Four Rail Passenger Service Types for Santa Cruz County

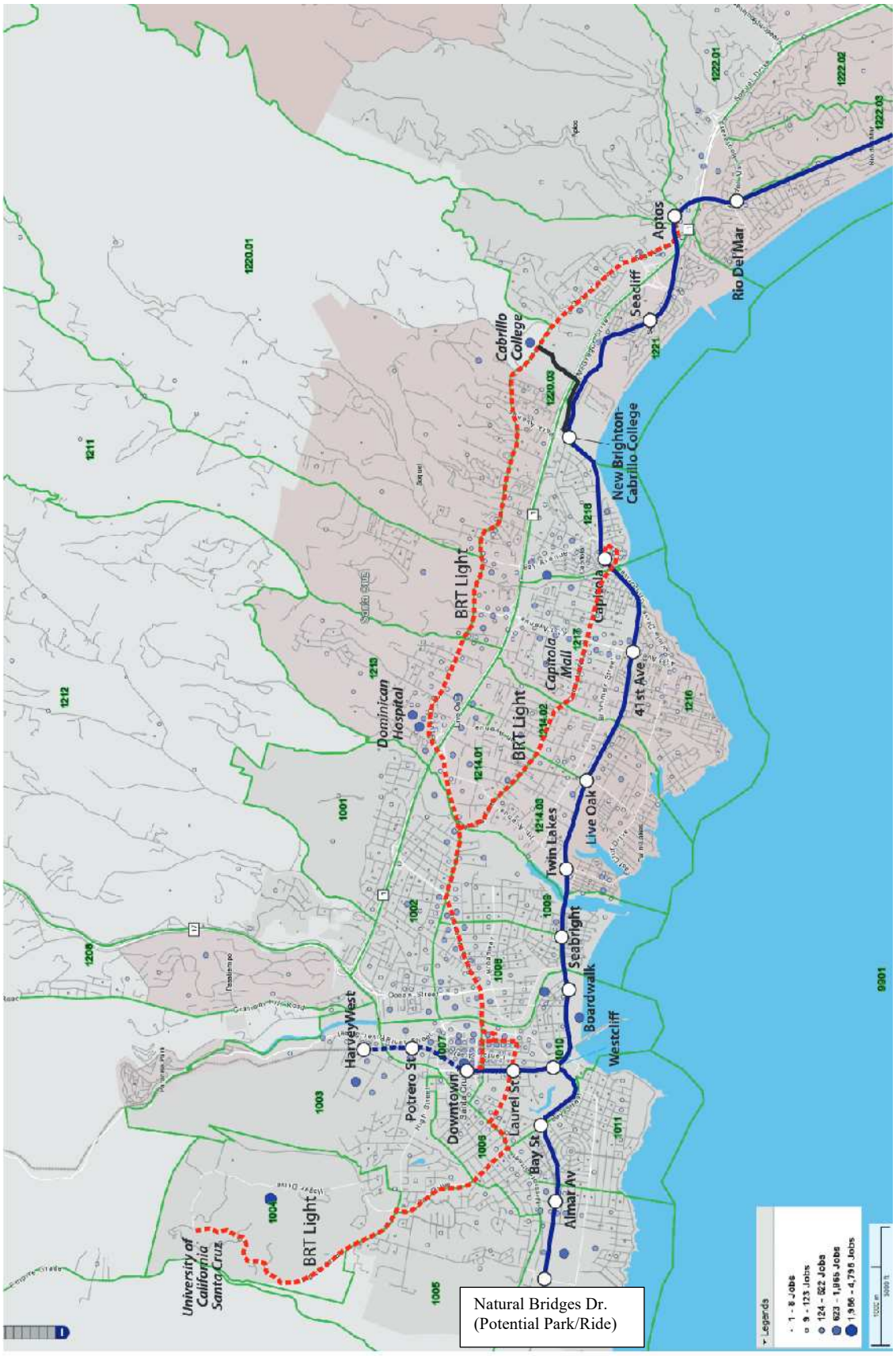
A Train Riders Association of California (TRAC)

WHITE PAPER

By Michael D. Setty, MUP

July 2022

Central Santa Cruz County area map from *Optimized Rail Passenger Service for Santa Cruz County*, April 2018.



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Front cover: Electric light rail in Valenciennes, France. This type of car is adaptable to battery propulsion. *Tramway de Valenciennes* system length is 33.8 miles with about 14,000 daily passengers in 2018. About 190,000 served (https://en.wikipedia.org/wiki/Valenciennes_tramway)

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Watsonville/Freedom area map from *Optimized Rail Passenger Service for Santa Cruz County*, April 2018.

Four Rail Passenger Service Types for Santa Cruz County

Train Riders Association of California (TRAC)

By Michael D. Setty, MUP[1]

Introduction

Santa Cruz County voters delivered a decisive "NO" vote of 73%[2] against County Measure D in the June 7th, 2022 California primary election.[3] In the wake of the overwhelming defeat of the Greenway Initiative, the big question is "What's next?" Strong public support for preserving rail options in Santa Cruz County suggests the time is now for innovative proposals to initiate a passenger rail program.[4]

In 2019, the SCCRTC received an unsolicited proposal from tram manufacturer TIG/m, which offered to restore the Santa Cruz Rail Branch Line (SCRBL) to service, providing for-profit rail service to the beaches of Santa Cruz County. In this paper, the Train Riders Association of California (TRAC) evaluates the economic feasibility of full-scale rail transit service, a public-private partnership inspired by the TIG/m proposal.

TRAC finds that excursion services and beach shuttles for visitors could help pay for the ongoing operation and maintenance of transit service on the SCRBL. Unlike traditional excursion trains, proposed beach shuttles bear a resemblance to transit service, with multiple schedules designed to carry passengers to and from the many beaches along the route, as well as other destinations such as the Beach Boardwalk, Capitola Village, Aptos Village or the Seascape Resort. Based on this, the author believes that beach shuttles initially designed for visitors could evolve into regular, daily all-year rail transit.

Unlike almost all public transit operations in the U.S., combining ridership by visitors with that by Santa Cruz County residents could help minimize operating deficits by providing larger average revenues per passenger compared to the low fares paid by residents. Such a system would require a well-thought out, very cost-conscious strategy and creation of a suitable and fair public-private partnership. SCCRTC, as owner of the railroad, would have the essential role of ensuring that the public interest is served (i.e., provision of affordable, frequent public transit) while meeting the investment goals of its partner.

This paper will distinguish between the various types of potential rail services and provide their likely parameters, e.g., potential ridership, potential revenues, and operating cost estimates. The four tiers of potential rail passenger service examined in this paper include:

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[1] Master of Urban Planning, San Jose State University 1981

[2] https://sccounty01.co.santa-cruz.ca.us/ElectionSites/ElectionResults/Results

[3] Measure D, the Greenway Initiative, was an anti-rail measure placed on the ballot with 16,000 signatures collected by Santa Cruz Greenway. https://www.facebook.com/SCCGreenway It would have stripped all language supportive of passenger and freight rail from the County's General Plan. Besides its legal impacts, Measure D functioned as an advisory measure. Passage would have destroyed political support for rail, influencing Santa Cruz County elected officials forever. Measure D was opposed by most elected officials, virtually every community organization, and by No Way Greenway. https://www.nowaygreenway.com/

[4] TRAC assumes that the Santa Cruz County Regional Transportation Commission (SCCRTC) will use dedicated funds for rail from the 2016 Measure D to provide local match for state and federal grants to reopen the Santa Cruz Rail Branch Line (SCRBL) over its 32-mile length to the minimal standards specified in its 2018 contract agreement with Progressive Rail, Inc. That is, trackage would be brought up to Federal Railroad Administration (FRA) Class 1 standards (maximum 10 mph for freight, 15 mph for passenger trains), and reopening and/or rehabilitation of all structures and bridges to allow unrestricted train movements (up to 268,000 lbs. per freight car and allowing all classes of passenger trains).

1. Battery-Electric Light Rail public transit services between West Santa Cruz, Santa Cruz, Capitola, Aptos, and Watsonville (e.g., services examined in the SCCRTC "Rail Transit Study"[5] and 2019-2021 "Transit Corridor Alternatives Analysis"[6]).
2. Seasonal Beach Shuttles between Davenport, Wilder Ranch State Park, Santa Cruz, Capitola, Aptos, Rio Del Mar, Seascape and La Selva (Manressa State Beach).
3. Excursion, Lunch/Dinner Trains, and Special Trains between Santa Cruz and Davenport (at times, limited special trains east of Santa Cruz to Capitola and Aptos, and Watsonville).
4. Revival of "*Suntan Special*" and Intercity Trains to Santa Cruz, integrated with potential intercity passenger services between the San Francisco Bay Area and Santa Cruz, Monterey and Salinas.

TRAC recommends that the RTC announce it is interested in proposals to operate any of the services described in this study. Of the four rail services discussed here, any of the three profit-making services could go forward as soon as the Santa Cruz Rail Branch Line is restored to operations (except for the transit service, which requires a subsidy). Because excursion and dinner service could begin with minimal to zero capital expenditures, it would be the most obvious place to start. It could be in operation, generating revenue for the RTC, while staff applies for grants to bring the rest of the Branch line back to full operation. Unlike past studies by RTC's consultants, TRAC is not proposing a complete rebuild of the line, or of its bridges. A small capital request for tie replacement and bridge repairs should be very competitive for State and federal funding.

Along with related services such as to/from the Monterey Peninsula and Salinas, our proposed low-cost "Santa Cruz Model" could be a template for many other areas in the United States. Private sector participation, in which business-like decisions are made as to the capital expenditures needed to restore service on unused lines, is a feasible alternative to the "gold-plated" approach of typical consultant-led transit bureaucracies. Taking a page from NASA's "Faster, better cheaper" strategy, more new rail systems could be created nationwide with this low-cost approach, providing larger overall benefits in mobility as well as greenhouse gas reductions than the typical agency "takes forever" approach. TRAC thinks this "Deliver it ASAP" approach is the way to develop rail passenger service in the United States.

Traditional excursion trains most often function as "rides to nowhere" that patrons ride for the enjoyment of the train ride itself, a delicious meal and/or scenery along the route. For example, the Big Trees & Roaring Camp Railroad provides the experience of riding behind steam locomotives through a thick redwood forest, with no destination in mind other than returning to the origin station. The Beach Train currently operating from the Roaring Camp facility in Felton offers passengers the options of a round trip ride to the Beach Boardwalk without alighting, or a 3-hour layover, since two daily trains are offered.

1. Battery-Electric Rail Transit Service

1a. Introduction

The growth of the Interstate Highway system destroyed the economics of passenger rail, forcing the consolidation of passenger services into Amtrak, and requiring the Congressional appropriation of annual subsidies. Congested highways have changed all that. Some rail services in metropolitan areas

[5] https://sccrtc.org/wp-content/uploads/2016/02/RailTransitStudy_FullDoc.pdf
[6] https://sccrtc.org/projects/multi-modal/transitcorridoraa/

now have profit potential and thus could be attractive to the private sector. Because Santa Cruz County suffers from serious highway congestion, a parallel congestion-free transit system would be attractive as an alternative to driving. Coupled with the profits from tourist operations, and possible sponsorships by local businesses, transit could be feasible with a low to zero subsidy.

