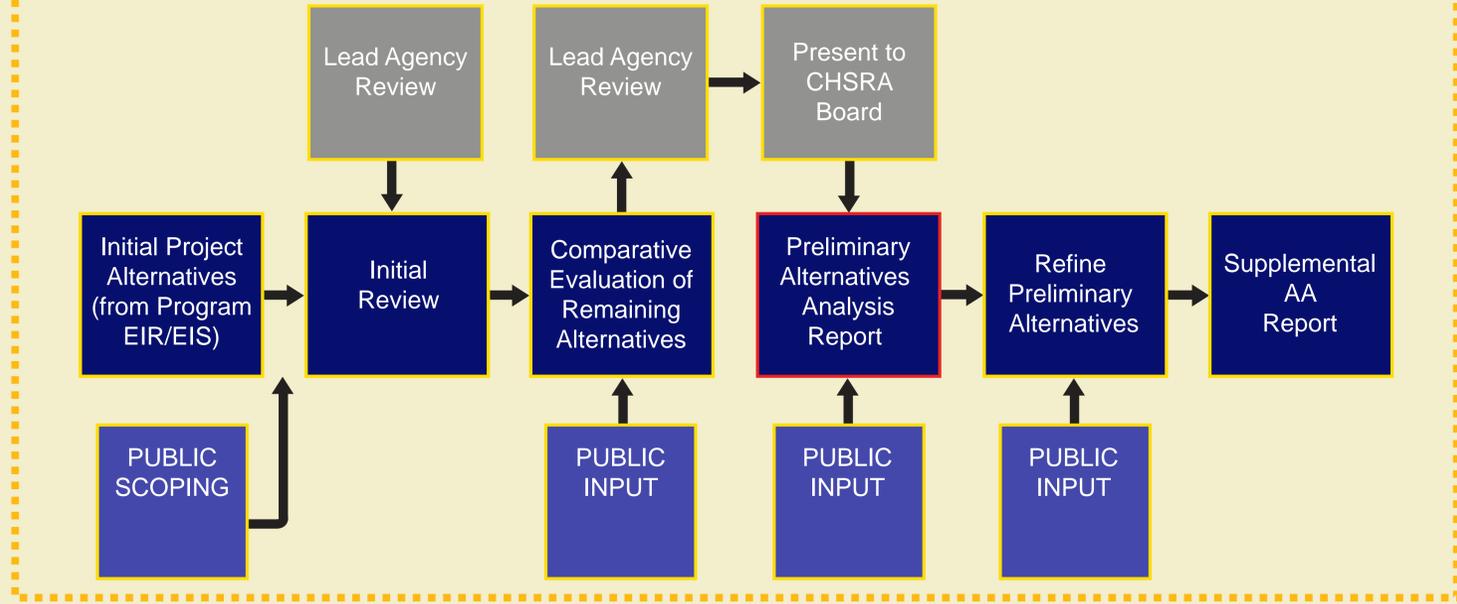


# Project Environmental Review Schedule and Alternatives Analysis Process

## Environmental Review Schedule



## Alternatives Analysis Process



Ongoing Community & Agency Meetings, Interviews, Communications





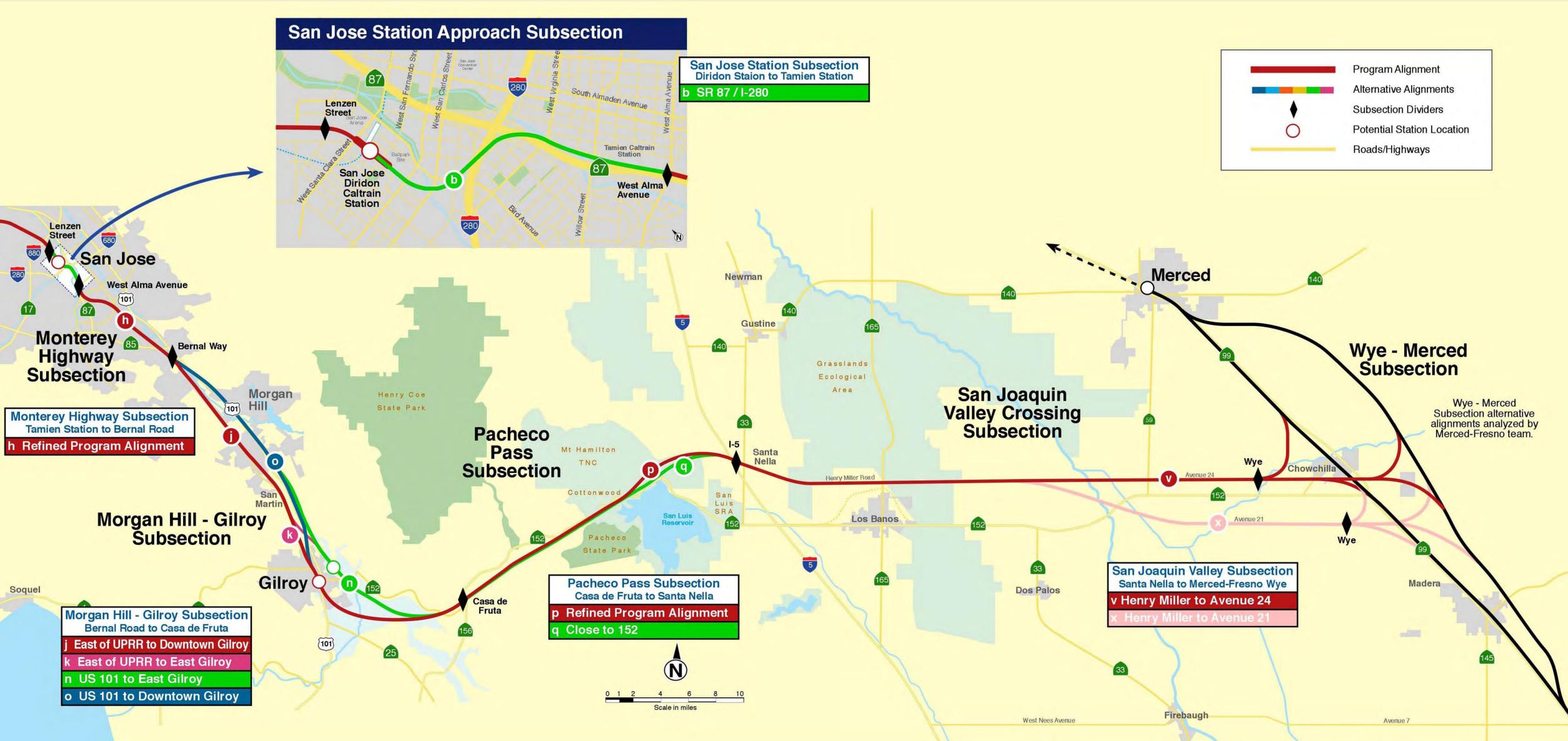
# Alternatives Analysis Evaluation Measures

<b>Category</b>	<b>Measures</b>
<b>Design objectives</b>	Travel time, cost
<b>Land use</b>	Consistency with land use and general plans
<b>Constructability</b>	Track type construction and access to the corridor
<b>Community impacts</b>	Amount of land acquisition
<b>Natural resources</b>	Impacts to wetlands, potential threatened and endangered species habitat, important farmlands
<b>Environmental quality</b>	Number of sensitive noise receptors
<b>Additional considerations</b>	Ability to meet project purpose and support by public and agencies





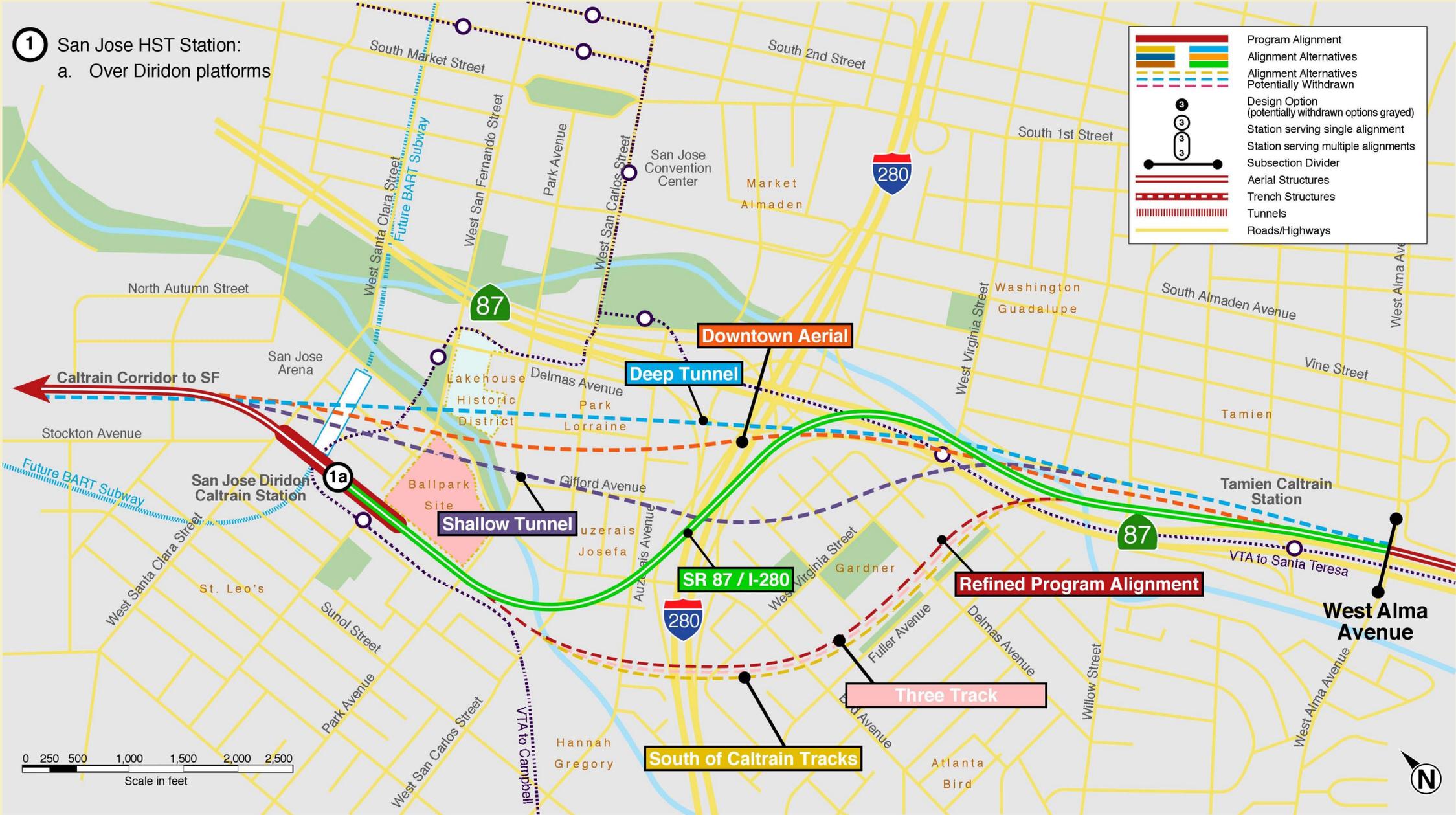
# San Jose to Merced Section Alignment Alternatives to be studied in the Draft EIR/EIS





