

Memorandum

TO: HONORABLE MAYOR
AND CITY COUNCIL

FROM: John Ristow

**SUBJECT: DIRIDON INTEGRATED STATION
CONCEPT PLAN – RAIL ALIGNMENT**

DATE: January 17, 2020

Approved

D. D. S. Y. L.

Date

1/17/2020

COUNCIL DISTRICTS: 3 & 6

OUTCOME

Improved understanding of the rail alignment options associated with an expanded and redesigned San José Diridon Station (Diridon Station).

BACKGROUND

When BART, commuter rail, high-speed rail, light rail, and supporting bus services converge, Diridon Station will support more high-capacity transit connections than any other place in the Bay Area. In order to plan for the substantial growth of Diridon Station, the City of San José, the Peninsula Corridor Joint Powers Board (PCJPB), Santa Clara Valley Transportation Authority (VTA), and the California High-Speed Rail Authority (CHSRA) (the “Partner Agencies”) formed a public agency partnership via a Cooperative Agreement in July 2018.

The Partner Agencies have been working together with a consultant team led by Arcadis Design & Consultancy and Benthem Crouwel Architects (“Team ABC”) since September 2018 to develop a spatial vision for a new and expanded station. The Layout Development Report completed by the Partner Agencies and Team ABC is included in the December 3, 2019 agenda packet to the City Council.

After considerable evaluation and interaction with the community, Team ABC and the Partner Agencies developed a fourth spatial layout (the “Concept Layout”) that optimizes transit and passenger needs, while supporting future development potential and balancing city and neighborhood impacts. The project staff of the four Partner Agencies jointly authored a memo in December 2019 that put forward three decisions related to the Concept Layout for consideration by the Mayor and City Council. This included the following:

- **Decision #1: Elevated Station Platforms.** Elevating the tracks and platforms will allow for street-level east/west connections through the station area, knit together neighborhoods on either side of the tracks, and facilitate connections for people walking,

bicycling, and driving.

- **Decision #2: Station Entrances at Santa Clara Street and San Fernando Street.** The Partner Agencies recommend two main concourses with four station entrances. One concourse is oriented toward Santa Clara Street and will be close to BART, light rail, bus, and other connecting modes to allow for quick transfers. The other concourse will be located near San Fernando Street and allow for easy connections to the bike network, creeks, existing neighborhoods, and future office and housing development.
- **Decision #3: Existing Track Approaches into the Future Station.** The Partner Agencies recommend maintaining track approaches that generally stay within the existing northern and southern corridors in order to leverage existing rail infrastructure, minimize overall community impact, and minimize the need to acquire significant land.

Previous Action and Direction

The San José City Council and Caltrain Board of Directors (JPB) accepted the first two staff-recommended decisions in December 2019. The San José City Council deferred weighing in on Decision #3 and scheduled a study session on January 28, 2020 to better understand the possible track approaches into the future station. The VTA Board of Directors received the plan update as an information item on their Consent Agenda, and CHSRA Board of Directors elected to defer making decisions on all three items until after City Council consideration. The study session will specifically assess the different track approaches to the south of the station and the relative benefits and tradeoffs of having trains run in the existing corridor as recommended by the staff of the Partner Agencies or on a viaduct structure over the I-280/SR-87 freeway interchange.

In their November 27 memorandum to City Council, Mayor Liccardo and Councilmembers Davis and Peralez asked staff to further investigate the following items during the January 28 study session:

1. What are the infrastructure requirements for the northern and southern corridor flyovers? What environmental concerns might these generate?
2. What are the property impacts of an I-280/SR-87 viaduct, both north and south of the Diridon Station, including impacts to future transit-oriented housing development?
3. What are the impacts of a viaduct to the Tamien Station, planned transit-oriented development in Tamien, and surrounding amenities like Tamien Park?
4. Is it possible to shift Caltrain, High-Speed Rail, and other heavy rail operators onto a viaduct?
5. From a track design perspective, the Union Pacific Railroad (UPRR) requires that freight tracks not exceed a one percent grade. Can the Partner Agencies request a variance that would support UPRR service on a viaduct? What is UPRR's response?
6. What are the potential visual impacts of the viaduct option?
7. What can the community anticipate in terms of the number of tracks and trains to support the Caltrain Service Vision, and High-Speed Rail service, in the Gardner/Gregory/North

Willow Glen neighborhoods? What potential corridor and track treatments and best practices are being considered for the existing corridor at this time?

8. What are the likely impacts to Fuller Park in the existing corridor scenario? What are the likely property impacts in the Gardner/Gregory/North Willow Glen neighborhoods?
9. What specific commitments can the City and the Diridon Integrated Station Concept Plan (DISC) Partner Agencies make to the surrounding community regarding mitigations of noise, vibration, visual impact, air quality, and safety?

Additionally, during the December 3 City Council meeting, the Mayor and Councilmembers asked for additional information on the following items to be presented in the study session:

1. What is the relative effectiveness of different techniques to mitigate noise and vibration impacts of train travel such as rubber bearings and track slabs?
2. What are the maintenance considerations for each of these techniques?
3. What are the impacts of each alternative track approach on different types of development, whether housing, office, open space, or other?
4. What land is made permanently undevelopable, and what land is undevelopable until reconstruction of the station and related track infrastructure is complete?
5. What are the environmental considerations associated with each track approach, particularly on the Los Gatos Creek, the Guadalupe River, and the trails that line these waterways?
6. What are order-of-magnitude cost differences for each track approach?

This memorandum has been prepared for the January 28, 2020 Study Session to more thoroughly explain Decision #3 and respond to related additional requests for information.

ANALYSIS

To facilitate the decision-making process for the track approaches (Decision #3), the Partner Agencies have prepared detailed information on the following topics. The memorandum is organized as follows:

- A. Potential Long-term Train Volumes & Track Needs (Diridon Station to Tamien Station)
- B. I-280/SR-87 Viaduct Alignment & Options
- C. Existing Southern Corridor Alignment
- D. Noise & Vibration
- E. Property & Development Opportunity Sites
- F. Capital Cost Comparison
- G. Alignment Option Comparison

The memo will present and discuss two distinct alignments for the southern rail corridor, and multiple options within those alignments. These include all trains on a four-track viaduct, two tracks through the existing alignment and two tracks on a viaduct, and a four-track option

through the existing alignment. Although there will be additional analysis in future phases of work to determine whether three or four tracks would be necessary if the existing corridor was used, this analysis compares a four-track option because the impacts of a three-track option would only reduce the critical impacts evaluated here.

The design decisions made at the station influence the track approaches into and out of the station and vice versa. Depending on the choice of heavy rail corridor alignment, the impacts could span as far north as the Caltrain Centralized Equipment Maintenance and Operations Facility (CEMOF) and as far south as Communications Hill, shown in Figure 1.

