

## Appendix E: Railroad Route Evaluation, Maps and Tables

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## 1.0 Railroad Operations

The Santa Cruz Big Trees Railroad is owned and operated by Roaring Camp Incorporated, located in Felton, California and has been in operation for over 40 years. Roaring Camp Railroad operates two tourist trains that depart from their depot directly adjacent to Henry Cowell State Park off Graham Hill Road. One departs the depot on a narrow gauge steam train on a round trip journey to Bear Mountain while the other heads south, on standard gauge rail, through Henry Cowell State Park to the Santa Cruz boardwalk. The corridor between Felton and the boardwalk is the one being assessed for a potential rail-trail. Tourists come from miles around to ride these trains, appreciate the history of the railroad and its depot and enjoy the surrounding environment dense with redwoods that have been preserved for centuries. The preservation of the historic nature of the corridor and its view shed is of major importance to Roaring Camp and its valued customers.

The railroad right of way under assessment is approximately 5-miles in length and ranges in width from 40 to 60 feet. This width is inclusive of extremely steep topography on both sides of the tracks. On average the tracks are roughly 4' 8-1/2" apart with approximately 9' between the ties. The tourist train on this track averages 10 miles per hour to allow visitors time to view the scenery and offer reduced wind exposure to passengers in the open car. The maximum track speed is 15 miles per hour. Trains run in limited service on this track between September and May, and almost daily between June and August.

## 2.0 Rails-with-Trails

Locating trails along active rail corridors often makes for a safe and effective location since they are designed to connect people between popular community locations and places where cyclists, walkers and other trail users want to go. For this particular instance the study is looking to link Roaring Camp Depot, Henry Cowell State Park and Felton to The City of Santa Cruz and its popular boardwalk and beaches. Rails-with-trails also make efficient use of a corridor by providing additional transportation choices and recreational opportunities to local residents and visitors, helping to reduce traffic congestion and demand on fossil fuel consumption while encouraging active recreation and a healthier lifestyle.

There are a many things to consider when conceptualizing a rail-with-trail including land ownership, adjacent use, train activity and speed, liability, safety and trail management. Many of these issues are often mitigated through public feedback and thoughtful design solutions while others may require formal review by a regulatory agency such as the California Public Utilities Commission (CPUC) or Federal Railroad Authority (FRA). The railroad corridor assessment is just a piece of the greater San Lorenzo Trail Feasibility study and needs to be evaluated against the Rt. 9 assessment and the assessment of the connecting corridors to determine the most feasible and safe connections between destinations offering the least impact to the environment.

## 3.0 Methodology

The assessment of the railroad right-of-way has been organized into twenty-one different segments based upon quarter mile intervals. The corridor under study begins at mile marker 121.8, at the intersection of Potrero Avenue and the railroad tracks in the City of Santa Cruz, and ends at mile marker 127.05 at the Roaring Camp Depot in Felton. Mile marker segments were calculated with the use of a pedometer while walking the corridor. Where available, pedometer recordings were cross-referenced against mile marker posts located along the corridor. This resulted in a maximum variance of .05 miles. Since the existing mile markers along the railroad right-of-way are limited in number and the conditions along each mile vary drastically, the study corridor is divided into quarter mile segments to allow for a more detailed representation of the existing conditions.

Similar to the Highway 9 Route Assessment a “project north” has been used, meaning that the right side of the railroad corridor heading north, from Santa Cruz to Felton, is always considered east, and the left side west, even though the railroad tracks may turn such that the actual compass directions are different.

A detailed summary has been prepared for each segment (see Appendix B), providing a general description of existing conditions and specifics including:

- **Post Mile** – beginning and ending
- **Adjacent topography** – slope of existing terrain
- **Adjacent features** – utilities and structures
- **Distance from centerline to edge of existing significant change in slope or vegetation** – width from center line of tracks (CL)
- **Adjacent Uses** – land use
- **Vegetation** – types in the vicinity or adjacent to the corridor
- **Significant Features** – bridges, retaining walls, connecting trails, opportunities and constraints

Each summary includes photos that typify or exemplify conditions in the segment. All photos were taken looking north unless otherwise specified.

#### 4.0 Trail Design Assumptions

Although there is no standard setback for a trail next to an active rail line, a minimum distance of 8.5 feet from centerline of track is used as a baseline in the typical conditions rating system. This allows a 3-foot minimum buffer between a freight car and the edge of a potential trail. Currently, within 13 of the 21 segments along the corridor the edge of the existing slope encroaches to within 6 to 7 feet from the centerline of tracks. Since the typical conditions rating also takes into consideration a minimum 5-foot path, it is necessary to have at least 13.5 feet of level terrain adjacent to the tracks in order to accommodate a trail. Therefore, of the 21 segments along the corridor, only 2 have a consistent shoulder of at least 13.5 feet from centerline of track to the edge of the existing slope.

It should be stressed that this 13.5 feet of clearance from the centerline is an absolute minimum. The railroad has requested that 10 feet be considered the minimum setback from the track centerline, assuming there is a barrier between the trail and the path. Typical minimum design width for a multi-use path shared by bicycles and pedestrians is 8 feet of pavement, with 2 foot shoulders on each side. This would require a total of 22 feet of clearance from the track centerline. However, the flatter urban segments of the railroad have a right-of-way width of only 40 feet, while steeper rural segments have right-of-way widths of 60 feet. Conceptual improvement sketches and cost estimates have been prepared assuming an 8 foot wide paved path with 1 foot shoulders.

#### 5.0 Typical Conditions and Potential Improvements

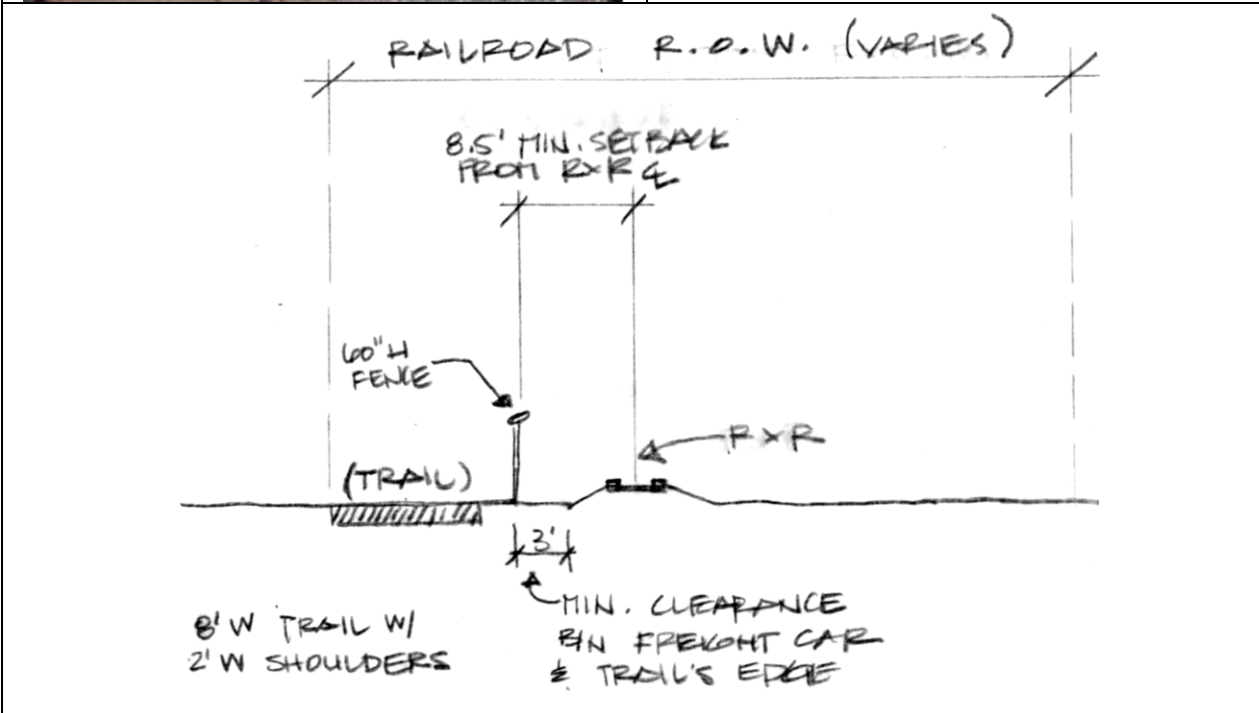
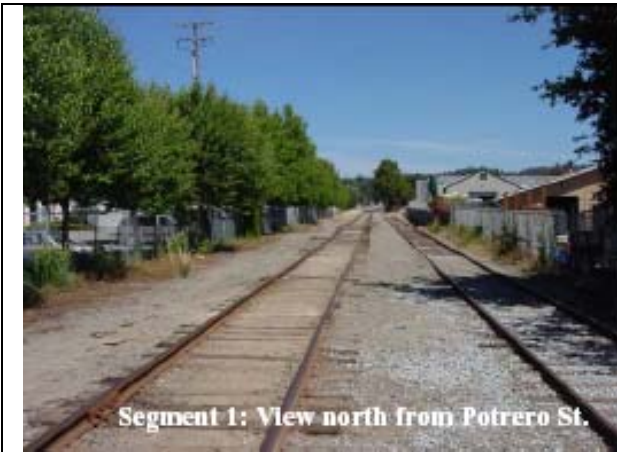
Typical conditions that occur along the railroad corridor are described below, along with sketches that indicate the type of improvements that would be required to construct a trail under these conditions. These sketches, along with a series of assumptions about construction requirements, provide the basis for study-level cost estimates.