# San Jose Station Approach Subsection

1 San Jose HST Station:  
a. Over Diridon platforms



**SR 87/I-280**

- Suggested by City of San Jose
- Minimizes impacts by utilizing existing freeway corridors
- Moves HST line away from the Gardner neighborhood and avoids impacts to the community

**Three Tracks**

- Unacceptable operating constraints for Caltrain (requires reduction from two Caltrain/UPRR tracks to one)

**Downtown Aerial**

- Numerous property takes
- Impacts the City of San Jose's planned development in the area
- Visual impacts

**Deep Tunnel**

- Construction complexity and risks, including: construction in poor soils at a depth of 140' with the chance of potential settlement; ground water issues; soil improvements required from the surface; no existing HST mined station in world; and would require 7-16 years to build.
- National Register archaeological site
- Would require reconstruction of Tamien Station and the SR 87 northbound ramp
- Costs 7 times the base case

**Refined Program Alignment**

- Impacts to Greater Gardner neighborhood (noise, vibration, visual, community cohesion)
- Impacts on Fuller Park and displacement of a nonprofit (house of worship)

**South of Caltrain Tracks**

- Numerous property takes greater than Refined Program Alignment
- Impacts to Fuller Park

**Shallow Tunnel**

- Requires the redesign and lowering of the planned BART station/tunnels 140' underground in poor soils with groundwater issues
- Impacts to new residential development
- Need to support future development over HST
- Impacts to Los Gatos Creek
- National Register archaeological site
- Would require reconstruction of Tamien Station and the SR 87 northbound ramp
- Costs 5 times the base case (plus additional BART costs and development support costs)





# San Jose Station Options Considered

## ✓ Over Diridon Platforms

- Compatible with SR 87/I-280 alignment alternative
- No residential or business displacements
- Potential effects to 2.4 acres of biological resources
- Impacts to existing railroad operations during construction
- Potential visual impacts to the existing historic depot

## ✗ Aerial Station (East of Existing Diridon Station)

- Potential effects to a large area of biologically sensitive habitat
- Impacts to cultural resources, including the Diridon Station
- Potential interference with the City of San Jose's redevelopment plans for the areas north, east, and south of the Diridon Station

## ✗ Underground Station (East of Existing Diridon Station)

- Major constructability impacts
- No residential or nonresidential displacements
- No impacts to sensitive biological habitat, cultural resources or the visual character of the area



San Jose Diridon Station at Alameda Simulation



San Jose Diridon Station Simulation

*Note: Draft simulations are subject to change*





# I-280/SR-87 Alignment Description

Follows existing transportation corridor to greatest extent possible  
Curvature of alignment not conducive to high speeds



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City of San Jose interested in an iconic bridge structure

Constructability potentially hindered by need to maintain existing freeway operations

Must avoid impacts to I-280 including the support structure underneath the roadway





# Examples of Iconic Bridges and HST Stations



**An Innovative Curved Cable-Stayed Bridge**



**Seri Wawasan Bridge**



**Iconic Bridge Concept for I-280/SR 87 Alignment**



**San Jose Station Concept**



**Liège-Guillemins TGV**

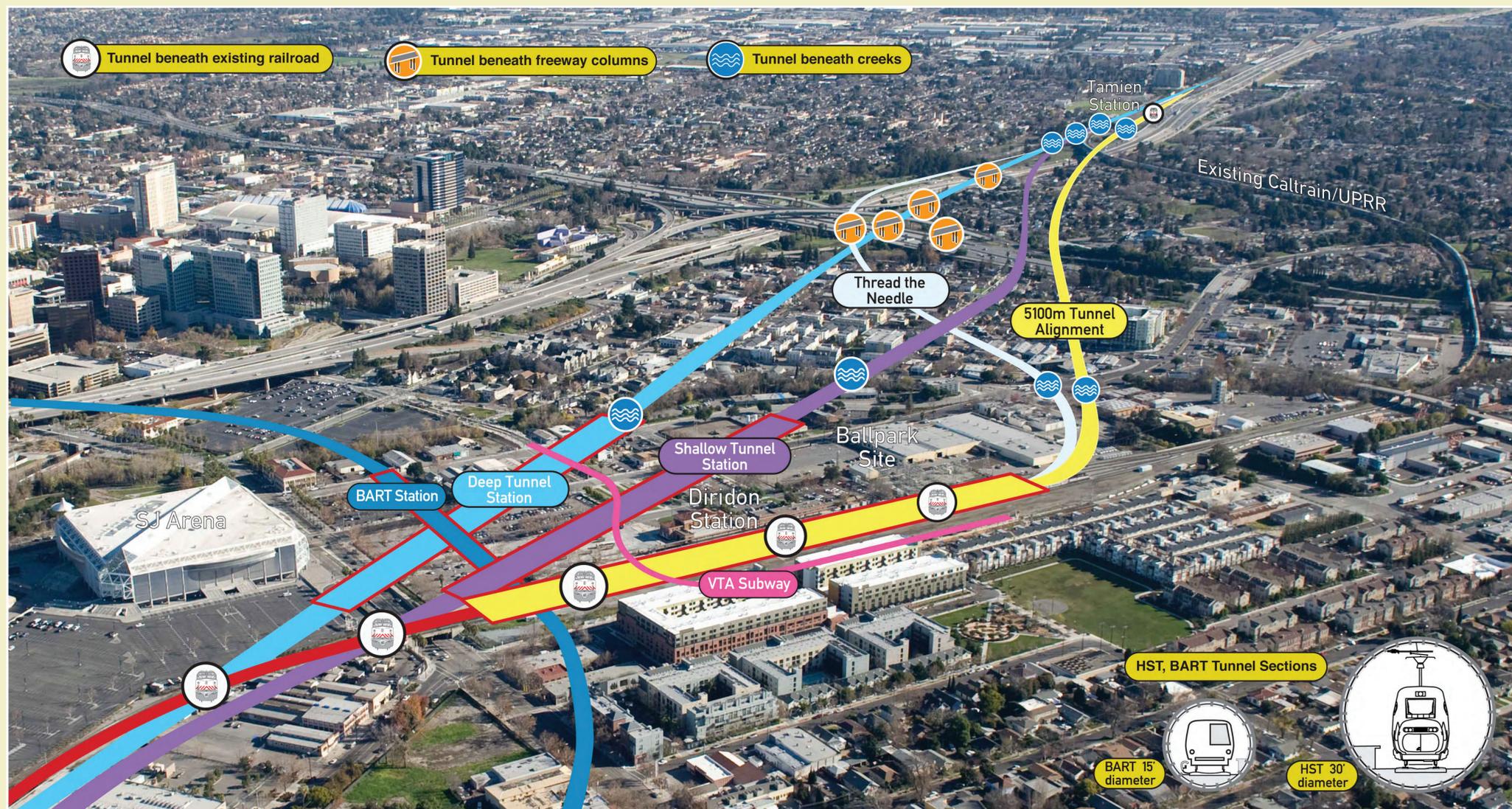


**Oriente Station in Lisbon, Portugal**





# San Jose Tunnel Alternatives



## Development of Tunnel Alternatives

- During the scoping process, several tunnel options were recommended
- City of San Jose and Voices of San Jose, a community-based public policy non-profit, identified three tunnel options: (1) Downtown Tunnel; (2) Thread the Needle; (3) 5100 Meter Tunnel
- City of San Jose requested the study of a shallow tunnel option, which may have significantly less constructability and fewer risk issues than a deep tunnel and station, but greater impacts at the surface and to future development





# Tunnel Overview – Ground Conditions

## Conditions on and under the Ground

### SOIL

- Presence of clay, silt, sand and gravel, which go as deep as 1,000 feet below ground level
- These types of soil require ground support to eliminate their tendency to run into tunnel and station excavation, with the potential for causing settlement at the surface

### HYDROLOGY

- Groundwater ranges from 4 to 18 feet below the ground surface (presence of a high groundwater table)
- Construction must be water tight to prevent excessive groundwater inflows