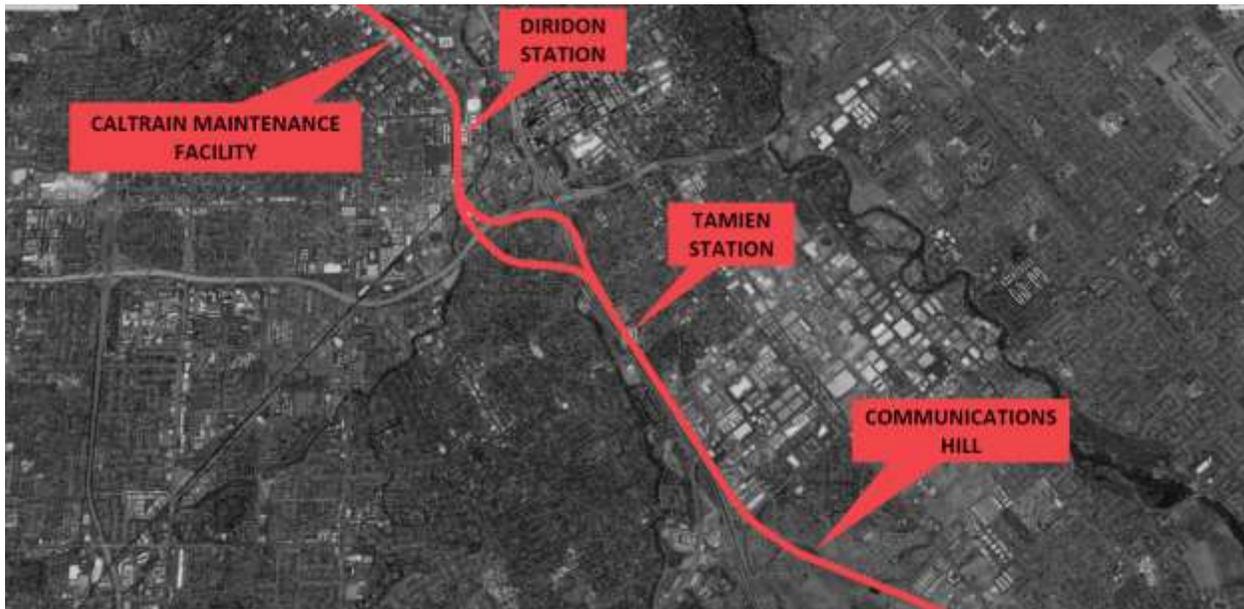


Figure 1 – Approximate Project Study Boundaries

A. Long-Term Train Volumes and Track Needs

Currently, five passenger and freight rail operators utilize the corridor within the above-mentioned scope boundaries. These operators are Caltrain, the Altamont Corridor Express (ACE), Capitol Corridor (CC), Amtrak, and Union Pacific Railroad (UPRR). In the future, the California High-Speed Rail Authority (CHSRA) is expected to begin service on the corridor, for a total of six anticipated operators.

Caltrain owns and manages the overall rail corridor running through Diridon Station and south to Tamien Station. However, UPRR owns a single track (Main Track 1) within this larger corridor. South of Tamien Station, the UPRR owns and manages the entire corridor. Various “trackage rights” agreements govern the use of the corridor and its tracks by individual operators. These agreements specify the rights of individual rail operators to operate different levels of service. They also detail the responsibility of the infrastructure owner (either Caltrain or UPRR) to dispatch and maintain the railroad for collective use.

Today, on a typical weekday, approximately 52 trains travel between Diridon and Tamien Stations (the daily number of freight trains varies). Train volumes south of Diridon today are shown in Table 1. They are significantly lower than potential future volumes for two reasons. First, CHSRA trains are not yet operating between Gilroy and San José and Caltrain’s current service volumes in the same corridor are limited by the existing infrastructure, funding availability and current, restrictive, trackage agreements with UPRR.

Second, Diridon Station is not currently a “through running” station – meaning that most trains using the station (including the majority of Caltrain trains and all CC trains) “turn” in the station (trains come into the station from the north, stop at Diridon Station and then return back northward.) Today, UPRR freight trains, Amtrak, ACE and a subset of Caltrain trains run “through” Diridon to Tamien and points further south before “turning” and heading north – these trains make up the 52 cited in Table 1. Turning trains at the station takes up space that could otherwise be utilized by through-running trains operating from Gilroy to San Francisco, which allows for increased service capacity south of Diridon Station. In addition, this increased capacity at Diridon Station can be accomplished without significantly increasing the overall footprint of the station and tracks.

Table 1 – Typical Train Volumes Today (2020)

Operator	Typical Weekday Train Volume
Caltrain	34
ACE	8
Capitol Corridor	0
Union Pacific	Up to 8
Amtrak	2
Total	Up to 52

Future Service Levels

Caltrain, CHSRA, ACE and CC have all adopted operator-specific, long range business plans or vision documents that describe their individual aspirations to grow rail service over the medium and long-term (some at a 50+ year horizon). When summed together, the individual long-range plans of each operator result in the daily train volumes shown in Table 2.

In the period after 2040, the collective train volumes contemplated by each operator could result in daily train volumes on the portion of corridor between Diridon and Tamien stations of up to 480 passenger trains per day (UPRR currently runs up to 8 trains daily; future growth or decline is unknown and not reflected in future totals). Caltrain’s adopted service vision aims to achieve robust service through and to south San José, with a goal of up to 268 trains per day. The ACE Forward Plan has a defined goal of up to 20 daily trains and CC’s Vision Plan specifies a goal of up to 30 daily trains. UPRR freight service has been variable in recent years and the long term trend is unclear. It is expected that Amtrak will maintain current service levels of two trains per

day. Finally, per CHSRA’s 2018 Business Plan, CHSRA expects to run up to 160 trains each day at full buildout of the statewide system.

These potential future train volumes should be caveated:

1. First, plans have been developed individually and independently by each operator and have not yet been fully harmonized with each other. The 2018 State Rail Plan began this process of harmonization and further coordination of individual operator plans will occur over the coming year and ultimately through the development of the next State Rail Plan.
2. Similarly, the plans from which these potential train volumes are derived are aspirational, and their achievement is contingent on major, multi-decades-long investments in rail infrastructure around the region and the state. Their implementation will be incremental and will occur gradually over many years.

As suggested above, rail service on the corridor will increase gradually, rather than all at once. For illustrative purposes, the Partner Agencies have also estimated the potential interim service levels for a 2030 horizon year, also listed in Table 2.

Table 2 – Estimated Interim (2030) and Long-Range Train Volumes

Operator	Example Interim Train Volume (2030)	Long-Range Service Goal (2040+)
Caltrain	116 to 166	268 (Adopted Service Vision)
ACE	20	20 (ACE Forward, non-electric service)
Capitol Corridor	30	30 (CC Vision Plan, non-electric service)
Union Pacific	Unknown	Unknown
Amtrak	2	2
High-Speed Rail	44	160 (2018 Business Plan)
Total	212 to 262	480*

**Note: UPRR currently runs up to 8 trains daily; future growth or decline is unknown and not reflected in future totals.*

Infrastructure Needs

The Partner Agencies have determined that no more than four tracks would be necessary and feasible along the existing southern corridor adjacent to the Gregory, Gardner, and North Willow Glen neighborhoods. Of these four tracks, there is a need for both electrified and non-electrified (diesel) tracks. For Caltrain and CHSRA to operate at both their interim and long-range service levels, two electrified tracks would be required. Determining whether diesel operators (ACE, CC, Amtrak, and UPRR) would require one or two non-electrified tracks depends on the following factors:

1. Further refinement of both the overall number of future trains planned as well as the details of schedules and service patterns;

2. The details of ongoing and future negotiations with the UPRR regarding the extent to which diesel passenger and freight services may share tracks; and
3. The long-term potential for ACE or CC to electrify their service or adopt performance-equivalent rolling stock that might allow them to utilize the electrified tracks.

The potential future train volumes suggest that the corridor will look and feel significantly different from today; as such, the corridor will need to be redeveloped to ensure that community concerns and issues are appropriately addressed and ensure that conditions for residents are as good as or better than today. Through the Concept Plan, the Partner Agencies aim to grade separate the existing at-grade crossings in the corridor through these neighborhoods with various treatments to comprehensively address noise, vibration, and visual concerns. This responds to both the projected train volumes and the potential need for four tracks in the segment of the corridor between Diridon and Tamien stations.

