



SANDAG REGIONAL BIKEWAY PROGRAM

# ENCINITAS COASTAL RAIL TRAIL PLANNING

## EVALUATION OF POTENTIAL ALIGNMENTS

JUNE 19, 2020





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# 1 POTENTIAL ALIGNMENTS & METHODOLOGY

This final report for the SANDAG Encinitas Coastal Rail Trail Planning project evaluates the opportunities and constraints of potential Coastal Rail Trail (CRT) alignments within the City of Encinitas.

The CRT is a regional north-south facility that is parallel to—and in most locations shares right-of-way (ROW) with—the North County Transit District (NCTD) railroad corridor and Coast Highway 101. It is part of the SANDAG Regional Bikeway Program and is being implemented in segments. The most recently completed segment is in the Encinitas community of Cardiff-by-the-Sea, spanning 1.1 miles between Santa Fe Dr and Chesterfield Dr (shown in cover photo).

The project team evaluated the feasibility of three potential alignments across multiple segments of the study area and identified the most feasible alignment for future detailed study. This written report is accompanied by roll-plot exhibits in Appendix A that depict the potential alignments, as well as rough-order-of-magnitude cost estimates in Appendix B.

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## KEY ASSUMPTIONS

The evaluation followed these key CRT design assumptions for all alignments:

- **Minimum 16' Width.** The CRT should be at least 16' wide to provide a comfortable, two-way facility that meets regional standards. This includes 12' of travel way plus two 2' shoulders.
- **Within or Immediately Adjacent to NCTD ROW.** Consistent with the policies of the *North Coast Corridor Public Works Plan/Transportation and Resource Enhancement Program (PWP/TREP)*, the CRT should be “within or immediately adjacent to” the NCTD ROW. If required by environmental, safety or physical constraints, the CRT may be within 150' of the NCTD ROW. Any deviation from this provision would require a *PWP/TREP* amendment approved by the California Coastal Commission.
- **Minimum 20.5' Setback from Rail.** The CRT should be sited as far as possible from the railroad tracks to maximize comfort for path users. At a minimum, all development must be set back a minimum of 20.5' from the closest center of any existing and planned railroad tracks, to allow for NCTD maintenance access. This 20.5' setback was agreed to be NCTD and the City of Encinitas and is depicted on all exhibits.

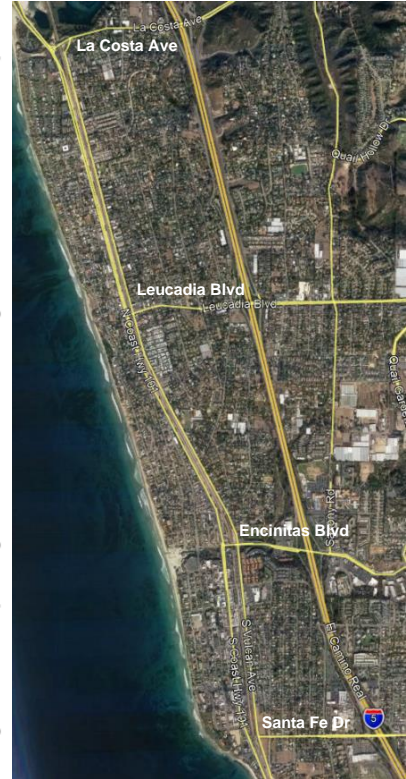
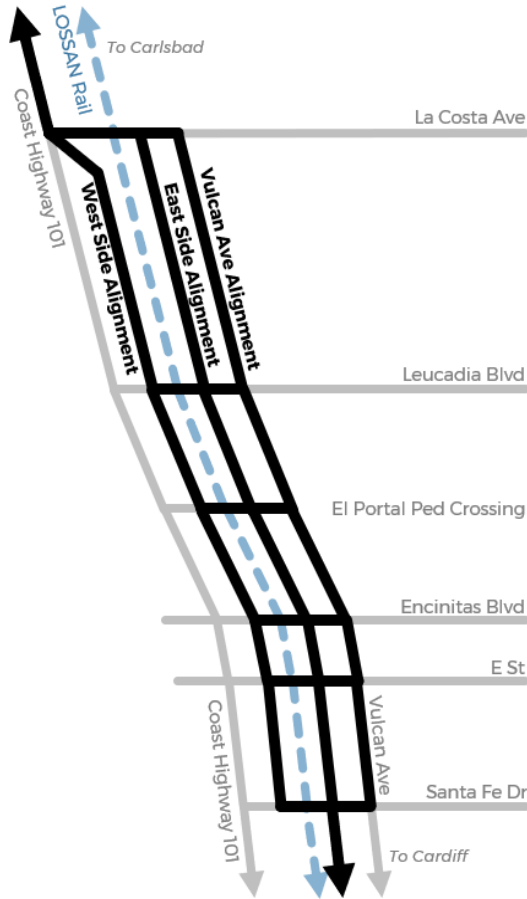
The memorandum in Appendix B-6 contains a full list of assumptions that informed the alignment evaluation and cost estimates.

# POTENTIAL ALIGNMENTS

The project team evaluated three alignments for each segment of the corridor, pictured at right:

- **West Side Alignment.**  
West of the railroad tracks, in/adjacent to NCTD ROW.
- **East Side Alignment.** East of the railroad tracks, in/adjacent to NCTD ROW.
- **Vulcan Ave Alignment.** East of the railroad tracks, in/adjacent to Vulcan Ave ROW.

This report is organized into sections based on the segments listed in the table below. Appendix A contains alignment exhibits and Appendix B contains rough-order-of-magnitude cost estimates for each segment.



Report Section & Segment	Alignment Exhibit
<b>Section 3: La Costa Ave to Encinitas Blvd</b>	
<i>West Side Alignment</i>	<i>Appendix A-1</i>
<i>East Side Alignment</i>	<i>Appendix A-2</i>
<b>Section 4: Leucadia Blvd Intersection</b>	<i>Appendix A-1/A-2</i>
<b>Section 5: Encinitas Blvd Intersection</b>	<i>Appendix A-3</i>
<b>Section 6: Encinitas Blvd to Santa Fe Dr</b>	<i>Appendix A-3</i>
<i>East Side Alignment (Long Term Scenario)</i>	
<i>Vulcan Ave Alignment (Near Term Scenario)</i>	
<b>Chesterfield Dr to Solana Beach</b>	<i>Appendix A-4 (City of Encinitas Stripping Plan)</i>



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## EVALUATION METHODOLOGY

The project team used the following approach to evaluate the feasibility of potential alignments:

- **Segments & Key Intersections.** Divide study area into segments and key intersections based on geography and common characteristics:
  - **Connection to Carlsbad.** North of La Costa Ave in the City of Carlsbad, the CRT uses Class II bike lanes and sidewalks along Coast Highway 101.
  - **La Costa Ave to Encinitas Blvd.** Approximately 2.6 miles and includes the Leucadia Blvd intersection (below).
  - **Leucadia Blvd Intersection.** At-grade rail corridor crossing straddled by high-volume intersections with Coast Highway 101 and Vulcan Ave.
  - **Encinitas Blvd Intersection.** Roadway undercrossing of the rail corridor straddled by high-volume intersections with Coast Highway 101 and Vulcan Ave.
  - **Encinitas Blvd to Santa Fe Dr.** Approximately 0.9 miles and includes Encinitas Station.
  - **Connection to Solana Beach.** South of Chesterfield Dr into the City of Solana Beach, the CRT uses Coast Highway 101. Improved Class II bike lanes are currently under construction by the City of Encinitas.
- **Alignment Constraints & Opportunities.** For each segment, evaluate the constraints and opportunities of three potential alignments:
  - **West Side Alignment.** West of the railroad tracks, in/adjacent to NCTD ROW
  - **East Side Alignment.** East of the railroad tracks, in/adjacent to NCTD ROW
  - **Vulcan Ave Alignment.** East of the railroad tracks, in/adjacent to the Vulcan Ave ROW
- **Rail Corridor Crossing Locations.** Identify potential east/west crossing locations that could connect feasible segments.
- **Connectivity Assessment.** Based on constraints, identify alignments with significant constraints or challenges to implementation. Then, by evaluating connectivity with adjacent alignment options, identify subsequent pathways that depend on connections to the most highly constrained options.

## 2 SUMMARY EVALUATION RESULTS

This section summarizes the overall evaluation results and identifies the most feasible alignment recommended for further study. The subsequent sections contain detailed discussions of each segment and key intersection.

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### KEY CONSTRAINTS

Four general constraints were identified during the evaluation of alignments, which led to the identification of the most feasible route. These key constraints are:

- **Rustic Temporary Parking Pods.** This constraint results from the City of Encinitas’s North Coast Highway 101 Leucadia Streetscape project, which proposes to install 9 “rustic temporary parking pods” between Coast Highway 101 and the railroad tracks. The project features an eight-foot-wide strip of parallel parking alongside a thirteen-foot northbound drive lane, partially located in NCTD ROW per agreement between the City of Encinitas and NCTD.
- **Right-of-Way (ROW).** This constraint includes insufficient width for installation of the CRT due to limited existing ROW widths and private improvements adjacent to and within the public ROW.
- **Drainage.** Drainage improvements adjacent to the railroad tracks are proposed as part of the planned double-track project. The space required for these open channels or comparable facilities (see Section 3) constrains the available width for the CRT. Additionally, the City of Encinitas is currently conducting a comprehensive watershed study—expected to be complete in late 2020—that may identify additional drainage options for the corridor.
- **Intersection Operations.** Two major intersections at Leucadia Blvd and Encinitas Blvd were evaluated regarding pedestrian, vehicle and rail operations to determine the optimal route for the CRT through these intersections.

## ALIGNMENT FEASIBILITY

The table and graphic below summarize the results of the evaluation. The constraints limiting the feasibility of each segment are identified in the table, while the graphic shows the “most feasible” alignment containing the fewest current constraints.

- ✓ Generally feasible
- Potentially feasible (constraint is temporary or may be avoidable)
- ✗ Highly constrained (constraint is significant, and may be unavoidable or cost prohibitive)

Segment	West Side Alignment	East Side Alignment	Vulcan Ave Alignment
<b>La Costa Ave to Leucadia Blvd</b>	<ul style="list-style-type: none"> <li>— Temp. parking pods</li> <li>— Drainage channel</li> </ul>	<ul style="list-style-type: none"> <li>✗ Drainage channel</li> <li>✗ Crossing to west side</li> </ul>	<ul style="list-style-type: none"> <li>✗ ROW constraint</li> <li>✗ Crossing to west side</li> </ul>
<b>Leucadia Blvd Intersection</b>	<ul style="list-style-type: none"> <li>— Geometry constraints</li> </ul>	<ul style="list-style-type: none"> <li>✗ Rail crossing operations</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>
<b>Leucadia Blvd to El Portal Crossing</b>	<ul style="list-style-type: none"> <li>— Temp. parking pods</li> </ul>	<ul style="list-style-type: none"> <li>✗ Crossing to west side</li> <li>— ROW constraint</li> </ul>	<ul style="list-style-type: none"> <li>✗ ROW constraint</li> <li>✗ Crossing to west side</li> </ul>
<b>El Portal Crossing</b>	<ul style="list-style-type: none"> <li>— Feasible for rail corridor crossing with design revisions</li> </ul>		<ul style="list-style-type: none"> <li>✗ ROW constraint</li> </ul>
<b>El Portal Crossing to Encinitas Blvd</b>	<ul style="list-style-type: none"> <li>— Temp. parking pods</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>	<ul style="list-style-type: none"> <li>✗ ROW constraint</li> </ul>
<b>Encinitas Blvd Intersection</b>	<ul style="list-style-type: none"> <li>✗ Roadway traffic operations</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible with double-track</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>
<b>Encinitas Blvd to G St</b>	<ul style="list-style-type: none"> <li>✗ ROW constraint</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible with double-track</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>
<b>G St to Santa Fe Dr</b>	<ul style="list-style-type: none"> <li>✗ ROW constraint</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>	<ul style="list-style-type: none"> <li>✓ Generally feasible</li> </ul>



## MOST FEASIBLE ALIGNMENT

Given the constraints summarized in the table above, the project team has identified a “most feasible” alignment as described below and shown at right. While this alignment contains the fewest constraints based on current information, its identification in this report does not eliminate other potential options from consideration. With many adjacent projects and planning efforts underway in the corridor—including the City of Encinitas watershed study, expected to be complete in late 2020—this evaluation may be revised if conditions change or new information arises.