There is a substantial variation in conditions within the segments along the corridor, however the generalizations made below can be used to provide a relatively accurate picture of the overall conditions. Similar to traffic level of service descriptions, they are organized A to F, A being the least constrained condition and F being the most constrained condition.

Because multiple railroad crossings are to be avoided in rail-with-trail design and development, each segment was inventoried and rated taking into consideration the most feasible side of the tracks to locate a potential trail. This does not preclude the opposite side from trail potential.

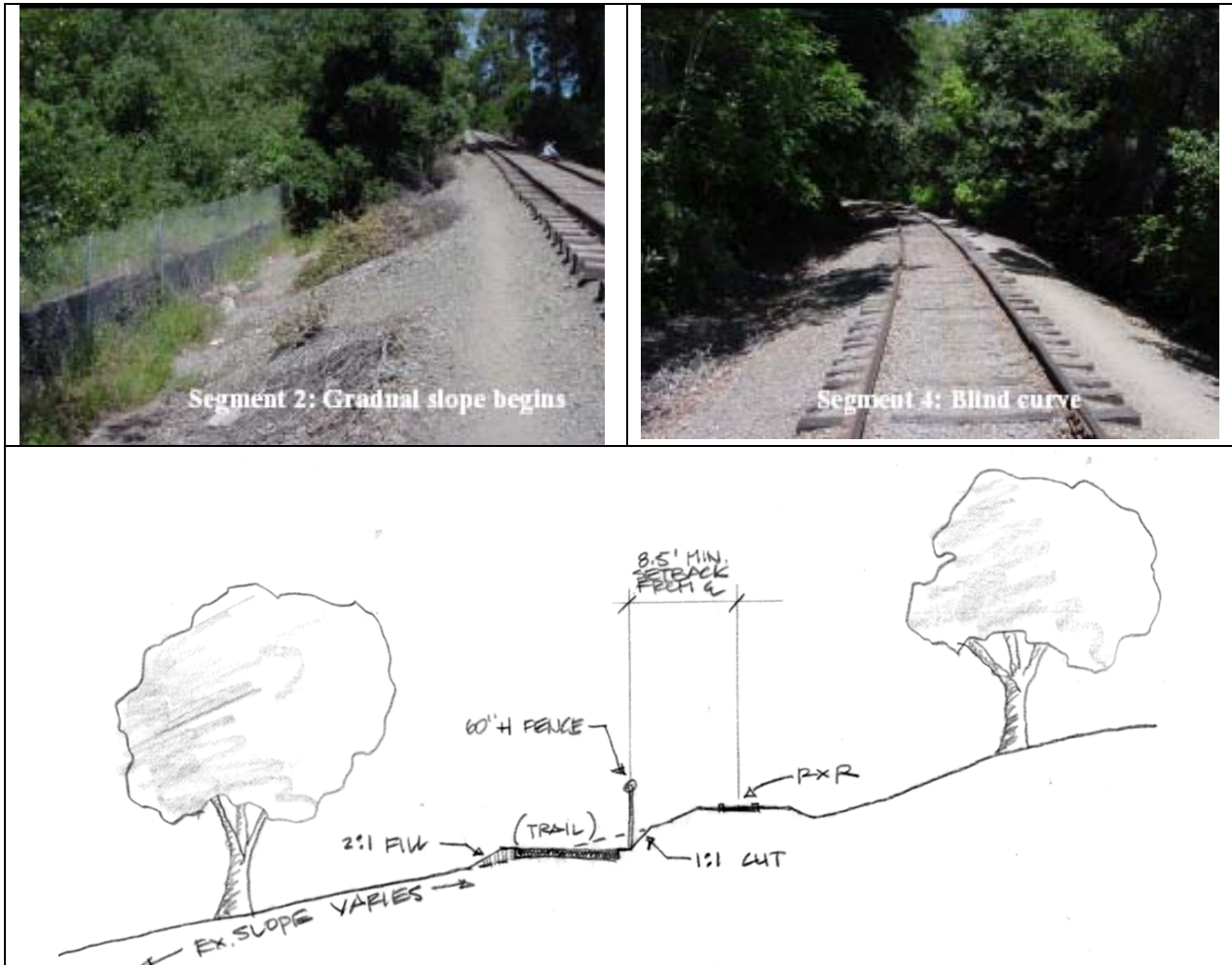
**A – Areas with level terrain and adequate clearance for trail (5.2 % of route)**

These areas are relatively flat and feature a minimum distance from the centerline of the railroad tracks of at least 8.5'. This allows for a minimum 3' buffer between a passing train (box car width 10.5') and the edge of a trail. The shoulder is wide enough to accommodate a multi-use pathway 8' wide with a 2' clearance to vegetation on the side and 8' of overhead clearance. Some barriers such as minor road crossings, culverts, trees, and signs would have to be addressed to complete or formalize these improvements.



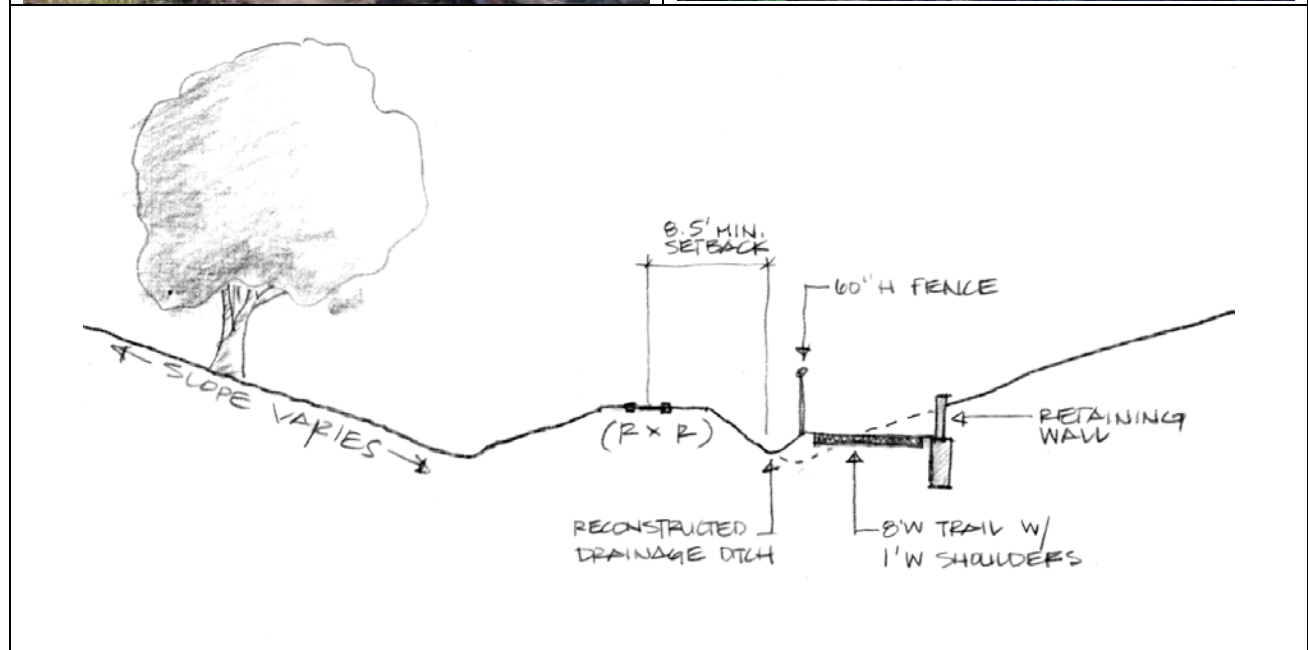
**B – Areas with gentle topography, few barriers to creating/improving bike and pedestrian access (9.1 % of route)**

Typically there is room to widen the corridor and/or construct a separate pedestrian path with some minor grading and drainage structure addition/improvement, though some relatively large barriers such as road crossings, culverts, trees, and signs would have to be addressed. The assumed average cross-slope for estimating purposes is 20% (5:1 horizontal:vertical).