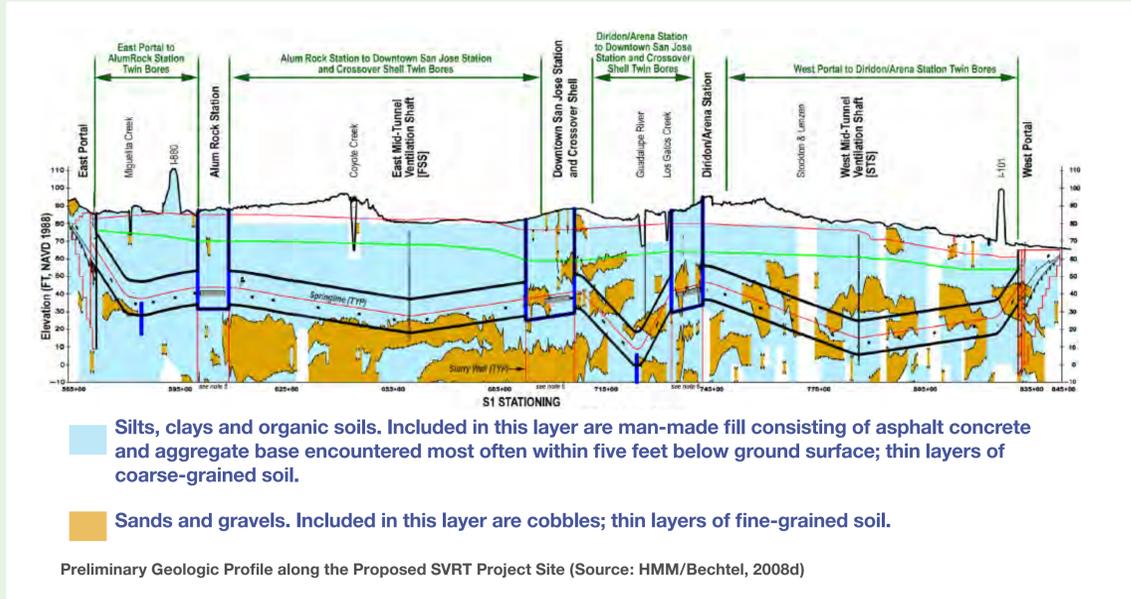
### EXISTING BUILDINGS AND STRUCTURE FOUNDATIONS

- Tunnel would be located in an urban area, among a dense concentration of existing buildings and structure foundations (including I-280/SR 87)
- The primary access point for construction will be at the portals and at cut and cover locations
- Surface impacts will occur when performing ground stabilization and constructing access points, ventilation vents, and openings for emergency response
- In the case of a shallow tunnel, cut and cover construction techniques will require full access to ground/surface along planned non-tunnel track alignment and station location, as well as some areas surrounding construction for staging and equipment

Ground investigations performed for the proposed BART project show the presence of silty clay, sand and gravel. It is assumed that the proposed HST tunnel and station would be excavated in similar ground conditions.

## Inherent Risks and Uncertainties

- Ground settlement requiring ground pre-treatment
- Earthquakes and subsequent liquefaction
- Major ground surface impacts, including vibration from construction and operations and fans providing construction ventilation, right-of-way acquisitions for shafts, portals, and station access
- Impacts on Guadalupe River and Los Gatos Creek
- Impacts on proposed BART station
- Impacts to surface conditions and buildings
- Limited future development above underground HST facilities





# Ground Surface Impacts for Tunnel Alignments



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## Station Area

- Soil stabilization and ground improvements from surface above station for SEM station construction
- Right-of-way requirements for ventilation, access shafts at station
- Future development above station limited

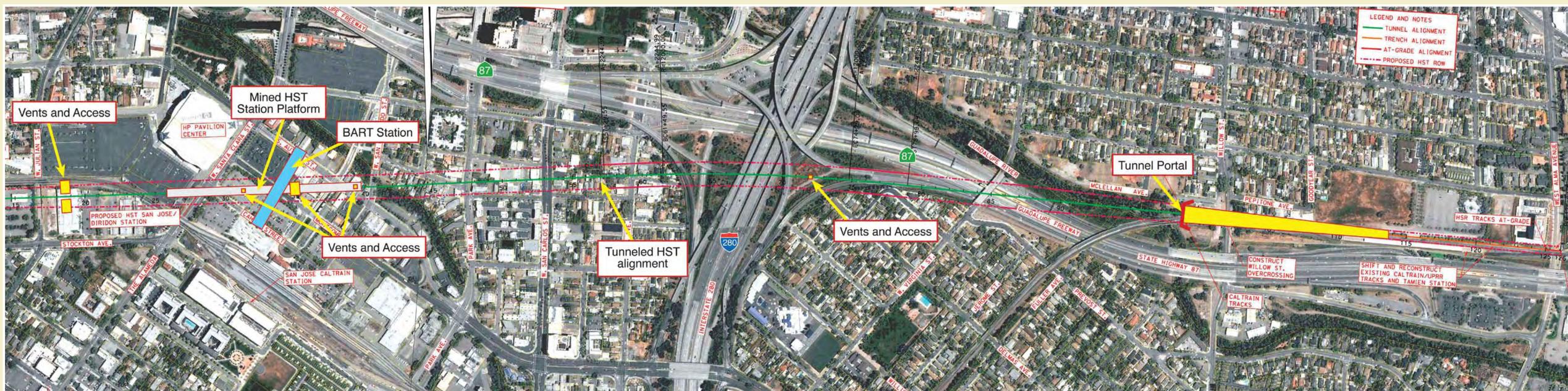
## Entire Alignment

- Soil stabilization and ground improvements at varying locations along entire alignment
- Right-of-way requirements (both temporary and permanent)
  - Tunnel entrance/exit (portals)
  - Vents
  - Access shafts for fire-life safety personnel and equipment
  - Construction “lay down” areas for equipment, TBM “trailing gear”, concrete plants and other construction staging needs
- Ground-borne vibration (from tunneling and high-speed trains)
- Ground movement and settlement
- Future development above tunnels may be limited in some areas





# Deep Tunnel Impacts



## Station Area

- The station box (1,380' long, 70' wide and 40' high) would be constructed in poor soils at a depth of 140' with the potential of ground settlement (additional risks and costs for repairs and damages)
- Extensive surface impacts for access, stairs, emergency access, ventilation, etc. would affect residences and businesses and possibly require relocation
- No precedent of a HST mined station anywhere in the world to follow

## Entire Alignment

- Poor soils and presence of a high groundwater table increases risk of groundwater infiltration and settlement during construction
  - Unsafe mining conditions for craftsmen and equipment
  - Extensive soil improvement measures required from surface
- Requires construction underneath SR 87 and I-280 foundations
- Requires reconstruction of SR 87 northbound ramp and Tamien Station
- Construction estimated to take between 7-16 years
- Construction in a National Register archaeological site
- Higher capital costs (7 times the base case)
- Higher operating costs





# Deep Tunnel Configuration Options

The first step in determining the optimal track and station configuration involved consideration of the various methods currently available. The information below shows the tunnel and station options considered in both cross-section and plan view with pros and cons noted on the left.

<p><b>ALTERNATIVE 3</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 70' WIDE NATM STATION CAVERN</li> <li>• 2 - 30' DIA. OUTSIDE TBM TUNNELS</li> </ul> <p><b>PROS:</b></p> <ul style="list-style-type: none"> <li>• SINGLE CAVERN AND ACCESS SHAFT</li> </ul> <p><b>CONS:</b></p> <ul style="list-style-type: none"> <li>• SIZE IS LARGER THAN (1b) SO TUNNEL CONST. MORE DIFFICULT/RISKY</li> <li>• COST: BASELINE ALTERNATIVE</li> </ul>	<p>EXPRESS</p> <p>SHAFT ACCESS</p> <p>70' CHAMBER FOR STATION TRACKS</p> <p>EXPRESS</p> <p>TBM</p> <p>NATM</p> <p>TBM</p>	<p>STATION PLATFORM</p> <p>EXPRESS TRACKS</p>
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Alternative 3 was selected as the best performing option for the conditions and used to develop tunnel layout as shown on next board