- **La Costa Ave to El Portal Crossing: West Side Alignment.** The rustic temporary parking pods being constructed by the City of Encinitas are designated as temporary and will require modification to fit the CRT.
- **El Portal Crossing to Encinitas Blvd: East Side Alignment.** The El Portal crossing can accommodate the CRT with design changes, and the East Side Alignment has sufficient room for the CRT without major impacts to Vulcan Ave.
- **Encinitas Blvd to G St (Near Term): Vulcan Ave Alignment.** Prior to construction of the double-track project, the most feasible alignment is a two-way cycle track along the east side of Vulcan Ave.
- **Encinitas Blvd to G St (Long Term): East Side Alignment.** With construction of the double-track project, the CRT can return to a Class I facility located in the rail ROW.
- **G St to Santa Fe Dr: East Side Alignment.** There is sufficient room to accommodate the CRT east of the rail corridor where it will connect with the recently completed segment at Santa Fe Dr.



- Feasible
- Feasible – with double track
- Potentially feasible
- Existing

## COST ESTIMATE SUMMARY

### ESTIMATED COSTS OF MOST FEASIBLE ALIGNMENT

The table below summarizes the estimated total project costs for the most feasible alignment identified by the project team, which is a hybrid of several evaluated segments. Appendix B-1 contains full cost estimates for each segment.

<b>Most Feasible Alignment Segment &amp; Key Elements</b>	<b>Estimated Cost *</b>
<b>La Costa Ave to El Portal Crossing</b> <i>West Side Alignment</i> <i>CRT above underground drainage channel (approx. 900')</i> <i>Removal of Coast Highway 101 parking pods as needed</i> <i>Signal modification at Leucadia Blvd</i>	\$8.6 million
<b>El Portal Crossing to Encinitas Blvd</b> <i>East Side Alignment</i> <i>Modification of El Portal Crossing with ramps</i>	\$2.6 million
<b>Encinitas Blvd to G St: Near Term Option</b> <i>Vulcan Ave Alignment</i> <i>4-way protected intersection at Encinitas Blvd</i> <i>CRT as 2-way cycle track on east side of Vulcan Ave with road diet</i>	\$0.6 million
<b>Encinitas Blvd to G St: Long Term Option</b> <i>East Side Alignment</i> <i>Bridge over Encinitas Blvd with double-track</i> <i>Signalization of E St/Vulcan Ave</i>	\$4.4 million
<b>G St to Santa Fe Dr</b> <i>East Side Alignment</i> <i>HAWK crossing north of G St (connects to Near Term Option)</i>	\$1.9 million

\* Includes construction, soft costs, and contingencies as detailed in Appendix B.



## ESTIMATED COSTS OF ALL ANALYZED SEGMENTS

The table below summarizes the estimated total project costs for each alignment segment analyzed by the project team. Appendices B-2 through B-5 (listed in the far-right column) contain full cost estimates for each segment.

<b>Alignment Segment &amp; Key Elements</b>	<b>Estimated Cost *</b>	<b>Cost Estimate Location</b>
<b>La Costa Ave to Encinitas Blvd: West Side Alignment</b> <i>CRT above underground drainage channel (approx. 900')</i> <i>Removal of Coast Highway 101 parking pods as needed</i> <i>Signal modification at Leucadia Blvd</i> <i>Tie-backs at Encinitas Blvd rail undercrossing</i>	\$11.3 million	Appendix B-2
<b>La Costa Ave to Encinitas Blvd: East Side Alignment</b> <i>Bridge overcrossing south of La Costa Ave</i> <i>CRT adjacent to drainage channel with retaining wall</i> <i>Realignment &amp; reconstruction of Vulcan Ave as needed</i> <i>Modification of El Portal Crossing with ramps</i>	\$22.8 million	Appendix B-3
<b>Encinitas Blvd to Santa Fe Dr: Near Term Option</b> <i>4-way protected intersection at Encinitas Blvd</i> <i>CRT as 2-way cycle track on Vulcan Ave with road diet</i> <i>HAWK crossing north of G St</i> <i>CRT adjacent to east side of rail corridor south of G St</i>	\$2.4 million	Appendix B-4
<b>Encinitas Blvd to Santa Fe Dr: Long Term Option</b> <i>Bridge over Encinitas Blvd with double-track</i> <i>CRT adjacent to east side of rail corridor</i> <i>Signalization of E St/Vulcan Ave with rail preemption</i>	\$6.1 million	Appendix B-5

\* Includes construction, soft costs, and contingencies as detailed in Appendix B.

### 3 LA COSTA AVE TO ENCINITAS BLVD

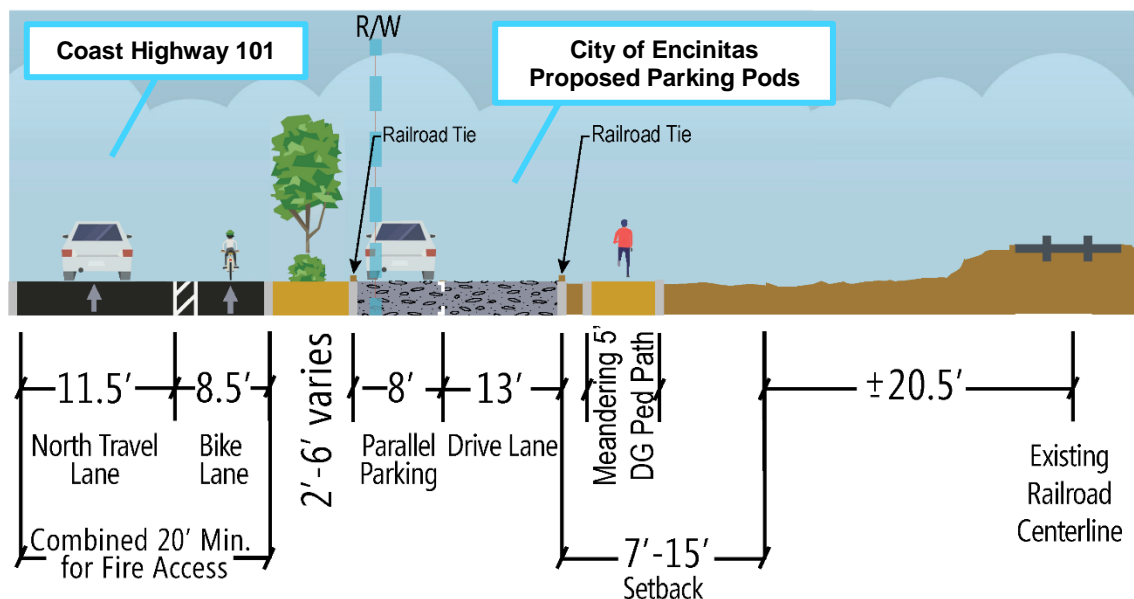
This northernmost segment is approximately 2.6 miles long and bound by many constraints, including the Leucadia Blvd intersection which is discussed in more detail in Section 4. Please refer to the alignment exhibits in Appendix A and cost estimates in Appendix B.

#### BOOKEND CONSTRAINTS

- **North Bookend: West Side Alignment at Coast Highway 101.** North of La Costa Ave heading into Carlsbad, the CRT must use Coast Highway 101—as all other alignments would require a new bridge structure across the environmentally sensitive Batiquitos Lagoon—meaning the facility must be west of the railroad corridor at this northern end.
- **South Bookend: Likely East Side/Vulcan Ave Alignment at Encinitas Blvd.** The CRT is highly likely to be east of the rail corridor in the adjacent segment south of Encinitas Blvd, as discussed in Section 5.

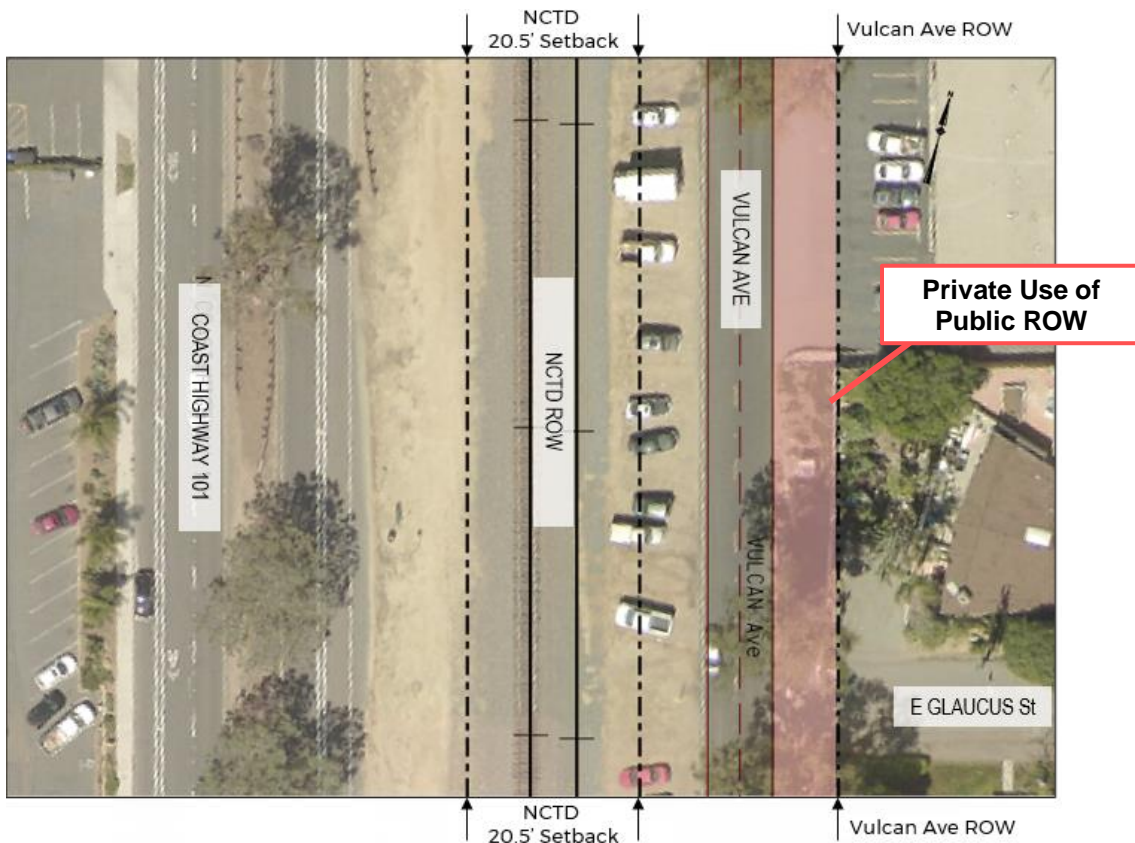
#### SEGMENT CONSTRAINTS

- **North Coast Highway 101 Leucadia Streetscape.** City of Encinitas project to calm traffic, install roundabouts, create new pedestrian crossings, add bike lanes, and improve pedestrian facilities on Coast Highway 101 from La Costa Ave to A St.
- **Rustic Temporary Parking Pods.** City of Encinitas project to install nine “rustic temporary parking pods” between Coast Highway 101 and the railroad tracks, featuring an 8’ strip of parallel parking alongside a 13’ northbound drive lane (see sample cross-section below). Partially located in NCTD ROW per agreement between City of Encinitas and NCTD.
- **La Costa to Swamis Double-Track.** SANDAG project to add a second main track to the railroad, which will shift the existing track west by approximately 5’ and add a new track to the east.