To estimate the operating costs of combining a beach shuttle and regular rail passenger service, the following assumptions have been made (Note—capital costs are all assumed to be grant-funded):

- The levels of regular rail passenger service estimated in the author's April 2018 paper *Optimizing Rail Passenger Service for Santa Cruz County*[7] has been assumed, e.g., every 30 minutes all day between West Santa Cruz, downtown Santa Cruz, and Watsonville.
- Hybrid, battery-electric or fuel-cell electric powered, accessible low-floor vehicles that meet the FRA Alternative Compliance Standard. The author estimates that a total of 12 100-seat vehicles would be needed, with up to 10 in service (five 2-car trains) plus 2 spare vehicles.
- To keep costs down, the existing railbed and tracks would be reused where possible. Besides restoring the bridges, upgrading track to FRA Class 3 (up to 59 mph allowed for passenger trains) or better. Track upgrades including new passing sidings at appropriate locations between Seascape and the San Lorenzo River, and double-tracking of the existing in-street track in front of the Boardwalk and Beach, and on Chestnut Street north to the Downtown/City Hall station.
- Construction of new station platforms at various locations. Upgrading platforms constructed earlier for the Beach Shuttles.
- Expanded maintenance facilities for the rail car fleet.
- Multimodal connections, including the development of bus stops adjacent to rail platforms, providing timed feeder bus connections where appropriate.
- A new active transportation and automated minibus/pedestrian/bicycle bridge over Highway 1 to access Cabrillo College.
- Installation of the latest technology rail signaling and control systems that meet requirements to provide Positive Train Control (PTC).
- Additional tracks and other minor capital improvements to minimize conflicts between passenger trains and freight trains, such as additional sidings and a passenger bypass track in the Watsonville switching area.
- Other capital improvements as required.

Figure 1 on the next page shows estimated demand from each potential rail station, based on a "direct demand" model developed for studies in the San Francisco Bay Area. The methods used to estimate ridership are outlined in the April 2018 paper, *Optimized Rail Passenger Service for Santa Cruz County: Maximizing Ridership and Benefits of Rail Passenger Service.*[8]

Daily ridership was estimated at about 14,000 daily boardings in the 2018 analysis, which is substantially higher than estimates from SCCRTC's *Rail Transit Study* completed in 2016. Additional ridership was obtained by 1). extending the proposed rail service to two additional downtown Santa

[7] Available at http://www.calrailnews.org/wp-content/uploads/2018/04/TRAC-White-Paper-2018-01-Optimized-Rail-Passenger-Service-for-Santa-Cruz-County-April-2018-Final.pdf
[8] *Ibid.*

Cruz stations, 2). adding a direct connection to Cabrillo College at the New Brighton station, and 3). 15-minute peak service between Santa Cruz and Aptos (this added service not included in this proposal).

As a sensitivity test in light of the reduced transit ridership following the Covid-19 pandemic, the modified 2018 analysis (11,200 riders) is reduced by 25%, yielding 8,400 daily riders.

Estimated ridership, fare revenues and operating expenses are based on the total level of anticipated service, which incorporates visitor-oriented beach shuttle services into the schedule. The estimate also includes a higher level of maintenance to meet FRA Class 3 standards, as well as a higher level of maintenance and security at upgraded and new stations. Higher costs for insurance, management and promotion are included, and for enhanced connecting bus service.

In this feasibility study, TRAC tested a low local fare. Projected local rail transit fares average $2.20 per boarding. That compares to an estimated $2.11 in operating revenues per boarding, including fares, for Santa Cruz Metro bus service[9] in Fiscal Year 2016-17. This calculation does not include establishment of zone fares for longer distances such as Watsonville, though zone fares should be considered for potentially faster service via rail compared to existing bus services. Slightly higher rail transit fares ($2.89 and $3.89 for the reduced-ridership scenario) would eliminate the need for a subsidy altogether.

Basic "walk-up" cash fares for Santa Cruz Branch line rail transit services would be geared towards visitors, that is, higher than typical transit fare levels. Local riders would be able to obtain much lower average fares per boarding through pre-purchased season passes such as those available to UCSC and Cabrillo College students, as well as available to middle and high school attendees. Multi-ride tickets and passes would also be offered, such as heavily discounted 20-ride tickets, weekly passes, two-week passes, and monthly passes, e.g., fare media not likely to be used by visitors. For discounts to seniors, persons with disabilities and low-income riders, user-side subsidies would be explored. In this analysis, it has also been assumed that residents using Beach Shuttles would pay transit fares rather than shuttle fares, greatly reducing fares paid with a commensurate reduction in Shuttle revenues.

[9] Santa Cruz Metropolitan Transit District *FY18 &FY FY19 Final Budget.* June 17, 2017. Ridership figure on page 10, Table on page 28. Available online at http://www.scmtd.com/en/agency-info/administration/financial-reports

Figure 1. Santa Cruz County Rail Patronage Estimate, 2018 Analysis

			A.M. Peak Period Ons & Offs		Equivalent All-Day Ons & Offs, All Stations	
			Proposed Service Frequencies			
	Census Tract	Population + Employment within 0.5 mile	30 min. peak periods 30-min. all day	15-min. peak periods 30 min. all day	30-min. peaks, 30-min. all day	15-min. peaks, 30-min. all day
Davenport Coast	=	2,500	156	156	468	468
Natural Bridges	1012	6,000	332	332	996	996
Boardwalk West	1011	6,636	340	340	1,020	1,020
Downtown – Chestnut & Laurel, Chestnut & Locust	**1007**	**8,388**	**593**	**786**	**1,779**	**2,358**
Boardwalk	1010	12,609	392	518	1,176	1,554
River East	1008	7,500	293	388	879	1,164
Harbor North	1009	4,000	254	336	762	1,008
Twin Lakes	1215	6,467	411	544	1,233	1,632
Twin Lakes East	1216-part	8,091	354	468	1,062	1,404
Twin Lake North	1214.03-part	4,518	261	346	783	1,038
Twin Lakes Northeast	1214.02-part	3,300	153	203	459	609
Capitola Mall	1217-part	8,000	420	556	1,260	1,668
Capitola-Downtown/Beach	1218	7,543	356	471	1,068	1,413
New Brighton-Cabrillo College#	**1218**	**9,000**	**588**	**778**	**1,764**	**2,334**
Seacliff	1221	4,524	165	226	495	678
Aptos Village	1220.03-part	3,500	294	475	882	882
Rio Del Mar 1	1222.03-part	4,395	264	350	792	1,050
Rio Del Mar 2	1222.01-part	4,000	259	342	777	1,026
La Selva Beach	1223-part	3,600	186	186	549	549
Watsonville West	1104	8,000	427	427	1,281	1,281
Watsonville-Downtown	1103	9,958	564	564	1,692	1,692
Pajaro	**Pajaro CCD**	**4,189**	**377**	**377**	**1,131**	**1,131**
Total, Population + Employment		136,718				
Employment		39,218				
Population		97,500				
		A.M. ons+offs	7,439	9,171		
		Daily ons+offs			22,317	27,513
		Daily Riders			**11,156**	**13,757**
# Based on average student attendance per weekday, e.g., (14,000 x 3 days/wk)/5=8,500						

Figures 2a and 2b show two ridership scenarios, with Figure 2b assuming a 25% reduction in estimated transit patronage in the wake of the Covid-19 pandemic. The exciting finding: a 1/8% sales tax ($6 million per year) would generate more than enough subsidy to float either of these transit scenarios.

	A		B	C	D
1	**Figure 2a. Summary Estimates for Rail Transit & Beach Shuttles**				
2	2018 Projections (without Covid-19 adjustments)				
3	Category		Beach Shuttles	Rail Transit (increment)	Total
4	**OPERATING CREWS**				
5	Rate per train-hour (2 crew X $60.00 + $25%)		$150.00	$150.00	$150.00
6	Revenue Train-Hours		11,000	15,000	26,000
7	Total Expense - Operating Crews		**$1,650,000**	**$2,250,000**	**$3,900,000**
8	Full Time Equivalent (FTE) Positions (2,080 hrs/yr)		10.6	14.4	25.0
9	**TRAIN FUEL/POWER**				
10	Rate per car-mile (electricity)		8 kwh	8 kwh	8 kwh
11	Price per kilowatt-hour		$0.25	$0.25	$0.25
12	Power cost per car-mile		$2.00	$2.00	$2.00
13	Estimated annual train-miles		200,000	260,000	460,000
14	Estimated annual car-miles		250,000	325,000	575,000
15	Total Train Fuel/Power		**$500,000**	**$650,000**	**$1,150,000**
16	**TRAIN MAINTENANCE**				
17	Estimated rate per car-mile		$4.00	$4.00	$4.00
18	Estimated annual car-miles		250,000	325,000	575,000
19	Total Expense - Train Maintenance		$1,000,000	$1,300,000	$2,300,000
20	**Subtotal, "Above The Rail" Expenses**		**$3,150,000**	**$4,200,000**	**$7,350,000**
21	Insurance, Management, Promotion		$2,000,000	$1,000,000	$3,000,000
22	Infrastructure, Maintenance, Stations		$2,000,000	$1,000,000	$3,000,000
23	**Subtotal, Operating Expenses before Markup**		**$7,150,000**	**$6,200,000**	**$13,350,000**
24	Allowance for Vehicle Lease/Capital Costs		$1,000,000	$0	$1,000,000
25	**Subtotal, Including Vehicle Leases/Purchase**		**$8,150,000**	**$6,200,000**	**$14,350,000**
26	Markup/Profit for Private Service Contractor		10.0%	10.0%	10.0%
27	Total Markup/Profit		$815,000	$620,000	$1,435,000
28	**GRAND TOTAL, INCLUDING MARKUP/PROFIT**		**$8,965,000**	**$6,820,000**	**$15,785,000**
29	Allowance for Added Connecting Bus Service		$0	$3,000,000	$3,000,000
30	**GRAND TOTAL, INCLUDING CONNECTING BUSES**		**$8,965,000**	**$9,820,000**	**$18,785,000**
31	Calculated Grand Total Cost Per Train-Hour, excluding buses		$815.00	$454.67	$607.12
32	Calculated Grand Total Cost Per Train-Mile, excluding buses		$44.83	$26.23	$34.32
33					
34	**REVENUES**				
35	Beach Shuttle Farebox & Parking Revenues #	LOW	$9,424,000 -$2,000,000		$7,424,000
36		HIGH	$10,536,000 -$2,000,000		$8,536,000
37	**SHUTTLE OPERATING MARGIN, LOW**		**$459,000**		
38	**SHUTTLE OPERATING MARGIN, HIGH**		**$1,571,000**		
39	Transit Fares, 3.4 million boarding rides @$2.20		$0	$7,480,000	
40	**TRANSIT OPERATING SUBSIDY**			(-$2,340,000)	

41	Estimated Farebox Recovery Ratio, LOW	105.1%	76.2%	
42	Estimated Farebox Cost Recovery, HIGH	117.5%	76.2%	
43	Calculated Above the Rail Cost Per Train-Hour	$286.36	$280.00	$282.69
44	Calculated Above the Rail Cost Per Train-Mile	$15.75	$16.15	$15.98
45	Annual round trips, Beach Shuttle riders	677,000 to 778,000		
46	Annual round trips, Transit riders	1,700,000		
47	Total round trips (two boardings equals a round trip)	2,277,000 to 2,378,000		
48	The same rail cars provide Beach Shuttle service and transit service. Shuttle service is distinguished by its higher fares and shorter operating hours. Local residents would pay the transit fare, which is much lower, whenever they ride during shuttle service hours.			
49	Net service levels and costs for transit increment shown in Column C. Column D summarizes shuttle services + transit increment. Revenue car-miles assumes 2-car trains operated 25% of the time. Annual boardings = 11,200 boardings/day X 300 days/year.			
50	Shuttle revenue train-hours: 240 annual days X 22 round trips (9:00am-8:00pm, every 30 minutes), Wilder Ranch-La Selva Beach 18 miles, allowance for special events. Revenue car-miles assumes 2-car trains operated 25% of the time.			
51	Transit revenue train-hours (includes Shuttle hours): 360 annual days X 32 2.5 hour round trips (5:30am-11:00pm), every 30 min. 5:30am-9:00pm, plus 60 minutes late at night. Watsonville to West Santa Cruz, 22 miles. Includes limited service to Wilder Ranch.			
52	Labor costs are based on escalated-TIG/m 2020 proposal costs of $57.00/crew person-hour, escalated to $60.00. Two-person crews assumed for larger vehicles, 25% markup for crew training, maintenance, testing, supervision and "deadhead."			
53	Average Beach Shuttle fare of $12.00 includes Boardwalk Shuttle from West Santa Cruz; all-day pass revenues for the entire line, ($18.00 to $20.00), and West Santa Cruz parking charges averaging $7.00-$8.00 per vehicle.			
54	# With Beach Shuttle integrated into total transit service, residents using Beach Shuttle are assumed to pay lower transit fares. Estimated Beach Shuttle fares are thus reduced by $2,000,000.			