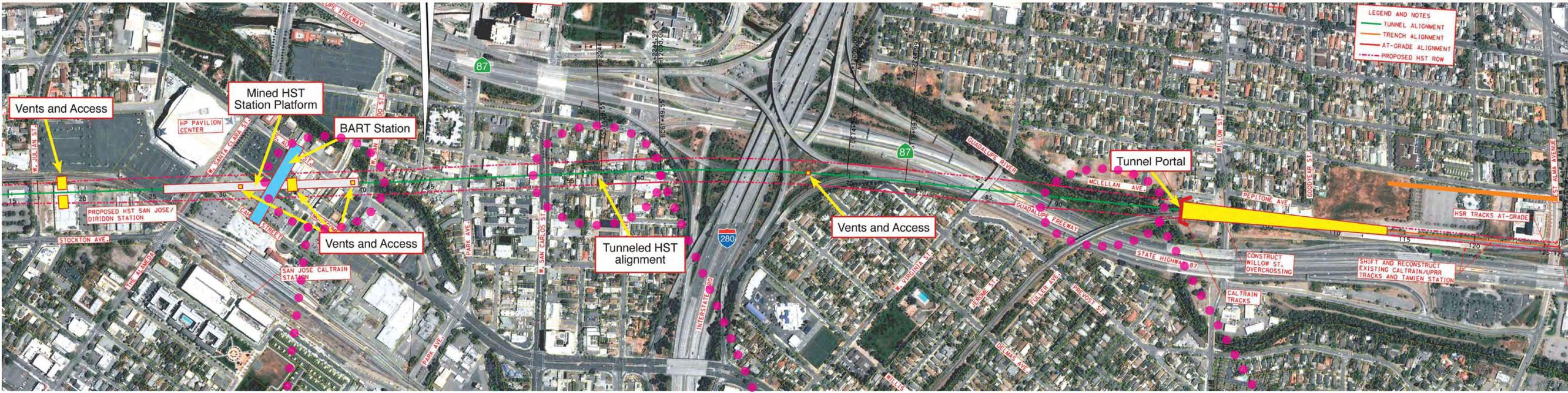
<p><b>ALTERNATIVE 1a</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 2 - 50' DIA. TBMS AT STATION</li> <li>• 4 - LAUNCH/RETRIEVAL SHAFTS</li> <li>• 2 - 30' DIA. OUTSIDE TBM TUNNELS</li> </ul> <p><b>PROS:</b></p> <ul style="list-style-type: none"> <li>• POSITIVE GROUND CONTROL</li> </ul> <p><b>CONS:</b></p> <ul style="list-style-type: none"> <li>• MULT. LARGE ACCESS SHAFTS</li> <li>• TBM/TRAILING GEAR AS LONG OR LONGER THAN STATION</li> <li>• COSTS: 1.28 X BASE</li> <li>• SCHEDULE: VERY LONG (EQUIP)</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>EXPRESS</p> <p>SHAFT ACCESS</p> <p>STATION TRACKS</p> <p>STATION TRACKS</p> <p>50' DIA.</p> <p>EXPRESS</p> <p>TBM</p> <p>TBM</p> <p>TBM</p> <p>TBM</p>	<p><b>PLAN</b></p> <p>STATION PLATFORMS</p> <p>EXPRESS TRACKS</p>	<p><b>ALTERNATIVE 4a/4b</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 60' DIA. EPBM TUNNEL</li> <li>• 2 - 30' DIA. TBM OUTSIDE TUNNELS</li> <li>• OR, 1 - 60' WIDE NATM CAVERN WITH 2 - 30' DIA. OUTSIDE TBM TUNNELS</li> </ul> <p><b>4a PROS:</b></p> <ul style="list-style-type: none"> <li>• SAME PROS AS (1a)</li> <li>• COST: 1.07 X BASE</li> <li>• SCH. LONGER THAN NATM</li> <li>• LARGEST TBM IN WORLD</li> <li>• RUNNING TRACK GEOMETRY</li> </ul> <p><b>4b PROS:</b></p> <ul style="list-style-type: none"> <li>• SAME PROS AS (3)</li> <li>• SAME CONS AS (3) EXCEPT AMPLIFY SIZE/RISK</li> <li>• COST: 1.10 X BASE</li> <li>• SCHEDULE: RELATIVELY SHORTER THAN TBM</li> <li>• RUNNING TRACK GEOMETRY</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>EXPRESS</p> <p>SHAFT ACCESS</p> <p>CHAMBER FOR STATION TRACKS</p> <p>60' DIA.</p> <p>EXPRESS</p> <p>TBM</p> <p>NATM / 60' DIA. TBM</p>	<p><b>PLAN</b></p> <p>DOUBLE PLATFORM</p> <p>EXPRESS TRACKS</p>
<p><b>ALTERNATIVE 1b</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 2 - 50' WIDE NATM STATION CAVERNS</li> <li>• 2 - 30' DIA. OUTSIDE TBM TUNNELS</li> </ul> <p><b>PROS:</b></p> <ul style="list-style-type: none"> <li>• CAN EXCAVATE TO ACTUAL OUTLINE</li> <li>• SINGLE ACCESS SHAFT</li> </ul> <p><b>CONS:</b></p> <ul style="list-style-type: none"> <li>• 2 CAVERNS MORE EXPENSIVE THAN ONE</li> <li>• COST: 1.38 X BASE</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>EXPRESS</p> <p>SHAFT ACCESS</p> <p>STATION TRACKS</p> <p>STATION TRACKS</p> <p>50' DIA.</p> <p>EXPRESS</p> <p>TBM</p> <p>NATM</p> <p>NATM</p> <p>TBM</p>	<p><b>PLAN</b></p> <p>STATION PLATFORMS</p> <p>EXPRESS TRACKS</p>	<p><b>ALTERNATIVE 5</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 1 - 140' WIDE NATM CAVERN AT THE STATION</li> <li>• 2 - 30' DIA. TBM TUNNELS TO STATION AREA</li> </ul> <p><b>PROS:</b></p> <ul style="list-style-type: none"> <li>• NONE PERCEIVED</li> </ul> <p><b>CONS:</b></p> <ul style="list-style-type: none"> <li>• EXCAVATED OPENING SIZE PROHIBITIVELY LARGE</li> <li>• NO ADVANTAGE TO CONSTRUCTING RUNNING TUNNELS BY NATM - MAKES ADJACENT RUNNING TUNNEL CONSTRUCTION MORE DIFFICULT</li> <li>• COST: 2.76 X BASE</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>SHAFT ACCESS</p> <p>140' CAVERN</p> <p>NATM</p>	<p><b>PLAN</b></p> <p>STATION PLATFORM</p> <p>EXPRESS TRACKS</p>
<p><b>ALTERNATIVES 2a &amp; 2b</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 2 - 50' WIDE NATM STATION CAVERNS</li> <li>• OR, 2 - 50' DIA. TBM STATION TUNNELS</li> <li>• 2 - 30' DIA. INSIDE TBM TUNNELS</li> </ul> <p><b>TBM PROS:</b></p> <ul style="list-style-type: none"> <li>• POSITIVE GROUND CONTROL</li> </ul> <p><b>TBM CONS:</b></p> <ul style="list-style-type: none"> <li>• MULTIPLE ACCESS SHAFTS</li> <li>• TBM/TRAILING GEAR ALMOST AS LONG AS STATION</li> <li>• COST: 1.28 X BASE</li> <li>• SCHEDULE: VERY LONG (EQUIP)</li> </ul> <p><b>NATM PROS:</b></p> <ul style="list-style-type: none"> <li>• CAN EXCAVATE TO ACTUAL OUTLINE</li> </ul> <p><b>NATM CONS:</b></p> <ul style="list-style-type: none"> <li>• ADDITIONAL ACCESS SHAFT</li> <li>• COST: 1.49 X BASE</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>STATION TRACKS</p> <p>SHAFT ACCESS</p> <p>EXPRESS</p> <p>EXPRESS</p> <p>50' DIA.</p> <p>STATION TRACKS</p> <p>NATM / 50' DIA. TBM</p> <p>TBM</p> <p>TBM</p> <p>NATM / 50' DIA. TBM</p>	<p><b>PLAN</b></p> <p>STATION PLATFORM</p> <p>EXPRESS TRACKS</p> <p>STATION PLATFORM</p>	<p><b>ALTERNATIVE 6</b></p> <p><b>NOTES / COMMENTS:</b></p> <ul style="list-style-type: none"> <li>• 2 - 70' WIDE NATM CAVERNS AT THE STATION</li> </ul> <p><b>PROS:</b></p> <ul style="list-style-type: none"> <li>• NONE PERCEIVED</li> </ul> <p><b>CONS:</b></p> <ul style="list-style-type: none"> <li>• UNNECESSARILY COMPLICATED/RISKY COMPARED TO SINGLE CENTER PLATFORM CAVERN</li> <li>• NO ADVANTAGE TO CONSTRUCTING RUNNING TUNNELS BY NATM - MAKES ADJACENT RUNNING TUNNEL CONSTRUCTION MORE DIFFICULT</li> <li>• COST: 1.60 X BASE</li> </ul>	<p><b>CROSS-SECTION</b></p> <p>EXPRESS</p> <p>SHAFT ACCESS</p> <p>TWIN 70' NATM CAVERNS</p> <p>EXPRESS</p> <p>NATM</p>	<p><b>PLAN</b></p> <p>STATION PLATFORMS</p> <p>EXPRESS TRACKS</p>



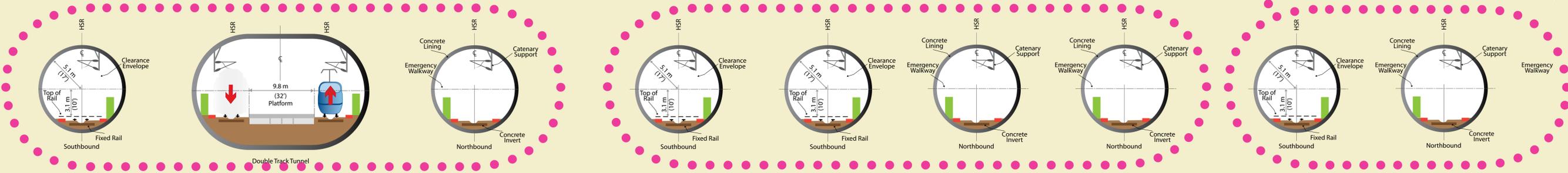


# Conceptual Downtown Tunnel Alignment

## Diridon Station to Tamien Station Track Configuration

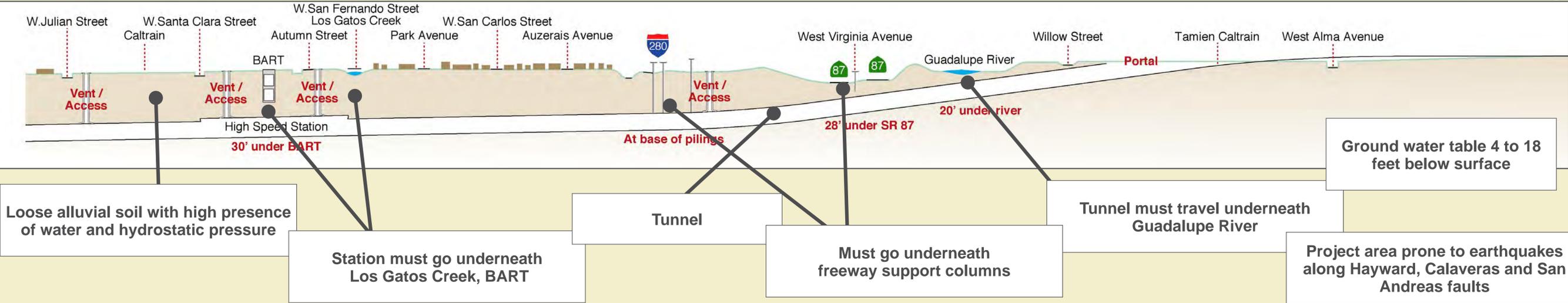


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## Diridon Station to Tamien Station Cross-Section

DRAFT PROFILE VIEW - subject to change





# Project Specific Requirements for Deep Tunnel Alignments

- **Deep tunnel and station**

- Alignment must traverse under I-280 interchange foundations, SR 87, Guadalupe River, Los Gatos Creek, planned BART station
- At station, ~140 ft. depth anticipated

- **Large station**

- ~1,380 ft. long with cross section of 40 ft. high by 70 ft. wide, includes a center platform and two tracks