Source: City of Encinitas, 2019

- **Double-Track Drainage.** Two planned stormwater drainage channels required to accommodate the rail corridor double-track project (but which do *not* accommodate drainage from Coast Highway 101 or Vulcan Ave), plus one existing channel:
  - **West of Rail Corridor.** Planned channel, roughly from La Costa Ave to north of Grandview St (approx. 2,000')
  - **East of Rail Corridor.** Planned channel, roughly from La Costa Ave to Leucadia Blvd (approx. 1.3 miles)
  - **East of Rail Corridor.** Existing channel, roughly from Union St to Orpheus Ave (approx. 1,200')
- **Vulcan Ave Informal Parking.** Unofficial parking areas in the undeveloped space between the existing railroad track and the Vulcan Ave southbound travel lane, located partially in the NCTD ROW and partially in the Vulcan Ave ROW.
- **Vulcan Ave ROW.** While the Vulcan Ave ROW is approximately 50' wide, the effective roadway width in this segment is 28'-30', measured from the NCTD ROW to eastern edge of the northbound travel lane. As shown in the figure below, there is an additional 20' of roadway ROW east of the northbound travel lane. However, this area is currently being used by many fronting properties for parking, landscaping, and other private purposes.



## POTENTIAL CROSSING LOCATIONS

If required, the CRT may be able to cross the railroad at the following locations in this segment:

- **La Costa Ave.** This existing roadway overcrossing at the northern end of the segment is highly constrained and would be a high-stress facility for bike/ped travel. It is also difficult to access from the rail corridor due to the grade separation, likely requiring out-of-direction travel though the Vulcan Ave/La Costa Ave intersection, which also would require additional safety improvements.
- **Potential CRT Bridge.** A new grade-separated crossing for the CRT over the railroad corridor would add approximately \$2.5 million to the project cost. This includes an estimated construction cost of \$1.4 million (see Appendix B-3) plus soft costs and contingencies. The major cost drivers are walls needed to achieve sufficient slope and elevation, which are required irrespective of bridge materials. This option is likely cost prohibitive, as it would consume a large share of the overall CRT project budget.
- **Leucadia Blvd.** This existing roadway crossing at the southern end of the segment is discussed in more detail in Section 4. It currently contains a pedestrian crossing of the railroad along the north side of Leucadia Blvd.
- **El Portal St/Union St.** This planned pedestrian undercrossing is in design by SANDAG in collaboration with the City of Encinitas. The current design includes stairs on the east side of the railroad and pathway widths that are narrower than CRT assumptions.
- **Encinitas Blvd.** This existing roadway undercrossing at the southern end of the segment is constrained by travel lanes and abutting bridge structures. As discussed below, the West Side Alignment north of Encinitas Blvd could cross to the east side of the railroad corridor using tie-backs under this railroad bridge.
- **Potential New Pedestrian Crossings.** The City of Encinitas *Cross-Connect Implementation Plan* is currently prioritizing and developing design concepts for potential new pedestrian crossings at the locations below. However, the ultimate timeline, compatibility with CRT, and funding for these projects is unknown.
  - Bishop's Gate Rd
  - Grandview St/Hillcrest Dr
  - Sanford St/Jupiter St
  - Phoebe St/Glaucus St
  - Daphne St/Basil St
  - Marcheta St/Orpheus Ave
  - A St/Sunset Dr

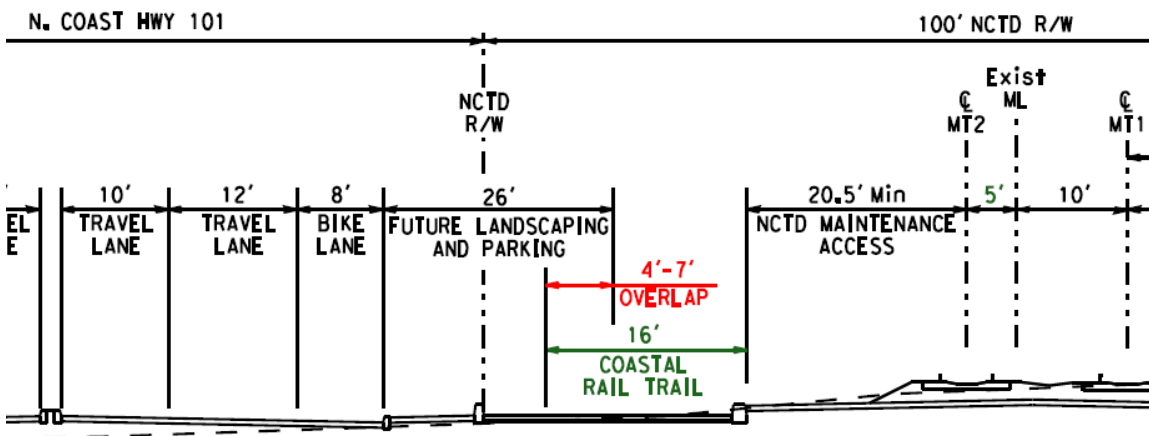


## WEST SIDE ALIGNMENT

The West Side Alignment in this segment is mainly constrained by the planned parking pods just east of Coast Highway 101, in addition to the double-track project and drainage requirements. Please refer to the alignment exhibit in Appendix A-1 and cost estimate in Appendix B-2.

### LA COSTA AVE TO LEUCADIA BLVD

**Key Constraint – Parking Pods.** The parking pods are proposed by the City of Encinitas to meet community goals and the California Coastal Commission permit requirement (see Appendix C) to provide 176 parking spaces between Coast Highway 101 and the railroad as part of the North Coast Highway 101 Leucadia Streetscape project. The planned parking pods constrain a West Side Alignment, with 5 of 6 pods encroaching into the 16' space needed for the CRT. The width of the overlapping (conflicting) area varies in this segment, as shown in the sample figure below (excerpted from Appendix A-1). However, the parking pods are considered a temporary improvement per correspondence between the City of Encinitas, NCTD, and SANDAG (see Appendix C).



The CRT project team conducted a detailed analysis showing how the parking pods and CRT could be accommodated together, which is summarized in Appendix D. The City considered this compromise solution but decided to proceed with construction of the parking pods as designed, to avoid delaying the Streetscape project. Modifications to these temporary improvements can and will be made by the City in the future as needed to accommodate the CRT or other NCTD improvements. The potential loss of the temporary parking will be a future challenge for the City to overcome prior to construction of the CRT or double-track projects.

**Key Constraint – Drainage Channel.** From La Costa Ave to just north of Grandview St, the double-track project requires a drainage channel west of the tracks:

- For an approx. 800' segment north of Bishop's Gate Rd, any CRT West Side Alignment (irrespective of the adjacent parking pod) would require undergrounding this channel. Placing the CRT atop the recommended 24" reinforced concrete pipe is estimated to add approximately \$1.4 million to the project cost. This includes an estimated construction cost of \$0.8 million (see Appendix B-2) plus soft costs and contingencies.

Alternately, the CRT alignment could use Coast Highway 101 north of Bishop's Gate Rd. While feasible, these Class II bike lanes are less desirable for the CRT than a Class I/IV protected facility.

- Between Bishop's Gate Rd and Grandview St, the drainage channel also conflicts with a planned parking pod.

## LEUCADIA BLVD INTERSECTION

Alignment options for the Leucadia Blvd intersection are discussed in Section 4.

## LEUCADIA BLVD TO ENCINITAS BLVD

**Key Constraint – Parking Pods.** Like the segment north of Leucadia Blvd, the planned parking pods would severely constrain a West Side Alignment south of Leucadia Blvd. All 4 pods in this segment—2 north of El Portal St and 2 south of El Portal St—encroach into the 16' space needed for the CRT. The width of the overlapping (conflicting) area ranges from 1' to 12.5'.

**Key Constraint – Private Parcels Near A St.** Beginning near A St approximately 700' north of Encinitas Blvd, several private parcels form a wedge shape between Coast Highway 101 and the rail corridor. The most feasible location for the West Side Alignment is east of these parcels, immediately adjacent to the rail corridor setback.

The project team also considered a CRT alignment within Coast Highway 101 for this segment between A St and Encinitas Blvd. However, this option has major feasibility constraints including high vehicular volumes at the Encinitas Blvd intersection. It is discussed further in Section 5.

**Key Constraint – Crossing to East Side at Encinitas Blvd.** As described above and in Sections 5 and 6, the bookend constraint at Encinitas Blvd likely requires a connection to either the East Side Alignment or Vulcan Ave Alignment. As such, the West Side Alignment would need to cross under the railroad bridge on the north side of Encinitas Blvd—likely via construction of tie-backs to provide the necessary 16' width—and then connect to one of the following alignments, which are further described in Sections 5 and 6:

- **Connection to East Side Alignment (Long Term).** The long-term scenario includes a CRT bridge adjacent to a new railroad bridge over Encinitas Blvd, to be constructed with the planned double-track project. The elevation difference of approximately 22' could be accommodated with a loop ramp—shown in the exhibit and cost estimate with a length of 530' and maximum grade of 4.1%—or a combination of elevators, ramps, and stairs.
- **Connection to Vulcan Ave Alignment (Near Term).** The near-term scenario includes an at-grade crossing of the Encinitas Blvd/Vulcan Ave intersection, connecting to a two-way cycle track along the east side of Vulcan Ave.

## ENCINITAS BLVD INTERSECTION

Alignment options for the Encinitas Blvd intersection are discussed in Section 5.