	A	B	C	D
1	**Figure 2b. Summary Estimates for Rail Transit & Beach Shuttles**			
2	2018 Projections (WITH Covid-19 adjustments)			
3	Category	Beach Shuttles	Rail Transit (increment)	Total
4	**OPERATING CREWS**			
5	Rate per train-hour (2 crew X $60.00 + $25%)	$150.00	$150.00	$150.00
6	Revenue Train-Hours	11,000	15,000	26,000
7	Total Expense - Operating Crews	**$1,650,000**	**$2,250,000**	**$3,900,000**
8	Full Time Equivalent (FTE) Positions (2,080 hrs/yr)	10.6	14.4	25.0
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10	Rate per car-mile (electricity)	8 kwh	8 kwh	8 kwh
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15	Total Train Fuel/Power	**$500,000**	**$650,000**	**$1,150,000**
16	**TRAIN MAINTENANCE**			
17	Estimated rate per car-mile	$4.00	$4.00	$4.00
18	Estimated annual car-miles	250,000	325,000	575,000
19	Total Expense - Train Maintenance	$1,000,000	$1,300,000	$2,300,000
20	**Subtotal, "Above The Rail" Expenses**	**$3,150,000**	**$4,200,000**	**$7,350,000**
21	Insurance, Management, Promotion	$2,000,000	$1,000,000	$3,000,000
22	Infrastructure, Maintenance, Stations	$2,000,000	$1,000,000	$3,000,000
23	**Subtotal, Operating Expenses before Markup**	**$7,150,000**	**$6,200,000**	**$13,350,000**
24	Allowance for Vehicle Lease/Capital Costs	$1,000,000	$0	$1,000,000
25	**Subtotal, Including Vehicle Leases/Purchase**	**$8,150,000**	**$6,200,000**	**$14,350,000**
26	Markup/Profit for Private Service Contractor	10.0%	10.0%	10.0%

27	Total Markup/Profit		$815,000	$620,000	$1,435,000
28	**GRAND TOTAL, INCLUDING MARKUP/PROFIT**		**$8,965,000**	**$6,820,000**	**$15,785,000**
29	Allowance for Added Connecting Bus Service		$0	$3,000,000	$3,000,000
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37	**SHUTTLE OPERATING MARGIN, LOW**		**$459,000**		
38	**SHUTTLE OPERATING MARGIN, HIGH**		**$1,571,000**		
39	Transit Fares, 2.52 million boarding rides @$2.20		$0	$5,544,000	
40	**TRANSIT OPERATING SUBSIDY**			(-$4,276,000)	
42	Estimated Farebox Recovery Ratio, LOW		105.1%	56.5%	
43	Estimated Farebox Cost Recovery, HIGH		117.5%	56.5%	
44	Calculated Above the Rail Cost Per Train-Hour		$286.36	$280.00	$282.69
45	Calculated Above the Rail Cost Per Train-Mile		$15.75	$16.15	$15.98
46	Annual round trips, Beach Shuttle riders		677,000 to 778,000		
47	Annual round trips, Transit riders		1,275,000		
48	Total round trips (two boardings equals a round trip)		1,952,000 to 2,053,000		
49	The same rail cars provide Beach Shuttle service and transit service. Shuttle service is distinguished by its higher fares and shorter operating hours. Local residents would pay the transit fare, which is much lower, whenever they ride during shuttle service hours.				
50	Net service levels and costs for transit increment shown in Column C. Column D summarizes shuttle services + transit increment. Revenue car-miles assumes 2-car trains operated 25% of the time. Annual boardings = 11,200 boardings/day X 300 days/year.				
51	Shuttle revenue train-hours: 240 annual days X 22 round trips (9:00am-8:00pm, every 30 minutes), Wilder Ranch-La Selva Beach 18 miles, allowance for special events. Revenue car-miles assumes 2-car trains operated 25% of the time.				
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53	Labor costs are based on escalated-TIG/m 2020 proposal costs of $57.00/crew person-hour, escalated to $60.00. Two-person crews assumed for larger vehicles, 25% markup for crew training, maintenance, testing, supervision and "deadhead."				
54	Average Beach Shuttle fare of $12.00 includes Boardwalk Shuttle from West Santa Cruz; all-day pass revenues for the entire line ($18.00 to $20.00), and West Santa Cruz parking charges averaging $7.00-$8.00 per vehicle.				
55	# With Beach Shuttle integrated into total transit service, residents using Beach Shuttle are assumed to pay lower transit fares. Estimated Beach Shuttle fares are thus reduced by $2,000,000.				

2. Seasonal Beach Shuttles[10]

2a. Introduction

Santa Cruz has a long history of rail access to its beaches and the Boardwalk. According to a short history on the Beach Boardwalk website:

> During the 1930s, tourists from the San Francisco Bay Area could take the Southern Pacific Railroad's [Suntan] Special right to the Boardwalk. Except for the years 1941 to 1947, trains ran from San Jose, Oakland, and San Francisco, and also connected Santa Cruz to Watsonville and Los Angeles. In 1932

[10] This section has been updated and adapted from the author's 2018 study, *Potential for Excursion Rail Service–Santa Cruz County,* prepared for TRAC, August 2018 (Copies available on request).

> alone, the train delivered as many as thirty-five hundred people each Sunday to Santa Cruz, where train cars were greeted with a blast of brass from the Beach Band.[11]

In the late 1990's, experimental *Suntan Special* trains were operated, attracting hundreds of passengers per train from the Bay Area. In July 1998, the Santa Cruz County Regional Transportation Commission (SCCRTC), partnering with the Transportation Agency for Monterey County (TAMC), published the *Around the Bay Rail Study***,** which included an analysis of reviving the *Suntan Special*. That study predicted weekend trains to the Santa Cruz Beach Boardwalk could very conservatively serve about 30,000 round trip passengers on 24 spring, summer, and early fall weekends, e.g., 48 days each with 600+ round trip passengers per day.[12]

Reviving the *Suntan Special* was also originally a key part of Progressive Rail's operating contract with SCCRTC, which was approved in 2018 to replace operations by Iowa Pacific Holdings.[13] This section is based in part on Progressive Rail's proposal. It examines how to provide parking for patrons, enabling them to take the train to many Santa Cruz County beaches and state parks. The last section of this paper describes how to provide service for potential visitors to arrive in Watsonville via a reestablished *Suntan Special*.

2b. Estimated Visits to Santa Cruz County Beaches

Based on state park statistics and author estimates, there are almost four million annual visits to the other beaches in Santa Cruz County--those besides the Main and Cowell Beaches adjacent to the Beach Boardwalk and Santa Cruz Municipal Pier. In a survey[14] conducted on a typical summer Saturday, Capitola Beach was found to attract 1,333 people over the course of the day. This is captured as "the Capitola Rule": approximately one person roundtrip per foot of beach on a typical summer Saturday.

In Capitola, approximately 20% of beachgoers arrived by means other than motor vehicles, such as walking, bicycling or transit, or on the same trip visiting destinations such as restaurants adjacent to the beach.[10] The author believes that shuttle trains serving the beaches can attract at least 10%-15% of beach visitors, depending on beach location, parking prices and supply, levels of congestion, and other factors.

Figure 3 (next page) summarizes annual estimated visits to state beaches, and other beaches in Santa Cruz County, plus Wilder Ranch State Park. Non-state beach attendance has been estimated by either reported figures (e.g., Santa Cruz Main and Cowell Beaches) or by using the "Capitola Rule" from above. For the undeveloped, relatively remote beaches located mostly between Davenport and Santa Cruz, this estimate was reduced 50% to be conservative.

Based on the author's estimates, on a typical summer Saturday, about 40,000 people visit Santa Cruz County beaches near the Santa Cruz Rail Branch Line. This is approximately 9.3 million Beach Boardwalk, Santa Cruz Municipal Pier, and beach visits per year. Of these, 21,000-22,000 are estimated to visit the Boardwalk, Santa Cruz Wharf and the Santa Cruz Main and Cowell Beaches on a typical

[11] http://memories.beachboardwalk.com/southern-pacific-railroads-sun-tan-special-1932
[12] Linked at http://sccrtc.org/projects/rail/rail-service-studies/ under "Past Rail Studies."
[13] Since 2019 Progressive Rail has contracted with the Roaring Camp Railroads to provide limited freight service in Watsonville. Given the failure of SCCRTC to fix 2017 storm damage on the SCRBL, Progressive Rail has lost interest in the Santa Cruz County market–unlike Roaring Camp Railroads.
[14] *Parking Analysis for the Capitola Village Area.* Prepared for the City of Capitola, RBF Consulting, Monterey Bay. 2008. Linked at http://www.cityofcapitola.org/publicworks/page/parking-needs-analysis.

summer weekend day; this is about 3.8 million visits per year when duplications are eliminated, e.g., it is assumed most Boardwalk and Pier visitors also visit the Main and Cowell Beaches.

Figure 3. Attendance, Santa Cruz Co. Shoreline Attractions, State Parks & Beaches Near Rail

Beach, North to South	Summer Saturday Daily Visits	Estimated Annual Visits*	Notes
Davenport Beach^	~600	120,000	
Shark Fin Cove Beach^	~250	230,000	
Bonny Doon Beach^	~500	90,000	
Panther/Seven Mile Beaches^	~900	170,000	
Laguna Creek Beach^	~1,300	230,000	
Four Mile Beach^	~800	150,000	
Other Beaches (poor access, private)^	~1,000	190,000	
Wilder Ranch State Park	1,300	474,949	
Natural Bridges State Beach	4,900	919,757	About 0.5 mile south of rail line
Santa Cruz Main/Cowell Beach	16,000	3,000,000	Same visitation as Boardwalk
Santa Cruz Wharf	--	2,500,000	Next to Boardwalk, Main Beach
Seabright/Twin Lakes State Beach	2,900	540,086	
Capitola Beach	1,333	250,000	
New Brighton State Beach	1,400	267,700	
Seacliff/Rio Del Mar State Beach	1,700	322,181	
Rio/Aptos Beaches	~3,000	520,000	Lack of access, parking
Manresa State Beach	1,200	222,535	
Grand Total	**36,100**	**9,280,000**	
Excluding Main Beach, Boardwalk, Wharf	20,100	3,780,000	

^ Beach visitation estimated based on measured visible beach length from Google Maps aerial photos. For beaches north of Wilder Ranch, Capitola Rule figure is reduced 50% due to undeveloped nature of these beaches, and relatively long walking distances from parking on Highway 1.

* Assumes Saturdays are 33% of weekly beach visits during summer season, e.g., May-October. Summer visitation is 2/3 of annual beach attendance. Rounded to nearest 10,000 unless actual counts available.

2c. Visitor Ridership Rules of Thumb

While prognostication of potential excursion railroad ridership is more art than science, there are guideposts. Reat Younger (who unfortunately died in 1993), a tourist railroad consultant, was able to plan many financially successful tourist railroads in the 1980's and early 1990's. Based on Younger's empirical observations, about 10% to 11% of the local population within 50 miles of the attraction can be expected to take a ride on a suitable rail line every year.

Although visitor shuttles that provide local trips to beaches and other non-work destinations have similarities to public transit, their goal of fun has more in common with the "joy ride" or "just to ride a train" purposes that traditional tourist trains cater to. Shuttles are especially able to attract visitor usage under conditions of limited and high parking prices and serious traffic congestion, which can be much

worse on weekends. The scenic vistas and attractive destinations present along the Santa Cruz coastline are the elements that can turn mere shuttle trips into true excursions.