- **Special track work required**

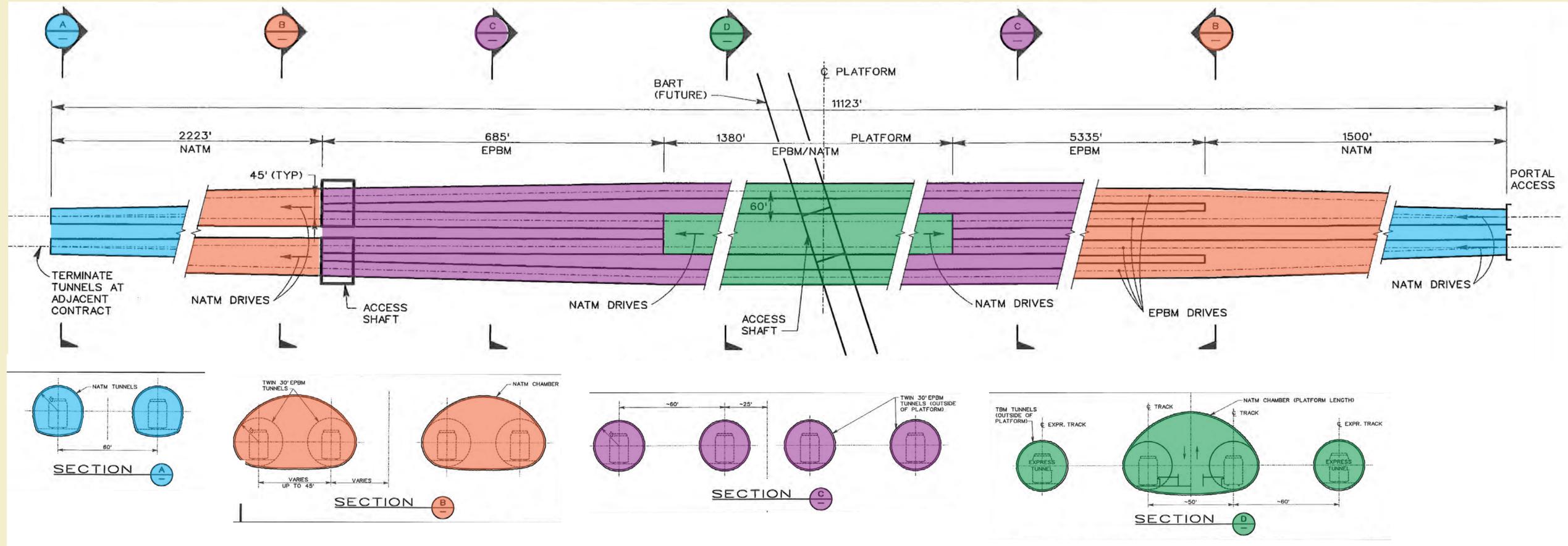
- Multiple track configurations, including 2 bore, 4 bore, non-circular locations for track switching, turnouts and cross-overs

- **Variety of surface-level requirements**

- Ground stabilization injected from the surface along the alignment, as needed prior to and during construction to reduce surface settlement and cave-ins at the station and tunnels
- Vertical access shafts for tunnel entrance, vents, fire-life safety personnel and equipment
- Construction access areas for concrete plants, contractor's "lay down" areas for equipment and excavated materials
- Tunnel construction requires additional areas for assembly of the tunnel boring machine's (TBM) "trailing gear"

- **Cost and schedule must be compatible with Proposition 1A**

## Diridon Station to Tamien Station Track Configuration





# Tunnel Construction Methods

## Investigate and Prepare Soil

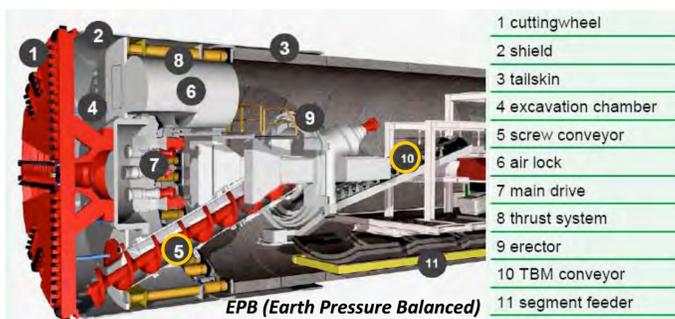


A slurry wall consists of vertical panels constructed end-to-end around the opening shaft perimeter to provide a watertight support system during excavation of the shaft

### Step 1: Site Preparations

- Soil needs to be stabilized to prevent the flow of groundwater, reduce surface settlement and cave-ins during mining
- Soil stabilization measures appropriate for the HST tunnel and station include ground freezing or installing a slurry wall
- Significant surface disruptions will occur for multiple reasons and at multiple locations: All access points and work areas, including tunnel portal, vents, fire-life safety access
- Station construction would require additional ground stabilization improvements

## Tunnel Boring

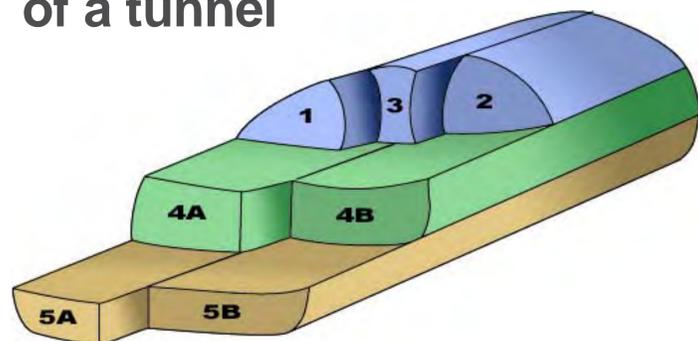


### Step 2: Construction and Excavation for a Tunnel

- Requires use of a Tunnel Boring Machine (TBM), which simultaneously advances and supports construction
- A TBM's trailing support gear (up to 1000' long) would be massive
- TBMs reduce (but do not eliminate) the risk of ground settlement and cave-ins
- TBMs do not work for non-circular openings (such as the track switches and cross-overs required for the HST project)
- TBMs of the size required are custom-made, which adds cost and time to the project

## Station Excavation

Sequential excavation of a tunnel



### Step 3: Construction and Excavation for a Station

- Requires use of the Sequential Excavation Method/New Austrian Tunnel (SEM/NATM) Method
- Capable of constructing non-circular openings, unlike a TBM
- Allows for "real-time" monitoring of soil conditions as construction advances
- High groundwater table poses significant issues, including increased ground instability
- Reduces (but does not eliminate) the risk of cave-ins
- Extremely expensive and custom equipment will increase delivery time





# Project Specific Requirements for Shallow Tunnel / Station Alignment

### Shallow tunnel station

- Shallow tunnel alignment crosses under SR 87, I-280, Los Gatos Creek and Guadalupe River
- Station box is 1,380 ft. long, 90 ft. wide and 80 ft. deep
- Includes a center platform and two tracks
- Similar requirements to deep tunnel alignment between Tamien and I-280

### Track work

- Express tunnels constructed by tunnel boring machine (TBM) methods and will run outside the station

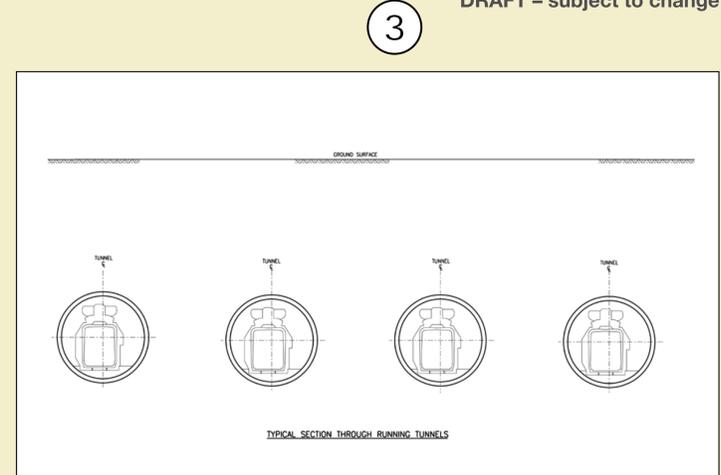
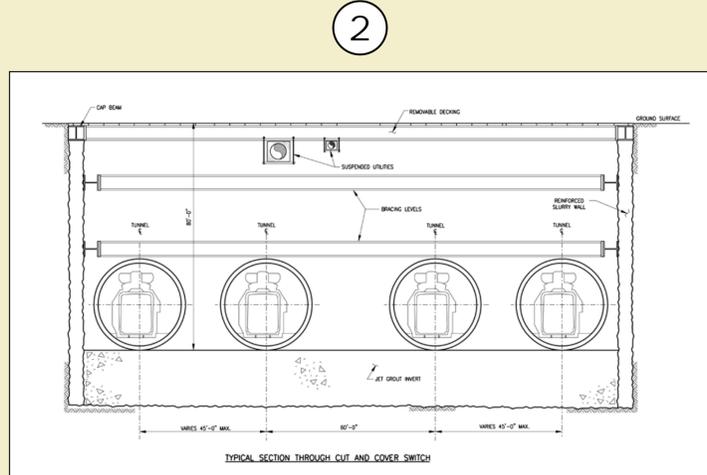
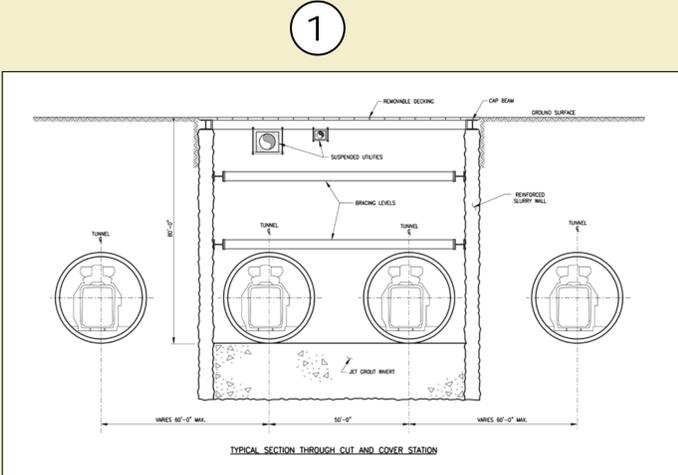
### Cut and Cover requirements

- Extensive site preparations, including utility relocations, and muck removal
- Extensive right-of-way required for full access to the ground/surface along the cut and cover alignment, as well as for areas adjacent to and outside the cut and cover footprint for staging and equipment
- Up to 1-2 acres adjacent to and outside the cut and cover footprint required for staging and equipment
- Support VTA LRT during construction
- Maintain Los Gatos Creek flows during construction

## Diridon Station to Tamien Station Track Configuration



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# Shallow Tunnel / Station Impacts Overview