B. I-280/SR-87 Viaduct Alignment & Options

In public meetings relating to the Concept Plan, community members and elected officials expressed interest in re-routing some or all train traffic onto a new, estimated three-mile long viaduct structure that would follow Interstate 280 (I-280) and State Route 87 (SR-87). The intent of this proposal is to divert train traffic away from the existing corridor and to reduce or eliminate the negative impacts of this train traffic on the Gregory, Gardner, and North Willow Glen neighborhoods—the neighborhoods along the current rail alignment.

The Partner Agencies analyzed the potential for a viaduct, considering the best possible alignment for this phase of the project and the necessary infrastructure to support it. This includes a viaduct that is operationally viable as well as compatible within the community. The analysis focused on the following topics:

1. The viaduct alignment south out of the station;
2. The need and placement for a flyover, which facilitates a separation between electrified and non-electrified (diesel) tracks necessary for electrified service to run along the viaduct; and
3. The feasibility of accommodating additional or all trains on the viaduct and the resulting impact on the infrastructure and service.

Viaduct Alignment

In recent years, both the City and CHSRA have developed options for a potential viaduct along the southern rail corridor. CHSRA spent close to a decade evaluating a viaduct option that fully avoided the Gardner community, which is shown in blue on Figure 2. In 2018, the City conceptually developed an additional viaduct option that aimed to minimize property impacts south of the station. This option, shown in green on Figure 2, is the southern-most viaduct alignment. The Partner Agencies asked Team ABC to analyze the operational effects of these

two alignments and to devise a viaduct option that achieves acceptable train speeds and reliability while minimizing impacts to existing properties and future transit-oriented development. The Concept Layout attaches the viaduct to an elevated, redeveloped station, a distinct difference from the CHSRA work. The result is an optimized alignment that is located between the other proposed alignments, shown in pink on Figure 2.

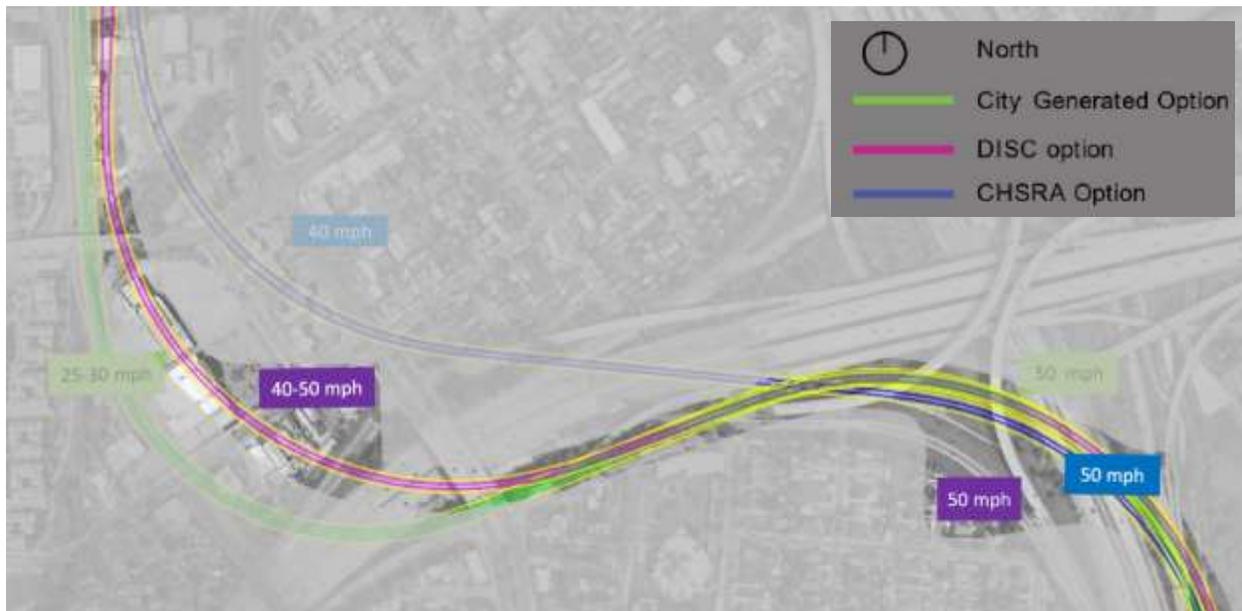


Figure 2 – Partner Agencies’ Optimized Viaduct Alignment

Explore All Trains on Viaducts

The Partner Agencies also received a request from both the Diridon Station Joint Policy Advisory Board (JPAB) and the City Council to investigate the possibility of routing all trains (diesel and electrified) on the I-280 viaduct in an effort to altogether remove the tracks within the existing southern rail corridor and thereby eliminate the negative impacts of the rail corridor on surrounding neighborhoods. The Partner Agencies and Team ABC analyzed the feasibility of this arrangement with the Concept Layout design and to Tamien Station.

To accommodate all trains – both electrified and diesel – would require four tracks on two distinct viaducts structures (two tracks on each viaduct). Two viaducts would be necessary because constructing a single viaduct large enough to accommodate all train traffic would require much larger footings that would be difficult to engineer and place. The viaducts are substantial pieces of infrastructure, approximately 45 to 50 feet wide each and built roughly 40 to 50 feet above ground. The doubling of the viaduct footprint to accommodate all trains would result in increased property, environmental, and visual impacts, as well as increased maintenance needs as compared to a single two-track viaduct. In addition, the engineers working for the

Partner Agencies are concerned about the feasibility of a dual viaduct construction since given the difficulty in placing proper footings around I-280, SR-87, and the Guadalupe River.



Figure 3 – Four-Track Viaduct Rendering

Viaduct Grade Challenges for Union Pacific Railroad

Placing all trains on the I-280 viaduct would require the freight tracks to exceed UPRR's one percent grade design standard. UPRR will not use new infrastructure that is designed with more than a one percent grade due to the limitations that steeper grades would place on freight operations when hauling large loads. Moving UPRR service off of the existing rail corridor (where they own Main Track 1 north of Tamien Station and own and maintain the entire corridor south of Tamien Station) and onto a viaduct would require their concurrence, which is unlikely to be received if their design standards are not followed. Design compensation for the horizontal curve would result in a grade equivalent to 1.4 or 1.5 percent. The limited distance within the critical section of the alignment – between the Warm Springs rail corridor and the I-280/SR-87 interchange – is insufficient to accommodate a grade change of one percent or less.

The Partner Agencies reached out to representatives with the UPRR regarding the idea of all trains being routed on a rail viaduct. The UPRR response primarily focused on the following concerns:

1. Overall effect on the UPRR operations.
2. Design standards, which affect rail operations, safety and have cost considerations.
3. Commercial implications to the UPRR's overall operation in California and nationally.
4. Real estate agreements and considerations including trackage rights and property arrangements given that the UPRR owns Main Track 1 on the existing corridor.

The UPRR would require extensive analysis on these topics. This analysis would likely yield outcomes that conflict with UPRR standards. This could cause the UPRR to not agree to the proposal or only agree to it with substantial design, schedule, or financial considerations that may be at odds with the delivery of the overall Diridon Station program.

Again, for this arrangement to be feasible, UPRR would need to make an exception to their one percent grade design standard. This would pose enormous risks to the design, approval, and implementation of the entire rail program, and would be dependent on the concurrence of a third-party with little incentive to cooperate with the Partner Agencies.