Figure 4. Reat Younger's Empirical Rules of Thumb for Tourist Railroads[15]

Daytrippers		
Local Residents	Within 0-25 miles	33% will ride attractive excursion service within 3 years
	Within 25-50 miles	29% will ride attractive excursion service within 3 years
	Within 50-100 miles	10% will ride attractive excursion service within 3 years
	Within 100-150 miles	4% will ride attractive excursion service within 3 years
Overnight Visitors	--	29%, exclusive of those who live within 100 miles but are staying overnight (e.g., 29% of visitors staying in immediate community only. *Total tourist market must be adjusted by length of operating season and number of visitors during that time.*

Monterey-Salinas Transit (MST) operates the free "MST Trolley" shuttle, with buses disguised as early 20th century electric streetcars between large parking garages in Downtown Monterey, Cannery Row stops, and its terminal at the Monterey Bay Aquarium. Prior to the Covid-19 pandemic, the MST Trolley attracted 240,000 annual passengers in Fiscal Year 2016-17. Daily ridership averaged between 1,500-2,000 daily boardings in July and August 2017, or 750-1,000 daily round trips.[16,17]

While only about 1%-2% of annual Monterey Peninsula visitors to all Peninsula attractions including Carmel, Pacific Grove, Carmel Valley and Big Sur currently use the MST Trolley, this usage rate increases to about 3%-4% of all Monterey visitors during July and August. On peak ridership days in the late 1980's prior to the opening of the 1,000 space Cannery Row garage, MST shuttles serving Cannery Row and the Aquarium regularly served more than three times as many passengers as now.

Given the history of the MST Trolley, as well as shuttle buses in visitor areas such as national parks and major attractions, shuttle buses and trains can attract large numbers of visitors under the right circumstances. This is especially so if they make it convenient to carry beach-going supplies, as well as bicycles and surfboards.

Unlike faux trolley buses such as the MST Trolley, "real" trains and streetcars generally are more comfortable due to smoother rides on rails rather than rubber tires and pavements. Trains also are generally free from congestion, unlike buses. In Santa Cruz, the potential rail route would be much more direct than road-based shuttle bus routes, which also would tend to get stuck in beach traffic. The rail line also would have much more scenic views than possible with buses, at locations such as the Capitola trestle, San Lorenzo River Rail Bridge and numerous other locations inaccessible by road.

Roughly four million people live within 50 miles of Santa Cruz, including Santa Cruz, Monterey, and San Benito Counties; however, most reside in the very affluent Santa Clara, San Mateo and southern Alameda Counties. Applying Younger's rules of thumb to Santa Cruz County, those persons residing

[15] *Basic Thinking*, 1992. Reat Younger. Self-published. This document is a comprehensive guide to planning, designing, financing and operating tourist railroads. Copy available on request by qualified persons. Rules of thumb based on phone conversation between author and Mr. Younger in 1992, less than a year before he died.

[16] The MST Trolley was among MST's most productive services before Covid, carrying 50-60 passengers/revenue vehicle hour. Source: MST Board Meeting Reports, linked at http://mst.org/about-mst/board-of-directors/board-meetings/

[17] Daily parking rates in the downtown Monterey East Garages served by the MST Trolley are $7 daily, compared to $5-$20 daily at the Cannery Row garage, depending on demand and time of year. http://www.monterey.org/Services/Parking/Public-Garages-and-Lots

within 50 miles of Santa Cruz County would make about 400,000 annual round trips on potential excursion trains. Similarly, about 580,000 annual rides could be expected from the estimated 2 million overnight visitors to Santa Cruz County. These two estimated sources of ridership total 1,080,000 potential riders making round trips. The Santa Cruz Beach Train and Redwood Forest Steam Train currently serve only 18% of this theoretical potential, with 60,000 and an estimated 140,000 annual (round trip) passengers, respectively.[18] As a result, there is plenty of potential ridership for other rail destinations in the area.

Interestingly, the excursion trains from the Roaring Camp station in Felton to the Beach Boardwalk attract that level of trips despite a price point of about $42.00 per adult.

Younger's rules of thumb can underpredict ridership where great attractions exist. In San Francisco, prior to the Covid-19 pandemic, there were 10 million overnight visitors, and 15 million day-trippers who traveled from more than 50 miles away, exclusive of commuters.[19] Younger would predict the overnight visitors to make about 2.9 million trips. The six million Bay Area residents who live within 50 miles of San Francisco would likely make about 660,000 annual trips. The additional 5 million residents who live between 50 and 100 miles from San Francisco (including from the Monterey Bay Area, the Sacramento region, and San Joaquin and Stanislaus Counties) would have made roughly 200,000 round trips annually on services roughly analogous to tourist trains, e.g., cable cars, historic streetcars, and ferryboats. These different groupings of visitors total an expected 3.5 million annual trips.

According to National Transit Database ridership data for the San Francisco Municipal Railway, 5.8 million one-way trips were made on cable cars and 7.46 million trips were carried on Muni's historic streetcars.[20] In both cases, visitors comprised more than 50% of cable car and streetcar riders, that is, roughly 7 million annual riders. This shows that visitor-oriented services in large tourist destinations are likely to draw unexpectedly high numbers of visitors to transit services that are attractive.

Since attractions like the cable cars, historic streetcars, San Francisco Bay cruises, the ferry to Alcatraz and ferries from Marin, Solano, and Alameda Counties are readily available, an argument could be made that at least in the case of San Francisco, tourist usage of transportation analogous to tourist trains has been significantly exceeded--a good indicator of demand for services in Santa Cruz.

Returning to the case of Santa Cruz County, the Roaring Camp Railroads has two separate operations. First, the Santa Cruz, Big Trees and Pacific Railroad (FRA reporting mark SCBG) operates the standard-gauge *Santa Cruz Beach Train*, providing excursions from Felton to the Beach Boardwalk. Most passengers travel is during the May-October peak tourist season. These excursions typically travel one hour in each direction, lay over at least one hour at the Boardwalk, and return in the third hour. The Beach Train generally attracts approximately 2% of all Boardwalk/Main Beach visitors, based on estimated total Beach/Boardwalk attendance.

The Roaring Camp and Big Trees Narrow Gauge Railroad (RCBT) company also operates the *Redwood Forest Steam Train*, which operates on six miles of narrow-gauge tracks (e.g., a twelve-mile round trip) behind former logging industry steam locomotives. While data for this operation was not reported to the Federal Railroad Administration (FTA), there are an estimated 140,000 annual riders, totaling about

[18] From the Federal Railroad Administration (FRA): http://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx . Also reports from local rail activists.
[19] From http://www.sftravel.com/san-francisco-statistics for 2017.
[20] Linked at http://www.transit.dot.gov/ntd/transit-agency-profiles.Agency ID 90015

200,000 annually for both railroads.[21] The SCBG and RCBT together constitutes the 5th largest tourist railroad operation in the U.S., not including museums that feature train rides.

2d. Matching Rolling Stock to the Market: Key to Visitor Rail Success?

Since the author's original 2018 study of the potential for Santa Cruz County excursion trains, numerous vehicle options have materialized, not available at that time. These include battery-electric trams available from TIG/m, used for the October 2021 rail demonstration on the SCBL in Watsonville and between Santa Cruz and Capitola.

Figure 5. TIG/m "ViaTran" Vehicle (2x size of TIG/m tram used in October 2021 demonstration)

In addition, newer DMUs operating in Europe from Stadler, Siemens and other manufacturers have also become available. This latter equipment is relevant because the rolling stock can be readily modified to meet alternative FRA standards. Some rolling stock designs are also modular. They could be retrofitted with fuel cells and batteries such as in TIG/m vehicles, replacing diesel engines. Used diesel multiple units (DMUs) from Germany such as Deutsch Bahn (DB) VT-628 units, evaluated in the 2018 study, remain available. The TIG/m tram used for the October 2021 service demonstration in Santa Cruz had 28 seats, with up to 50 standing comfortably (the manufacturer claims up to 100 seated and standing, but that is extreme crowding). Their ViaTran vehicle is estimated to seat 60-70 persons, with similar numbers standing comfortably.

The estimated price per vehicle is $4-$5 million, about twice the 28-seat version. Estimated top speed is 50 mph, the same as the 28-seat version (although the vehicle for the demonstration operated under the 15-mph speed limit of FRA Class 1 trackage).

This vehicle appears to have adequate capacity to meet projected demand for Beach Access Shuttles most of the time. TIG/m trams would have level boarding like most new light rail vehicles in the U.S. and Europe. However, single vehicles may lack sufficient capacity for peak weekend days in the summer (see demand analysis discussion below).

[21] According to data collected by the Heritage Rail Alliance, there were 200,000 annual riders at the "Roaring Camp & Big Trees." See http://www.atrrm.org/2018/03/heritage-rail-ridership-attendance/ for a database of ridership on U.S. tourist railroads that provided data.

If ViaTran vehicles ran in tandem with the 28-seat TIG/m vehicle, a two-car train would have about 100 seats plus a similar number of standees. Two ViaTran vehicles in two-car trains would have 120 to 140 seats, plus a similar standing capacity.

Used European DMUs (for conversion to battery-electric). Since the author's 2018 analysis that recommended older German VT-628 DMU trainsets, newer DMUs have become available on the used market in Germany, Italy and a few other European countries. These include several dozen Stadler GTW 2/8 trainsets (two axles powered out of eight) dating from the early 2000's. A regional rail operator serving Frankfurt au Main in the German state of Hesse has several dozen trainsets for sale, being replaced by hydrogen/electric Alstom Coradia LINT regional trains. Similarly, up to eleven newer Stadler GTW-2/8s[22] may be available from a Northern Italy operator by 2023 - 2024, since a decision to electrify the line served has been underway for several years.

Older Alstom Coradia LINT trainsets[23] may also be available from a Czech operator, but the condition of these vehicles is unknown. Many new LINTs are now powered by hydrogen/battery power, but many new purchases in Europe are also fully electrified.

Used European equipment would require refurbishment. However, the Stadler rolling stock has modular engine compartments with two diesel engines in the middle of each car, as shown in Figure 6.

For conversion to battery-electric, the engines could be removed, replaced by fuel cells and battery banks, and perhaps smaller diesel engines for emergency "limp home" ability.

The Alstom equipment has similar power trains, but under the train floors. Like the Stadler cars, it appears that there is sufficient room for engine replacement with fuel cells and battery banks under the vehicle floors, and perhaps a small "limp home" engine as well.

Figure 6. New Jersey River LINE GTW 2/6 Trains, Similar to Trains Available in Frankfurt

[22] https://en.wikipedia.org/wiki/Stadler_GTW

[23] https://en.wikipedia.org/wiki/Alstom_Coradia_LINT

2e. Seasonal Beach Shuttle Demand Analysis

This analysis evaluates the potential for beach shuttle services along the Santa Cruz coastline. Another section discusses their future potential integration with the proposed revival of the *Suntan Special* by SCCRTC's rail operator. The results of this analysis were evaluated to determine how local rail services aimed at visitors can support daily year-round rail passenger service in a cost-effective manner, serving both visitors and area residents.

The *Capitola and Aptos Recreational Rail Study* conducted for SCCRTC between 2003 and 2005 evaluated several beach shuttle scenarios, for which the project consultant predicted between 10,000 and 25,000 annual riders for each scenario, regardless of location. In the author's view, this study was problematic. The proposed service between Cliff Drive in Capitola and Aptos Village would have operated over 120 days per year (which the author assumes would have been all weekend days from May to October, weekdays Memorial Day through Labor Day, and on weekends during the "shoulder" periods in April, May, September, and October). The consultant assumed a total of 360 daily round trips annually, with trains operating between 11:00 a.m. and 5:00 p.m. This implies a total of three daily round trips when trains operate, or roughly a 180-minute (3 hour) headway.

As previously shown in Figure 3, an estimated total of 840,000 beach visits collectively occurs each year at Capitola Beach, New Brighton State Beach and Seabright/Aptos State Beach. Assuming 50% of beach visits occur when the beach shuttle trains were operating 3 round trips day, 420,000 visits would occur. With estimated shuttle ridership of between 10,000 and 25,000 annually, the *Recreational Rail Study* estimated a mode share of 2.4% to 6.0%, which seems very low.[24] It didn't help that about 120 days of annual operation would capture only about 50%-60% of total annual beach attendance between Capitola and Aptos Village.