## EAST SIDE ALIGNMENT/VULCAN AVE ALIGNMENT

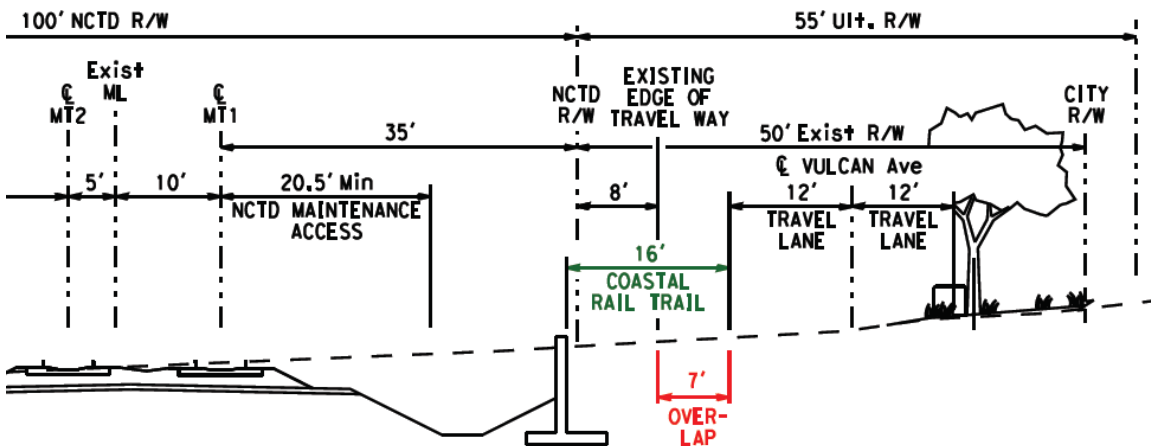
The East Side Alignment in this segment would be adjacent to—and in some locations overlapping—a potential Vulcan Ave Alignment. Both alignments are constrained by the drainage channel required for the double-track project and existing uses in the adjacent Vulcan Ave ROW. They are also constrained by the bookend requirement for a West Side Alignment north of La Costa Ave. Please refer to the alignment exhibit in Appendix A-2 and cost estimate in Appendix B-3.

### LA COSTA AVE TO LEUCADIA BLVD

**Key Constraint – Drainage Channel & Vulcan Ave ROW.** The double-track project includes a drainage channel between the new second track and the Vulcan Ave ROW running approximately 1.3 miles between La Costa Ave and Leucadia Blvd. A potential East Side Alignment would need to share space with either the drainage channel or the Vulcan Ave ROW.

The alignment exhibit in Appendix A-2 (and the excerpted figure below) depicts the latter option, with the CRT using the part of the Vulcan Ave ROW and adjacent to the drainage channel with retaining walls as needed. As detailed in Appendix B-3, implementing this alignment option between La Costa Ave and Encinitas Blvd is estimated to cost at least \$22.8 million. It includes the following modifications to Vulcan Ave:

- Realigning of Vulcan Ave to shift travel and parking lanes to the east
- Eliminating parking on the west side of Vulcan Ave
- Repurposing portions of the eastern edge of the Vulcan Ave ROW for roadway purposes that are currently being used by fronting properties for private purposes (cost includes demolition and roadway construction, but does not include potential legal and/or political costs of ROW reclamation)



Alternately, if the drainage channel is placed underground below the CRT, both facilities would fit without major changes to Vulcan Ave. However, this is estimated to cost approximately \$32.2 million (see flood control memo in Appendix B-3) and therefore is considered cost prohibitive. The major cost drivers are the size of the conveyance—estimated as a 72" reinforced concrete pipe—and the construction methods required to keep the rail corridor operational during construction. This option likely would include curb and gutter improvements and the installation of parallel parking along the west side of Vulcan Ave.

**Key Constraint – Crossing to West Side.** With the connecting CRT segment north of La Costa Ave aligned on Coast Highway 101, an East Side Alignment would need to cross to the west side of the rail corridor somewhere in this segment, either via a new CRT bridge—which is considered cost prohibitive due to its approximately \$2.5 million cost (discussed above and included in Appendix B-3)—or via potential new pedestrian crossings to be constructed by the City of Encinitas, which are currently in very early stages of development and unfunded.

## **LEUCADIA BLVD INTERSECTION**

Alignment options for the Leucadia Blvd intersection are discussed in Section 4.

## **LEUCADIA BLVD TO ENCINITAS BLVD**

Initial analysis indicates there is enough space to accommodate an East Side Alignment across this whole segment. Similar to the new CRT segment along San Elijo Ave in Cardiff, it likely would include curb and gutter improvements and the installation of parallel parking along the west side of Vulcan Ave. While the current informal parking would be eliminated, a substantial amount is likely to be replaced as parallel parking.

The CRT would incorporate the design of the planned pedestrian undercrossing at El Portal St/Union St, which includes a path along Vulcan Ave. This undercrossing also could serve as a rail corridor crossing point for the CRT, allowing it to shift from a potential West Side Alignment north of this location to the likely East Side Alignment/Vulcan Ave Alignment south of Encinitas Blvd (see Section 5).

## **ENCINITAS BLVD INTERSECTION**

Alignment options for the Encinitas Blvd intersection are discussed in Section 5.

## 4 LEUCADIA BLVD INTERSECTION

Leucadia Blvd is a major east-west roadway that crosses the rail corridor at-grade, with adjacent high-volume intersections at Coast Highway 101 and Vulcan Ave. Please refer to the alignment exhibits in Appendix A and cost estimates in Appendix B.

This intersection is highly constrained and will require further analysis, including coordination with the City of Encinitas, NCTD, and the California Public Utilities Commission (CPUC). The sections below describe these constraints and discuss several potential alignment options. However, none of the options are ideal solutions, and all pose potential feasibility issues that will require further study.

### BOOKEND CONSTRAINTS

The planned parking pods west of the rail corridor are the most notable constraint to both the north and south. However, the significant constraints at the Leucadia Blvd intersection are likely to dictate whether the CRT is ultimately aligned west or east of the tracks in these adjoining segments.

### INTERSECTION CONSTRAINTS

This section describes six key constraints that will affect potential CRT alignments:

- Double-tracking and NCTD maintenance setback
- North-south pedestrian movement
- Regulatory approvals
- Rail signal preemption
- Intersection geometry
- Traffic operations

#### DOUBLE-TRACKING & NCTD MAINTENANCE SETBACK

The La Costa to Moonlight Double Track Project will add 2.1 miles of second main track to the rail corridor, including through the Leucadia Blvd crossing. The new track is expected to be located east of the existing track. Additionally, all development must be set back a minimum of 20.5' from the center of the closest existing and planned railroad tracks to allow for NCTD maintenance access. These two constraints severely limit the space available for the CRT between the railroad and Vulcan Ave.

**Potential Challenges.** The second track and 20.5' setback are likely to limit the feasibility of an East Side Alignment through this intersection. The 20.5' setback also creates a minor constraint for the West Side Alignment, but is not expected to render it infeasible, as the future new track will be located to the east of the existing track.

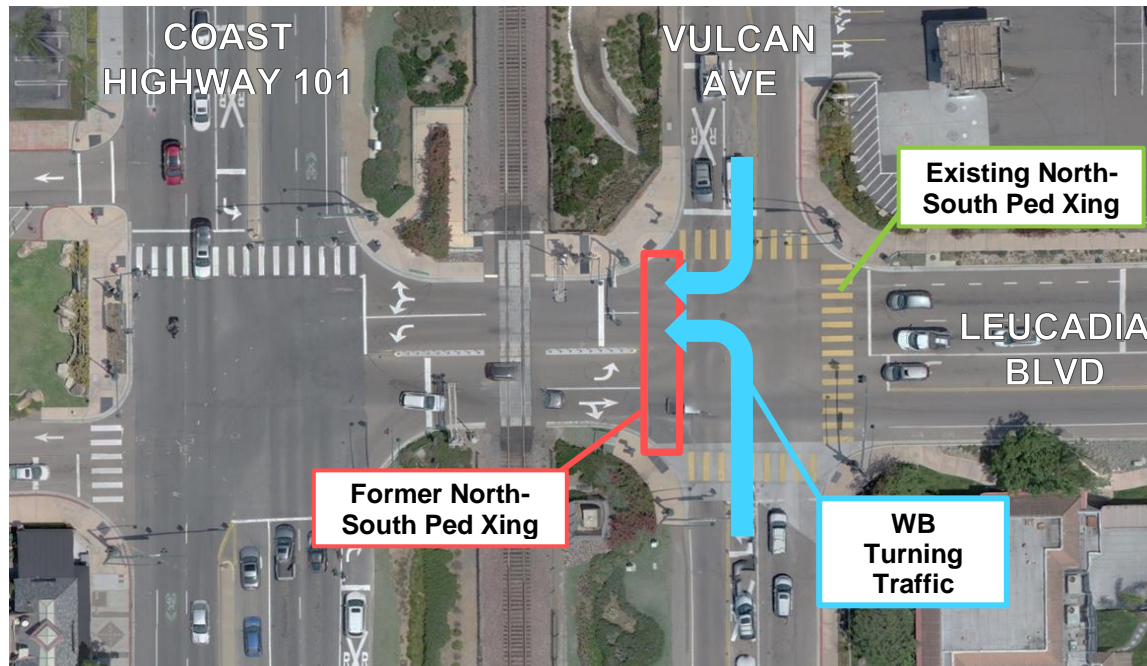
#### NORTH-SOUTH PEDESTRIAN MOVEMENT

The rail crossing and adjacent intersections at Coast Highway 101 and Vulcan Ave are controlled by one coordinated signal. As shown in the figure below, the north-south movement of pedestrians is allowed *only* across the eastern leg of the Vulcan Ave/Leucadia Blvd intersection.

This is a change from prior to 2011 (documented in Google Maps), when north-south pedestrian movement also was allowed across the western leg of the Vulcan Ave intersection. Restricting pedestrians to the eastern edge of the intersection reduced delay for westbound traffic turning from Vulcan Ave (blue arrows in the figure below), which is a permitted movement during the

green phase. Pedestrian movement along this leg without a protected left-turn phase also poses a potential safety issue.

**Potential Challenges.** This is likely to limit the feasibility of an East Side Alignment through this intersection.



## REGULATORY APPROVALS

Any change to the operation of this at-grade crossing and associated intersections will require review and approval by NCTD, the City of Encinitas, and the CPUC. Approval by the CPUC is likely to follow the process outlined in General Order 88-B, which requires the consensus of all three agencies.

**Potential Challenges:** Reviews by NCTD, the City of Encinitas, and the CPUC will require substantial lead time and may reveal additional issues or requirements.

## RAIL SIGNAL PREEMPTION

When a train approaches the at-grade crossing, it activates a signal-preemption routine that clears the crossing of any conflicting traffic—first by ending any active north-south pedestrian phase (along the eastern leg of the Vulcan Ave intersection) by allowing sufficient time for pedestrians to clear the intersection, then by holding all traffic movements except the east-west clearance of vehicles away from the at-grade crossing.

**Potential Challenges.** Rail signal preemption may not be a limiting factor for the CRT. Based on field observations, the existing pre-emption routine already allows for the full north-south movement of pedestrians across the eastern leg of the Vulcan Ave intersection, which is the same duration that a multi-use path would require. These observations will need to be validated through more detailed study including consultation with the City of Encinitas, NCTD, and CPUC. Any modifications to signal operations involving rail signal preemption requires CPUC approval.





## INTERSECTION GEOMETRY & ASSOCIATED DRAINAGE

The distances are very short between the existing/proposed railroad tracks and the adjacent intersections of Leucadia Blvd with Coast Highway 101 and Vulcan Ave. These short distances limit the available space for the CRT. Immediately north of Leucadia Blvd on the east side of the track, an existing drainage channel runs to the north and is planned to be preserved and lengthened with the double-track project.

In addition, there is also a significant vertical grade change in the profile of Leucadia Blvd from the existing rail elevation west to Coast Highway 101. This presents drainage issues on the west side of the rail corridor, including sheet flow across the intersection during storm events.