Conclusion: *Given all these concerns and considerations, the Partner Agencies have concluded that placing all trains on the I-280 viaduct is a fatally flawed design option. Other potential alignment options are discussed in the following sections.*

All Passenger Trains on Viaducts

Placing all passenger trains – both electrified and diesel, including Caltrain, CHSRA, ACE, CC, and Amtrak – on a new viaduct would also require the construction of a total of four tracks on two distinct viaduct structures (two tracks on each viaduct), even with UPRR remaining on the existing corridor. This would provide two tracks for the electrified services and up to two tracks for the diesel passenger rail. This is because it is most practical to construct the full width needed for future service levels at once. This option would also require a flyover north of Diridon Station and could require adjustments to the platform configuration at the station. It also could mean that there would be little to no mitigation within the existing corridor for the remaining freight train impacts, with all future growth and investment dedicated to the viaduct structures.

Given the potential impacts associated with the viaduct structure and the fact that freight trains would continue service on the existing southern corridor, the Partner Agencies have not further investigated this option.

Electrified Trains Only on a Viaduct Require a “Flyover”

For the southern rail corridor to utilize an I-280 viaduct, a “flyover” either directly north or south of Diridon Station would be required. The purpose of a flyover is to ensure the reliability, capacity, and efficiency of rail operations by removing at grade conflicts between trains needing to cross from one side of tracks to the other. Electrified trains would need to cross diesel services to get to the east side of the station to utilize the viaduct.

Between W. Santa Clara St. and the area just south of Tamien Station, the track organization for the Concept Layout includes an electrified corridor on the west side and a non-electrified corridor on the east side. This is because most diesel service comes from the east and continues to the east, with only the low-volume Vasona Branch on the west. Electrified and non-electrified service cannot operate on the same tracks because of the high volume of electrified services, creating a need for separate tracks for diesel freight and electrified service. The volume of trains

on each corridor will be such that crossing the corridors at grade would significantly disrupt operations for all services. As such, a flyover would be required if the corridors must switch sides (as would be the case if an I-280 viaduct was used).

Southern Flyover

A flyover south of Diridon Station could accommodate all or most electrified service, as electrified trains can travel at much steeper grades than diesel trains. This arrangement is illustrated on Figure 4. From the elevated tracks (approximately 25-30 feet) at the station, the electrified tracks would ascend to approximately 60-70 feet, whereas the non-electrified tracks must descend to grade. The non-electrified tracks must descend quickly to return back to grade by the start of the Vasona Branch in the southwest.



Figure 4 – Longitudinal Section of Southern Flyover

The southern flyover creates a “wall” of infrastructure that presents both functional and visual barriers to east-west connectivity – impeding a key objective of the Concept Plan, which is to better connect neighborhoods on both sides of the tracks. This concerns W. San Carlos St. and Auzerais Ave.; Park Ave. is also affected but is already an underpass currently. W. San Carlos St. and Auzerais Ave. would need to be reconstructed below grade via an underpass and/or roadway tunnel. These roadway tunnels would span an approximate distance of 1,000 feet, roughly located between McEvoy St. west of Diridon Station and S. Montgomery St. toward Downtown. These roadway tunnels would need to clear not only the rail corridor, but also Los Gatos Creek. Figure 5 illustrates an underpass/roadway tunnel cross section at W. San Carlos St.



Figure 5 – Rendering of a Roadway Tunnel at W San Carlos St.

In evaluating the option of a southern flyover, the Partner Agencies have identified and analyzed the following challenges and tradeoffs:

1. Added roadway underpass and/or roadway tunnel infrastructure given the intersection of rail, streets, trails, and the creek, which creates a “spaghetti-like” web of infrastructure;
2. Degraded access and connectivity for motorized and non-motorized travel between and to neighborhoods in the east and west (i.e., driveway access, street parking, etc.);
3. Compromised urban conditions due to a roadway tunnel and/or underpass (i.e., poor lighting, poor lines of sight, as illustrated in Figure 6);
4. Ongoing burden of maintaining the proposed roadway tunnels, including from flooding;
5. Difficulty in obtaining environmental clearance and necessary permits.



Figure 6 – Posey Street Tube, Oakland to Alameda

Additionally, the southern flyover is physically incompatible with the specified concourse locations in the Concept Layout design. To accommodate the southern flyover, the station would need to be shifted north, which would result in significant property impacts, including SAP Center parking lots A, B, and C and land for transit-oriented development north of W. Santa Clara St.

Conclusion: *Considering these factors, the Partner Agencies eliminated the option of a southern flyover from further consideration, as presented to the San José City Council on December 3, 2019.*

Northern Flyover

A flyover north of Diridon Station would be compatible with the Concept Layout design with a very slight shift of the station to the south to allow for the rail flyover north of the station. For a northern flyover, the Caltrain and CHSRA trains would be placed on the flyover, which would be elevated to approximately 60 to 70 feet. This arrangement would allow the electrified tracks to move from the eastern most platforms at the station to the western most tracks north of the station. This northern flyover option has been included in all further analysis of an I-280 viaduct.

Other Considerations in Assessing the Two-Track Viaduct

To fully assess a two-track viaduct for electrified trains, the Partner Agencies explored:

1. The trail system and natural resources;
2. The Tamien Station area;
3. Construction and Maintenance; and
4. New visual impacts.

Trail System and Natural Resources

While the Partner Agencies have not completed extensive work to examine the full breadth of impact the I-280 viaduct would have to the local trail network, the presence of a viaduct would degrade the vitality of the trail system.

The I-280 viaduct would need to cross the Los Gatos Creek Trail and then generally follow the Guadalupe River and trail with footings adjacent to the trail and within the riparian corridor. This enables the viaduct to utilize the space available between the existing tracks and SR-87. The Partner Agencies anticipate that the viaduct structure and footings would cross the planned Three Creeks Trail (also known as the Willow Glen Spur Trail).

Based on the proposed location of the viaduct and associated footings, the Partner Agencies have serious concerns about the likely impacts of building a viaduct structure on the Guadalupe River Trail and on the riparian habitat where the viaduct would cross the Guadalupe River. The viaduct

structure and footings may reduce the width of the Guadalupe River Trail and introduce barriers to visibility and monitoring. The viaduct may also affect design work now underway to extend the Los Gatos Creek Trail from Auzerais to Bird Avenue. Given these likely impacts, the Partner Agencies believe that the environmental review process for approving the viaduct structure would almost certainly be protracted and risky. Ultimately, a host of resource agencies, including federal agencies like the U.S. Army Corps of Engineers and the Department of Fish and Wildlife, and State agencies like California Fish and Game, would need to concur with the proposed design. These agencies may not agree to the placement of the infrastructure and/or proposed design. There is particular concern about environmental impacts during construction, given ample space would be needed during this period.

Tamien Station Area

The construction of an I-280 viaduct would also have implications for Tamien Station and the surrounding neighborhoods. Currently, there are two tracks for Caltrain and one non-electrified track for diesel trains at Tamien Station. To accommodate a Caltrain stop (CHSRA is not planning to stop) at Tamien Station with an I-280 alignment, the electrified tracks and platforms at the station must be elevated. In this scenario, shown in Figure 7, the future platforms would be located directly above the existing platforms. Diesel trains, which also do not stop at the station, would continue to utilize the tracks at the existing grade level at Tamien Station. The Partner Agencies expect that the viaduct would extend south from Tamien Station for approximately 1.75 miles and come back to grade near Communications Hill.

