HSR Response to Morgan Hill Locally Generated Concepts:

The City of Morgan Hill has requested that the California High-Speed Rail (HSR) Authority respond to the following three locally generated concepts (LGCs) along Highway 101:

Locally Generated Concept 1: Open Trench:

Don Sepulveda presented an alignment that horizontally, appeared similar to the existing HSR viaduct alignment and explained that by putting it in an open trench, built similarly to the Alameda Rail Corridor would save cost, since the Alameda Corridor was constructed for less than the Authority's estimate for a viaduct. Direct property impacts were presented as being the same as the HSR viaduct alternative.

(1) Evaluation

a) **Trench Design Considerations:**

The design criteria for a typical HSR trench is different from what was used in the Alameda Corridor. This chapter will explore these differences in detail.

i) **HSR Trench**

A trench along the west side of US101 in Morgan Hill would be comparable to the trench used in the previous east side US101 alignment alternative. The trench would need to be sufficiently wide to fit two HSR trains and emergency walkways, 42' internal clearance. The top-of-rail would be approximately 37' deep to support the 27' clearance envelope of the train and provide 10' of space for over crossing streets and utilities where needed. The external dimensions of the trench would be approximately 50' wide and 45' deep. Additionally, the trench would require a maintenance access road, 15' wide, adjacent to the western side of the trench. Overall the amount of ROW required by the trench would be 65' at a minimum, which is wider than the 58' need for a viaduct.

Previous geotechnical investigation data show the groundwater approximately 20' below ground at most places along the alignment, which is higher than the bottom of the trench. Due to the high ground water, the trench will need to be supported by temporary shoring during construction and then anchored with tension piles in the final condition. Therefore, cut-off walls would need to be installed on the outside of the trench walls, typically double the depth of the actual trench. The purpose of the cut-off-wall is to control groundwater intrusion in to an excavation, to minimize the requirement for dewatering. The ground water table around the outside of the trench remains at the same place due to the cutoff walls and the ground water table below the trench is lowered during construction.

Trenches built in high groundwater areas also require friction piles to resist the uplift caused by hydrostatic forces. These are the four cast-in-drilled-hole (CIDH) piles shown in Figure 1. These piles are 3' in diameter and would be approximately 60' deep in the location. Concrete struts are also be used to support the top of the walls and to resist seismic loading during an earthquake.

Locating and relocating utilities may be challenging for trench construction. All utilities must be relocated during construction of the trench, and although they can be designed to cross over a trench along roadway bridges, utility bridges and struts. With viaduct construction, many utilities can be avoided by the strategic placement of viaduct support foundations.