**C – Areas with gentle topography, or adjacent relatively level terrain, but significant adjacent trees, and/or private use and improvement barriers (28.6% of route)**

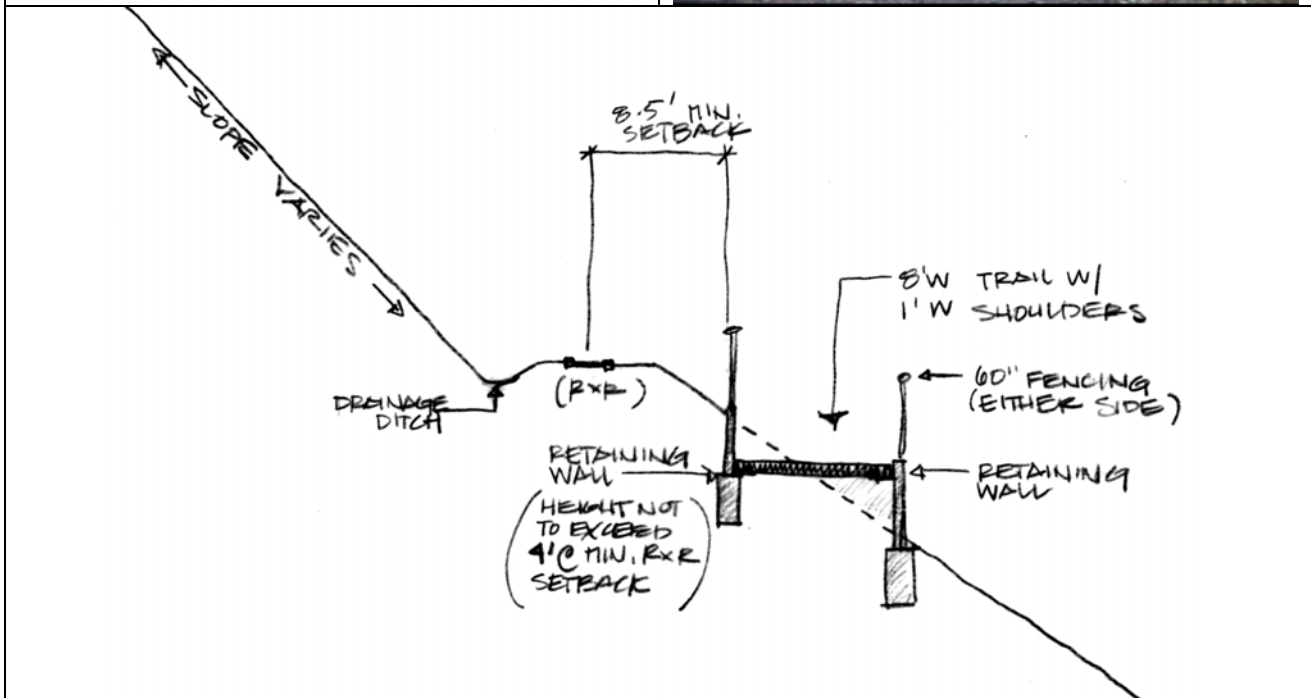
This type includes residential or private/public lands where structures or mature trees (typically redwoods) are adjacent to the corridor, and/or the cross-slope is such that widening the corridor to provide a multi-use trail would require construction of a retaining wall assumed to average 3 feet high. The assumed average cross-slope for estimating purposes is 25% (4:1 horizontal:vertical).





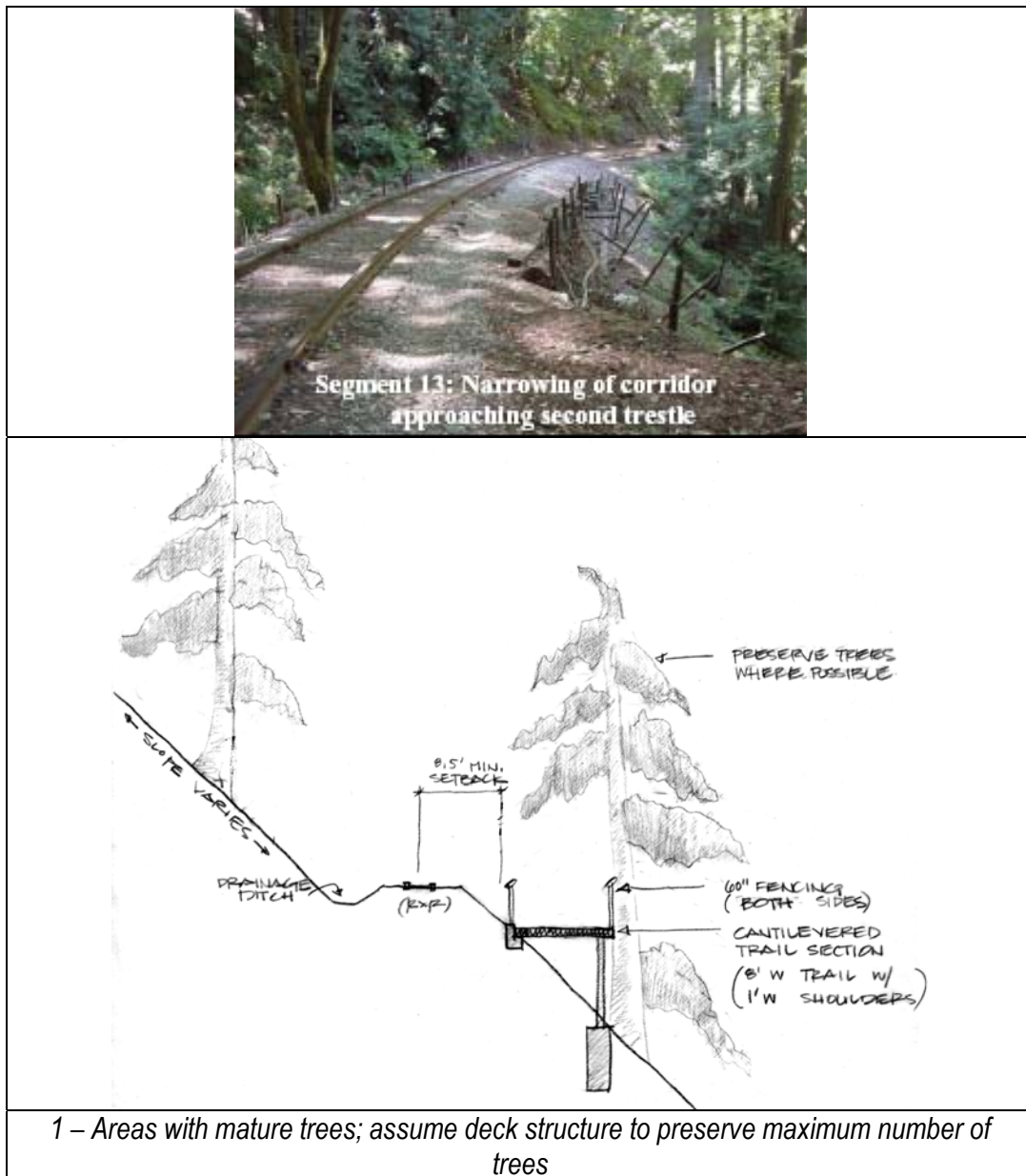
**D – Areas with steep topography immediately adjacent to the tracks (33.3% of route)**

This condition is typical where there is no flat ground upon which to widen or create a parallel trail. Retaining walls would be necessary to create the space for a trail. Use of two smaller retaining walls rather than one larger retaining wall would allow balance of cut and fill during grading for the trail. Typically these areas have many small to medium trees, primarily redwoods, which would need to be cut to create space for the trail. The assumed average cross-slope for estimating purposes is 66% (1.5:1 horizontal:vertical), which requires approximately 7 feet average height of retaining walls to create a 10 foot wide space for the trail.



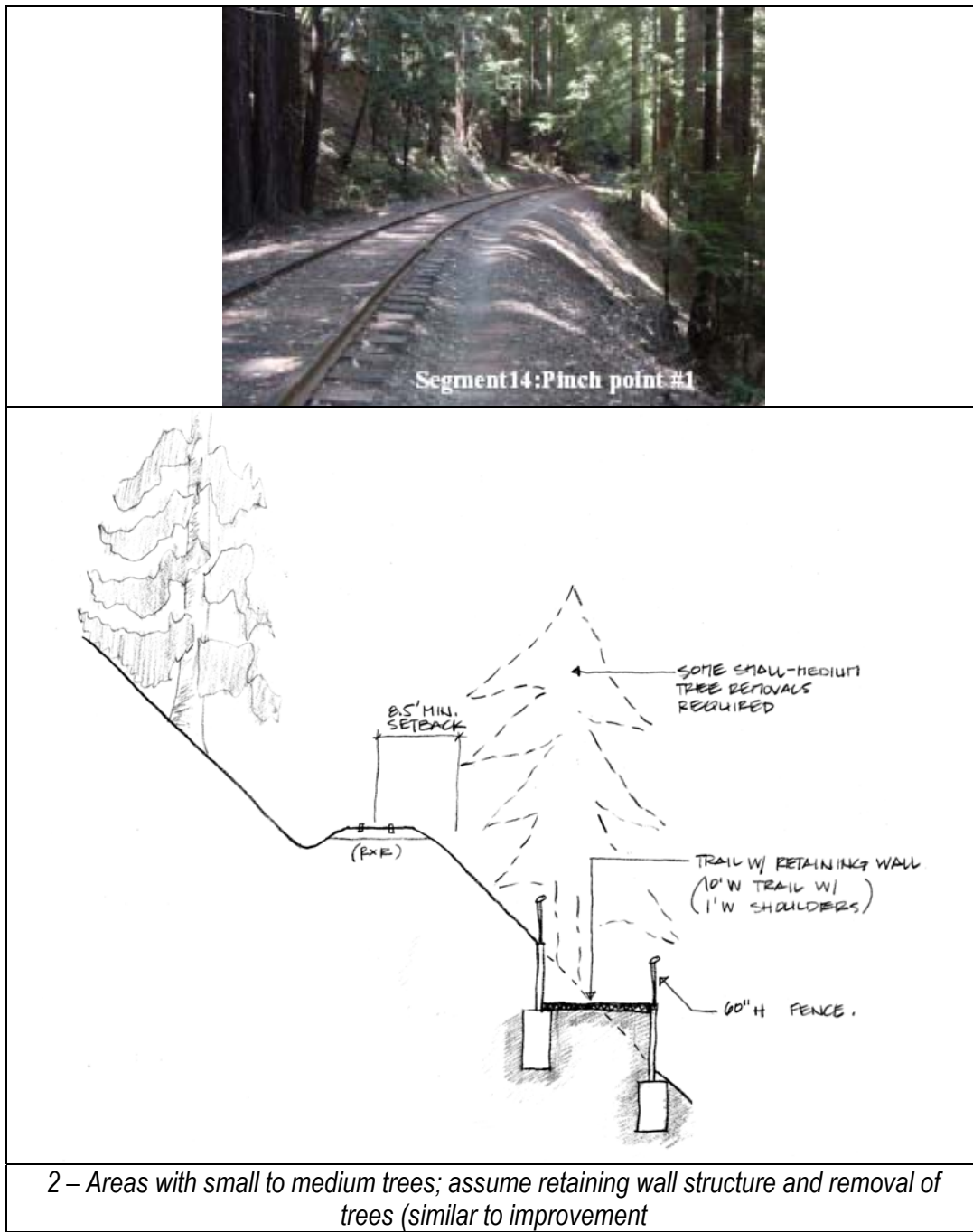
**E – Areas with steep topography immediately adjacent to the tracks and adjacent mature trees, and/or private use and improvement barriers (14.3% of route)**