One odd feature of the *Recreational Rail Study* is that it projected the same range of patronage for a potential Highway 1 intercept parking lot station to the Beach Boardwalk as it did for Capitola to Aptos Village. The projected annual ridership of 10,000 to 25,000 is very low compared to the existing *Santa Cruz Beach Train* service from Felton, which carried 60,000 annual riders in 2016 at fares averaging around $26-$31 round trip (e.g., child and adult fares, respectively at the time) **plus** $10 for parking.[31]

With the Boardwalk, Santa Cruz Main Beach and Santa Cruz Wharf serving 8.5 million individual visits–a net of 4 million visits estimated by the author when double-counting is eliminated–beach shuttle trains to the Boardwalk would be likely to serve an order of magnitude more riders than the *Santa Cruz Beach Train,* assuming frequent service, moderately-priced parking, and fares of about $10 for a round trip. Two vehicles could provide 20-minute frequencies from this location, though where nearby parking could be established is problematic[25].

A more logical location for a rail shuttle station and parking lot for beach rail shuttles would be in West Santa Cruz, perhaps at Natural Bridges Drive, where SCRTC owns a large amount of railroad property sufficient for 400-600 parking spaces, plus parking on the surrounding streets in this industrial area.[33] From this West Santa Cruz location, two DMUs could provide service every 15-20 minutes since the

[24] See pages 7-11 of the *Recreational Rail Study* for the study's logic behind the 10,000-25,000 annual estimates.

[25] The largest nearby parking lots are at the Santa Cruz Costco north of Highway 1, and Gateway Plaza shopping center south of Highway 1 on River Street.

distance is less than two miles each way. A passing track would need to be constructed at the midpoint of this potential shuttle route, roughly between Almar Avenue and the Bay Street crossing.

The author's 2018 excursion train study evaluated four Beach Shuttle scenarios. These were (1) West Santa Cruz–Beach Boardwalk Rail Shuttle; (2) West Santa Cruz–Beach Boardwalk Rail Shuttle & Davenport Beaches Shuttle; and (3) Beach Boardwalk, Davenport Beaches & East Beaches Rail Shuttle. Projected results for each scenario are summarized in Figure 7.

Figure 7. Summary of Beach Shuttle Scenario Results, 2018 Analysis

	Projected Round Trips	Projected Revenues	Operating Expense, Capital Charges	Net Operating Margin
West Santa Cruz–Beach Boardwalk Shuttle	350,000-400,000	$3,000,000-$3,450,000	$2,010,000 + $512,000 capital	$478,000 to $928,000
Beach Boardwalk Shuttle & Davenport Beaches	462,000-528,000	$4,440,000-$4,794,000	$2,873,000 + $922,000 capital	$645,000 to $993,000
Full Davenport–Boardwalk–East Beaches Shuttle	777,000-878,000	$8,220,000-$8,994,000	$6,110,000 + $1,485,000 capital	$625,000-$1,399,000

All figures in 2018 dollars.

In this 2022 analysis, a full 20-mile Beach Shuttle system between Wilder Ranch State Park, West Santa Cruz, Beach Boardwalk, Capitola, Aptos, Rio Del Mar, Seascape, and La Selva (Manresa State Beach) is evaluated. Figure 8 (next page) summarizes estimated operating expenses, projected revenues, and patronage for this proposed service. Limited service to Davenport is assumed, with most services terminating at Wilder Ranch State Park. Service is projected to operate every 30 minutes, 10-11 hours per day, for 200 days per year, e.g., during "beach season."

Full Beach Shuttle services between Wilder Ranch and La Selva is marginally less profitable than projected in the 2018 analysis. This is due to much higher fuel prices, higher estimates for train maintenance, and an increase in estimated track maintenance expenses.

Figure 8. Summary Estimates for Wilder Ranch State Park–La Selva (Manressa State Beach)			
Category	Unit Cost	Factor	Total Cost, Category
Operating Crews*	$150.00	16,000 revenue hours	$2,400,000
Train Fuel/Power**	$4.00	200,000 train miles	$800,000
Train Maintenance	$5.00	200,000 train miles	$1,000,000
Subtotal, "Above the Rail" Expenses			**$4,200,000**
Track Maintenance, Parking Lot & Stations, Security	Lump Sum		$2,000,000
Insurance, Management, Promotion	Lump Sum		$2,000,000
Grand Total, Operating Expenses			**$8,200,000**
Estimated Farebox & Parking Revenues***			$9,424,000 to $10,536,000
Potential Operating Margin Before Capital Charges			**$1,224,000 to $2,388,000**
Estimated Margin Before Capital Charges, Percent			15% to 29%
Estimated Annual Carrying Cost - Capital			$1,500,000
Projected net profit after capital charges			($378,000) to $888,000
Potential net margin (%) after capital charges			(3.9%) to 9.1%
Annual round trips, including Boardwalk Shuttle riders			777,000 to 878,000

* Based on TIG/m 2020 proposal costs. Total includes crew training, maintenance testing, supervision and "deadhead."

** Assumes $6.00/gallon for diesel fuel and/or similar costs for electricity for battery-electric operation.

*** Averaged fare of $12.00 per person, including Boardwalk Shuttle from West Santa Cruz, all-day pass revenues for the entire line, ($18.00 to $20.00), and West Santa Cruz parking charges.

3. Excursion, Lunch/Dinner Trains, and Special Trains

3a. Introduction

While excursion, lunch, dinner, and special trains do not offer public benefits like congestion relief, they are likely to have strong financial performance, of interest to the private sector. As a result, such services could generate significant revenues to SCCRTC to offset the ongoing costs of maintaining and administering the Santa Cruz Rail Branch Line (SCRBL).

The 2011 rail business analysis[26] completed for SCCRTC projected up to 11,000 dinner and 19,000 excursion train passengers (30,000 total) between Santa Cruz and Davenport by the third year of operations. However, this analysis did not outline the basis on which the report authors relied for these estimates. These estimates appear to be "back of the envelope" calculations. These compare poorly to the 200,000+ Roaring Camp Railroads passengers in 2019 and earlier, and the 90,000 annual passengers[27] served by the wine tour, lunch and dinner trains operated by the Napa Valley Wine Train (NVWT) in 2019 and prior years.

Most directly comparable to Santa Cruz is the Napa Valley Wine Train (NVWT), which offers a wide variety of winery tour, lunch, dinner, and specialized experiences. Wine Train prices are quite high, varying from $175 to $225 per person for standard lunches and dinners, and up to $645 per person for The Legacy Tour, a six-hour all-day tour of three upscale wineries, a 4-course gourmet lunch and complimentary wine. *The Legacy Tour* is unusual: Its capacity is limited to 60-70 persons, riding in 2-3 cars pulled by a 44-ton locomotive.

[26] https://sccrtc.org/wp-content/uploads/2011/07/100300-EconAnal-BusinManagPlanAnal.pdf

[27] Data obtained from https://railroads.dot.gov/accident-and-incident-reporting/overview-reports/train-miles-and-passengers

NVWT pricing strategies match recent Napa Valley trends towards increasingly affluent, upscale visitors, which was evident even before the Covid-19 pandemic. Similarly, many accommodations charge well over $1,000 per night[28]; the average Napa Valley hotel bill is close to $250 per night and increasing[29]. While the Napa Valley was starved of overseas visitors during the Covid-19 pandemic, this trend towards more affluent, upscale visitors mostly from California has continued unabated.

Annual visitation to the Napa Valley is comparable to Santa Cruz County. According to Visit Napa Valley, in 2018 there were 3.85 million visitors who spent $2.23 billion, generating $85.1 million in transient occupancy, sales and other taxes for Napa County governments. Visitor spending grew 15.9% between 2016 and 2019 despite the 2017 wildfires, while total visitor volume increased 8.9%. The tourism industry is the second largest employer in Napa County after the wine industry, employing 15,872 persons with a $492 million payroll as of 2018.[30] The Napa Valley's main draw is from the San Francisco Bay Area and Greater Sacramento, with limited international visitors after Covid.

Santa Cruz County is clearly a more "downscale" destination than the Napa Valley, despite being only a 60/90-minute drive from very affluent Santa Clara and San Mateo Counties. Comparable data for Santa Cruz County for roughly the same number of visitors includes:[31]

- Tourism is a $1.1 billion industry in Santa Cruz County (based upon 2019 figures)
- Average hotel occupancy for 2019 was 68.5 percent.
- The average room rate for 2019 was $166.18.
- Average travel expenditures per person are $604.00 per trip or $151.00 per day. Per day spending per person averages $39.60 for lodging, $32.20 for meals, $17.40 for shopping, $10.20 for attractions/entertainment and $20.40 for other expenses.
- The average travel group consists of 5 people.
- The average length of stay in 2019 is 2.4 nights.
- Santa Cruz County's primary markets include the San Francisco Bay Area and the Central Valley.

Some stark differences appear when comparing NVWT with the previous rail business analysis for lunch, dinner and excursion trains between Santa Cruz and Davenport. Wine Train prices are clearly among the highest for lunch and dinner trains in North America, let alone their prices for excursion/wine tours. However, this also provides a baseline for evaluating what could be offered between Santa Cruz and Davenport, adjusted for the major differences between these tourist markets.

Overall, the average Napa Valley visitor spends twice as much per person per day as in Santa Cruz County. This reflects the larger share of beach visits, which is a much less costly activity than visiting wineries and wine tastings. Overnight visitor volumes in Santa Cruz County are comparable to the Napa Valley, but average accommodations prices are about 40% to 50% lower. Overall, this suggests that successful lunch, dinner and excursion trains between Santa Cruz and Davenport must offer relatively affordable prices.

[28] For example, a basic room at Meadowwood is $1,200 per night through Expedia. Several properties charge much more.
[29] Another example of high prices raising the average hotel price: https://napavalleyregister.com/news/local/napas-stanly-ranch-resort-welcomes-guests/article_c1357c80-e777-11ec-94cc-b71ab88203e5.html
[30] https://www.visitnapavalley.com/about-us/research/
[31] https://www.santacruz.org/press/facts-stats-faqs

Current excursion prices offered by the Roaring Camp Railroads[32] are a good starting point for pricing Santa Cruz-Davenport services. Currently, an adult *Redwood Forest Steam Train* ticket is $39.95 and $24.95 for children 2-12. Similarly, the *Santa Cruz Beach Train* is $41.95 for adults, and $27.95 for children 2-12.[33]

As previously noted, a 2011 analysis for the SCCRTC estimated a total of 11,000 potential dinner train patrons on the 12-mile Davenport line and 19,000 for excursion trains. That study estimated mostly weekend and summer operations, with 110 dinner trains departures operating annually and 190 excursion train departures. The study for SCCRTC also estimated average dinner prices of $75.00 per person (2010 dollars), and about $40.00 per person for excursions, resulting in about $1.5 million annual revenues. Again, the basis of these estimates was not specified in the study.

The author does not believe the prior study adequately weighed the significance of the two very large, very affluent markets[34] within a 60-to-90-minute drive: San Mateo County (2019 median household incomes of $160,000+) and Santa Clara County (2019 household median incomes of about $140,000). The nearly three million residents of these counties are the largest target markets for potential lunch, dinner, and excursion trains. Monterey Bay Area residents make up a secondary market that is likely more price-conscious.

3b. Analysis

If lunch and dinner trains attracted the same percentage of visitors (~2%) as NVWT does in the Napa Valley, Santa Cruz-Davenport service would attract about 80,000-100,000 annual passengers. Roaring Camp Railroads currently attracts about 4%-5% of Santa Cruz County visitors. Actual patronage would depend on many factors: (1) number of departures operated annually; (2) the fit between prices, quality and level of food services offered; (3) service ambience and atmosphere, including reliability of train service; (4) effectiveness of marketing to target markets, and perceived value of the offer relative to the actual quality of food and service offered; and (5) for potential excursion trains between Santa Cruz and Davenport along the coast, the overlap (if any) with the market for current Roaring Camp Railroads tourist trains.