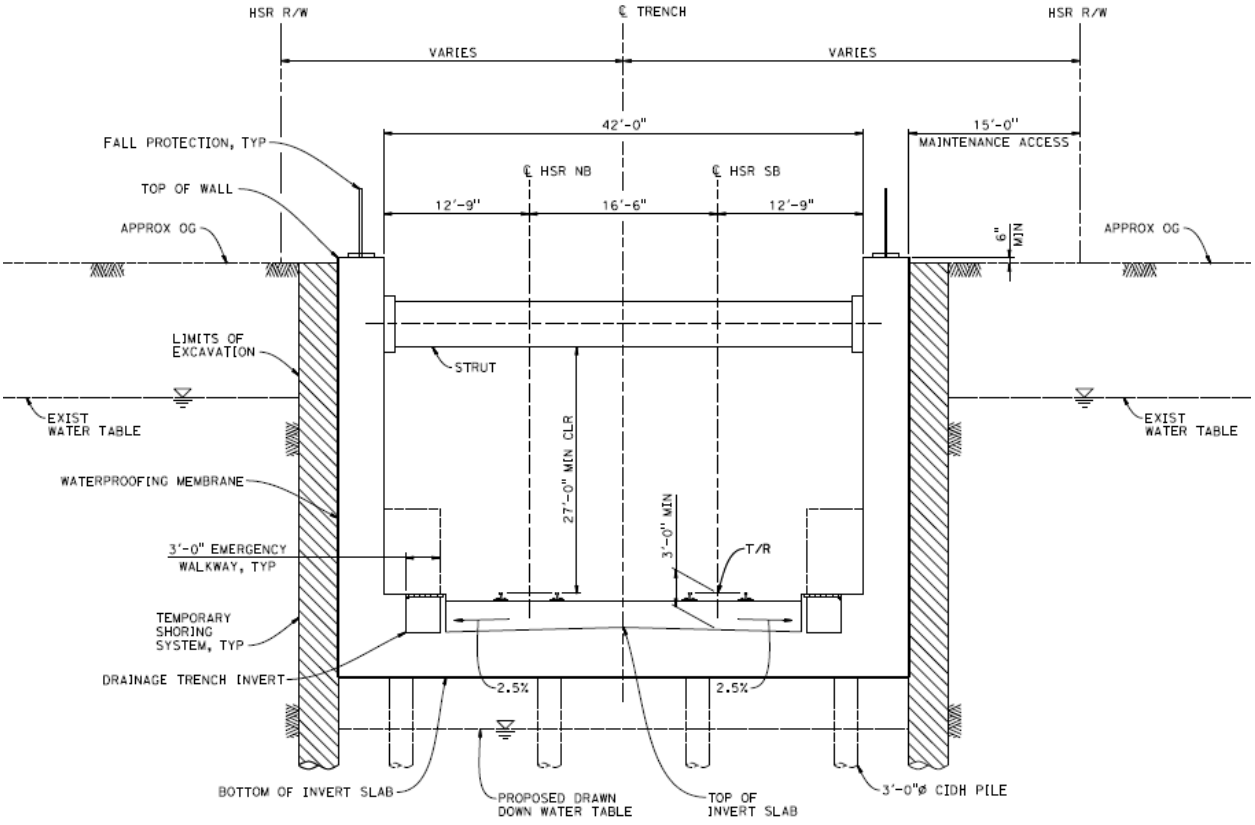


TABLE 1

ALT 1 AND ALT 2 SOUTH GILROY/US101 TRENCH								
DIMENSION SCHEDULE								
H	H100	B	NO. OF STRUTS	T1	T2	T3, AS APPLICABLE	3'-0" CIDH PILES	
							NO. OF ROWS	LONG. SPACING
0' TO 32'	10'-0"	4'-0"	N/A	3'-0"	4'-0"	N/A	N/A	N/A
0' TO 32'	15'-0"	4'-0"	N/A	4'-0"	6'-0"	N/A	N/A	N/A
0' TO 32'	30'-0"	4'-0"	N/A	4'-0"	5'-0"	N/A	4	12'-6"
>32' TO 35'	35'-0"	4'-0"	1	4'-0"	5'-0"	5'-0"	4	12'-6"
>35'	45'-0"	6'-0"	1	4'-0"	5'-0"	5'-0"	4	12'-6"

Figure 1: Typical HSR trench

ii) **Alameda Trench**

The Alameda Corridor Trench is not comparable to the type of trench needed for Morgan Hill, due to different soil and ground water conditions. The walls of the trench were constructed using secant piles, formed by installing a series of secondary piles overlapping primary piles. After both sides of the trench wall are constructed, the body of the trench may be excavated out and a cast-in-place invert slab is installed at the bottom of the trench. Please refer to Figure 2, which was taken from a white paper written by the designers of the Alameda Corridor Trench from PTG and HNTB in July 2000.

Judging from the depth of the trench walls, this was not an area of high ground water. There was also no need to use friction piles to hold down the trench, as would be required around the Morgan Hill area. Secant pile construction is an efficient method of trench construction. They have better stiffness compared to sheet piles and can be installed in difficult ground conditions. However, it is HSR's policy not to use secant pile walls because the waterproofing is hard to achieve in the joints.