These areas, typically in Henry Cowell State Park, have both steep slopes and some adjacent mature redwood specimens (e.g. larger than 36" in diameter) that would be very undesirable to cut. Also, there is often a limited line of sight (LOS) for the train operator and the trail user. To save the maximum number of trees, the trail could be elevated on a deck or "sidehill bridge" structure installed adjacent to the large trees, as shown below. In stretches without trees or with smaller trees, retaining walls could be used to support the trail. This is assumed to occur in 1/2 the length of areas with E conditions. The assumed average cross-slope for estimating purposes is 100% (1:1 horizontal:vertical), which requires approximately 10 feet average total height of retaining walls or deck to create a 10 foot wide space for the trail.



E – (cont'd.) Areas with steep topography immediately adjacent to the tracks and adjacent mature trees

type D)



**F – Areas with existing major retaining walls, bridges, or trestles (9.5% of route)**

These areas require construction of a parallel bridge structure for the trail, which is assumed to be simpler and less expensive than reconstructing the existing railroad bridge or retaining wall. Many of these areas also have a limited line of sight (LOS). Attaching to the existing structure is assumed to be infeasible due to the unknown structural condition of the existing structure. The trail bridge structure would not have to reach the same elevation as the adjacent railroad structure, if conditions allowed the trail to gradually drop and climb back up to the elevation of the railroad through these areas. In some cases a trail could be constructed on the slopes above or below the wall or trestle, using a retaining wall configuration similar to that shown for Improvement Type E. For estimating purposes, this is assumed to be feasible in ¼ of the length of areas with F conditions. The assumed average cross-slope for estimating purposes is 100% (1:1 horizontal:vertical), which requires approximately 10 feet average total height of retaining walls to create a 10 foot wide space for the trail.



<p>1 – Areas with large retaining walls, bridges, or trestles</p>	<p>2 – Areas where grades allow trail to be routed to base of retaining wall or trestle (similar to improvement type E)</p>

## 6.0 Summary of Conditions

The Santa Cruz Big Trees railroad corridor runs adjacent to the Route 9 corridor separated by topography and vegetation as it departs the City of Santa Cruz. The tracks cross Route 9 approximately two miles to the north and head into Felton while Route 9 continues northwest to Ben Lomond and Boulder Creek. The tracks are located on a plateau carved into the wall of the San Lorenzo River Gorge with moderate to mostly steep slopes down to the east and the San Lorenzo River and mostly steep slopes up to the west.

Similar to the Route 9 assessment, the conditions along the railroad corridor fluctuate considerably between segments and sometimes significantly within each segment. There is generally flat topography directly adjacent to the tracks/ties with space sufficient for walking single file for a majority of the corridor, although with minimal clearance to a passing train or hiker at times. Additionally, one might be encouraged to walk between the tracks (as many trespassers do) at times because they may be viewed as more suitable to walk upon than the adjacent eroded or sloping terrain.

In several areas, especially along the second and fourth miles, the corridor has low suitability for creation of a trail mainly due to topography. Within these segments the tracks are elevated or the shoulder is extremely narrow due to nearly vertical slopes on both sides of the tracks. These areas would require significant re-design of existing retaining walls and/or construction of adjacent structures to support a trail. Issues would also need to be addressed relating to trail user and train operator line of sight. The other mile segments have multiple areas of concern, but are somewhat more feasible due to greater trail connectivity potential, greater shoulder width and limited adjacent vegetation. Overall, review of the existing conditions shows more than half the corridor (57%) includes steep topography immediately adjacent to the tracks with the need for construction of an adjacent structure to support a trail (D – F).

## 7.0 Estimate of Probable Cost

Existing conditions and trail improvement concepts (A – F) were identified for each of the 21 railroad route segments based on the site assessment described in Appendix B. In some cases conditions varied within a segment and it was split into two designations, assumed to occur equally within the segment. Costs were estimated for the improvement concepts identified for each condition. Note that, as discussed in Section 1.3, in 50% of the areas with Condition E, it was assumed that Improvement Type D would be feasible, and in 25% of areas with Condition F, Improvement Type E was assumed to be feasible. This was done to reflect potential cost savings from careful engineering of the solutions in future phases.

It is important to note that the recommended improvements are not necessarily the most feasible or economical design solutions. Far more detailed site information and design would be necessary to determine this. The design concepts represent a reasonable engineering solution given the available information at this study stage. Similarly, the cost estimates are prepared with a general level of detail appropriate to a study product, and represent a reasonable expectation of costs that would be encountered for such a trail project.

Table 1 lists the estimated cost by segment and provides the total cost. Table 2 provides the detail of the estimate for each improvement type (A – F).

**Table E-1: Summary, Estimate of Probable Construction Costs, Railroad Trail Route**

1/4 mi. Segment	Start Post Mile	Most Feasible Side	Existing Condition	Assumed Improvement Type	% Improvement Type	Improvement Length (L.F.)	Cost per LF	Segment Cost	Notes
1	121.80	west	A	A	100%	1320	\$176	<b>\$231,884</b>	Potrero St. in S. Cruz
2	122.05	west	A	A	50%	660	\$176	\$115,942	small bridge
			B	B	50%	660	\$229	\$151,404	
							<b>Subtotal</b>	<b>\$267,346</b>	
3	122.30	west	C	C	50%	660	\$443	\$292,070	
			E	D	25%	330	\$709	\$233,980	
				E	25%	330	\$2,408	\$794,653	
							<b>Subtotal</b>	<b>\$1,320,703</b>	
4	122.55	west	C	C	100%	1320	\$443	<b>\$584,140</b>	
5	122.80	west	D	D	100%	1320	\$709	<b>\$935,920</b>	
6	123.05	west	D	D	100%	1320	\$709	<b>\$935,920</b>	
7	123.30	west	C	C	50%	660	\$443	\$292,070	
			D	D	50%	660	\$709	\$467,960	
							<b>Subtotal</b>	<b>\$760,030</b>	
8	123.55	west	D	D	50%	660	\$709	\$467,960	steep cuts, retaining wall
			F	E	25%	330	\$2,408	\$794,653	
				F	25%	330	\$2,779	\$917,090	
							<b>Subtotal</b>	<b>\$2,179,703</b>	
9	123.80	west	E	D	25%	330	\$2,408	\$794,653	trestle
			F	E	50%	660	\$2,408	\$1,589,306	
				F	25%	330	\$2,779	\$917,090	
							<b>Subtotal</b>	<b>\$3,301,049</b>	
10	124.05	west	C	C	100%	1320	\$443	<b>\$584,140</b>	entering Henry Cowell S.P. - Hwy 9 crossing
11	124.30	west	B	B	100%	1320	\$229	<b>\$302,808</b>	
12	124.55	west	C	C	100%	1320	\$443	<b>\$584,140</b>	Rincon trail crossing, small trestle
13	124.80	east	E	D	50%	660	\$709	\$467,960	short, low trestle
				E	50%	660	\$2,408	\$1,589,306	
							<b>Subtotal</b>	<b>\$2,057,266</b>	
14	125.05	east	D	D	75%	990	\$709	\$701,940	
			E	E	25%	330	\$2,408	\$794,653	
							<b>Subtotal</b>	<b>\$1,496,593</b>	
15	125.30	east	E	D	50%	660	\$709	\$467,960	small existing retaining walls
				E	50%	660	\$2,408	\$1,589,306	
							<b>Subtotal</b>	<b>\$2,057,266</b>	
16	125.55	east	E	D	25%	330	\$709	\$233,980	
			F	E	50%	660	\$2,408	\$1,589,306	
				F	25%	330	\$2,779	\$917,090	Inspiration Point - steep cliff w/viaduct
							<b>Subtotal</b>	<b>\$2,740,376</b>	
17	125.80	east	D	D	100%	1320	\$709	<b>\$935,920</b>	Ox Cart Trail to "Garden of Eden"
18	126.05	east	D	D	100%	1320	\$709	<b>\$935,920</b>	
19	126.30	west	D	D	50%	660	\$709	\$467,960	
			F	E	25%	330	\$2,408	\$794,653	
				F	25%	330	\$2,779	\$917,090	trestle over San Lorenzo River
							<b>Subtotal</b>	<b>\$2,179,703</b>	
20	126.55	east	C	C	100%	1320	\$443	<b>\$584,140</b>	trail would use State Park routes
21	126.80	east	C	C	100%	1320	\$443	<b>\$584,140</b>	trail would use State Park routes

Total Length: 5.25 mi.