**Potential Challenges.** The planned drainage channel highly constrains the East Side Alignment immediately north of Leucadia Blvd. In addition, the vertical grade change creates potential cross-slope for the CRT as well as potential drainage issues, and may constrain the West Side Alignment as discussed in the next section.

## TRAFFIC OPERATIONS

The *Traffic Impact Analysis (TIA)* for the City of Encinitas *North Coast Highway 101 Streetscape Improvement Project*, published in 2016, analyzed existing and future traffic conditions at the intersections of Leucadia Blvd/Coast Highway 101 and Leucadia Blvd/Vulcan Ave.

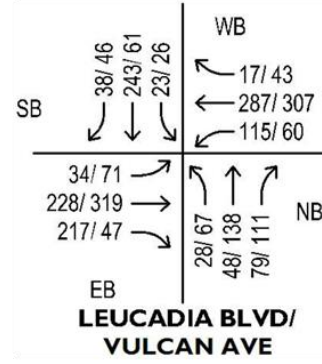
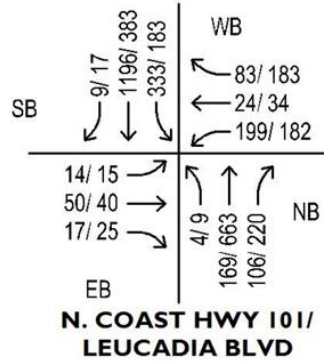
As shown in the diagrams and table below, in 2015, the *TIA* found that approximately 6,800 vehicles crossed the intersections during the combined AM and PM peak hours on a typical weekday. By 2035, the *TIA* projects this volume to grow by 24% to approximately 8,400 vehicles.

Without considering the effects of rail signal preemption, the *TIA* analysis found an intersection level of service (LOS) D in the AM peak hour and LOS C in the PM peak hour. In 2035, the *TIA* projects degradation to LOS E in the AM peak hour and LOS D in the PM peak hour.

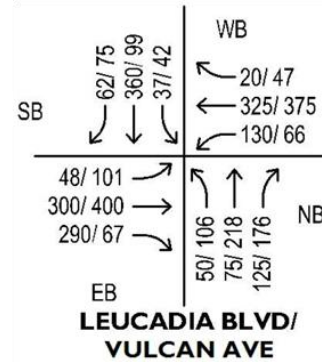
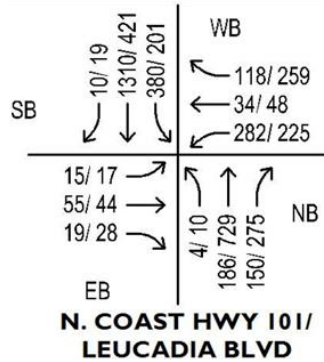
Rail signal preemption will further degrade intersection operations because it overrides the standard signal timing routine assumed in the *TIA* to give priority to approaching trains. Currently, there are 52 preemption events on a typical weekday (26 Amtrak, 22 COASTER, and 6 freight trains). Over the next decade, the number of preemption events is expected to nearly double, with the rail corridor accommodating an estimated 101 trains per day by 2030. This will further degrade intersection operations.

**Potential Challenges.** Intersection delay is a challenge at both intersections and could increase with CRT implementation. This will require in-depth analysis in the next phase of study including detailed coordination with the City of Encinitas and CPUC.

## 2015 Peak Hour Volumes



## 2035 Peak Hour Volumes



Source: North Coast Highway 101 Streetscape Improvement Project Traffic Impact Analysis (TIA), City of Encinitas, 2016

Year	Intersection	Peak Hour	Delay	LOS
2015	Coast Hwy 101 / Leucadia Blvd	AM	52.0	D
		PM	33.3	C
2035	Leucadia Blvd / Vulcan Ave	AM	52.2	D
		PM	44.2	D
	Coast Hwy 101 / Leucadia Blvd	AM	69.5	E
		PM	36.8	D
Leucadia Blvd / Vulcan Ave	AM	68.8	E	
	PM	47.9	D	

Source: North Coast Highway 101 Streetscape Improvement Project Traffic Impact Analysis (TIA), City of Encinitas, 2016

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## WEST SIDE ALIGNMENT

The most feasible CRT alignment through this intersection is the West Side Alignment. There are three potential options outlined below. Please refer to the alignment exhibit in Appendix A-1 (Options 1 and 2 depicted) and cost estimate in Appendix B-2 (Option 1 included).

### WEST SIDE ALIGNMENT OPTION 1: CRT WEST OF TURN LANE

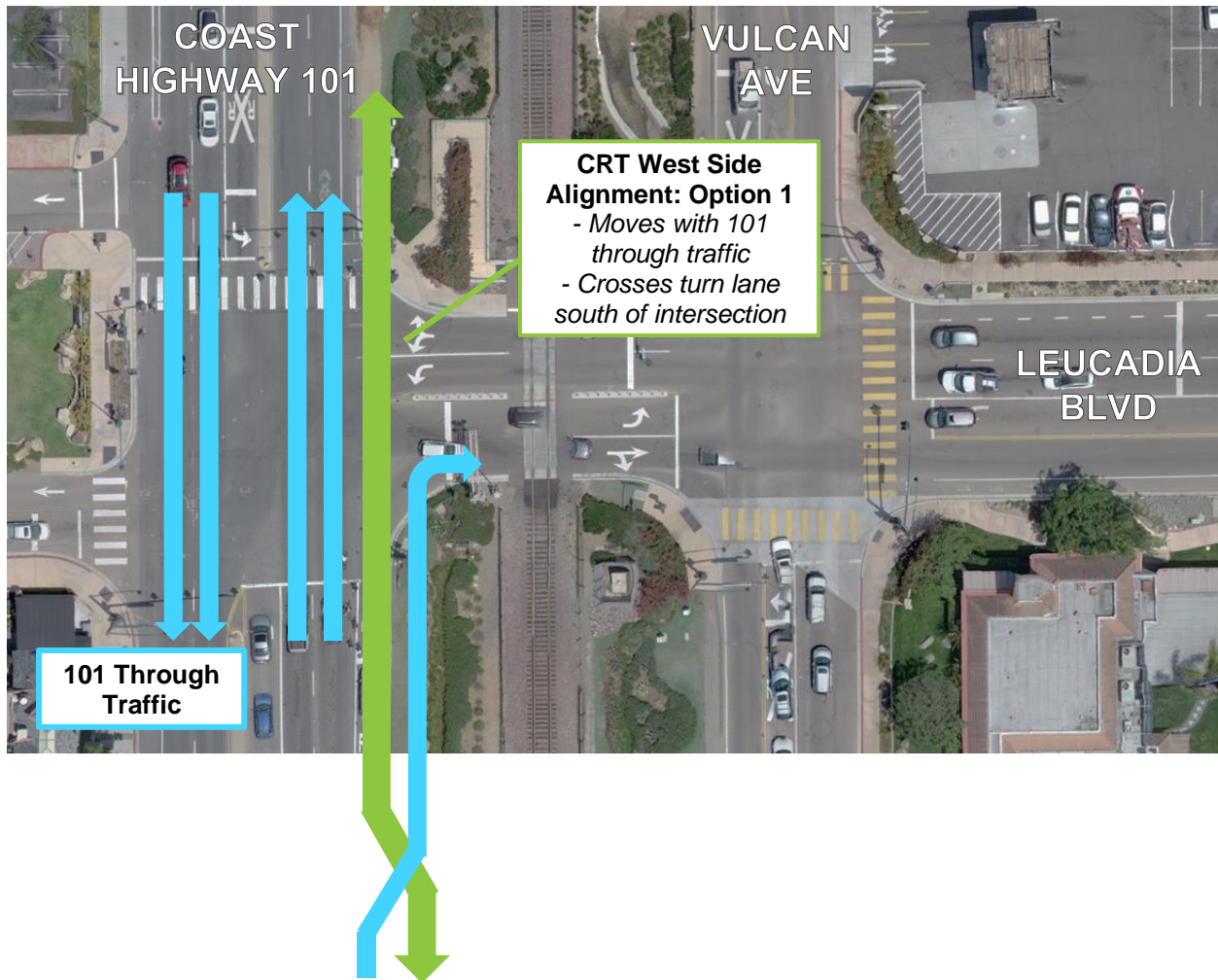
In Option 1, the northbound right-turn lane and two-way CRT would cross approximately 300' south of the intersection, removing the bike/ped/auto conflict from the turning movement and providing a clear pathway for autos. At the intersection, two-way CRT traffic (in green below) would receive a green signal overlapping the Coast Highway 101 through movements (in blue).

**Geometry & Associated Drainage.** From a geometric perspective, this option may be preferred to Option 2, since the vertical grade difference between the existing track and Coast Highway 101 is less on the west side of the right-turn lane. As such, the cross-slope of the CRT through the intersection is likely to be less severe than in Option 2. However, the vehicular turn lane will require further evaluation to determine the acceptable cross-slope and may require restrictions for long-axle vehicles. In addition, this alignment will require further evaluation of drainage needs given the tendency for sheet flow across the intersection during storm events.

Option 1 also would require a conflict area south of the intersection where autos and CRT users must cross paths. This crossing could be accomplished with striping and in-pavement flashers activated by cyclists or pedestrians. Advanced warning signs would alert drivers to the pending crossing. In addition, this option requires a smaller turning radius for vehicle right-turn movements, since the right turn lane is being shifted to the east, closer to the railroad corridor.

**Intersection Operations.** Option 1 would not affect the planned signal timing or add additional delay to the intersection. There would be a slight delay at the conflict area south of the intersection for right-turning vehicles.

This concept requires further analysis including detailed coordination with the City of Encinitas, NCTD, and CPUC.