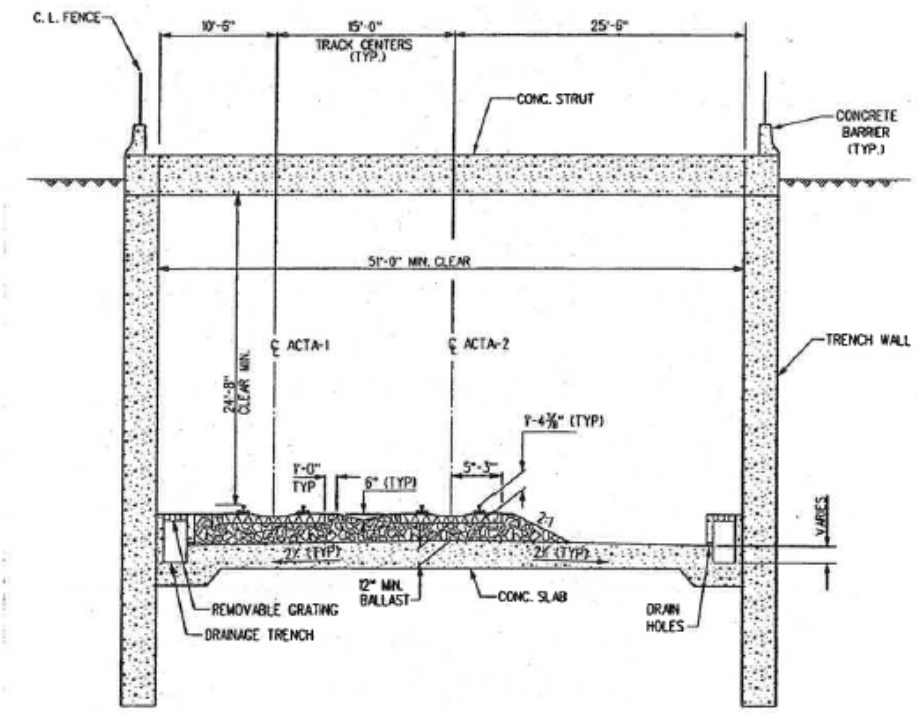


Figure 2: Standard Trench Cross Section

The following Table compares several factors of the HSR trench versus the Alameda Corridor Trench:

Features	HSR Trench	Alameda Corridor Trench
Construction Method	Install low permeability cut-off walls, in advance of cast in place concrete walls	36" Secant Pile Construction
Depth (Existing Ground to Rail)	27' + Appx 10'	24'-8" + Appx 5'
Width (internal clearance)	42'	51'
Wall Thickness	4'	3' diam piles + 8" shotcrete
Strut Spacing	25'	25'
Piles	36" CIDH piles	None
Excavation (CY/Mi)	1,605,000	1,526,000
Waterproof	Yes - Exterior	No

b) **Trench Alignment and Impact Considerations:**

The horizontal alignment presented by Don Sepulveda matched the existing viaduct alignment. The HSR alignment was designed at a reduced 150 mph design speed to reduce impacts to residential and business properties. The proposed HSR viaduct travels over several US 101 bridge abutments and ramps. Since the LGC trench has the same horizontal alignment, the US 101 bridges will require complete reconstructions, due to apparent conflicts between the proposed trench and the bridges. Additionally, since the ramps will also require reconstruction, Caltrans may require that the ramps be re-designed and re-constructed to meet current design standards. The current proposal will need to be expanded to show new US 101 intersections at each trench crossing. The revised intersections should be analyzed for additional right-of-way requirements.

Alternatively, the LGC could be modified to avoid impacts to the bridges; however, that revised alignment would likely need to move to the west, away from the freeway, resulting in additional impacts to residential and business properties. Impacts and reconstruction of US 101 ramps would likely still be a consideration with a re-aligned LGC.

The visual impacts of a trench would likely be less than a viaduct; however, there will also be differences associated with potential US 101 intersection reconstructions and/or horizontal alignment adjustments. For a trench, a continuous fence is required along HSR right-of-way for safety and security, whereas fencing may only be needed at access stair locations for the viaduct. Potential mitigation for visual and community impacts would likely also be different.

Noise and vibration would also be different, due to changes in both the vertical and/or horizontal alignments and would need to be further studied to quantify.

It is expected that there would be more disruption to traffic to construct a trench, as bridge abutments, roadways and utilities would have to be relocated either temporarily or permanently to avoid the trench. Stage construction at roadway and ramp locations will likely be needed to maintain traffic during trench construction, but it will be highly disruptive to neighboring facilities. If the highway

intersections require re-construction, coordination between roadway reconstruction and trench construction would be needed. The viaduct superstructure would not require any highway ramp reconstruction. The foundations of the ramp may be constructed with minimal impacts to freeway facilities. The viaduct will likely be constructed with pre-cast segments, which would be constructed at off-site casting yards and delivered by travelers along the HSR right-of-way; thus, minimizing construction traffic on US101 or local streets.

c) **Trench Cost Considerations:**

The estimated price per mile of a HSR trench is $320 million/versus $150 million/mile for a viaduct. At this level of design, the pricing used is reflective of the average material and labor rates estimated for the region, with appropriate contingencies for unknown risk.