Total Estimated Cost: \$25,559,104

## 8.0 Preliminary Conclusions

Review of the Santa Cruz Big Trees Railroad (SCBT) right-of-way by the consultant team, representatives from the County of Santa Cruz Public Works Department, Rails-to-Trails Conservancy (RTC), and community members at a June 2, 2004 community meeting, concluded it to be one of the least feasible potential routes for a multi-use trail from Felton to Santa Cruz. As a result it is recommended that the San Lorenzo Trail Feasibility study will focus on other alternative routes.

The study determined that this route was less feasible than others for several reasons. Although the corridor ranges in width from 40-60 feet, the nature of its steep topography limits the potential of a trail without substantial grading, drainage and construction of structures to support a trail, and considerable environmental impacts to the surrounding vegetation and land uses. Several portions of the route cross trestles or are supported by large retaining walls or near vertical cliffs. Many of these constrained areas are located in close proximity to Highway 9, and/or the San Lorenzo River, further limiting the feasibility of a bypass or reconstruction of the section. These constraints resulted in a high estimated cost for constructing the connection relative to other alternatives.

The corridor also has multiple curves, resulting in a limited line of sight in some sections for both the conductor and an individual walking or biking along the corridor. Line of sight is an important consideration, knowing it could take an SCBT train up to 200 feet to stop for a pedestrian or bicyclist. Braking distances can vary drastically on the tracks and depend on weather conditions, the number of cars, weight of the cars and train speed. Since there are several segments along the tracks with a line of sight of less than 100 feet, this is an area of concern that would also need to be addressed to improve safety.

Despite the constraints that cause the SCBT corridor to be economically infeasible to improve as a formal regional bicycle and pedestrian connection, it is used by pedestrians and bicyclists on a regular basis. It is becoming increasingly popular in the summer months as people utilize it to connect to local swimming holes and adjacent designated and un-designated hiking paths.

Currently, use of this corridor is considered trespassing since there are no legal trails along or adjacent to the tracks. Nevertheless, local travel maps identify two trails (the Ox Trail and the Rincon Trail) adjacent to the tracks. Both of these trails are informal dirt paths along the tracks and not officially recognized as trails since they are located on private railroad property. The popularity of these paths and their extensive use is a concern to both SCBT and the County of Santa Cruz due to liability and the dangers of travel so close to an active rail line without separation. SCBT is also concerned with areas along the tracks where there is an embankment on both sides of the tracks, and a bridge or a trail that has access to the right-of-way, especially where it occurs at a right angle to the tracks. These areas do not allow an individual much time or space to move out to the way of a train, even if it is traveling at only 10 miles per hour.

The recommendation to focus the study elsewhere is based on the objective of creating the most easily implemented continuous trail connection from Felton to Santa Cruz. However, RTC, SCBT and many local trail advocates believe the SCBT rail corridor offers potential trail connection opportunities to popular hiking and biking destinations. It is the recommendation of RTC that the County of Santa Cruz continue to pursue the trail as a route in the short-term along segments that are physically feasible, as identified in the preliminary assessment. This should focus on segments of the trail route that have significant use and demand, and are



most economically feasible to improve. Development of the complete Felton-to-Santa Cruz connection is not entirely infeasible, only less feasible/more expensive than other options identified as part of this study. In the long-term and in better economic times, a continuous trail may become a viable project. The County should continue dialogue with SCBT and pursue improvement of the safety and recreational experience along the rail corridor. One option is to look at ways of increasing safety along the corridor with minor physical improvements. These might include minor widening of the level portion of the right-of-way, debris removal, erosion control, fencing, and signage, including train schedules. Highly used and feasible segments should be implemented as trails.

In general, rails-with-trails offer an incredible asset to a community by providing much-needed access to popular destinations, encouraging increased physical activity, and providing an additional transportation choice. Since Santa Cruz County community members utilize this corridor regularly without the formal recognition of a trail, it would be to the benefit of the railroad, the County, and its residents to look at ways of making this corridor increasingly more suitable for bicycle and pedestrian transportation.

**Table 2: Engineer's Estimate of Probable Cost, Railroad Route  
 Ifland Engineers**

Cost estimates per linear foot of trail

**CONDITION "A"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork (for Bike Trail) - cubic yard per linear foot	LF	1	10	1.5	1.67	\$8.00	\$13.33
8' Wide Bike Trail	LF		1		1	\$50.00	\$50.00
6' Chain Link Fence	LF		1		1	\$35.00	\$35.00
Trail Signage	LF				1	\$2.00	\$2.00
Erosion Control	LS				1	3%	\$3.00
Mobilization	LS				1	5%	\$5.00
Clearing & Grubbing	LS				1	5%	\$5.00
<b>CONDITION "A" SUBTOTAL:</b>							<b>\$113.33</b>
CONTINGENCIES		15%					\$17.00
DESIGN		15%					\$17.00
ENVIRONMENTAL		10%					\$11.33
REVIEW & INSPECTION		15%					\$17.00
							<b>\$62.33</b>

- Notes:**
1. B = width of grading
  2. C = depth of earthwork average
  3. Dollar amount per sq ft
  4. Dollar amount per lf at culvert
  5. Sq ft / lf of 4' wall with 1' below grade
  6. Cu yd / lf of trail 8" deep swale either side with 2' invert & 5' either side clearing and grubbing
  7. Cost / sq ft of deck
  8. Area of deck per lf

**CONDITION "A" TOTAL: \$175.67**

**CONDITION "B"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork (for Bike Trail) - cubic yard per linear foot	LF	1	15	3	5.00	\$8.00	\$40.00
8' Wide Bike Trail	LF		1		1	\$50.00	\$50.00
6' Chain Link Fence	LF		1		1	\$35.00	\$35.00
Trail Signage	LF				1	\$2.00	\$2.00
Erosion Control (for grassing slopes upon completion)	LS				1	5%	\$7.00
Mobilization	LS				1	5%	\$7.00
Clearing & Grubbing	LS				1	5%	\$7.00
<b>CONDITION "B" SUBTOTAL:</b>							<b>\$148.00</b>
CONTINGENCIES		15%					\$22.20
DESIGN		15%					\$22.20
ENVIRONMENTAL		10%					\$14.80
REVIEW & INSPECTION		15%					\$22.20
							<b>\$81.40</b>

**CONDITION "B" TOTAL: \$229.40**

**CONDITION "C"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork (for Bike Trail) - cubic yard per linear foot	LF	1	15	3	5.00	\$8.00	\$40.00
8' Wide Bike Trail	LF		1		1	\$50.00	\$50.00
6' Chain Link Fence	LF		1		1	\$35.00	\$35.00
Trail Signage	LF				1	\$2.00	\$2.00
Retaining Wall (max 4' height)	LF	5 <sup>5</sup>	20 <sup>3</sup>		1	\$100.00	\$100.00
Reconstructed Drainage (grass swales on both sides of trail)	LF	1.5 <sup>6</sup>	15		1	\$22.50	\$22.50
Extend Railroad drainage (21" Ø HDPE with 2# Headwalls avg length 20' per culvert. 1# each 200'; prefab headwall \$100 per unit)	LF	20	70 <sup>4</sup>	200	1	\$8.00	\$8.00
Erosion Control	LS				1	3%	\$8.00
Mobilization	LS				1	5%	\$12.00
Clearing & Grubbing for shrubs and vegetation	LS				1	5%	\$8.00
<b>CONDITION "C" SUBTOTAL:</b>							<b>\$285.50</b>
CONTINGENCIES		15%					\$42.83
DESIGN		15%					\$42.83
ENVIRONMENTAL		10%					\$28.55
REVIEW & INSPECTION		15%					\$42.83
							<b>\$157.03</b>

**CONDITION "C" TOTAL: \$442.53**

**Table 2: Engineer's Estimate of Probable Cost, Railroad Route (cont'd)**

Cost estimates per linear foot of trail

**CONDITION "D"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork (for Bike Trail) - cubic yard per linear foot	LF	1	15	3	5.00	\$8.00	\$40.00
8' Wide Bike Trail	LF		1		1	\$50.00	\$50.00
6' Chain Link Fence on both sides	LF		1		2	\$35.00	\$70.00
Trail Signage	LF				1	\$2.00	\$2.00
Retaining Wall (max 4' height) on both sides	LF	10 <sup>3</sup>	20 <sup>3</sup>		1	\$200.00	\$200.00
Reconstructed Drainage (grass swales on both sides of trail)	LF	1.5 <sup>5</sup>	15		1	\$22.50	\$22.50
Extend Railroad drainage (21" Ø HDPE with 2# Headwalls avg length 20' per culvert. 1# each 200'; prefab headwall \$100 per unit)	LF	20	70 <sup>4</sup>	200	1	\$8.00	\$8.00
Tree Removal (50 Trees/mile, \$2K per sm./med. tree)	EA	5280	50	2000	1	\$18.94	\$18.94
Erosion Control	LS				1	3%	\$12.00
Mobilization	LS				1	5%	\$19.00
Clearing & Grubbing	LS				1	5%	\$15.00
<b>CONDITION "D" SUBTOTAL:</b>							<b>\$457.44</b>
CONTINGENCIES			15%				\$68.62
DESIGN			15%				\$68.62
ENVIRONMENTAL			10%				\$45.74
REVIEW & INSPECTION			15%				\$68.62
							<b>\$251.59</b>