## WEST SIDE ALIGNMENT OPTION 2: CRT EAST OF TURN LANE

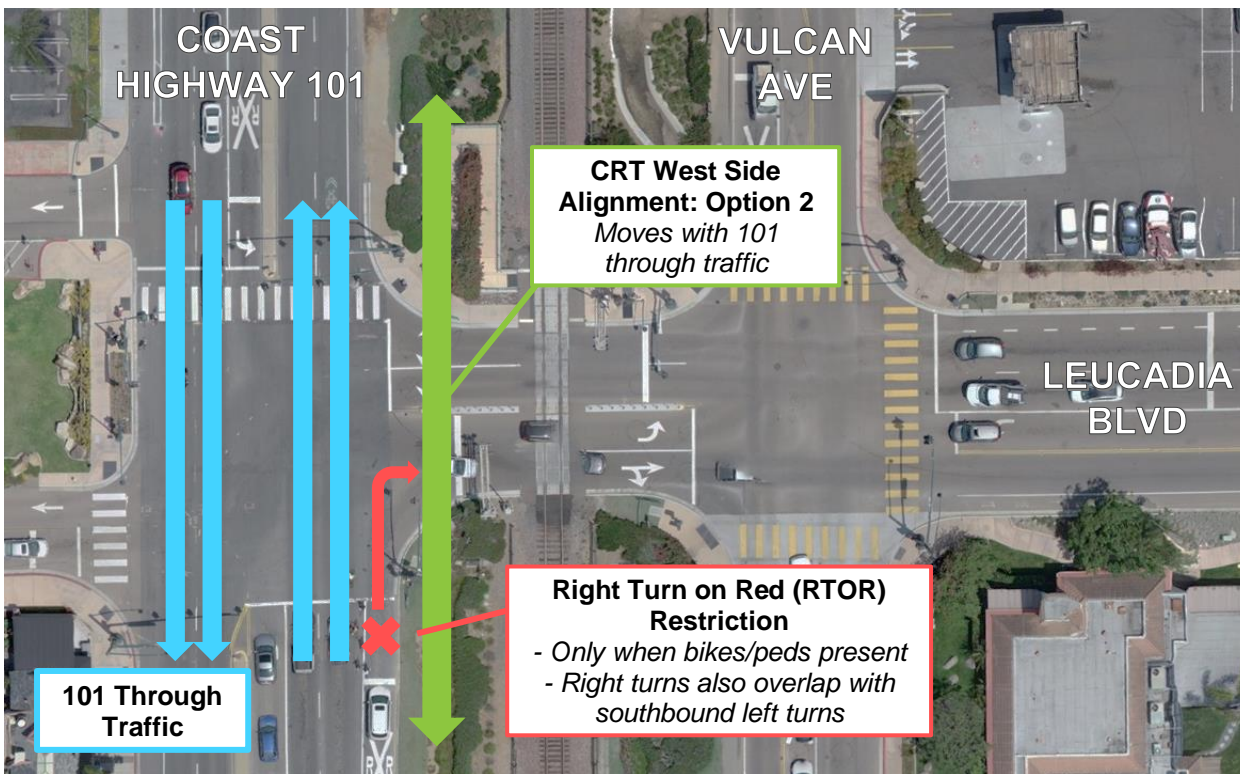
Option 2 avoids the southern bike/ped/auto conflict of Option 1 with minor modifications to intersection phasing to provide protection for CRT users. Like Option 1, at the intersection two-way CRT traffic (green) would receive a green signal overlapping the Coast Highway 101 through movements (blue arrows). However, Option 2 would prohibit northbound right turns on red (RTOR) across the bikeway (red arrows) during this phase *only* when cyclists or pedestrians are present. Northbound right turns also would share an overlap phase with southbound left turns.

**Geometry & Associated Drainage.** Option 2 is challenged by the vertical grade difference between the existing track and Coast Highway 101. Locating the CRT east of the right turn lane could result in a large CRT cross-slope through the intersection. However, this alignment provides for a larger turning radius for vehicle right-turn movements. In addition, this alignment will require further evaluation of drainage needs given the tendency for sheet flow across the intersection during storm events.

**Intersection Operations.** With the only change to operations being the RTOR prohibition for certain movements during a single phase, the project team’s preliminary evaluation based on data in the *TIA* indicates this change would have little impact on overall intersection operations and delay. In addition, the overlap phase for northbound right turns and southbound left turns is sufficient to accommodate *TIA*-projected volumes in 2035.

Option 2 is not expected to affect rail signal preemption timing, as the existing preemption scheme needs to include the full time necessary for the north-south crossing along the eastbound leg of the Vulcan Ave intersection. This means Option 2 would not increase the total cycle length, and therefore would not affect the exiting rail preemption.

This concept requires further analysis including detailed coordination with the City of Encinitas, NCTD, and CPUC.





### **WEST SIDE ALIGNMENT OPTION 3: CRT BRIDGE OVER LEUCADIA BLVD**

Given the constraints of this complex intersection, an alternate option is constructing a grade-separated overcrossing for the CRT. As described above and included in Appendix B-3 (for a CRT crossing just south of La Costa Ave), a new grade-separated crossing for the CRT is estimated to add approximately \$2.5 million to the project cost. The major cost drivers are walls needed to achieve slope and elevation, which are required irrespective of bridge materials.

As with the other options for the Leucadia Blvd intersection, this option has many feasibility constraints and will require further study and including detailed coordination with the City of Encinitas, NCTD, and CPUC.



## EAST SIDE ALIGNMENT

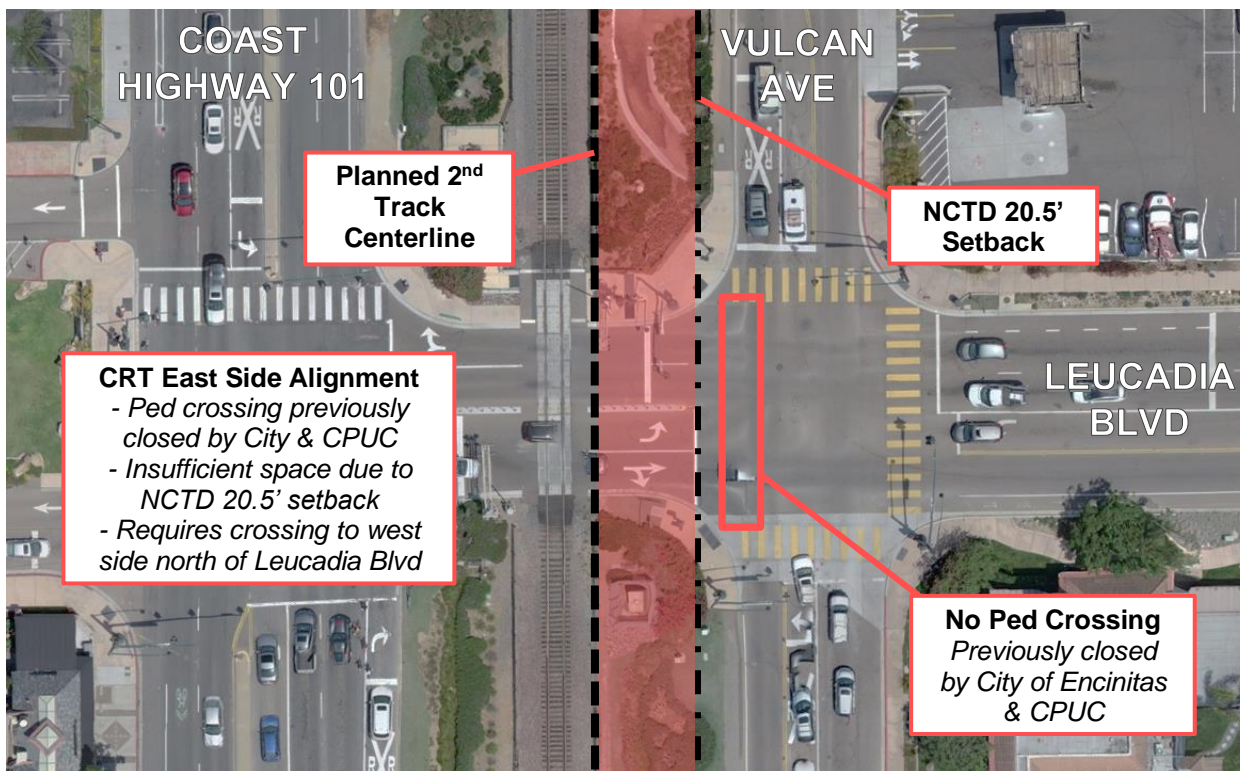
The East Side Alignment is highly constrained by several factors:

**Key Constraint – Double-Track and NCTD Maintenance Setback.** As described above, the La Costa to Moonlight Double Track Project is expected to construct a second railroad track east of the existing track, which also will include a 20.5-foot maintenance setback. Additionally, an existing and planned drainage channel constrain the CRT immediately north of Leucadia Blvd.

**Key Constraint – North-South Pedestrian Operations.** As described above, current operations allow the north-south movement of pedestrians *only* across the eastern leg of the Vulcan Ave/Leucadia Blvd intersection. Just as north-south pedestrian crossings are no longer allowed across the western leg of the intersection, an East Side Alignment is similarly constrained.

**Key Constraint – Crossing to West Side.** With the connecting CRT segment north of La Costa Ave aligned on Coast Highway 101, an East Side Alignment would need to cross to the west side of the rail corridor somewhere between Leucadia Blvd and La Costa Ave. Options evaluated include:

- **La Costa Ave.** The existing bridge is highly constrained.
- **Potential New Pedestrian Crossings.** The City of Encinitas is studying new grade-separated rail crossings and has identified two potential areas—Grandview St/Hillcrest Dr and Sanford St/Jupiter St—as two of the highest-priority locations for implementation. However, the projects are in very early stages of development and currently unfunded.
- **New CRT Bridge.** A new grade-separated crossing for the CRT is estimated to add approximately \$2.5 million to the project cost, as described above and included in Appendix B-3. The major cost drivers are walls needed to achieve slope and elevation, which are required irrespective of bridge materials.



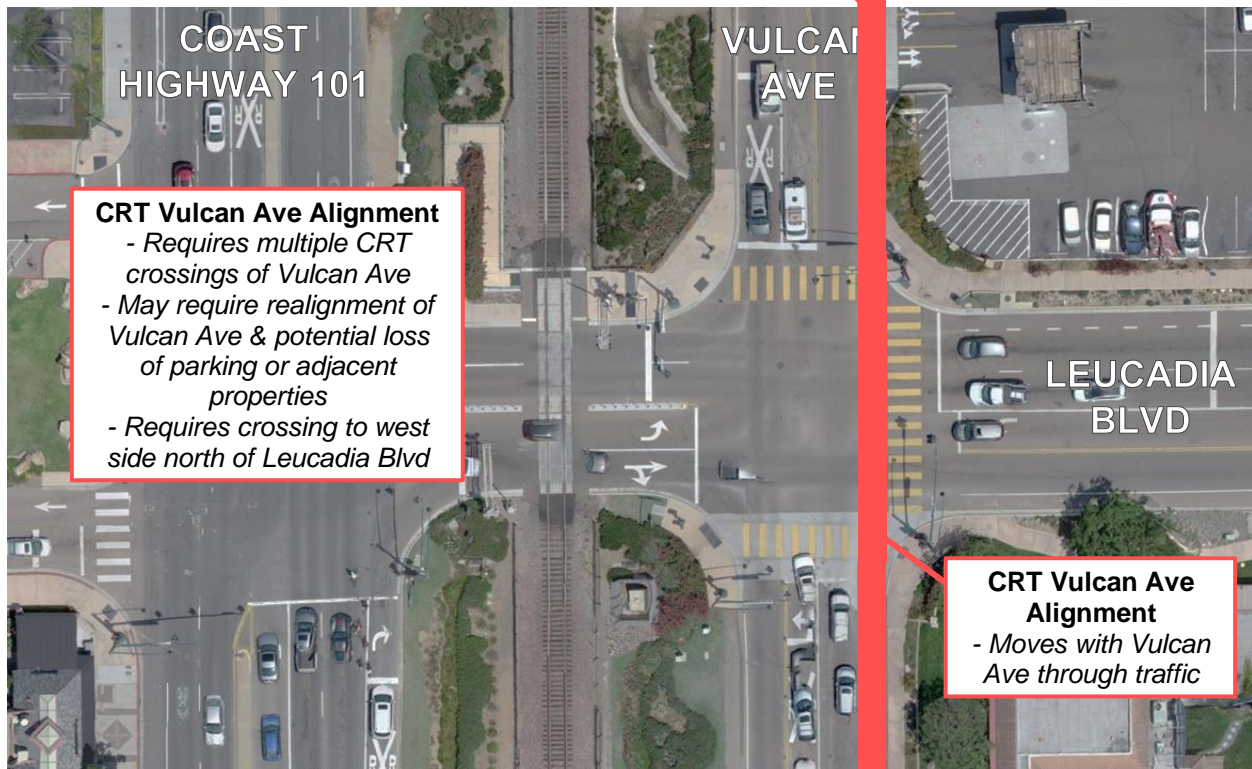
## VULCAN AVE ALIGNMENT

Having the CRT operate with Vulcan Ave through traffic—via a two-way cycle track along the eastern leg of the intersection—is likely to be feasible for crossing the intersection itself. However, several other constraints may limit its feasibility. Please refer to the roll plot exhibit in Appendix A-2 and cost estimate in Appendix B-3.