Although the actual cost of constructing the Alameda Corridor may be less than these estimates, adjusted for inflation, it is not appropriate to assume that the design used for the Alameda Corridor would be acceptable for the Morgan Hill location. Additionally, the impacts on existing facilities (highway interchanges and utilities) are unknown and would add to the cost of a trench at this location. Therefore, it is not a straight cost comparison between the Alameda Corridor and a trench in Morgan Hill. Design standards and site conditions are very different. As noted by the City of Morgan Hill during their design review, trenches also have higher operating costs due to the need for pump stations to remove any water than enters the trench.

(2) Summary and Conclusion:

At this level of analysis, comparable design criteria must be applied for the preliminary design. The Alameda Corridor Trench concept uses secant pile construction, which HSR criteria does not find acceptable. Based on the HSR directive designs for the seismic performance and waterproofing, the trench is estimated to cost over two times more than the viaduct. For HSR to study a trench, the trench alignment must present enough benefits to justify the additional cost.

Although the visual impacts of a trench may be less than that of a viaduct, the other impacts are expected to be similar and may even be significantly greater than that of a viaduct, including impacts to real property and existing infrastructure. Due to the magnitude of the cost difference between the trench and the viaduct with comparable impacts, the Authority concludes that the trench would not be a cost effective alternative and further study is not warranted.

Locally Generated Concept 2: Complex Structures over US101:

Don Sepulveda presented an alignment that spanned over US 101. The northern limit of the alignment started on the east side of US 101 at a location that ties into an LGC by the City of San Jose. The SJ LGC consisted of a bored tunnel with the southern portal on the east side of US 101. Over US 101, there would be a series of straddle bent and pergola supports. This structure would presumably start from Burnett Avenue and end at Tennant Ave, approximately 4.5 miles.

The alignment on the northern end could be modified to tie into the existing HSR viaduct alignment, as an alternative concept. This Morgan Hill LGC ties into the existing HSR viaduct alternative at the southern limits.

(1) Considerations:

a) Design Considerations

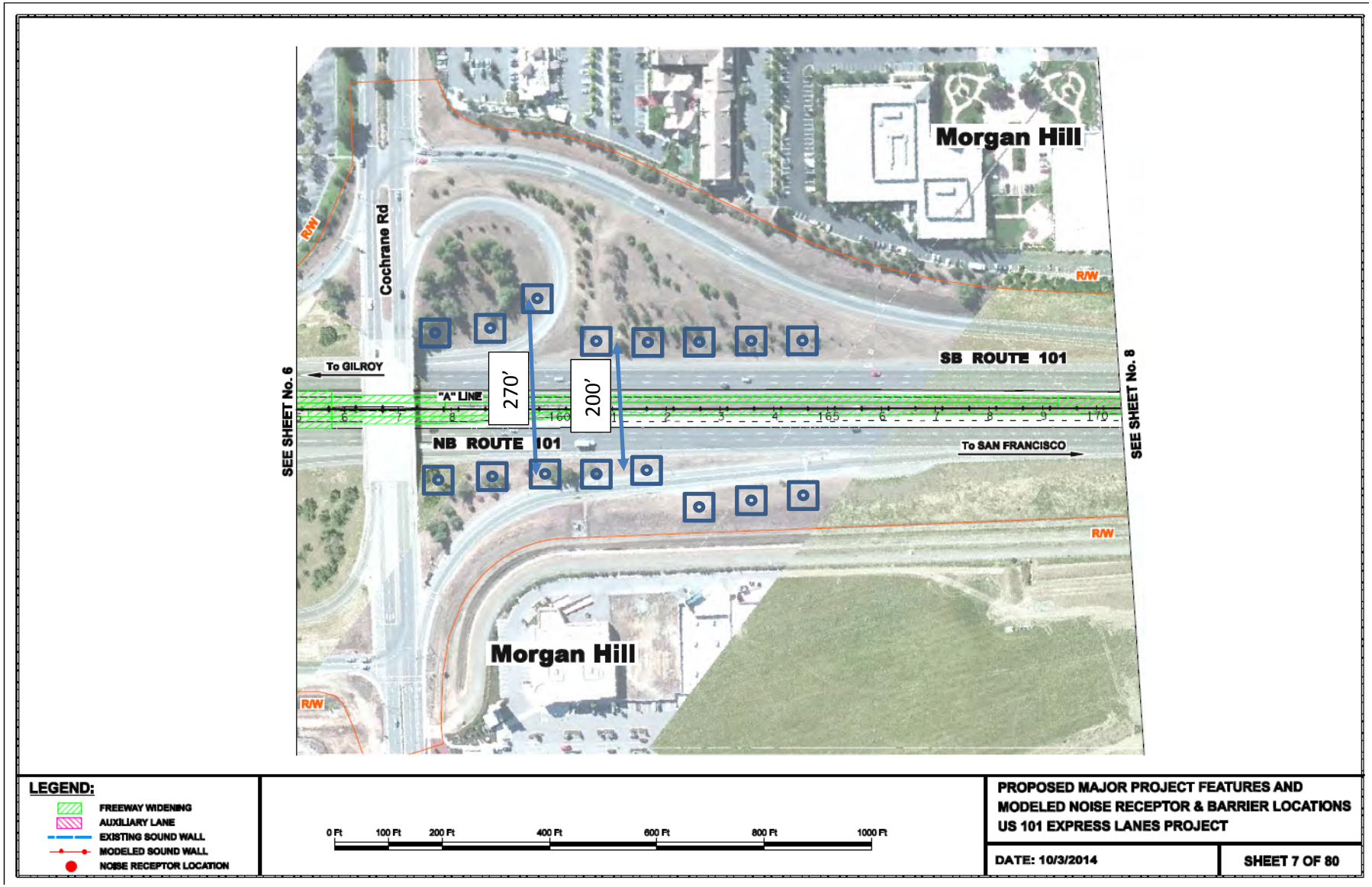
This alignment option involves constructing a pergola structure over US101, from Burnett Avenue to Tennant Avenue, approximately 4.5 miles. This area of US-101 has been identified in Caltrans' Route Concept Report for HOV expansion lanes in the median. Therefore, the columns of the pergola must be placed on the outside edges of the freeway and the deck must span 200'. At the interchange areas, the pergola must span up to 270' to allow room for the ramps. The transverse beams would have to be approximately 20' deep (10:1 length to depth ratio) to maintain the level of stiffness needed. Structures like this are not constructible nor cost effective.

(For more information on the project, please see the Caltrans Initial Study Report: http://www.dot.ca.gov/d4/documents-environmental/101_express_lane_project/101_express_lanes_final_environmental_document.pdf)

To create a structure like this, casting yards would be needed to precast the large 200' x 20' girders. However, a very large crane would be needed to lift the girder into place. Cranes like this simply do not exist. The typical concrete girder for HSR is 110' long for that reason.

Alternatively, the contractor could also construct the girders using falsework and formwork. The pergola construction method would require multiple freeway lane closures to install the girders over the freeway traffic. The deck will be a mix of solid platform and horizontal beams, so different construction methods will be expected. The transverse girders would need to be precast on site and then installed by crane. The contractor must build falsework over the freeway to allow for installation of the bridge deck. The construction of the falsework would require temporary closures and detouring of traffic. Due to expected limitations on closures, it is expected that the overall duration of construction could be significantly longer than that of the viaduct construction. Caltrans would not allow the closure of their facility for such an extended period.

Figure 2: HSR Complex Structure over US-101 (Drawing taken from Caltrans Initial Study Report)



b) Cost Considerations

Due to various unknowns associated with the design of the complex structures, it is difficult to estimate the actual cost; however, the massive support structures needed to span the freeway and carry the HSR superstructure would be in the range of 2 to 3 times higher than the viaduct being proposed by HSR. Many of the right-of-way impacts that spanning the freeway is hoping to avoid may still be impacted and not avoidable.

2) Summary and Conclusion:

The complex structural supports needed to build the HSR alignment over US 101 would be very large and will not be feasible to construct, due to the amount of large girders spanning the freeway. Since the supports would need to be located outside the existing highway right-of-way, direct property impacts cannot be eliminated. The cost to construct is expected to be much greater than any potential savings in right-of-way, when compared to the existing viaduct alternative. Due to the constructability issues, added cost, and visual impacts, the Authority concludes that the Complex Structures over US101 concept would not be a feasible concept and further study is not warranted.