East of the pick-up and drop-off area next to Tamien Station, VTA has an approved TOD project slated to begin construction next year and will be in place well before the start of any potential viaduct construction in this area. The viaduct structure is expected to be approximately the same height as the TOD development. To accommodate the viaduct in this area, a very large straddle bent structure would be necessary to support the viaduct given the width of the SR-87, the freeway on-ramp, and the existing rail. Although this structure has not been designed as part of the Concept Plan, the Partner Agencies believe that the construction period for such a structure would be very significant. Additional implications of this structure could likely include adverse effects on the TOD site, including impacts to circulation, code compliance, and habitability, as well as along the edge of Tamien Park.

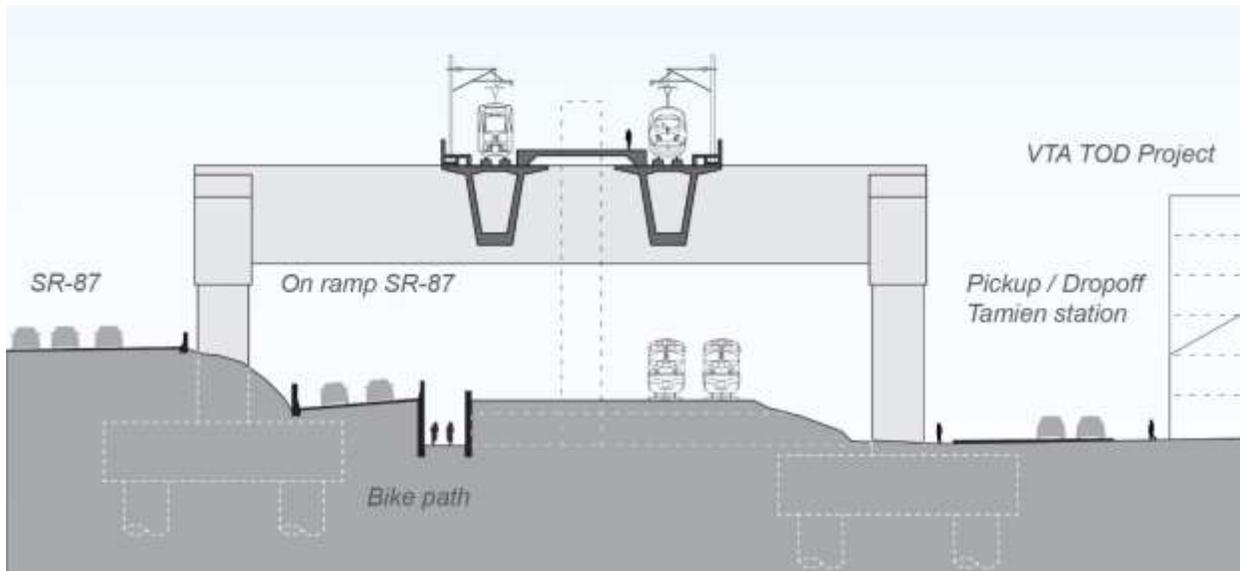


Figure 7 – Cross-section of I-280 Viaduct at Tamien Station

Construction and Maintenance

A key element to consider is how a new viaduct could be constructed. There are significant concerns on how the construction of a new viaduct could impact community. It is likely that the construction duration would be multi-year and construction methods to install new footings and large structures would be complex. Considerations construction impacts are:

1. Staging areas for construction equipment in sensitive areas or within communities
2. Impacts to riparian corridor during construction including potential closure of trails
3. Impacts to SR-87 and to existing rail corridor operations to construct the needed straddle bents for Tamien Station
4. Construction related impacts throughout communities due to noise, dust, traffic, etc.

While maintenance needs for an I-280 viaduct would not be determined until subsequent phases of the project, the Partner Agencies have identified the following considerations and challenges associated with maintaining the structure:

1. A viaduct results in overall increased mileage (approximately 3 miles) of track to maintain.
2. Accessing elevated tracks for maintenance purposes is more difficult than accessing tracks at grade, as there would be limited points of access to the viaduct structure.
3. The viaduct adds more infrastructure (e.g., footings, straddle bent, etc.) to maintain across a substantial distance.
4. The overall cost of maintaining a structure is anticipated to be higher than an at grade corridor due to height, span, and length.

New Visual Impacts

The viaduct would introduce new, permanent visual impacts to the surrounding communities, including the Washington-Guadalupe, Tamien, and Alma-Almaden neighborhoods. Figure 8 illustrates a potential new view of the I-280 viaduct along the Guadalupe River Trail. Additionally, there would likely be visual impacts in several locations adjacent to the rail corridor, including:

1. north of Diridon Station with the addition of a flyover structure, resulting in two levels of elevated tracks.
2. Between Diridon Station and I-280 (Vasona Branch, the existing corridor, and I-280 viaduct) with the construction of three elevated structures.
3. From I-280 to Communications Hill with infrastructure located at an elevation of approximately 40 to 50 feet above grade. More specifically, along the Guadalupe River, at Tamien Station, and the residential area at Communications Hill.



Figure 8 – Possible new view of I-280 Viaduct on Guadalupe River Trail Looking South

Summary of an I-280/SR-87 Viaduct

Although the Partner Agencies assessments of the potential impacts of an I-280 viaduct are preliminary, they have identified the following challenges and tradeoffs that would likely result from the construction of such significant infrastructure:

1. Disrupts the trail system, natural environment, and the riparian corridor.

2. Construction of significant new rail infrastructure within the Tamien Station area, including potential effects on both Tamien Park and on the circulation of VTA's TOD project.
3. Poses environmental clearance, permitting, and constructability challenges, and also would result in increased maintenance needs.
4. Creates permanent visual impacts to multiple neighborhoods, including Washington-Guadalupe, Tamien, and Alma-Almaden.

C. Existing Southern Corridor Alignment

The Partner Agencies have worked to investigate and optimize the existing southern corridor to carry planned additional future levels of service. The goal is to leverage and modernize an existing rail asset in a manner compatible with the surrounding community and with a clear intent to not worsen, and ideally improve, the rail corridor and its interface with the neighborhood.

The Partner Agencies desire to fully grade separate crossings along the rail corridor. Grade separation improves safety, circulation, and eliminates regular train horn noise. With an elevated station and tracks, this goal can be more easily accomplished. In the Concept Layout design, the elevated tracks at the station would descend to be at grade south of West Virginia St., near Bird Ave. Elevating the tracks allows for grade separations between the rail and other traffic while also improving east-west connectivity. The Partner Agencies believe this grade separation is important given the anticipated increase in rail service in this corridor.

The Partner Agencies have determined that no more than four tracks would be necessary and feasible along the southern corridor, through the Gregory, Gardner, and North Willow Glen neighborhoods. Of these four tracks, there is a need for both electrified and non-electrified (diesel) tracks. The previous section on train volumes articulated the various complexities related to the number of tracks needed to support future rail service. For purposes of analysis, the Partner Agencies have focused on a four-track option, which would require an approximate 80-foot wide corridor.

Fuller Park

The Partner Agencies have also evaluated the effects of the expanded rail corridor on Fuller Park. Currently, the northernmost portion of Fuller Park is located in the rail corridor and owned by Caltrain. The City owns and maintains the other portions of the park. The Partner Agencies estimate that much of the park space currently located on rail property would be impacted, while impacts to the City-owned property would be avoided. Most of the loss would likely be behind the current tree line, rather than the widely used portion of the park. Figure 9 is an artist concept of how Fuller Park could look with the addition of a new green wall. Caltrain and the City are committed to working together and with the community to plan for a vibrant Fuller Park.