## IMPACTS TO BART

- The currently proposed San Jose BART station would be constructed using cut and cover methods at a depth of approximately 60' deep
- A shallow HST tunnel/station would necessitate the lowering of the BART station to a depth of 140' underground (effectively requiring BART to address similar challenges identified with a deep HST tunnel/station)
  - A deep BART station would be mined in an area with poor soils and the presence of a high groundwater table
  - Deeper BART tunnels would result in steeper tunnel grades for the trains



L.A. Metro (Wilshire to Vermont)

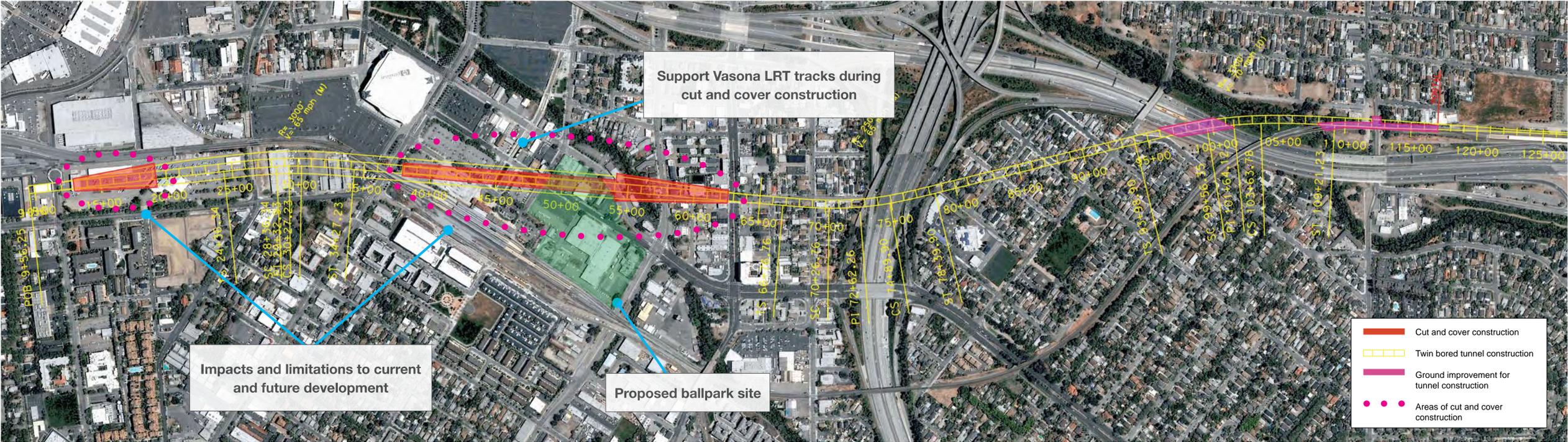
## CONSTRUCTION IMPACTS

- Site preparations, including soil stabilization, utility relocations, dewatering, and muck removal would occur at all portal locations, access points, and where needed for safety
- Construction in a National Register archaeological site
- Los Gatos Creek flows need to be maintained during construction
- Disruption to VTA Vasona light rail line
- Requires reconstruction of both the SR 87 northbound on-ramp and Tamien Station
- Extensive right-of-way required for construction and staging, including possible relocation of large numbers of businesses and residents
- Ground movement, settlement and vibration
- Minimum 7 years to construct, eliminating development options during construction
- Extensive cost (5 times the base case, plus BART tunnel/station lowering costs and construction of a concrete slab above HST facilities for development)





# San Jose Shallow Tunnel Alignment



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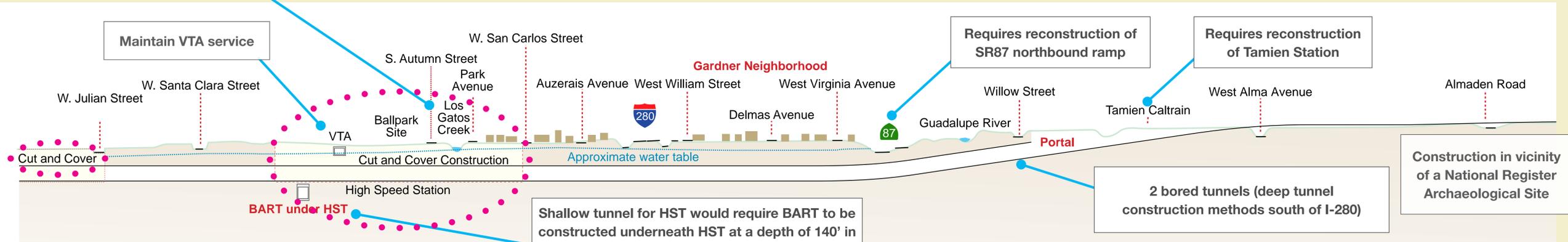
### SURFACE IMPACTS

- Open cut at station and track transitions, ventilation structures and access shafts, ground stabilization, traffic/bus/emergency vehicle detours, additional right-of-way and construction noise and vibration

### IMPACTS TO DEVELOPMENT

- Requires construction of a 5-foot deep concrete slab supported by piles spanning HST facilities for protection of HST (cost approximately \$85 million to \$100 million)

Los Gatos Creek flows must be maintained during cut and cover construction



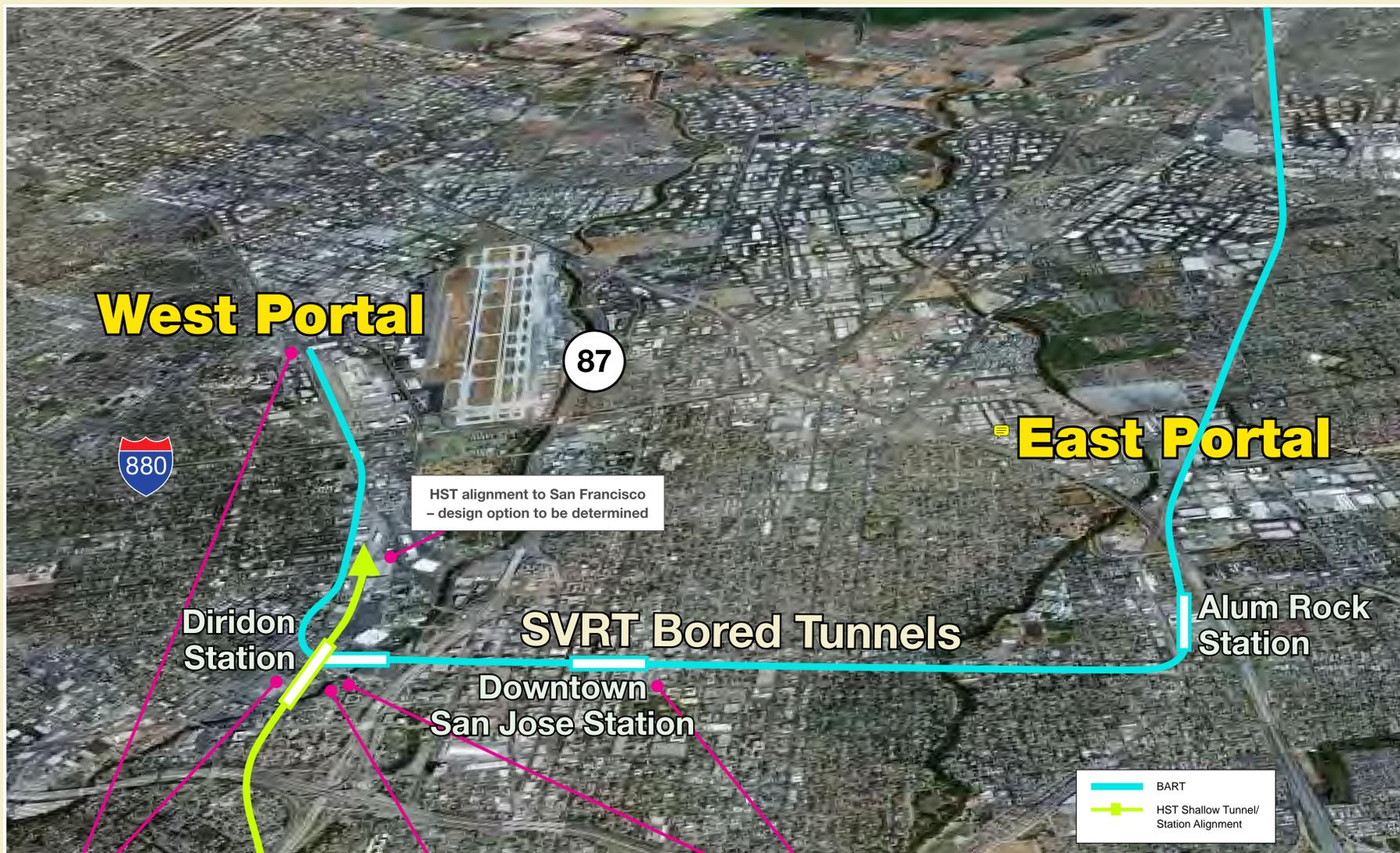
DRAFT PROFILE VIEW – subject to change





# Implications of a Deep BART Tunnel / Station Underneath HST

A shallow HST tunnel alignment would require BART to construct its station and tunnels below the HST shallow tunnel/station at Diridon Station. It is anticipated that a deep BART tunnel and station would face some of the same challenges and risks identified with the downtown deep tunnel alignment for HST, and would likely have higher construction costs and longer construction schedules.