**Notes:**

1. B = width of grading
2. C = depth of earthwork average
3. Dollar amount per sq ft
4. Dollar amount per lf at culvert
5. Sq ft / lf of 4' wall with 1' below grade
6. Cu yd / lf of trail 8" deep swale either side with 2' invert & 5' either side clearing and grubbing
7. Cost / sq ft of deck
8. Area of deck per lf

**CONDITION "D" TOTAL: \$709.03**

**CONDITION "E"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork (for Bike Trail) - cubic yard per linear foot	LF	1	15	3	5.00	\$8.00	\$40.00
8' Wide Bike Trail	LF		1		1	\$50.00	\$50.00
6' Chain Link Fence on both sides	LF		1		2	\$35.00	\$70.00
Trail Signage	LF				1	\$2.00	\$2.00
Precast post tensioned concrete deck on cast-in-place piers	LF	120 <sup>7</sup>	10 <sup>8</sup>		1	\$1,200.00	\$1,200.00
Extend Railroad drainage (21" Ø HDPE with 2# Headwalls avg length 20' per culvert. 1# each 200'; prefab headwall \$100 per unit)	LF	20	70 <sup>4</sup>	200	1	\$8.00	\$8.00
Tree Removal (10 Trees/mile, \$4K per large tree)	EA	5280	10	4000	1	\$7.58	\$7.58
Erosion Control	LS				1	3%	\$42.00
Mobilization	LS				1	5%	\$67.00
Clearing & Grubbing	LS				1	5%	\$67.00
<b>CONDITION "E" SUBTOTAL:</b>							<b>\$1,553.58</b>
CONTINGENCIES			15%				\$233.04
DESIGN			15%				\$233.04
ENVIRONMENTAL			10%				\$155.36
REVIEW & INSPECTION			15%				\$233.04
							<b>\$854.47</b>

**CONDITION "E" TOTAL: \$2,408.04**

**CONDITION "F"**

ITEM	UNIT	Variable (dimensions based on sketches for ea. scenario)			QTY	UNIT PRICE	TOTAL
		A	B <sup>1</sup>	C <sup>2</sup>			
Earthwork for Construction Access Trails - cu yd / linear ft	LF	1	15	3	5.00	\$8.00	\$40.00
8' Wide Bike Path striping and surface finishes	LF		1		1	\$10.00	\$10.00
6' Chain Link Fence on both sides	LF		1		2	\$35.00	\$70.00
Trail Signage	LF				1	\$2.00	\$2.00
Extend Railroad drainage (21" Ø HDPE with 2# Headwalls avg length 20' per culvert. 1# each 200'; prefab headwall \$100 per unit)	LF	20	70 <sup>4</sup>	200	1	\$8.00	\$8.00
Precast post tensioned concrete deck on cast-in-place piers	LF	144 <sup>7</sup>	10 <sup>8</sup>		1	\$1,440.00	\$1,440.00
Tree Removal (50 Trees/mile, \$2K per sm./med. tree)	EA	5280	50	2000	1	\$18.94	\$18.94
Erosion Control	LS				1	3%	\$48.00
Mobilization	LS				1	5%	\$78.00
Traffic Control	LS				1	5%	\$78.00
<b>CONDITION "F" SUBTOTAL:</b>							<b>\$1,792.94</b>
CONTINGENCIES			15%				\$268.94
DESIGN			15%				\$268.94
ENVIRONMENTAL			10%				\$179.29
REVIEW & INSPECTION			15%				\$268.94
							<b>\$986.12</b>

**CONDITION "F" TOTAL: \$2,779.06**

**San Lorenzo Valley Trail Feasibility Study**  
**Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

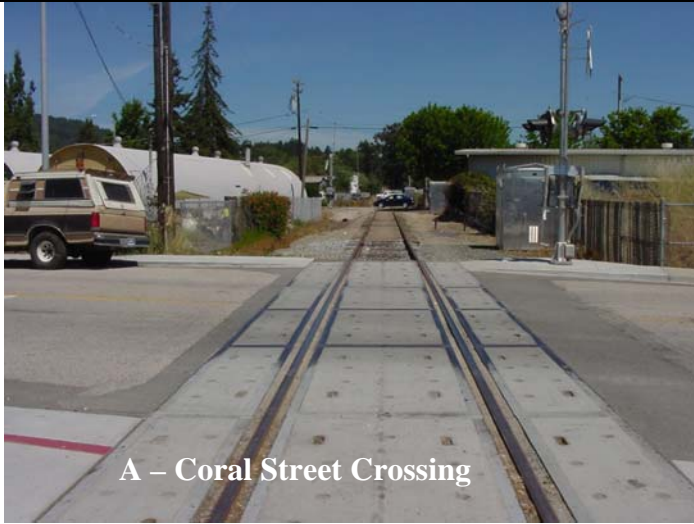
**Segment 2 – Coral St heading into the forest.** Similar to the previous segment except both sides of the tracks are flanked by industrial use until the tracks enter the forest. A drainage ditch is present on the west side of the tracks from Coral to Encinal Street. There is approximately 12' from the CL of tracks to the top edge of this ditch narrowing to 6.5' near the culvert at Fern on the West. This repeats between Fern to the culvert at Encinal. The tracks cross Fern at approx. MM 122.1 and Encinal near MM 122.17. All street crossings are at grade and have consistent traffic activity. North of Encinal there is no drainage ditch and the shoulder widens to 20' again from CL. As the corridor enters the forest, just north of all adjacent industrial use, a gentle slope begins on both sides of the tracks. There is no significant vegetation within this segment but there appears to be significant debris dumping within the drainage ditch.

Total segment length: **.25**  
 Current bicycle access condition: **B**  
 Current pedestrian access condition: **B**  
 Potential for improvement for bicycles:  
 Potential for improvement for pedestrians:  
 Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
122.05 to 122.30	Flat, but drainage ditch erodes into the corridor narrowing the shoulder at street crossings	Utilities cross and run within portion of the corridor along fence to the west	± 6.5' – 12' from CL on the west	Industrial	Low grasses and Oaks begin to appear on approach to next segment	Drainage ditch, erosion issues, multiple street crossings

**Segment 2 (cont'd)**

**San Lorenzo Valley Trail Feasibility Study**  
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**A – Coral Street Crossing**



**B – View of drainage ditch**



**Segment 2: Flat topo north of Encinal**



**Segment 2: Gradual slope begins**

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Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 3 – Bridge crossing & Vernon Street.** This segment begins with a narrowing of the corridor as the railroad becomes elevated. Both sides have a moderate to steep slope dropping approx. 6', with approximately 7' – 8' from the CL of tracks to the edge of the slope on the west. Adjacent use is scattered residential housing, agriculture, and thick vegetation. One residence at approx. MM 122.39 on the west is directly adjacent to the corridor with minimal buffer. Just north of this residence is a narrow bridge crossing at approx. MM 122.42 with approx. 5' – 6' from CL of tracks. North and to the east of the bridge Vernon Street (MM 122.47) dead ends at tracks & connects to Rt. 9. There is also a residence here with a fence and garage acting as a buffer to the corridor.

Total segment length: **.25**

Current bicycle access condition: **E**

Current pedestrian access condition: **D**

Potential for improvement for bicycles:

Potential for improvement for pedestrians:

Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
122.30 to 122.55	Steep slopes drop off on both sides of tracks, erosion issues along ties leaves little to no room to pass comfortably under current conditions	Narrow train bridge over Golf Club Drive, Adjacent residential housing, Small creek (Pogonip Creek?) runs parallel to corridor to the west at bottom of slope	± 7' - 8' from CL of tracks to top of slope on west	Agriculture to the west, residential both sides	Thick riparian habitat on West and Oaks as dominant tree	potential crossing to Vernon St on the east with access to Rt. 9

**San Lorenzo Valley Trail Feasibility Study**  
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**Segment 3 (cont'd)**



**San Lorenzo Valley Trail Feasibility Study**  
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**Segment 4 – Lower Meadow Trail, beginning of Pogonip Open Space Segment.** This segment begins near the County line where Lower Meadow trail leads into Pogonip from the railroad corridor on the west (a utility pole marks this location). The corridor widens just slightly from the previous segment, remains straight, and levels off once again to the west. Slopes to the east remain moderate to steep with no fencing or buffer down to Rt. 9. Shoulder to the west averages b/w 10' -12' from CL to the up slope but there is potential for retaining walls & minor cuts into this slope to widen the shoulder.