Figure 9 – Artist concept of Fuller Park with new green wall

D. Noise and Vibration

The Partner Agencies aim to maintain the quality of life in the neighborhoods near the rail corridor. Specifically, the Partner Agencies will work to develop a design that results in noise, vibration, and visual conditions that are no worse and ideally better than today, even with higher future train volumes. As conditions change and growth occurs, it is reasonable to expect that the physical environment will change with respect to noise, vibration, and visual aesthetics. The Partner Agencies recognize the expected increase in train volumes through the southern corridor concerns the surrounding community. In response to the City Council’s request, the Partner Agencies have provided more information around these areas for consideration.

It is important to clarify the difference between a “project feature” and a “mitigation measure.” A project feature is a design element or component that is solidified as part of the fundamental design of a project. This becomes part of the project’s official description that is subject to environmental review. A “mitigation measure” is defined both by the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA) guidance as an action to be taken to reduce or avoid a significant impact resulting from a proposed project. Mitigation cannot be proposed or required where there is not impact or less than significant impact.¹ While there is a regulatory environment that guides how transit projects assess and evaluate potential environmental impacts, communities and cities can decide to pursue additional mitigation beyond what is required by legal guidance. These types of measures, sometimes called

¹ Source: *Title 14. California Code of Regulations*, Chapter 3. Guidelines for Implementation of the California Environmental Quality Act, Article 9. Contents of Environmental Impact Reports, 15126.4 Consideration and Discussion of Mitigation Measures Proposed to Minimize Significant Effects

betterments, can be determined through a planning process with communities and factor in multiple areas of focus to address how best to fit new or expanded projects into existing communities. During the environmental review process, the project sponsor would ensure open and transparent dialogue with the community. Often community outreach can help inform and shape project features, betterments or mitigation measures.

The following sections articulate the process, regulation, methodology for the assessment of noise and vibration levels for a rail project, as well as related project experiences.

What generates rail noise or vibration?

Train traffic produces both noise, which is the sound that can be heard, and vibration, which is what can be felt. To begin, noise and vibration results from several factors for rail projects:

1. Noise:
 - a. Generated by the wheels on the tracks, as vehicles travel at different speeds, the condition of the railway track structure, the horns, and some railway equipment such as at-grade crossing bells.
 - b. People are typically more sensitive to intermittent noise than background, constant noise.
 - c. Different types of land use are more or less sensitive to noise such as a residential neighborhood versus a commercial office building.
 - d. The time of day that people are sensitive to noise varies. For example, people in residential areas are more sensitive to noise during overnight hours.

2. Vibration:
 - a. Generated by the weight and type of train as it travels across the tracks.
 - b. Minimized or exacerbated by ground soil conditions, which are very important to how vibration transmits through the ground.

How are noise and vibration assessed for rail projects?

The analysis of impacts resulting from a rail project is completed during the environmental review process. For federally funded projects, this will fall under the guidance of NEPA and in California, CEQA. Often, environmental documents accommodate the requirements of both NEPA and CEQA since federal and state funds and approvals are needed for large transportation projects.

Generally, the following must fall into place to initiate environmental review:

1. A project sponsor has been identified.
2. A project definition is complete.
3. Funding is in place to prepare the environmental analysis and preliminary engineering.

Specific guidance and criteria for both NEPA and CEQA guide how agencies are to conduct the assessment of impact resulting from new or expansion of rail projects. These are:

1. Federal Transit Administration (FTA) *Transit Noise and Vibration Impact Assessment*;
2. Federal Railroad Administration (FRA) *High-speed ground transportation noise and vibration impact assessment manual*; and
3. CEQA guidelines.

Transit noise and vibration assessments will typically include:

1. Assessment of the ambient noise setting that the project will travel through:
 - a. This is to determine the existing noise or vibration conditions
 - b. Completed by conducting field measurements
 - Analysts take measurements for a full day period, as well as specific hourly measurements.
2. Using field measurements, calculate the forecasted new noise or vibration impacts.
 - a. This is done using the FTA, FRA, and State guidelines.
 - b. This determines the severity of the impact: low, moderate, or severe.
3. Assessment and recommendation of the mitigation measures that could be included in a project to reduce the forecasted impact.

Related Projects

In December 2014, Caltrain published a Final Environmental Impact Report (EIR) for the proposed modernization of service between San José and San Francisco which included the electrification of the line and replacement of diesel locomotives with EMU (electric multiple unit) trains. The proposed project, known as the Peninsula Corridor Electrification Project (PCEP), would replace 75 percent of the fleet (the remaining conversion would occur over time and pending funding). The project includes installing the required overhead catenary system to power the new electric trains. The project increases the trains per hour per direction from five today to six with the opening of the electrified service. It also accommodates future high-speed services by installing the same type of power system needed for the CHSRA project. The EIR described the benefits of electric trains services along the Peninsula Corridor to air quality and reduction of greenhouse gas emissions, but also disclosed the potential direct, indirect, and cumulative impacts associated with the project improvements. The Caltrain PCEP has a relatively small footprint to the degree that the physical improvements are largely within the existing Caltrain right-of-way.

Existing ambient noise measurements were taken at multiple locations along the alignment, including three locations in San José, one of which was identified as the highest ambient noise level along the line. There were 92 Caltrain movements on an average weekday in 2014 with a proposal to increase to 114 daily train movements with PCEP. Based on the transition from

diesel operation to EMU operation, including the increase in trains, noise levels were not anticipated to increase significantly. No moderate or severe noise impacts were identified for this study.

It was noted, however, that the analysis did not account for any future noise that could be attributed to additional service, such as high-speed rail operations. The analysis also did not account for any train operations which might be on an elevated structure, which has been suggested in the viaduct scenarios.

Similarly, CHSRA is currently working on the Draft EIR/EIS for the project segment from Merced to San José. The EIR/EIS will evaluate the impacts associated with the construction and operation of the high-speed rail system in this project section. The CHSRA environmental review will evaluate the potential impacts of adding high-speed rail infrastructure and high-speed rail trains, including alternatives with a viaduct over I-280/SR-87 and in the existing rail corridor. It will also articulate the improvements, design features, operational characteristics, and proposed mitigation measures needed to address the incremental addition of CHSRA rail infrastructure and services. The CHSRA Draft EIR/EIS is expected to be out for public review in Spring 2020.

The Partner Agencies have not yet initiated detailed engineering and environmental review work that would shed light on expected future noise and vibration levels in the corridor. However, electrified passenger trains are relatively quiet at the speeds anticipated in the corridor (around 55mph), and generally much quieter than the diesel trains currently using the corridor. Based on analysis by Caltrain for the PCEP and other similar projects, as more trains travel through the corridor it is likely that horn noise at non-grade-separated crossings would be the most significant source of future train noise in this corridor.

What measures can be used to mitigate noise and vibration?

Generally, noise and vibration impacts are best addressed at their source.

Noise dampening measures could include:

1. Installation of barriers, walls, or berms
2. Adjustment to or elimination of honking horns typically via grade separation or creation of FRA-approved quiet zone
3. Improvements to the track itself to eliminate the “click-clack” caused by joints between sticks of rail
4. Insulation of homes or sensitive receptors
5. Quieter vehicles such as electric trains

Vibration mitigation measures could include:

1. Constructing a modern railway structure to strengthen the railbed over which the trains travel
2. Installing vibration absorption materials into the track structure or in the ground

There are different ways to mitigate, and Figures 10 and 11 illustrate some examples of a green wall and modern track railway.