The author notes that the Beach Train "through the redwood forest to the Beach Boardwalk" experience would be an entirely different experience than a ride along the Santa Cruz oceanfront to Davenport. Dinner trains could also be scheduled to operate at late afternoon or early evening hours during the year, to track sunsets along the coastline.

Given the very high fares charged by NVWT and the differences between the Napa Valley and Santa Cruz County visitor markets, it is apparent that more moderate pricing for Santa Cruz-Davenport service is required for reasonable scenarios. The 2010 analysis postulated an average dinner train fare of $75.00 in 2010 dollars, which seems low. By 2025, when lunch, dinner and excursion trains could be implemented, average lunch/dinner fares are postulated to be $100.00 or $150.00 per person. Excursion fares are proposed to average $30.00-$40.00 per person.

[32] https://www.roaringcamp.com/

[33] Roaring Camp also offers significant discounts by prior reservation for groups, for the Forest Train at $24.95 adults and $20.95 for children 2-12, minimum purchase of 25. Beach Train fares are discounted to $26.95 for adults, and $23.95 for children. Special trains can be operated for groups at these prices for a minimum of 40 tickets on the Forest Train, and 200 tickets for the Beach Train.

[34] https://www.census.gov/library/visualizations/2018/comm/acs-5yr-income-all-counties.html

Similarly, potential passenger volumes are estimated between 20,000 and 60,000 for the lunch/dinner trains, with a commensurate number of annual trains operated. For excursion trains, between 30,000 and 60,000 annual passengers are projected. Further, a total of three excursion round trips would be provided on days when trains are operating, assumed at 180-200 days per year. This would allow for layovers in Davenport and at selected beach stops between Santa Cruz and Davenport. Train cars comparable to the Roaring Camp Beach Train are assumed, e.g., a diesel locomotive with a mix of open and closed passenger cars.

Rail operating costs are estimated by working backwards from Roaring Camp Railroads' group pricing for operating a separate Beach Train for groups of 200 or more, at average prices about $25.00 per ticket, totaling $5,000 per dispatched train. For lunch and dinner trains, the $5,000 estimate has been used. For the assumed three round trip excursions trains on days operated between Santa Cruz and Davenport, a daily cost of $7,000 has been assumed, allowing for additional fuel, incremental maintenance, and added staffing costs for the proposed second and third roundtrips.

Potential scenarios for lunch, dinner and excursion trains are summarized in Figure 9 below. "Gross Margin" for lunch and dinner trains do not include additional costs for food, food service personnel and operations, nor do they include capital expenses which could be substantial. Capital costs would depend highly on the private sector's choices for the quality of the equipment; the NVWT has spent between $500,000 and $1,000,000 rehabilitating each of its passenger cars, plus constructing an expensive commissary. It is also assumed "Rail Operating" includes allowances for marketing and promotion, track maintenance and track rental charges. Excursion train capital charges are assumed to be paid out of the Gross Margin. Extra trains, such as Santa Claus trains, are a likely seasonal addition to the schedule.

Figure 9. Santa Cruz-Davenport Lunch, Dinner, and Excursion Train Scenarios

Scenario	Annual Trains	Projected Patronage	Annual Revenues		Rail Operating *	Gross Margin*	
			Low	High		Low	High
Dinner Train	110	20,000	$2,000,000	$3,000,000	$550,000	$1,450,000	$2,450,000
Lunch, Dinner	220	40,000	$4,000,000	$6,000,000	$1,100,000	$2,900,000	$4,900,000
Lunch, Dinner	350	60,000	$6,000,000	$9,000,000	$1,750,000	$4,250,000	$7,250,000
Excursion	570**	30,000	$900,000	$1,200,000	$1,330,000	($430,000)	($130,000)
Excursion	570**	45,000	$1,350,000	$1,800,000	$1,330,000	$20,000	$470,000
Excursion	570**	60,000	$1,800,000	$2,400,000	$1,330,000	$670,000	$1,070,000

* **Plus** food, food personnel and operations expense. This depends on quality of the offer, target markets, etc.
** Assumes three round trips on days when operated. Variable is projected ridership.

4. Arriving in Santa Cruz by Train

Reviving intercity rail passenger service between the San Francisco Bay Area, Santa Cruz and the Monterey Peninsula has been almost continuously under study for half a century, ever since the April 1971 discontinuance of the Monterey-San Francisco *Del Monte Express*. Caltrans studied reinstating the *Del Monte Express* in the late 1970's; during the 1980's more than one study was completed of restarting intercity service from the Bay Area, including revival of the *Suntan Special*.

In the 1990's, SCCRTC sponsored demonstration runs of the *Suntan Special* using Amtrak and Caltrain equipment. During the 1990's and 2000's, the Transportation Agency of Monterey County (TAMC) conducted several studies of extending either Capitol Corridor or Caltrain service to Salinas via Pajaro

and Castroville. TAMC is currently developing rail infrastructure required to extend trains from San Jose to Salinas, including a rebuild of the existing Salinas station, a layover yard for overnight storage and maintenance of trains, as well as plans for new stations in Pajaro and Castroville. It is not clear when these various projects will be finished and ready for service, but certainly service can be expected within the next five years.

4a. San Francisco Bay Area –Santa Cruz/Monterey Ridership Potential—Past Studies

The 1998 *Around the [Monterey] Bay Rail Study* sponsored by SCCRTC and TAMC conservatively predicted 30,000+ round trip passengers on a revived *Suntan Special* operating on twenty-four spring, summer, and early fall weekends (e.g., 48 days per year) between San Jose and Santa Cruz via Gilroy and Watsonville. This was 625 passengers per trip. The *Around the Bay* study also predicted that similar weekend service to the Monterey Peninsula might attract more than 60,000 annual round trips with one round trip train per day on weekend days year-round. This is 576 projected passengers per train.

The *Caltrain Extension to Monterey County: Alternatives Analysis, Ridership Validation Report* from January 2009 predicted that daily shuttle trains operating every 45 minutes from Salinas to San Jose via Watsonville (Pajaro) and Gilroy might attract 7,500 daily boardings in the year 2035. If such a service was implemented, Bay Area residents accessing Santa Cruz County and Monterey Peninsula visitor destinations would likely constitute a large percentage of midday and weekend patronage.[35]

The 2009 study examined several options for extending Caltrain service between Gilroy, Pajaro, Castroville and Salinas. The "Shuttle Train Service to San Jose" alternative serves as the basis of the proposal for San Francisco Bay Area to Santa Cruz/Monterey Peninsula service outlined in this paper. As stated by the 2009 study:

> ***Shuttle Train Service to San Jose***
>
> Since publication of the Caltrain Extension to Monterey County Alternatives Analysis report in April 2007, the Metropolitan Transportation Commission, Peninsula Corridor Joint Powers Board, Santa Clara Valley Transportation Authority, and the Transportation Agency for Monterey County have been working to devise a long-range regional passenger rail service plan which would reflect the:
>
> - Peninsula Corridor Joint Powers Board's goal of electrifying passenger rail service between San Francisco and San Jose
> - Metropolitan Transportation Commission's goal of establishing high speed rail service between San Francisco and Los Angeles via San Jose and Gilroy
> - Santa Clara Valley Transportation Authority's goals of extending BART service to downtown San Jose, and maintaining and enhancing commuter rail service between San Jose and Gilroy
> - Transportation Agency for Monterey County's goals of providing convenient and attractive public transportation service between Monterey and the San Francisco Bay Area, to include a connection to high-speed rail.
>
> Ridership forecasts were prepared for these options using the Santa Clara Valley Transportation Authority model and Year 2035 demographic data set and highway/transit networks prepared by VTA, with no adjustment or revision to any aspect of the model, assuming 20-minute maximum wait times. Two scenarios were tested. A base case option would operate shuttle train service

[35] Caltrain Extension to Monterey County: Alternatives Analysis. Ridership Validation Report, January 2009. https://www.tamcmonterey.org/files/7c78f6464/Ridership_Validation_Final_Report.pdf

> between Gilroy and San Jose on 45-minute [weekday peak period] headways. This service would be bi-directional to recycle trainset equipment. A Caltrain Extension to Monterey County option would originate trainsets in Salinas, operating northbound in the morning and southbound in the evening, with trains laying over in Salinas during the evening, and in San Jose during the midday.
>
> Table 18 reports the ridership forecasts for these two options. The table indicates that the shuttle service to Salinas option would attract an additional 9,134 system-wide boardings per weekday, over and above the base option of shuttle service to Gilroy. Assuming the Year 2005 trip table correction factor of 0.80 applies to Year 2035 conditions, ridership potential for the Caltrain Extension to Monterey County would be approximately 7,300 to 7,500 riders per day, based on Parsons' application of the VTA Regional Travel Forecast Model.

The 2019 *Monterey Bay Area Network Integration Study* included a conceptual plan for extending Capitol Corridor or Caltrain trains from the San Jose Amtrak/Caltrain station, with an ultimate proposal of hourly all-day service between San Jose, Gilroy, Pajaro, Castroville, and Salinas (17 daily round-trip trains). This study missed the forest for the trees, projecting only about 2,000 daily passengers for such a service, including commuters to and from Santa Clara County. By not proposing direct rail service to Santa Cruz and Monterey, the study ignored the Monterey Bay Area's largest intercity and visitor markets.

According to the *Network Integration Study's* estimates, potential commuter and intercity traffic from the Watsonville and Salinas area would attract about 2%-3% of all trips between the Bay Area and the Monterey Bay Area. This potential patronage is insufficient to support a cost-effective passenger rail service, averaging a projection of only 55-60 passengers per train and a 15%-20% farebox recovery ratio, assuming favorable operating costs of around $35.00 per train-mile.

Requiring transfers to access major destinations such as Santa Cruz and Monterey reduces potential ridership by 25%-50%, depending on the details of the required transfers (direct "timed connections" perform much better than randomly timed train arrivals and departures). Likely bus ridership is even lower, estimated by the *Network Integration Study* at about 2/3 of potential ridership by train.

TRAC finds the 2009 *Caltrain Extension to Monterey County: Alternatives Analysis, Ridership Validation Report* ridership potential of 7500 riders on a Monterey Bay rail extension to be credible. However, the lower market shares projected in the 2019 *Network Integration Study* compared to the 2009 study suggest that direct intercity rail service to both Santa Cruz and Monterey is required for cost-effective service and acceptable farebox cost recovery ratios.

4b. TRAC's Own Ridership Analysis

A better starting point would be to examine the results from existing short-distance rail corridors in California that are roughly analogous in two ways: (1) they direct serve large coastal tourist destinations including beaches; and (2) they offer relatively frequent intercity rail passenger service. Figure 10 summarizes two markets chosen for examination in this analysis, the Santa Barbara and Carpinteria areas, and Coastal San Diego County along the I-5 corridor. Both areas are served by the Pacific Surfliners, with 5 daily round trips between Los Angeles and Santa Barbara (and one long-distance trip) and 12 between Los Angeles and San Diego. See Figure 10 (next page).

Both the Santa Barbara area and Coastal San Diego County are year-round destinations, as are Santa Cruz County, the Monterey Peninsula and Big Sur. Like many other coastal areas within California, both areas benefit from California's mild Mediterranean climate. Like Santa Cruz, in both areas there often are relatively warm days in late fall, winter and early spring that attract people to their numerous beaches, like Santa Cruz County and oftentimes in Monterey.