DRAFT - subject to change

BART would experience the same construction impacts and challenges identified for the deep HST station and tunnels, including:

- Excavation of station and tunnels in an area with poor soil and a high water table
- Soil stabilization
- Ground improvements
- Extensive right-of-way
- Vibration
- Ground movement and settlement
- Limited future development in some areas above the tunnel and station

Large vertical grade difference between Diridon Station and BART West Portal

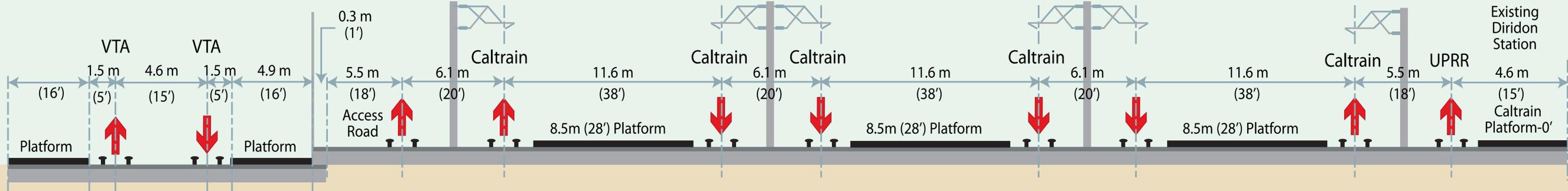
BART would be built underneath HST shallow station, approximately 140-160 ft. below ground

Large vertical grade difference between proposed Downtown Station (1st & Santa Clara) and Diridon Station, a distance of less than 1 mile that requires increasing track grade up to 1.5%

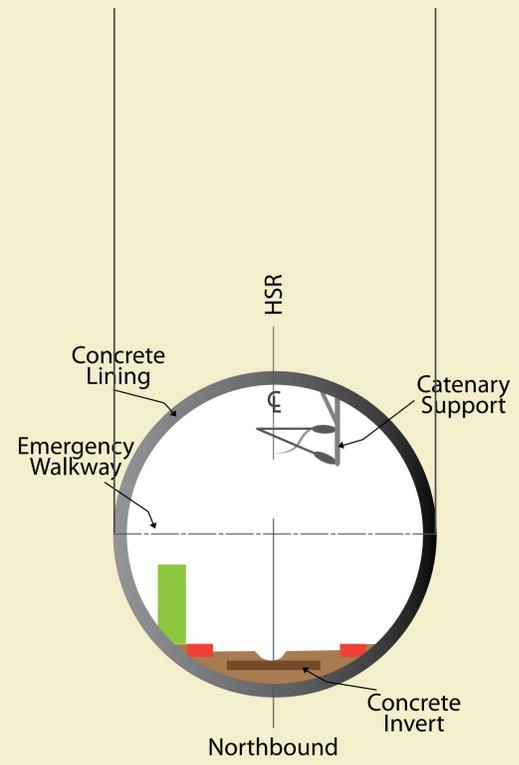
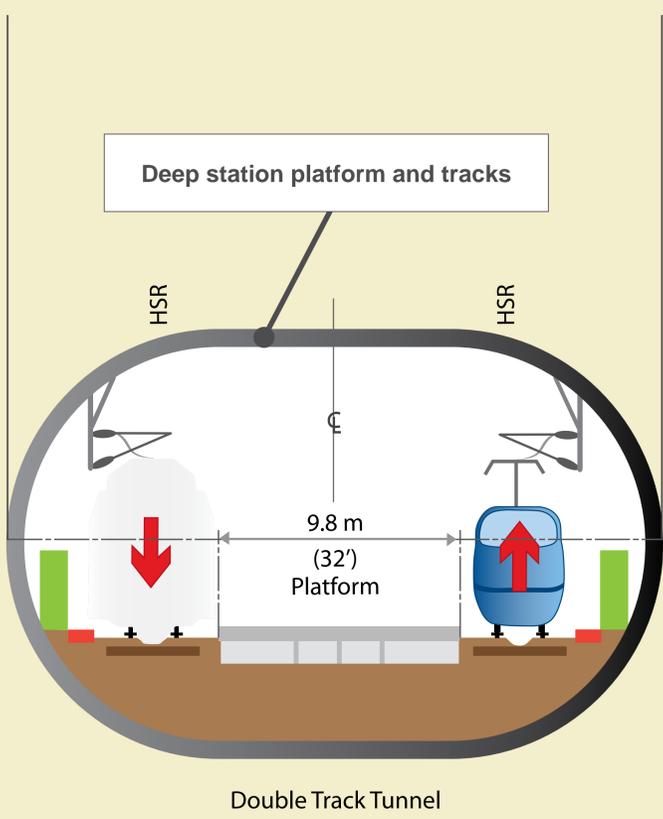
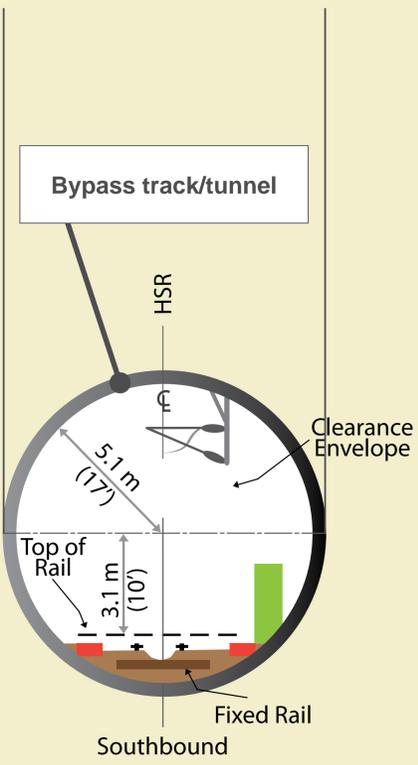




# Station/Tunnel Option "5100 Meter" and "Thread the Needle" Alignments



The high potential of track settlement from the tunneling operation for the "5100 Meter" tunnel and the "Thread the Needle" tunnels puts the train riding public at risk, which is of major concern for these alignments.

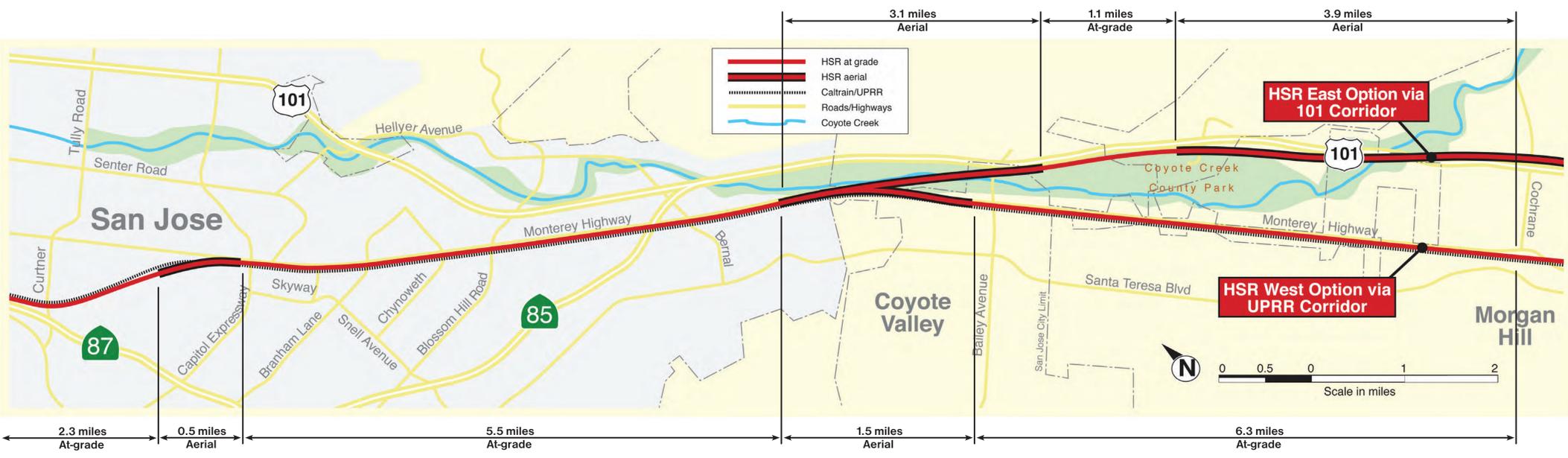
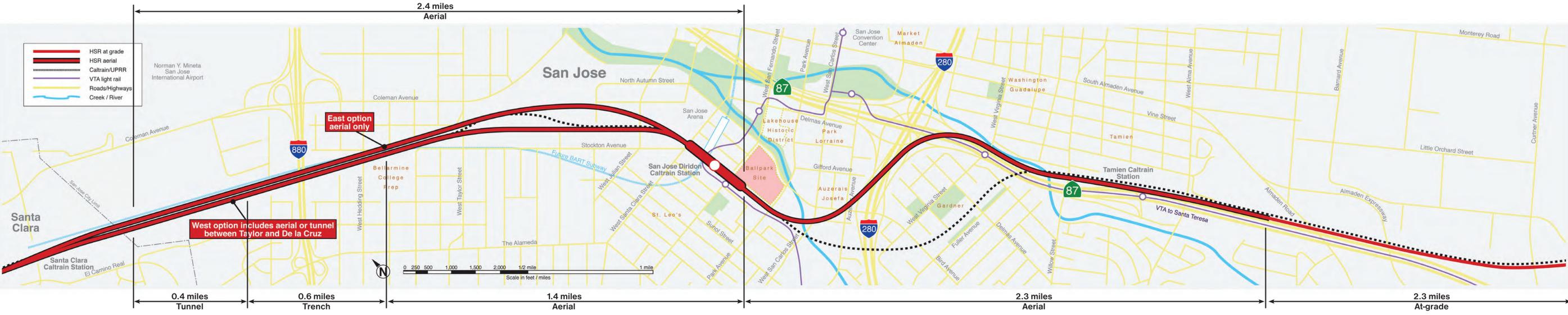


DRAFT CROSS-SECTION – subject to change





# HST Alignment through San Jose





# Risk/Impact Evaluation Matrix for San Jose Tunnel/Station Alternatives

The project team evaluated foreseeable potential risks and impacts associated with the different types of the proposed HST San Jose tunnel/station alternatives