**Key Constraint – Vulcan Ave Realignment & Potential Loss of Parking or Adjacent Properties.** If the CRT remains in the Vulcan Ave ROW outside the intersection, maintaining two-way traffic likely would require realigning the roadway. Nearly all adjacent properties fronting Vulcan Ave have some encroachment onto the public ROW that is currently used for parking, landscaping and other private purposes. These private encroachments would need to be vacated for the realignment of the roadway.

**Key Constraint – Multiple Crossings of Vulcan Ave.** If the CRT only enters the Vulcan Ave ROW to cross Leucadia Blvd (and otherwise matches the East Side Alignment), this concept would create two additional conflict points between autos and bikes at the Vulcan Ave crossing locations. This also may cause traffic delays on Vulcan Ave.

**Key Constraint – Crossing to West Side.** Like the East Side Alignment described above, a Vulcan Ave Alignment would need to cross to the west side of the rail corridor somewhere between Leucadia Blvd and La Costa Ave. As described with the East Side Option, the most feasible way to do this—a new CRT bridge—is estimated to add approximately \$2.5 million to the project cost, as described above and included in Appendix B-3.



## 5 ENCINITAS BLVD INTERSECTION

Encinitas Blvd is a major east-west roadway that crosses under the rail corridor, with high-volume intersections at Coast Highway 101 and Vulcan Ave. Please refer to the alignment exhibits in Appendix A and cost estimates in Appendix B.

### BOOKEND CONSTRAINTS

- **North Bookend: Likely East Side/Vulcan Ave Alignment.** As discussed in Section 3, significant constraints west of the rail corridor likely will require the CRT to approach Encinitas Blvd from the north via the East Side Alignment or Vulcan Ave Alignment. This would be true even if the West Side Alignment were implemented to the north; as described in Section 3, even this option would cross the rail corridor along the north side of Encinitas Blvd using tie-backs under the railroad bridge.
- **South Bookend: Likely East Side Alignment (Long Term) or Vulcan Ave Alignment (Near Term).** As discussed in Section 6, significant constraints west of the rail corridor likely will require the CRT to approach Encinitas Blvd from the south via the East Side Alignment or Vulcan Ave Alignment. In the near-term scenario, the East side likely is infeasible due to significant impacts to the existing transit station bus bays and parking lot. Therefore, in a near-term scenario, the Vulcan Ave Alignment (specifically the east side of Vulcan Ave) is likely to be the most feasible. The East Side Alignment is feasible in a long-term scenario if the CRT is designed and incorporated into the double-track project, as described in Section 6.

### INTERSECTION CONSTRAINTS

- **La Costa to Swamis Double-Track.** SANDAG project to add a second main track to the railroad to the east of the existing track.
- **Grade-Separated Rail Alignment.** Any CRT alignment within the NCTD ROW will need to cross over Encinitas Blvd with the railroad tracks, requiring design coordination with the double-track project and potentially adding to project cost.

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## WEST SIDE ALIGNMENT

As described in Section 3, the West Side Alignment north of Encinitas Blvd likely would cross to the east side of the railroad corridor before crossing Encinitas Blvd (using tie-backs under the railroad bridge). The alternate option to use the Coast Highway 101/Encinitas Blvd intersection is highly constrained due to intersection operations and high volumes/high stress for bicycles.

**Key Constraint – Intersection Operations.** Intersection operations would likely require a separate phase for the CRT, causing delays at the intersection.

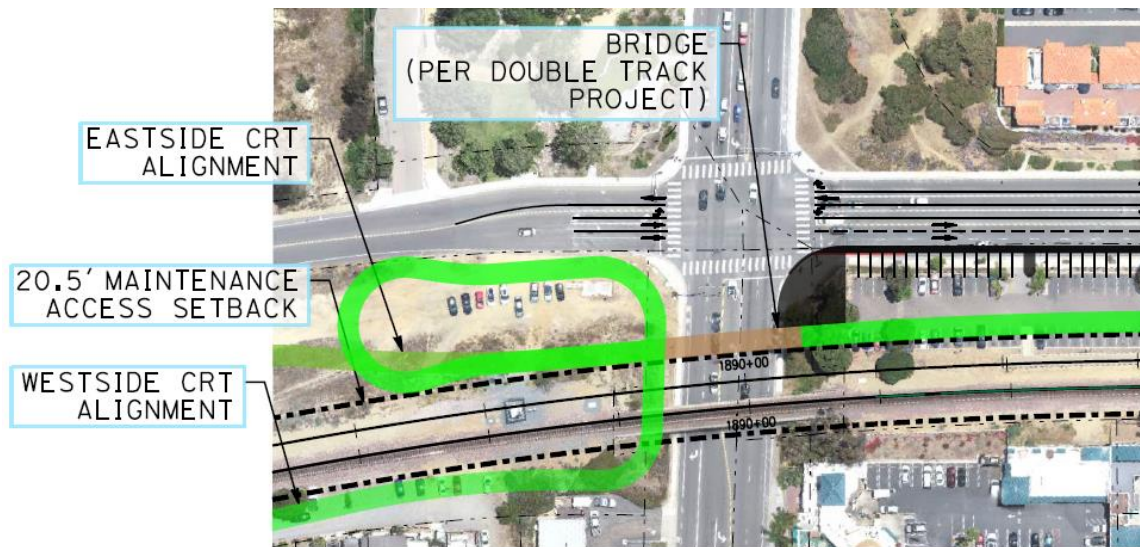
**Key Constraint – High Volume/High Stress.** The western alignment through the Coast Highway 101/Encinitas Blvd intersection is not ideal due to high volumes, and any alignment for bicycles would be considered high stress without lane reductions on Coast Highway 101.



## EAST SIDE ALIGNMENT (LONG-TERM SCENARIO)

An East Side Alignment is only potentially feasible in a long-term scenario if it is implemented with the planned double-track project, which will lengthen the station platforms to 1,000' and add a bridge over Encinitas Blvd.

The CRT could be accommodated in this alignment if it is designed as part of the double track project, providing additional bridge width over Encinitas Blvd for the CRT. Please refer to the alignment exhibit in Appendix A-3 (excerpted in the figure below) and cost estimate in Appendix B-5.

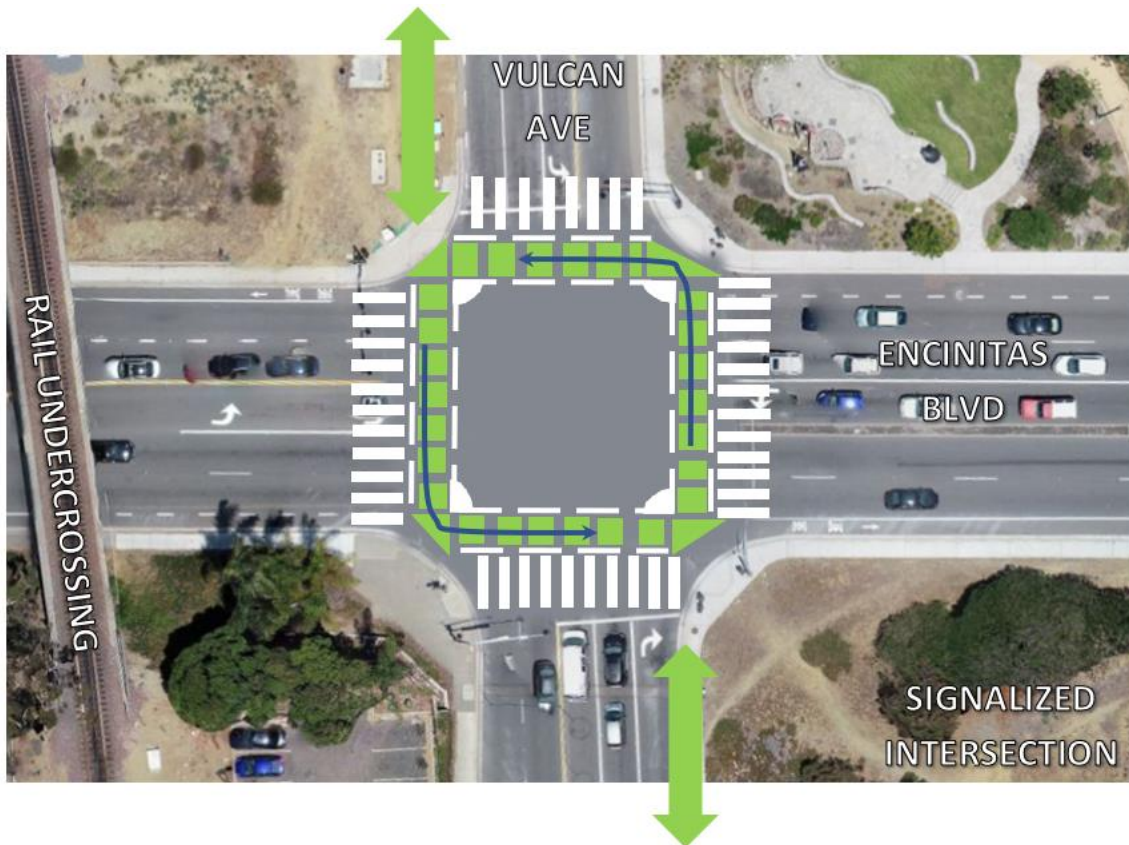


## VULCAN AVE ALIGNMENT (NEAR-TERM SCENARIO)

As discussed above and in Section 6, in a near-term scenario, north of Encinitas Blvd the East Side Alignment is most feasible, while south of Encinitas Blvd the CRT transitions to the east side of Vulcan Ave. Therefore, the CRT near-term alignment must find a way to cross from Vulcan Ave through the Encinitas Blvd intersection. (This is not likely to be necessary during the long-term scenario because the CRT is expected to use the East Side Alignment adjacent to the railroad.)

**Preferred Concept: 4-Leg Protected Intersection.** The project team analyzed several options and identified a 4-leg protected intersection as the preferred option. This concept provides the most protection for all intersection movements, including CRT “through” trips as well as interactions with the Class II bike lanes on Encinitas Blvd. Please refer to the alignment exhibit in Appendix A-3 and cost estimate in Appendix B-4.

The intersection is currently signalized with pedestrian movements allowed across all four legs of the intersection, as shown in the figure below. The fully protected intersection concept would include one-way bike crossings adjacent to the crosswalk markings, across all four legs of the intersection. These bike crossings would be signed and striped to provide signalized crossings of all legs in the same direction of travel as vehicular movements. By providing signs and signals in the direction of vehicular travel for bicycle movements, contra-flow conflicts are prevented, and bicyclists can navigate around the intersection to the opposite corner in a two-stage movement.