Figure 10. Comparative Statistics, Santa Barbara Area and Coastal San Diego County						
	Population	Estimated Visitors	Tourism Impact	Daily Trains	2017 Amtrak Boardings & Alightings	Amtrak Riders as % of Annual Visitors
Santa Barbara South Coast*	220,000	7,200,000	$1.9 billion	6	474,846	6.6%
Coastal San Diego County**	3,351,000	35,000,000	$11.6 billion	12	1,860,284	5.3%
Applying factors to:					Low Estimate (5.3%)	High Estimate (6.6%)
Santa Cruz County	275,000	5,000,000	$1.1 billion		265,000	330,000
Monterey Peninsula/County	434,000	8,000,000	$3.2 billion		424,000	528,000
Total					689,000	858,000
* Santa Barbara and Carpinteria areas. Source: https://santabarbaraca.com/press_releases/santa-barbara-south-coast-visitor-profile-study-shows-tourism-injects-1-9-billion-santa-barbara-economy/ For 2016-17 season.						
** Entire County population. Source: https://www.sandiego.org/-/media/files/pdfs/fast-facts.pdf?la=en						

While Amtrak boardings and alighting figures are not tightly related to visitor totals, the author believes passenger volumes are useful for this paper's "20,000-foot view." Applying the Santa Barbara and San Diego County percentages (under pre-Covid conditions) to Santa Cruz County and the Monterey Peninsula, results in 689,000 to 858,000 projected total annual boardings and alightings.[36]

4c. Proposed Operations

The April-September 2022 *California Rail News*[37], TRAC's newspaper, focused on Santa Cruz County Measure D. This issue included an article, *TRAC's Thoughts on S.F. Bay Area – Monterey Bay Rail Service*. We incorporate a portion of that article here as TRAC's proposal to move Bay Area- Monterey Bay Area rail service forward, along with additional supporting analysis.

> "According to the *Monterey Bay Area Network Integration Study,* the projected cost of operating Diesel Multiple Units (DMUs) and/or Battery Electric Multiple Units (BEMUs) between Monterey and Santa Cruz is $23.00 per train-mile. This is consistent with operating costs for the 100-seat New Jersey "River Line" DMU services between Trenton and Camden, and costs for eBART DMU service between Antioch and Baypoint/West Pittsburg."

An excellent example of a modern Battery-Electric Multiple Unit (BEMU) is the "WINK" train design by Stadler Rail[38] of Switzerland as shown in Figure 11. This particular design can operate under catenary electrification, on batteries, or even diesel power if necessary.

Revival of the *Suntan Special* on weekends all year and on weekdays from May to October may be financially feasible, particularly if BEMUs or Diesel Multiple Units (DMUs) are used during lighter ridership such as summer weekdays and on winter weekends. See Proposed Operations discussion below. Longer, locomotive-hauled trains may be needed on weekends May to October.

[36] Compared to these data, the 2019 *Network Integration Study* ridership estimates are low. This is not surprising, since the 2019 analysis assumed only intercity trips to the Bay Area from the Watsonville and Salinas areas–areas that produce relatively little intercity travel due to low incomes and limited visitor volumes, compared to Santa Cruz and the Monterey Peninsula.

[37] Available at: http://www.calrailnews.org/wp-content/uploads/2022/05/crn0422-p1-8.pdf.

[38] Product literature is available at: https://www.stadlerrail.com/en/products/detail-all/wink/198/

Figure 11. Example of 2-car "WINK" BEMU trainset by Stadler Rail of Switzerland

Estimated operating costs in the 2019 analysis for the SCBRL were about $70-$75 per train-mile for the electric light rail proposed by SCCRTC, for one- or two-unit regional rail trains. This was considerably higher than the $55-$60 per train-mile estimated for Caltrain commuter rail service extension from San Jose to Salinas using locomotive-hauled 6-8 car, 700-800 seat passenger trains.

Without diesel engines, the BEMUs will have lower fuel and maintenance costs. We assume a cost of $30/train-mile on the SCBRL. To cover higher costs of operating between San Jose and Monterey/Santa Cruz on the Coast Mainline than likely on the SCRBL, this article [and this paper] assumes $35.00 per train-mile for BEMUs.

To provide the most-cost effective services between the S.F. Bay Area, Monterey, and Santa Cruz, TRAC suggests major changes in proposed services. As noted in the 2022 article:

> "The valuable part of the *Monterey Bay Area Network Integration Study* is its proposal for an integrated service vision for regional rail service between Santa Cruz and Monterey, similar to Swiss and other European [rail operating practices.] The vision includes hourly timed connections in both directions at the Pajaro/Watsonville station, between Monterey Bay Area regional service and extended Caltrain or Capitol Corridor services. Cross-platform connections would be provided. Rail infrastructure improvements would be planned around the service concept, which is how rail network planning is done in Switzerland and Germany."

TRAC's alternative plan [outlined in the *Rail News* article] is as follows:

- Upgrade existing trackage on the Monterey and Santa Cruz branch lines to FRA Class III (up to 59 mph) for a small fraction of the cost of complete track replacement. This is achievable at about $5 million per mile, including Positive Train Control (PTC) that does not require wayside signals.

- The Coast Route between San Jose and Los Angeles should be purchased by the State, primarily to reduce costs and to enable implementation of through-service between San Francisco, San Jose and Los Angeles, and regional services between the S.F. Bay Area and Monterey Bay Area, and services out of Los Angeles.
- [In 1992, the Los Angeles County Transportation Commission was granted an option by Southern Pacific Lines (Railroad), prior to its purchase by Union Pacific, to purchase the entire Coast Line from Los Angeles into the San Francisco Bay Area. It is unclear whether this purchase option is still valid in 2022, or whether it could be passed on to the State of California.[39]]
- Instead of locomotive-hauled trains, operation south of San Jose would use BEMUs such as those available from Switzerland. BEMUs could operate under Caltrain electrification, where available, and on batteries elsewhere. BEMU trainsets south of San Jose could operate in pairs, with one trainset operating through to Santa Cruz, splitting at Pajaro from the Monterey-bound section. This would minimize [the number of] main-line "slots" needed, providing no-transfer service to Santa Cruz and downtown Monterey.
- For through service to San Francisco, the BEMUs could also be attached to Caltrain expresses between San Jose and San Francisco, if designed to be compatible with Caltrain's future electric fleet.

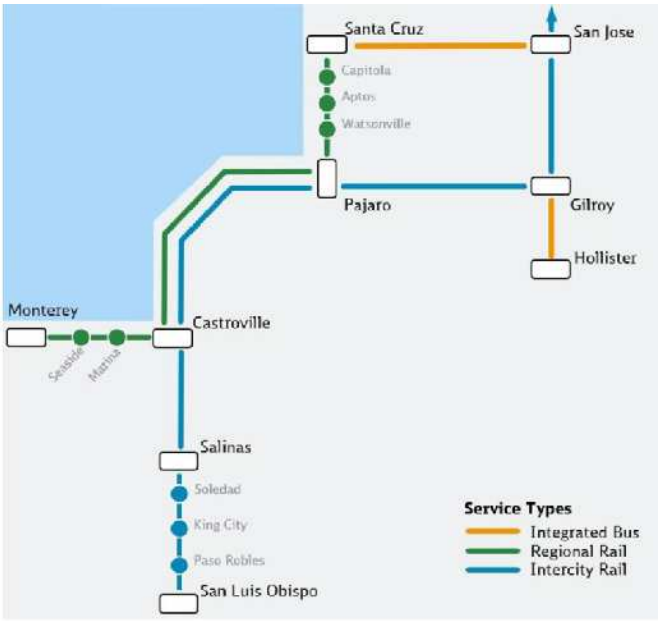
Additional capital costs would include double-tracking the remaining 8.5 miles of track between Morgan Hill and Gilroy, a short stretch of single track between Gilroy and the junction with the San Benito Branch Line to Hollister, portions of single track through the Pajaro River canyon to Aromas, and between the south end of Elkhorn Slough and Castroville (Monterey Branch Line junction.

- Maximize double track at both ends of Elkhorn Slough to improve schedule reliability. In the long run, consider a bypass or rail viaducts to improve Slough water circulation and raise the track bed to mitigate projected sea level rise.

Figure 12 (next page) shows the 2050 "Vision Plan" for Monterey Bay rail services outlined in 2019's *Monterey Bay Area Network Integration Study.* The major difference in TRAC's plan would be operation of "mainline" service from San Jose directly to both Santa Cruz and the Monterey Peninsula. Instead of mainline service, Salinas would be served by a shuttle train connecting to the main trains in Castroville. As previously discussed in this paper, independent local trains would also operate on the Santa Cruz Rail Branch Line in addition to through BEMU service from San Jose.

[39] https://www.joc.com/la-transit-agency-gets-option-buy-sps-coast-line-route-proposed-high-speed-use_19920930.html

Figure 12. 2050 "Vision" Plan for Monterey Bay Area Rail Passenger Service



Local trains could also operate between the Monterey Peninsula, Castroville and Salinas, though that would require double track between Castroville and Salinas. The advantage of the TRAC plan is that service on the mainline between Pajaro and Castroville would be limited to hourly slots in each direction, postponing the need to doubletrack the section through the Elkhorn Slough area.

4d. Estimated Operating Costs and Revenues

As previously noted, the *Monterey Bay Area Network Integration Study* proposed a total of 17 round trips between the San Jose Amtrak/Caltrain station and Salinas. If operated seven days per week, 52 weeks per year, this results in 2,380 revenue train-miles per day totaling 869,000 train-miles per year. The $35.00 per train-mile cost estimate includes operation of two 3-4-car trainsets such as the Stadler BEMUs between San Jose and the Pajaro station. A shuttle train would connect Castroville to Salinas, serving about 1,000 daily passengers.

This proposed service pattern results in a total of 595,680 annual train-miles between San Jose and Pajaro. After southbound trains split (and reconnect in the northbound direction) in Pajaro each hour, one BEMU trainset would operate the 20 miles to the Beach Boardwalk and downtown Santa Cruz; the second would travel the 26 miles to downtown Monterey from Pajaro. With fewer stops, travel time for the two branches should be similar. The summary of estimated train-miles in each mode and operating cost calculations are summarized in Figure 13 on the next page. Passengers on each segment are based on local population and estimated usage by visitors, split as estimated above to each branch line.

4e. Discussion and Analysis

Figure 13. Bay Area-Monterey Bay Area Train-Miles, Operating Expense, Operating Revenue						
Estimated Operating Expenses, 2022 Dollars						
Segment	Distance, Miles	Round Trips	Daily Train-Miles	Annual Train-Miles	Cost Per Train-Mile	Total Operating Cost (Annual)
San Jose – Pajaro	49.0	17	1,666	608,090	$35.00	$21,283,150
San Jose–Gilroy (local service)	*30.0*					
Pajaro – Santa Cruz	20.0	17	680	248,200	$30.00	$7,446,000
Pajaro – Castroville	10.0	17	340	124,100	$30.00	$3,723,000
Castroville – Salinas	11.0	17	374	136.510	$30.00	$4.095,300
Castroville – Monterey	16.0	17	544	198,560	$30.00	$5.956,800
Total	**106.0**	**17**	**3,604**	**1,315,460**	**$32.31**	**$42,504,250**
Estimated Patronage & Operating Revenues, 2022 Dollars						
Segment		Annual Passengers on segment	Average Trip Length[40]	Annual Passenger-Miles &	Average Per Passenger-Mile	Total Operating Revenues** (Annual)
San Jose – Pajaro	49.0	2,800,000	45.0	142,000,000	$0.25	$31,499,500
San Jose – Gilroy*	*30.0*	800,000	20.0	16,000,000	$0.25	$4,000,000
Pajaro – Santa Cruz [premium visitor fare]	20.0	1,600,000	12.0	20,050,000	$0.304	$6,092,500
Pajaro – Castroville	10.0	2,109,000	10.0	21,090,000	$0.25	$5,272,500
Castroville – Monterey	16.0	2,100,000	13.1	27,600,000	$0.25	$6,900,000
Castroville – Salinas	11.0	500,000	11.0	5,500,000	$0.25	$1,375,000
Grand Total, Passengers[41]	**106.0**	**4,159,000**	**56.9**	**216,240,000**	$0.25	**$55,139,500**
Projected Operating Margin						**$12,635,250**
Projected Operating Margin – Train Mile					**+29.7%**	**$9.61**
Figure 13 is based on detailed data and assumptions shown in Appendix A, Figure A-2.						
Does not include ancillary revenues such as parking charges, advertising, station concessions, etc.						

The results of Figure 13 result in an estimated average load of 164.1 passenger-miles per train-mile (189,400,000 annual passenger-miles / 1,154,130 annual train-miles). This result compares favorably with the *Pacific Surfliners* corridor in Southern California. The projected average load is also significantly higher that the Capitol Corridor between the Bay Area and Sacramento region.