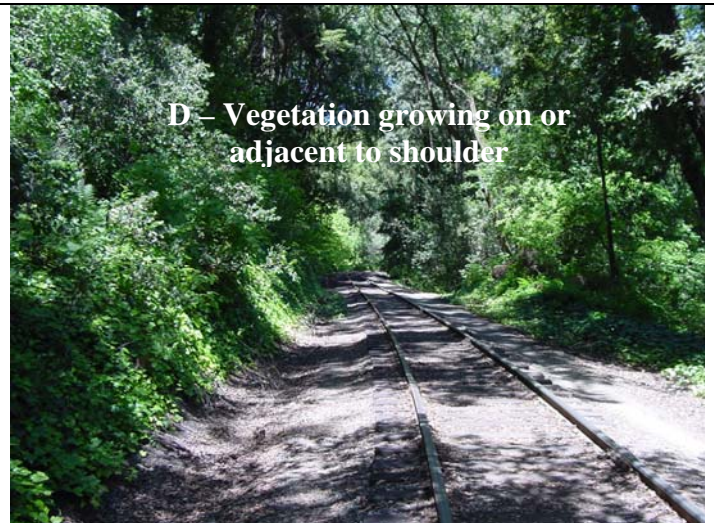
Total segment length: **.25**  
 Current bicycle access condition: **C**  
 Current pedestrian access condition: **C**  
 Potential for improvement for bicycles:  
 Potential for improvement for pedestrians:  
 Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
122.55 to 122.80	Terrain is mostly level to the west gradually sloping down from the tracks, mod – steep slopes down to Rt. 9 on the east	Fencing has changed to 3' wooden posts with 3 barb wire rungs covered in ivy	± 10' - 12' from CL to edge of steep up slope on west	Forest & parkland	Ivy and oaks dominate this segment & hang over or grow close to shoulder	Potential for trail with vegetation clearing, MM 122.64 blind curve to the west approx. 75'-100' line of sight



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**Segment 4 (cont'd)**



**San Lorenzo Valley Trail Feasibility Study  
Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 5 – Southern Pogonip Open Space Segment.** This segment is similar to the above segment and begins at the top of an S curve in the tracks. It begins relatively flat past a large fallen redwood propped on stumps. The shoulder narrows and drops off at the beginning of a second S curve in the tracks with a limited line of sight (LOS) approx. 200'. In the middle of this S curve the shoulder flattens again but returns to a steep grade approaching the next segment. There are two single track trail heads leading up a slope into Pogonip along this segment. Approx. locations: Trail #1 (MM 123.02), Trail #2 (MM 123.09).

Total segment length: **.25**  
 Current bicycle access condition: **D**  
 Current pedestrian access condition: **D**  
 Potential for improvement for bicycles:  
 Potential for improvement for pedestrians:  
 Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
122.80 To 123.05	Begins relatively flat, middle of the segment the tracks are raised with steep slopes down on both sides (approx. 9' vert. separation) & continues until next segment	2 single track trail heads leading into Pogonip (most likely connect to Brayshaw or Prairie Trails), Large fallen redwood is a major obstacle to a trail on the west shoulder	± 5' – 9' from CL to down slope on the west	Pogonip open space to the west	Beginning of redwood & oak mix – Riparian habitat @ bottom of slope to the west	segment has many blind corners with 2 S-curves in the tracks

**San Lorenzo Valley Trail Feasibility Study**  
**Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 5 (cont'd)**



**A – Beginning of segment**



**B – First trail head into Pogonip**



**C – Steep slopes & blind curve**

**San Lorenzo Valley Trail Feasibility Study**  
**Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 6 – Central Pogonip Open Space Segment.** This segment begins with the continuation of the steep slopes from the previous segment for less than .1 mi. then steep up slope returns on the west approx. 7' - 9' from CL of tracks. Significant erosion has occurred directly adjacent to the railroad ties in several locations around (MM 123.18). There is a view shed to a small creek (possibly Pogonip Creek) down the slope to the west along the middle of this segment. There is one blind curve in this segment with approx. 75' LOS and a mature redwood relatively adjacent to the tracks. One single track trail head leads into Pogonip up a small grade to the west.

Total segment length: **.25 mi.**  
 Current bicycle access condition: **D**  
 Current pedestrian access condition: **D**  
 Potential for improvement for bicycles:  
 Potential for improvement for pedestrians:  
 Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
123.05 To 123.30	Relatively steep slopes until middle of segment where terrain levels off to a gentle slope away from the tracks to the west, remains so until next segment	Single track trail leads up small grade to the west into Pogonip (most likely connects to the Fern Trail)	± 7' – 9' from CL of tracks on west	Pogonip still lies to the west while scattered residential housing is separated by approx. 100' vegetation & a down slope to the east, Rt. 9 is visible through the vegetation at times	Mostly redwoods	Blind curve – approx. 75' LOS at MM123.19, significant erosion around railroad ties to the west, Approx. MM 123.26 Redwood 16' from CL of tracks

**San Lorenzo Valley Trail Feasibility Study**  
**Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 6 (cont'd)**



A – Beginning of segment / erosion



B – Trail head into Pogonip



C – Blind curve



D – Relatively level topo mid-end segment

**San Lorenzo Valley Trail Feasibility Study  
Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 7 – Central Pogonip Open Space Segment.** This segment is mostly straight with some minor curves in the tracks. The segment begins with a relatively wide shoulder (12' from CL) on the west to the steep up slope with scattered debris, narrowing to 6' from CL towards the end of the segment. The topography is mostly level to the west and becomes increasingly more steep to the east. A mature redwood is located at approx. MM 123.46, 11.5' from CL of tracks. There is significant erosion of the railroad ballast on the west and small retaining walls have been constructed in attempts to reduce this. The shoulder to the west narrows around a curve at approx. MM 123.52 & becomes wide enough for a trail on the east for approx. 300' until the steep slope returns only 6' from CL of tracks. At this point the shoulder on the west widens for a short distance to approx. 13' from CL.

Total segment length: **.25**

Current bicycle access condition: **D**

Current pedestrian access condition: **C**

Potential for improvement for bicycles:

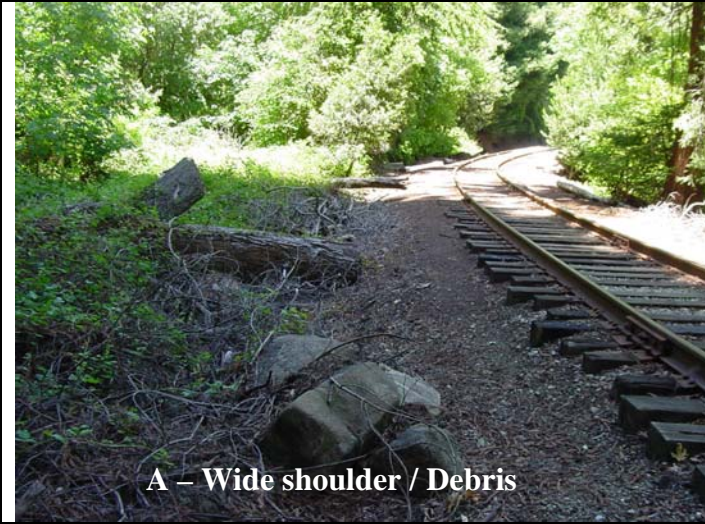
Potential for improvement for pedestrians:

Most feasible side for a potential trail: **West**

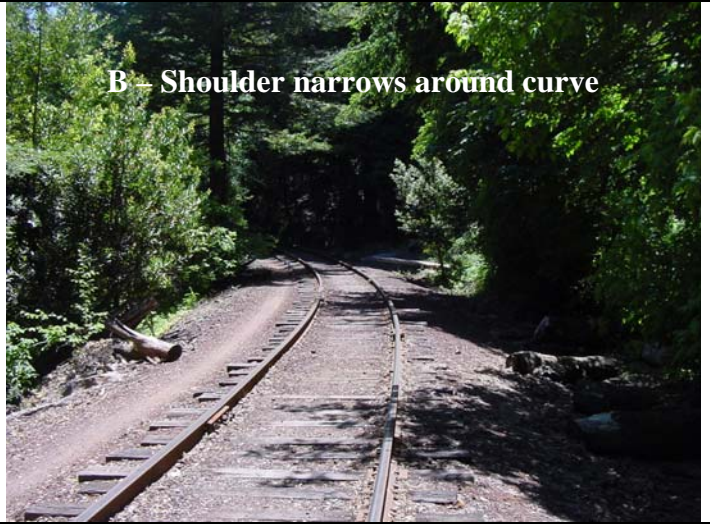
<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
123.30 To 123.55	Terrain is mostly level to the west for ± 6' -12' to a steep rise in the terrain, remains steep to the east, several ditches in the shoulder to the west drop off close to tracks	Excessive debris accumulation along the west shoulder, Approx. MM 123.46 Redwood 11.5' from CL	± 6-12' from CL to slope on west, a 300' portion on the east at approx. (MM 123.52) is suitable for a trail where the west shoulder narrows around a curve	Pogonip Open Space	Mixed forest & Redwood	2 blind curves approx. 100' LOS

**San Lorenzo Valley Trail Feasibility Study**  
**Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

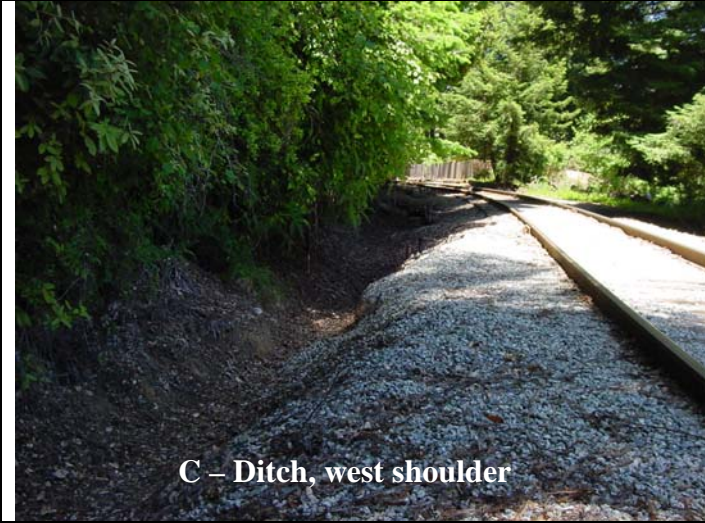
**Segment 7 (cont'd)**



**A – Wide shoulder / Debris**



**B – Shoulder narrows around curve**



**C – Ditch, west shoulder**



**D – Looking South -small ret. walls for ballast**

**San Lorenzo Valley Trail Feasibility Study  
Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 8 – Northern Pogonip Open Space Segment.** This segment is consistently narrow with an approximate 6’ – 8’ shoulder from CL of tracks to the up slope on the west. Steep slopes remain on the east, dropping off sharply at times to Rt. 9 below. Retaining walls exist where excessive erosion has occurred directly adjacent to the tracks, leaving very little room to safely pass. There are sections along the west where large stones (possible ledge) exists making cut into the existing slope difficult for a potential trail. A concrete drainage culvert runs along the second half of this segment on the west shoulder.