Locally Generated Concept 3: Median of US101:

The City of Morgan Hill suggested a HSR alignment in the median of US-101.

(1) Considerations:

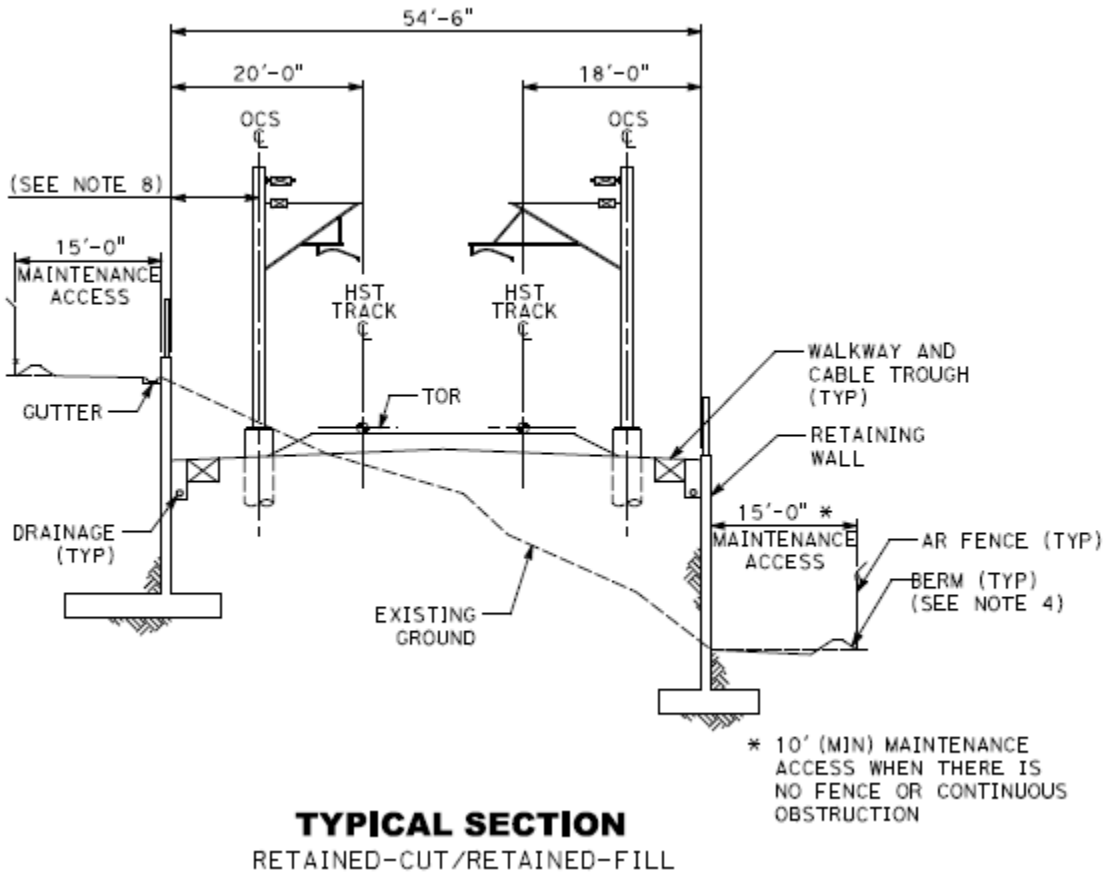
a) Design Considerations

This area of US-101 has been identified in Caltrans' Route Concept Report for HOV expansion lanes in the median. High-Speed Rail would be prohibited from building there.

(For more information on the project, please see the Caltrans Initial Study Report: http://www.dot.ca.gov/d4/documents-environmental/101_express_lane_project/101_express_lanes_final_environmental_document.pdf)

Furthermore, the median of US-101 varies between approximately 45' o 68'wide from edge of travelway to edge of travelway. A standard HSR at-grade cross section is 54'-6" + 10' minimum maintenance access road. The median is not wide enough for the entire length through Morgan Hill. South of Tenant, the HSR would have to slow down to speeds of approximately 90 mph, violating travel time mandates for the section.

Figure 3: High-Speed Rail At-grade Typical Section



2) Summary and Conclusion:

An at-grade alignment in the median of US-101 is not constructible because of Caltrans' future express lanes project.