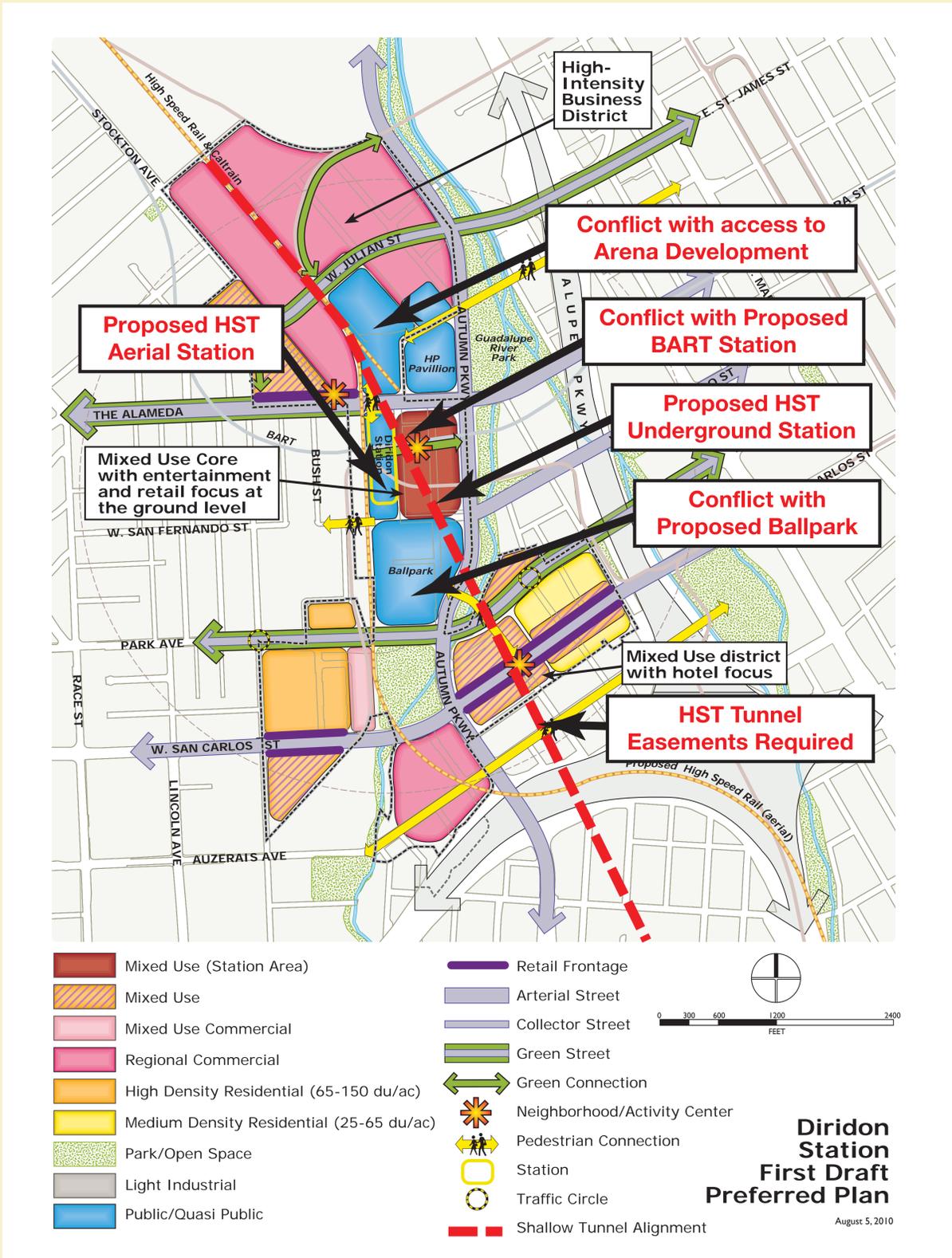
Evaluation Criteria		Aerial Option <sup>1</sup>	Deep Mined Option <sup>2</sup>	Shallow Cut & Cover Option <sup>3</sup>
Cost and Schedule	Operating Costs	L	H	M
	Capital Costs	L	H	M
	Schedule	L	H	M
Constructability	Constructability	L	H	M
	Surface Disruption	M	M	H
	Disruption to Existing Railroads	M	L	H
	Damage to Surface/Near Surface Structure	L	H	M
	Impact to Existing Foundations	L	H	M
	Disruption to and Relocation of Utilities	M	L	H
Geotechnical Constraints	Ground Type	L	H	M
	Settlement	L	M	L
	Flooding/Inrush of Water to the Excavation	L	H	M
	Groundwater	L	H	M
Disruption to Communities	Residential/Business Impact	M	L	H
	Local Traffic Maintenance & Detour Routing	M	L	H
	City Division	M	L	L
Environmental Impacts	Noise/Vibration/Dust	H	L	H
	Visual/Aesthetic Issues	H	L	M
Environmental Resources	Biological Resources	M	L	L
	Cultural/ Archaeological Resources	L	M H	M H
Others	Emergency Response	L	H	M
	Staging	L	L	L
	Future Development	L	M	H
	Right-of-way	M	M	M

Notes: 1. SR-87/I-280 Aerial Alternative and Refined Program Alignment  
 2. Deep Tunnel Option, 5100m Tunnel & Thread the Needle Tunnel  
 3. Shallow Tunnel Option

Risk/Impact Rating Low Medium High



# Location of HST Station and Alignments Relative to Proposed Diridon Station Area Redevelopment

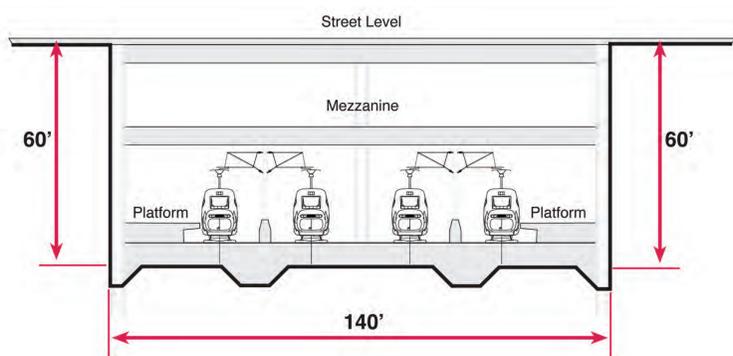




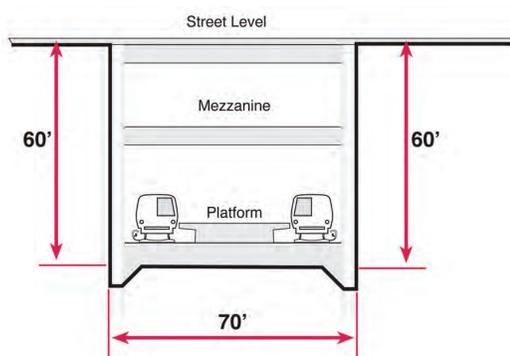
# Volume Comparison of HST Tunnel/Station vs. BART Tunnel/Station

Facility Component	HST (LxWxD)	BART (LxWxD) for same total length as HST	Volume HST Tunnel/Station (Cubic Yards)	Volume BART Tunnel/Station (Cubic Yards)
Tunnels	21,200 linear feet LF x 30 ft Diameter	8,800 linear feet x 15 ft Diameter	554,700	115,200
Station	1,400LF x 140FT x 60FT	900FT x 70FT x 60FT	436,000	140,000
Track Transition Structures	North of HST station box = 600FT x 150FT x 60FT South of HST station box = 800FT x 200FT x 60FT	None Required	555,000	N/A
Tunnel Crossovers, Vent Shafts, Access Shafts	9 each x 40FT x 30FT Diameter.	None required in Diridon Station Area	9,420	N/A
<b>Total Volume</b>			<b>1,555,555</b>	<b>255,000</b>
<b>Ratio of Volumes</b>			<b>6.10</b>	<b>1.00</b>

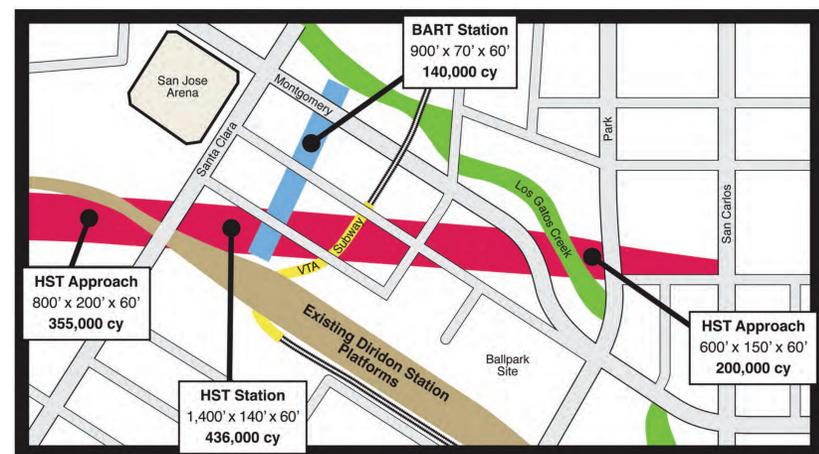
\*Note: This table is for comparison purposes only



HST section



BART section



Excavation footprints in cubic yards (cy)





# Capital Cost Estimate (2009 Dollars Millions)

**TABLE 4 - CAPITAL ESTIMATE (2009 DOLLARS MILLIONS)**

	Construction (\$2009)	Program & Contingency (35%)	Total Capital Cost (\$2009)	Cost Factor
<b>NORTH OF DE LA CRUZ TO DIRIDON</b>				
Aerial	\$151	\$53	\$204	1.00
Tunnel	\$455	\$160	\$615	3.01
<b>SOUTH OF DIRIDON TO TAMIEN</b>				
Program Alignment	\$288	\$103	\$398	1.00
I280/SR87	\$359	\$126	\$485	1.22
Deep Tunnel	\$2,127	\$762	\$2,941	7.39
Shallow Tunnel	\$1,461	\$524	\$2,020	5.08
<b>COMBINED TOTAL CAPITAL COST</b>				
Aerial North and I280/SR87			\$689	1.00
Tunnel North and Shallow Tunnel South	Total does not include additional cost of \$140 addition to BART+ & \$100 HST protection*		\$2,635	3.82

+ Estimated additional costs to construct deeper BART station box

\* To prevent potential damage to the HST station/tunnel from above, a pile supported, 5 foot thick, 200 feet wide, 2,300 feet long, reinforced concrete slab would be constructed above the facility. This would allow flexibility for future development of the Diridon Station Area that has not been yet determined with an assumed building height limit of ten stories.





# How to Participate

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