Required improvements include a signal modification to provide a pair of bicycle signal heads per crossing movement (8 total signal heads). These bicycle signal movements would align with the vehicle “through phase” of the traffic signal. The intersection will require further study to determine if a no-right-turn-on-red phase or a trap lane for right-turning movements would be required. Additionally, further study is required to determine if a road diet is necessary to provide safe refuge for bicyclists to queue between crossing movements. Expanded curb returns and/or small curb islands may also be necessary to help facilitate the bicycle queueing areas at each corner. Signal modifications at this intersection may result in traffic delays and will require further coordination with the City of Encinitas.

**Other Concepts Evaluated.** The project team also considered several additional options to cross Vulcan Ave in the near-term scenario that may be feasible but are not preferred, including:

- Diagonal crossing allowing movement of bike traffic through the center of the intersection.
- “Danish” crossing featuring a 2-stage perpendicular crossing for two-way bike traffic.

## 6 ENCINITAS BLVD TO SANTA FE DR

This segment is approximately 0.9 miles long and includes Encinitas Station. Please refer to the alignment exhibits in Appendix A and cost estimates in Appendix B.

### BOOKEND CONSTRAINTS

- **North Bookend: Likely East Side/Vulcan Ave Alignment at Encinitas Blvd.** As discussed in Sections 3 and 5, significant constraints west of the rail corridor likely will require the CRT to cross Encinitas Blvd using the East Side or Vulcan Ave Alignment.
- **South Bookend: More Direct Connection to East Side/Vulcan Ave Alignment South of Santa Fe Dr.** The newly completed CRT in Cardiff is located east of the rail corridor, including a pathway leading to the bicycle/pedestrian undercrossing at Santa Fe Dr. While this undercrossing could accommodate the CRT on either side, an East Side Alignment would offer a more direct connection without needing to cross the railroad.

### SEGMENT CONSTRAINTS

- **Dense Development Immediately West of Rail Corridor.** The Old Encinitas business district and Coast Highway 101 commercial parcels line the western edge of the rail corridor.
- **La Costa to Swamis Double-Track.** SANDAG project to add a second main track to the railroad to the east of the existing track.
- **Encinitas Station Platform Replacement.** In conjunction with the double-track project, the existing 600' platform will be replaced by 2 1000' platforms. To avoid constructing platforms on curved track, the new platforms are likely to extend south across D St, requiring the closure of D St to auto traffic. The project potentially could include a pedestrian undercrossing and plaza.
- **NCTD Bus Bays.** Between D St and E St, NCTD operates a series of bus bays serving routes 101, 304, and 309, with buses stopping at interior bays as well as along Vulcan Ave.

### POTENTIAL CROSSING LOCATIONS

If required, the CRT may be able to cross the railroad at the following locations in this segment:

- **Encinitas Blvd.** This existing roadway undercrossing at the northern end of the segment is constrained by travel lanes and abutting bridge structures. As discussed in Section 3, the West Side Alignment north of Encinitas Blvd could cross to the east side of the railroad corridor using tie-backs under this railroad bridge.
- **D St.** This existing roadway at-grade crossing with a traffic signal is constrained in its current configuration but could accommodate a crossing if needed with Class II bike lanes. If the station platform replacement does result in closure of the roadway, the project potentially could include a pedestrian undercrossing and plaza.
- **E St.** This existing roadway at-grade crossing is constrained but could accommodate a crossing if needed with Class II bike lanes.
- **Santa Fe Dr (“Swami’s”).** This existing pedestrian undercrossing at the southern end of the segment could accommodate the CRT.
- **Potential New Pedestrian Crossing at H St/I St.** The City of Encinitas *Cross-Connect Implementation Plan* is currently prioritizing and developing design concepts for potential new pedestrian crossings, including one at H St/I St. However, the ultimate timeline and funding for these projects is unknown.



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## WEST SIDE ALIGNMENT

The project team identified significant constraints for several potential West Side Alignments:

- **Within or Immediately Adjacent to Rail ROW.** Heavily constrained by Coast Highway 101 commercial parcels and existing railroad track. A CRT alignment here would require major ROW acquisitions.
- **Coast Highway 101.** Currently a shared-use but high-stress bike facility, Coast Highway 101 is heavily constrained by existing travel lanes and on-street parking serving the Old Encinitas business district. A CRT alignment here would require reconfiguration of the roadway to eliminate traffic lanes or parking.
- **3<sup>rd</sup> St.** The City of Encinitas has installed Class II bike lanes on 3<sup>rd</sup> St, approximately 800' west of the rail corridor. A CRT alignment here would require out-of-direction travel, contains steep slopes between A St and C St, would need to cross Coast Highway 101 twice, and also would require a *PWP/TREP* amendment for an alignment greater than 150' from the NCTD ROW.

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## EAST SIDE ALIGNMENT (LONG TERM SCENARIO)

Between Encinitas Blvd and E St, the East Side Alignment is constrained in a near-term timeframe by the existing parking lots for Encinitas Station (between Encinitas Blvd and D St, and south of E St), and the NCTD bus bays (between D St and E St). See Vulcan Ave Alignment discussion below for a feasible alignment in a near-term scenario (prior to the double-track project implementation).

Overall, an East Side Alignment is feasible in a long-term scenario if it is designed with the double-track project and includes the elements discussed below. Please refer to the alignment exhibit in Appendix A-3 and cost estimate in Appendix B-1/B-5.

### ENCINITAS BLVD TO E ST

The figure below is an excerpt from Appendix A-3 showing the following elements that are likely to be required between Encinitas Blvd and E St for the East Side Alignment:

- **Vulcan Ave Road Diet Between D St & E St.** Reduction from 4 travel lanes to 3 (depending on traffic analysis, could be 2 northbound/1 southbound, 1 northbound/2 southbound, or 1 northbound/1 southbound with shared center-turn lane).
- **Relocation of Station Parking to Planned Structure.** SANDAG has completed a project study report of a potential parking structure east of Vulcan Ave, between D St and E St. It would contain shared parking for Encinitas Station, the City of Encinitas civic center, and Old Encinitas destinations.
- **Relocation of NCTD Bus Bays.** In conjunction with the Vulcan Ave road diet, the existing bus bays would need to be shifted to the east to accommodate the CRT and adjacent rail projects. The bus bays could be rebuilt with no loss of operational capacity, including preservation of the pull-out area along southbound Vulcan Ave.



## E ST TO G ST

South of E St, the East Side Alignment generally is feasible. Between E St and G St, the alignment would require repurposing some of the existing station parking area between E St and G St, most likely requiring elimination of one row of parking. However, this parking could be replaced by the planned parking structure across Vulcan Ave (discussed above) or by extending the remaining row of parking farther south.

## G ST TO SANTA FE DR

South of G St, there is ample room for the East Side Alignment. It would connect to the existing CRT segment at Santa Fe Dr and the adjacent pedestrian undercrossing. A similar concept was proposed in a 2017 SANDAG study prepared by Nasland Engineering.

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## VULCAN AVE ALIGNMENT (NEAR TERM SCENARIO)

For a near-term scenario, prior to implementation of the double-track project, the CRT alignment on Vulcan Ave is generally feasible, if accompanied by a Vulcan Ave road diet described above. Please refer to the alignment exhibit in Appendix A-3 and cost estimate in Appendix B-1/B-4.

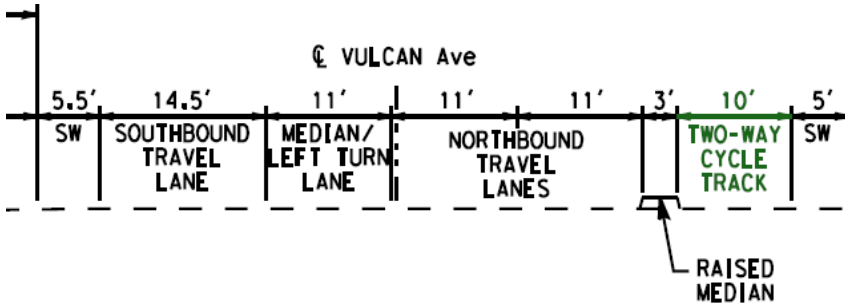
Several variations of a Vulcan Ave Alignment have been proposed in prior studies:

- **Preferred Concept: Two-Way Cycle Track on Vulcan Ave from Encinitas Blvd to E St.** The City of Encinitas *Active Transportation Plan and Rail Corridor Vision Study* envision a two-way protected cycle track along the east side of Vulcan Ave between Encinitas Blvd and E St. It likely would require a reduction of one travel lane on Vulcan Ave as described above. South of E St, the facility would cross to the west side of Vulcan Ave and essentially overlap the East Side Alignment discussed above.

This concept is feasible and could be a viable and/or near-term alternative to the East Side Alignment. It is depicted in Appendix A-3 (and in the excerpted figure below) and is described in more detail in the following pages.

- **Other Concept Evaluated: Class II Bike Lanes on Vulcan Ave.** Bike lanes were conceptually proposed between Encinitas Blvd and G St in a 2014 SANDAG report prepared by Toole Design Group. This would require a reduction of one traffic lane on Vulcan Ave between Encinitas Blvd and E St.

While feasible, Class II bike lanes are less desirable for the CRT than a Class I/IV protected facility.



### ENCINITAS BLVD TO E ST

Between Encinitas Blvd and E St, the Vulcan Ave Alignment is most feasible on the east side of the roadway as a two-way cycle track. There is one intersection along this segment, located at Vulcan Ave and D St. It is currently signalized with pedestrian movements allowed across all four legs of the intersection, as shown in the figure below. As the CRT is most feasible on the east side of Vulcan Ave, it would continue through the intersection on the east side.

Improvements to the Vulcan Ave/D St intersection include a signal modification to control vehicle right-turn movements to prohibit conflicts with bicycle movements. Bicycle movements align with vehicle “through phase” of the traffic signal. This intersection requires further study to determine if a no-right-turn-on-red phase or a trap lane for northbound right-turn movements is required. This intersection also may be a candidate for a transit queue jump in the southbound direction. Signal modification at this intersection may result in traffic delays and would need to be reviewed and approved by CPUC since it is adjacent to the at-grade rail crossing.





## E ST TO G ST

**Preferred Concept.** With the East Side Alignment preferred south of G St, the Vulcan Ave Alignment needs to cross Vulcan Ave between E St and G St. The project team analyzed several options and consulted with the City of Encinitas to identify the following preferred option, shown with the following key features in the exhibit in Appendix A-3 and cost estimate in Appendix B-1/B-4:

- Crossing E St along the eastern leg of the intersection, similar to D St but using stop control.
- Remaining on the east side of Vulcan Ave between E St and midway between F St and G St.
- Crossing Vulcan Ave via HAWK signal between F St and G St, roughly aligned with the southern end of the Encinitas Station parking lot.



**Other Concepts Evaluated.** The project team also considered several additional options to cross Vulcan Ave in the near-term scenario that may be feasible but are not preferred, including:

- Danish or protected crossing at E St with stop control
- Danish or protected crossing at E St with signalization
- Diagonal crossing at E St with signalization
- HAWK crossing at G St with stop control

## G ST TO SANTA FE DR

South of G St there is ample room for the East Side Alignment. While the Vulcan Ave Alignment may be feasible here, the East Side Alignment is preferred and connect to the existing CRT segment at Santa Fe Dr and the adjacent pedestrian undercrossing. Please refer to the alignment exhibit in Appendix A-3 and cost estimate in Appendix B-4.