Figure 10 – Sample noise wall mitigation



Figure 11 – Sample modern railway track

It is important to note that vibration measures are highly subject to final design because soil conditions, site conditions, and track design must all be completed to a fairly high level of detail to effectively determine vibration mitigation. This level of detail is typically achieved at 60 to 90 percent design level. (This project is at roughly two percent design.)

There are many important factors to consider in determining the most appropriate noise or vibration mitigation measures to apply. These include the presence of freight trains, the presence and type of ambient noise, and/or existing vibration conditions, as well as project design features.

Some project design features may obviate what would otherwise likely be environmental impacts. For example, in the case of the Concept Plan, the elevated station and tracks facilitate grade separation in the station area; grade separation inherently reduces train noise, particularly from train horns.

What have other cities/agencies done?

Bringing new transit services into communities brings both benefits and impacts. In particular, new transit systems built in the United States in recent years have all faced how best to bring these new systems online in a satisfactory manner to the communities that they serve.

Experiences in Salt Lake City, Utah

The Utah Transit Authority (UTA) operates bus, light rail and commuter rail services in the Salt Lake City area. Between 2006 to 2015, the agency experienced a rapid growth in its rail network by building nearly 70 miles of new transit services. Most of these rail projects were built within existing rail rights-of-way. Two of these projects traveled through residential communities along freight corridors that saw low use by the freight operators for many years, as depicted in Figure 8. The proposed project would add new light rail service with 15-minute headways, or effectively adding trains about every 7.5 minutes. This meant that these residents would experience a significant change to their community and environment. Of particular concern were noise and vibration due to increasing train services from fairly low train movements – maybe one movement per week – to relatively frequent transit services.



Figure 12 – Synthetic Fencing in Salt Lake City, Utah

UTA completed NEPA, including the *Transit Noise and Vibration Assessment*, as well as community outreach on these new rail lines. The change in the conditions did warrant mitigation measures that UTA deployed. Through the NEPA process and as a result of community engagement activities, UTA constructed three types of barriers to address the noise created by the new rail lines:

1. Concrete barrier walls
2. Earthen berms
3. Synthetic fencing

The type of barrier was chosen depending on the particular location and site conditions. For example, earthen berms were built where there was sufficiently wide rail right-of-way to accommodate such a structure. The berms were designed to be at a height that would absorb the

noise from the wheel-to-rail interface of the light rail vehicles. The concrete walls were built in more narrow areas where the barriers were required to be fairly tall due to the difference in height between the rail corridor and residents' backyards. The synthetic fencing was constructed where the height between the rail corridor and resident's backyard was fairly level. Figures 12 and 13 show examples of the synthetic fencing used.

UTA also worked with cities to institute quiet zones on these corridors to help reduce noise at the at-grade crossings. UTA and the local cities did not elect to pursue grade separation projects due to the significant costs associated with these relative to the number of crossings per corridor.

UTA also offered noise insulation to discrete homes that were adjacent to both the rail right-of-way and an at grade crossing. In these locations, the barrier or berm did not extend far enough, for safety reasons, to adequately abate the train noise and the at grade crossing equipment created additional noise issues.

During the final design of the project, vibration mitigation measures initially deployed were deemed ineffective in a several discrete locations. As a result, the agency reconstructed the rail track structure to include concrete rail ties, continuously welded rail, and new sub-surface structure that would firmly hold the track structure in place. In specific locations where the homes were either (1) extremely close to the corridor, (2) near special track work (i.e., cross-overs or turn-outs), and where virtually (3) no freight movements existed, the agency used shredded rubber ties within the track structure to absorb rail vibration. In other cases, vibration testing done during final design demonstrated that mitigation measures would be essentially ineffective. As a result, UTA elected not to construct vibration mitigation measures.



Figure 13 – Synthetic Fencing in Salt Lake City, Utah

E. Property and Development Opportunity Sites

In response to the City Council's request for a better understanding of the relative differences in property impacts for maintaining the existing alignment and the two-track I-280 viaduct, the Partner Agencies have prepared a conceptual estimate of property impacts. The Partner Agencies also assessed the potential impacts to residential and commercial development sites based on

work underway in the Diridon Station Area Plan update and Downtown West development proposal. As previously noted, at this stage of the planning process, the estimates are very conceptual and subject to change based on a variety of factors.

The Partner Agencies determined that, in either alignment option, additional property will be required to expand and modernize the railway. This property is primarily linear strips along and east of the existing rail corridor. The following summarizes how property and TOD implications are expected to differ between the two alignment options.

I-280 Viaduct

North of Diridon Station, slightly more property is required to build the northern flyover. This has relatively minor additional property and TOD effects, other than the visual and noise implications of the flyover.

South of Diridon Station, the viaduct has more significant impacts, primarily within two areas identified for potential TOD:

1. Up to 1,500 new homes are proposed in the area bounded by the existing corridor, W. San Carlos St., Royal Ave., and Auzerais Ave. This property would be bisected by the viaduct structure, significantly reducing the development potential and attractiveness of the site. Without the benefit of site-specific fit analysis, the viaduct is estimated to result in the loss in the approximate range of 800 units. The impact up to and during the construction of the viaduct would likely be even more.
2. Between the existing corridor, Auzerais Ave., Royal Ave., and I-280, over 700,000 square feet of new office/commercial development could be realized, per a capacity analysis performed by Skidmore, Owings and Merrill. This property would also be bisected by the viaduct structure, similarly reducing the development potential and attractiveness of the site. The remnant parcels may restrict the ability to achieve optimal office floorplates, further diminishing the likelihood of redevelopment for commercial use.

According to preliminary evaluation conducted by the Partner Agencies' economic and development experts, the presence of the viaduct would likely reduce the attractiveness of both areas to developers, and could make it more difficult for potential projects to receive financing. In addition, the timing of development would presumably be delayed until after the viaduct is completed.

South of I-280, property impacts from the viaduct are expected primarily within Caltrans right-of-way, the Guadalupe River corridor, and the area between the existing rail corridor and SR-87. Depending on the particular rail services that utilize the viaduct and the length of the viaduct structure, additional property may be required, particularly during construction, near Tamien

Station, including along the edges of VTA's TOD and Tamien Park, and south of Curtner Avenue near Communications Hill.

Existing Corridor

Differential property impacts of the existing corridor lie within the Gardner/North Willow Glen neighborhoods. Preliminary analysis identified portions of properties that may be effected by a four-track corridor. This includes:

1. Estimated up to 13 properties with residential uses; primary residences may not be impacted; rather, property impacts may be limited to portions of backyards, perhaps driveways, secondary structures, etc.
2. A reduction in the size Fuller Park by approximately 30 to 33 percent; this loss would likely be behind the current tree line, rather than the widely used portion of the park.
3. A potentially significantly impact to the San José Word of Faith Church.
4. Up to two parcels with commercial uses; again, main structures may not be impacted.

F. Capital Cost Comparison

In response to the City Council request, the Partner Agencies also prepared preliminary cost comparisons for the two alignments to understand the relative differences between the two. The initial cost estimates only include those costs directly associated with the station, including the station building, tracks, concourses, underpasses, bus facilities, and light rail facilities. Additionally, the estimate for the viaduct alignment includes the costs associated with raising the tracks and platforms at Tamien Station. For both estimates, the relocation of CEMOF and the PG&E Substation is not included.