Total segment length: **.25**

Current bicycle access condition: **F**

Current pedestrian access condition: **F**

Potential for improvement for bicycles:

Potential for improvement for pedestrians:

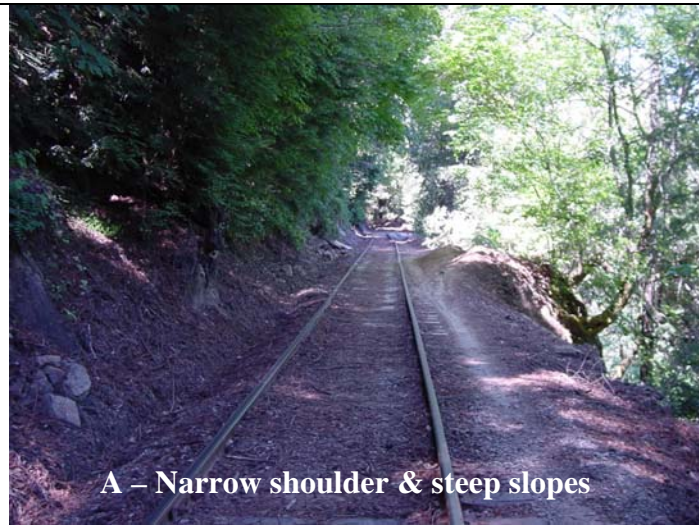
Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
123.55 To 123.80	Gentle adjacent slopes to the west for 6’ – 8’ to an extremely sharp rise in the terrain	Ledge & large stones exist along the slope to west	± 6’ – 8’ from CL on the west	Pogonip Open Space	Mixed forest & Redwoods	Approx. MM123.83 concrete drainage culvert begins & runs along west shoulder



**San Lorenzo Valley Trail Feasibility Study  
Appendix E: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 8 (cont'd)**



**A – Narrow shoulder & steep slopes**



**B – Large stone along west slope**



**C – View of retaining wall looking south**



**Segment 8: Looking South – west shoulder**

**San Lorenzo Valley Trail Feasibility Study  
AppendixE: Santa Cruz Big Trees Railroad Trail Route Assessment**

**Segment 9 – Northern Most Pogonip Segment to Rt. 9 Railroad Crossing.** This segment begins around a blind curve to the west with approx. 75’ – 100’ LOS. The concrete drainage culvert (approx. 300’ in length) continues into this segment around the curve and terminates just south of the 1942 trestle. The 1942 trestle is located near MM 123.93 and creates a difficult and dangerous crossing for pedestrians or cyclists. The Limekiln Trail runs below the trestle connecting Rt. 9 and the railroad corridor to the Rincon Trail and Pogonip Open Space. There is a steep man-made path leading down to this trail from the railroad corridor to the west. Rt. 9 is visible from the trestle and also crosses a bridge at this location with little to no room for pedestrians or cyclists. This segment begins approx. 13’ from CL (over concrete culvert) to the west and narrows at the trestle and north of the trestle to (± 8’) from CL to the up slope on the west. Steep slopes remain on the east down to Rt. 9.

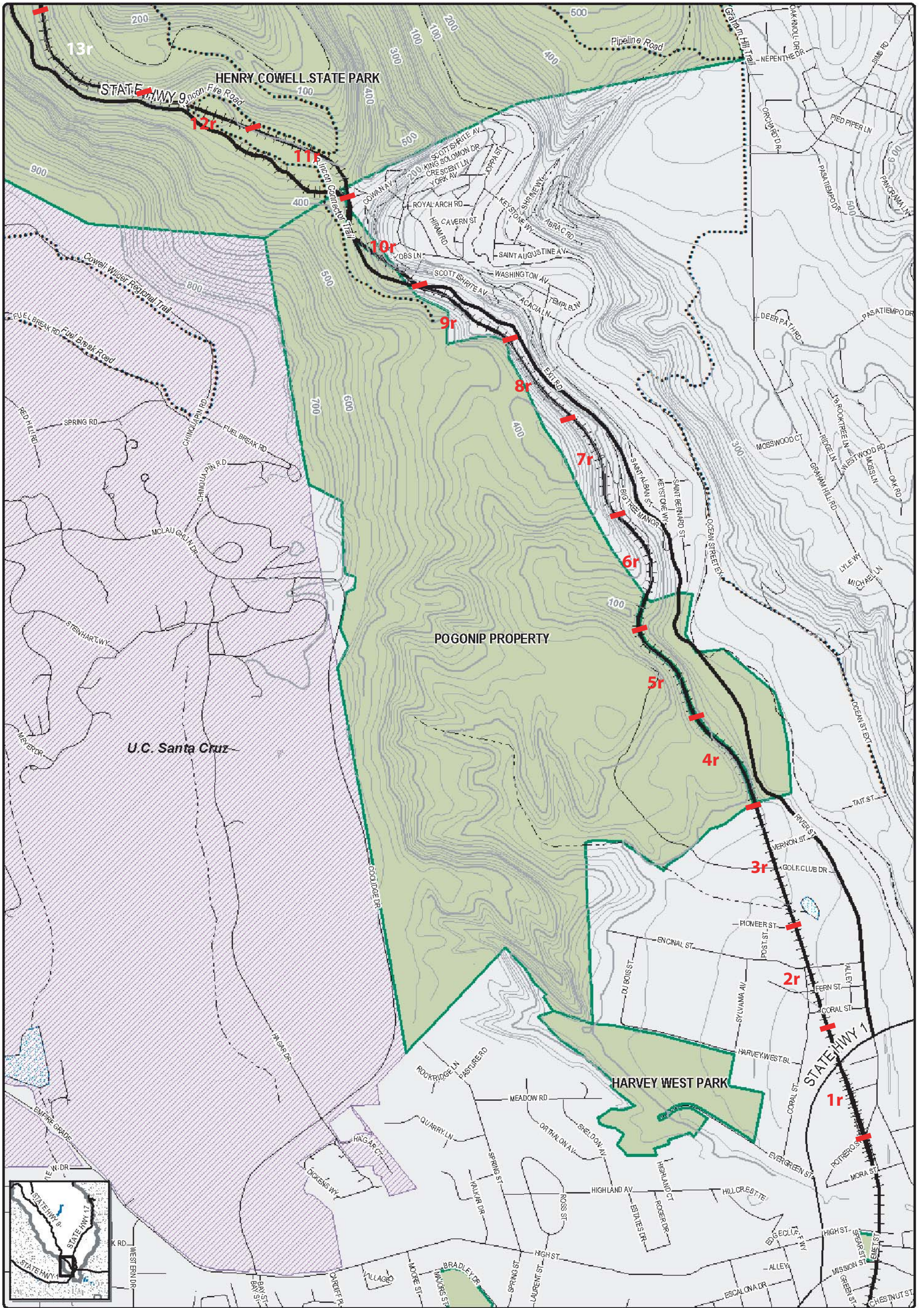
Total segment length: **.25**  
 Current bicycle access condition: **E**  
 Current pedestrian access condition: **E**  
 Potential for improvement for bicycles:  
 Potential for improvement for pedestrians:  
 Most feasible side for a potential trail: **West**

<b>Post Mile</b>	<b>Adjacent Topography</b>	<b>Adjacent Features</b>	<b>Distance to edge of existing significant change in slope or veg.</b>	<b>Adjacent Uses</b>	<b>Vegetation</b>	<b>Significant Features</b>
123.80 To 124.05	Steep slopes on both side of the tracks with little room for a trail	Call box MM 124.05 (13’ from CL)	± 8’ – 13’ from CL on west	Rt. 9 to the east & Pogonip Opens Space to the west	Mixed forest & Redwoods	Blind curve approx. MM 123.8, 1942 RR trestle (MM 123.93), concrete drainage culvert along west shoulder

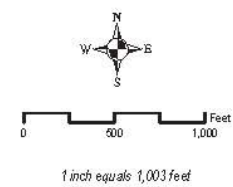
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Segment 9 (cont'd)





**Figure E-1: Railroad Route South**  
**San Lorenzo Valley**  
**Trail Feasibility Study**



**DISCLAIMER:**

*This map has been assembled using data from public agencies and other third-party sources. It is intended for study and planning purposes only, and does not constitute a survey-grade product.*

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