Given that capital cost estimates are very preliminary, the Partner Agencies have evaluated the costs for the two alignments using an order of magnitude comparison. The Partner Agencies estimate that rebuilding Diridon Station using the Existing Corridor alignment with a four-track alignment will cost billions of dollars, and that the I-280 viaduct alignment would cost roughly double this amount.

G. Comparing Alignment Options

In considering the alignment options, the Partner Agencies looked at several points of comparison. These areas were identified based on ongoing conversations with the community and elected officials. The Partner Agencies acknowledge that the effects of the two rail alignment options differ between neighborhoods: some might experience noise, visual, and vibration impacts with one option and not the other. Table 3 below summarizes the partners overall findings when comparing the alignment options.

Table 3 – Comparing Alignment Options

Points of Comparison	Existing Rail Alignment in 2040	I-280 Rail Viaduct <u>Plus</u> Existing Rail Alignment in 2040
Train Volumes	Overall Increase	Overall Increase
Neighborhoods Affected	Same as Today	Same as Today Plus Additional Neighborhoods
Infrastructure Footprint	Modest Increase	Significantly More
Noise and Vibration	Modest Increase	May Affect Larger Geography/Population
Visual	Modest	Significant Change to Visual Landscape
Environmental	Some	Significantly More (Incl. Guadalupe River)
Maintenance	Modest	High
Flyover Required	No	Yes
Cost	Base/Cost Option	~2x Base Cost
Property	Low to Moderate	Medium to High

EVALUATION AND FOLLOW-UP

The rail alignment for the Diridon Integrated Station Concept Plan is agendized for decision at the February 4, 2020 City Council meeting. Additionally, the decision making bodies of the other three Partner Agencies will make a decision on the Concept Layout on:

- Caltrain Board of Directors, February 6, 2020
- VTA Board of Directors, February 6, 2020
- CHSRA Board of Directors, February 18, 2020

As detailed in the December 3, 2019 staff memorandum and attached Joint Partner Agency Report, in the next phases of planning the Partner Agencies will continue to work on the southern track approach in close consultation with neighboring communities, including:

- Grade separations keeping people and vehicles away from train traffic while maintaining good local connectivity and access;
- Sound and vibration dampening treatments for tracks;
- Aesthetic and functional treatments like sound walls with added landscaping (“green walls”) or other attractive, maintainable coverings;
- Optimize design to minimize the need to demolish existing buildings and/or acquire land; and
- Fuller Park as a permanent, city-owned park with high-quality landscaping and other amenities to be determined through a community-based process.

In addition, the Partner Agencies will work to develop appropriate metrics that will enable tracking and monitoring of these goals and conditions over time.

The Partner Agencies will continue to provide periodic updates to the Transportation and Environment Committee and/or City Council at key milestones in the Concept Plan's development.

CLIMATE SMART SAN JOSÉ

The information in this memo aligns with one or more Climate Smart San José energy, water, or mobility goals.

PUBLIC OUTREACH

The Partner Agencies have conducted five community meetings, including a Spanish-language meeting, three presentations to the City's Station Area Advisory Group (SAAG), three pop-up booths at Diridon Station and community events, an online survey, an online townhall, and additional meetings with stakeholder groups and neighborhood associations. In addition, the Partner Agencies have presented and received important feedback from the Diridon Joint Policy Advisory Board (JPAB) at five meetings. The community input has informed the Partner Agencies' work throughout the Concept Plan process, which has culminated in a single, optimized layout – the Concept Layout.

More information is available at the project website: www.diridonsj.org/disc.

COORDINATION

This memorandum has been coordinated with the City Manager's Office and City Attorney's Office.

COMMISSION RECOMMENDATION/INPUT

No commission recommendation or input is associated with this action.

HONORABLE MAYOR AND CITY COUNCIL

January 17, 2020

Subject: Diridon Integrated Station Concept Plan – Rail Alignment

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CEQA

Not a Project, File No. PP17-009, Staff Reports, Assessments, Annual Reports, and Informational Memos that involve no approvals of any City action.

/s/

JOHN RISTOW

Director of Transportation

For questions, please contact Eric Eidlin, DOT Station Planning Manager, at (408) 795-1638.

Attachment A – [December 3, 2019 Item City Council Materials](#)

Attachment B – Glossary of Terms

GLOSSARY

- ACE - Altamont Corridor Express. Operator of non-electrified passenger rail service connecting San Jose to Stockton.
- Alignment – Direction and position given to the center line of the railway track on the ground in the horizontal and vertical planes
- Amtrak – non-electrified passenger rail service provider, also known as the National Railroad Passenger Corporation
- BART - Bay Area Rapid Transit
- Berm – a raised barrier constructed of earth or sand
- CC – Capitol Corridor; provider of non-electrified passenger rail service connecting San Jose to Sacramento and Auburn
- CEMOF – Caltrain’s Centralized Equipment Maintenance & Operations Facility
- CEQA - California Environmental Quality Act
- CHSRA - California High-Speed Rail Authority; provider of future electrified high-speed passenger rail service
- Concept Layout - The track and station configuration that holds the most promise to fulfill key project objectives and that the Partner Agencies are therefore recommending for further study.
- Concept Plan – A joint effort of the Diridon Partner Agencies to identify the future spatial layout of Diridon Station, including the arrangement of modes, the way in which the station is integrated into the surrounding community, as well as an organizational framework to deliver the vision.
- Concourse - A large open area inside or in front of a public building, as in an airport or train station, where stairs, elevators, escalators, and other vertical circulation elements are located that allow passengers access the platforms
- Constructability – refers to the ease and efficiency with which something can be built
- EIR – Environmental Impact Report, an environmental document prepared to satisfy California State environmental review requirements under CEQA.
- EIS – Environmental Impact Statement, an environmental document prepared to satisfy federal environmental review requirements under the National Environmental Policy Act (NEPA)
- Electrified tracks – railway track on which electrified trains operate; electrified railway systems operate on electric power supplied via overhead lines
- EMU - Electric Multiple Units
- Fatally flawed design – a design that is certain to fail due to deficiencies in design, difficulties in construction, or other insurmountable challenges
- Flyover - An overpass that crosses over another road or railway to provide a grade separation between different transportation modes
- Footings – concrete shafts that provide the foundation for an elevated structure, like a viaduct
- FRA – Federal Railroad Administration
- FTA – Federal Transit Administration

- Layout - A combination of the physical elements that create a conceptual design for the station and intermodal hub
- NEPA - National Environmental Policy Act
- Non-electrified tracks – railway track on which diesel (or freight) trains operate; trains that operate on non-electrified track are powered by engines
- Northern corridor – The heavy rail corridor between Diridon Station and CEMOF
- Partner Agencies – the four agencies that have entered into a cooperative partnership to complete the Concept Plan; Santa Clara Valley Transportation Authority (VTA), City of San José, Caltrain, and CHSRA.
- Property Impacts – A conceptual estimate of properties or parcels that could potentially be affected by an alignment
- Right-of-way – the land occupied by a railroad
- Rolling Stock – vehicles used on a railroad
- Southern corridor – The heavy rail corridor between Diridon Station to Communications Hill
- Straddle bent – a structure that spans a roadway to support a viaduct
- Team ABC - A Study Team consisting of Arcadis and Benthem Crouwel Architects
- TOD - Transit-Oriented Development
- UPRR - Union Pacific Railroad
- UTA - Utah Transit Authority
- Viaduct – A long bridge-like structure that carries a road or railroad across an area to provide a grade separation between different transportation modes.
- VTA - Santa Clara Valley Transportation Authority