Projected performance is projected to be excellent compared to the *Pacific Surfliners* and Capitol Corridor (which have the second and third highest intercity ridership in the U.S.), despite the much higher populations served by these latter corridors. This is partly explained by the large, concentrated visitor destinations in Santa Cruz County and the Monterey Peninsula. While commuter patronage post-Covid is likely to be much smaller than previously projected, this market would still make up a significant portion of patronage.

[40] Estimated passenger-miles on each segment were calculated by applying locations of likely highest patronage on each segment, e.g., for example, not all visitors from San Jose will travel to Santa Cruz, but to Aptos, Capitola, or elsewhere.

[41] Total passengers on the network, combining multiple segments. For example, San Jose to Santa Cruz visitors would use the San Jose-Pajaro and Pajaro-Santa Cruz segments. Trips by Monterey Peninsula residents to San Jose would use the Castroville-Monterey, Castroville-Pajaro, and Pajaro-San Jose segments.

The projected operating profit margin of about $13.4 million per year is significant, but it is insufficient to cover of the projected infrastructure need (e.g., mostly additional double-track and new stations) between San Jose and the Monterey Bay Area. However, as with the other proposed services on the Santa Cruz Rail Branch Line, private-sector operations appear feasible, in partnership with state and local governments, who in principle could lease fixed facilities to the winning private proposal(s). One advantage of leasing public-owned infrastructure is that a private operator could be terminated due to poor performance and other contract breaches

5. Conclusion

This paper was structured to outline an overall approach to service introductions on the Santa Cruz Rail Branch Line. Clearly, Santa Cruz County residents are interested in electric rail transit, followed by Beach Shuttles and passenger service from the San Francisco Bay Area. While lunch, dinner, and excursion trains from Santa Cruz to Davenport are probably of limited interest to locals, they could bring in significant revenues, which would help pay for line maintenance and improvements.

Introducing trains from the Bay Area onto the SCRBL will require two or three additional sidings to accommodate 30-minute headways for local rail service, as well as to reserve capacity for other local services, freight, special trains, etc. TRAC believes the line can be structured to accommodate 15-minute headways with those additional sidings on what would remain primarily a single-track line. A sufficient number of sidings would allow up to four trains per hour in each direction. Initially, one of the additional "slots" could be filled by hourly Bay Area trains.

The fourth "slot" would provide reserve capacity to operate additional peak period local trains on the SCRBL, direct service to Salinas and Monterey if demand warrants, and special trains, as may be needed. Note that because excursion and dinner trains would operate mostly to the west of the City of Santa Cruz, they should not require additional track capacity.

It is important to note that Sacramento's RT Metro light rail system operated as a mainly single-track system for decades, running more than 16 hours per day every 15-minutes in each direction, indicating that a properly designed route can still be high capacity, even with the limitations of single-track.

APPENDIX A. Details of TRAC's Own Ridership Analysis

A.1. Monterey Bay Area Ridership Study

The 1998 *Around the [Monterey] Bay Rail Study* sponsored by SCCRTC and TAMC conservatively predicted 30,000+ round trip passengers would use a revived *Suntan Special* operating on twenty-four spring, summer, and early fall weekends (e.g., 48 days per year) between San Jose and Santa Cruz via Gilroy and Watsonville (625 passengers per train). The *Around the Bay* study also predicted that similar weekend service to the Monterey Peninsula might attract more than 60,000 annual round trips with to one round trip train per day on weekend days year-round. This is 576 projected passengers per train.

Revival of the *Suntan Special* may be profitable, particularly if Diesel Multiple Units (DMUs) or Battery-Electric Multiple Units (BEMUs) are used during lighter ridership periods outside late spring, summer, and early fall weekends. Longer, locomotive-hauled trains may be needed on busy May to October weekends, depending on good weather and other conditions.

TRAC believes potential visitor ridership to/from Santa Cruz County and the Monterey Peninsula would be higher than predicted by the Amtrak data comparison with the Santa Barbara area and San Diego County (Figure 10, page 27), and 1998 estimates for reviving the *Suntan Special.*

A.2. Potential Monterey Bay Area Rail Ridership by Locals

The 2019 *Monterey Bay Area Network Integration Study* proposed a 17-round trip service between Santa Cruz, Monterey, and San Jose. TRAC proposes modifying this service plan to provide direct service legs to Santa Cruz and the Monterey Peninsula. The *Network Integration Study* projected 600,000 annual passengers between Salinas, Castroville, Watsonville. The population of these areas is about 300,000 residents, which works out to be about two annual intercity rail rides per capita.

There are about 150,000 additional residents of Central Santa Cruz County west of Watsonville that would be directly served by the Santa Cruz Rail Branch Line. There are about another 150,000 residents of the Monterey Peninsula, including Carmel Valley and the City of Marina. TRAC's proposal for the 17-round trip service proposed by the *Network Integration Study* is to operate service with BEMUs, with two trainsets coupled into one train between San Jose and Pajaro, then have one unit split off in Pajaro to provide direct service to Santa Cruz. The second trainset would run through to downtown Monterey. A shuttle train would operate from Salinas to Castroville, connecting to trains to/from San Jose.

The population directly served in TRAC's plan is double that served by the service proposed in the *Network Integration Study*. This doubles the projected ridership to about 1.2 million per year. This number is in addition to estimates for visitors discussed above. It incorporates a significantly reduced number of commuters to Santa Clara County and the Bay Area compared to earlier estimates.

Combined with visitor trips via rail, as shown by Figure 13 (page 31), we estimate that there would be a total of 2.8 million annual intercity trips on for Bay Area–Monterey Bay Area service. This compares favorably to the 2009 estimate made for a San Jose-Salinas peak-period only shuttle service running every 45 minutes. In retrospect, that estimate probably greatly overestimates potential commuter volumes to Silicon Valley and the San Francisco Bay Area, particularly given post-Covid trends towards much a higher proportion of "working at home."

A.3. Calculations Using the Reat Younger Rules of Thumb

Figure A-1. "Rules of Thumb" Applied to Monterey Bay Area Rail Ridership

		Santa Cruz County		
Category	Rule of Thumb	Population*	Annual Round Trips	One-Way Trips
Population Within 50 miles[42]	10% ride per year	3,500,000	350,000	700,000
Population 50-100 Miles[43]	3.3% ride per year	3,000,000	100,000	200,000
Population 100-150 Miles[44]	1.3% ride per year	4,000,000	54,000	108,000
Less current Roaring Camp Railroad's patronage			(200,000)	(400,000)
Net Total Potential Annual Ridership*			**304,000**	**608,000**
		Monterey Peninsula/County		
Category	Rule of Thumb	Population*	Annual Round Trips	One-Way Trips
Population Within 50 miles[45]	30% ride within 3 years	3,500,000	350,000	700,000
Population 50-100 Miles[46]	10% ride within 3 years	2,000,000	120,000	240,000
Population 100-150 Miles[47]	4% ride within 3 years	3,000,000	40,000	80,000
Net Total Potential Annual Ridership			**510,000**	**1,020,000**
Grand Total**			**814,000**	**1,628,000**
* Visitors plus local populations in Santa Cruz, Monterey, and San Benito Counties. Local riders are a significant share of Roaring Camp Railroads patronage. To obtain visitors only in Santa Cruz, Roaring Camp excluded.				
** Rounded to 1.6 million.				

Based on Reat Younger's rules of thumb applied to the totals shown in Figure A-1, direct passenger service to both Santa Cruz and the Monterey Peninsula may attract 1,600,000 or more annual one-way passengers as calculated in Figure A-1. TRAC estimates about 600,000 one-way trips to/from Santa Cruz County (Figure A-2, Row 4) from the S.F. Bay Area, and about 1,000,000 one-way trips to/from the Monterey Peninsula (Figure A-2, Row 5). Its larger size reflects the larger number of visitors to the Monterey Peninsula compared to Santa Cruz County.

This number is about twice the ridership resulting from applying Amtrak ridership factors from Santa Barbara and San Diego County to annual visitation. (Figure 10, page 27.) Accommodating such volumes is likely to require at least hourly services when potential non-visitor intercity rail ridership by Monterey

[42] Santa Cruz County, Santa Clara County, Southern Alameda County, and the southern half of San Mateo County.
[43] The rest of Alameda County, Contra Costa County, north half of San Mateo County, San Francisco, southern Solano and Marin Counties.
[44] Sonoma, Napa, the rest of Solano, Yolo and Sacramento, Placer and El Dorado Counties (e.g., the Sacramento urbanized area).
[45] Monterey Bay Area including San Benito County, Santa Clara County, and small portions of Southern Alameda and San Mateo Counties.
[46] The rest of Alameda County, West and Central Contra Costa County, and the north half of San Mateo County.
[47] The counties listed for Santa Cruz County are included, along with San Francisco, Marin, southern Solano and Marin Counties. San Luis Obispo County is also within this range, but is not a significant source of visitors, compared to the S.F. Bay Area.

Bay Area residents is added to the total.

A.4. Estimated Ridership and Revenues by Rail Line Segment

The details of the analysis that are summarized in Figure 13 (page 31) are provided in Figure A-2 below. It shows estimated one-way trips for each of the five rail line segments, broken out by each of the individual rail passenger markets.

Figure A-2. Rail Patronage by Segment, Passenger Miles & Operating Revenues, 2022

	A	B	C	D	E	F	G
1	Segment, Market(s)	Seg-ment Length, Miles	Annual Passengers on Segment	Average Trip Length	Annual Passenger-Miles	Fare per Passenger -Mile	Operating Revenues (Annual)
2	**San Jose – Pajaro Segment**	**49.0**					
3	San Jose – Gilroy (local trips on segment)	*30.0*	800,000	20.0	16,000,000	$0.25	$4,000,000
4	San Jose – Santa Cruz visitors		600,000	45.0	27,000,000	$0.25	$6,750,000
5	San Jose – Monterey visitors		1,000,000	45.0	45,000,000	$0.25	$11.250,000
6	San Jose – Santa Cruz County residents		550,000	45.0	24,750,000	$0.25	$6,187,500
7	San Jose – Monterey County residents		650,000	45.0	29,250,000	$0.25	$7,312,000
8	**Total, San Jose – Pajaro Segment**	**49.0**	**3,600,000**	**39.4**	**142,000,000**	**$0.25**	**$35,499,500**
9	**Pajaro–Santa Cruz Segment**	**20.0**					
10	San Jose – Santa Cruz visitors		600,000	18.0	10,800,000	$0.35	$3,780,000
11	San Jose – Santa Cruz County residents		550,000	10.0	5,500,000	$0.25	$1,375,000
12	Santa Cruz–Watsonville–Monterey local trips		250,000	15.0	3,750,000	$0.25	$937,500
13	**Total, Pajaro – Santa Cruz Segment**		**1,600,000**	**12.5**	**20,050,000**	**$0.304**	**$6,092,500**
14	**Pajaro – Castroville Segment**	**10.0**					
15	San Jose – Monterey visitors		1,000,000	10.0	10,000,000	$0.25	$2,500,000
16	San Jose – Monterey Peninsula Residents		300,000	10.0	3,000,000	$0.25	$750,000
17	San Jose – Salinas/N. Monterey Co. residents		300,000	10.0	3,000,000	$0.25	$750,000
18	Monterey (Salinas) – Santa Cruz Co. local trips		509,000	10.0	5,090,000	$0.25	$1,272,500
19	**Total, Pajaro – Castroville Segment**	**106.0**	**2,109,000**	**10.0**	**21,090,000**	**$0.25**	**$5,272,500**
20	**Castroville – Monterey Segment**	**16.0**					
21	San Jose – Monterey visitors		1,000,000	15.0	15,000,000	$0.25	$3,750,000
22	San Jose – Monterey Peninsula residents		300,000	11.0	3,300,000	$0.25	$825,000
23	Monterey – Watsonville – Santa Cruz local		300,000	11.0	3,300,000	$0.25	$825,000
24	Monterey – Salinas local trips		500,000	12.0	6,000,000	$0.25	$1,500,000
25	**Total, Castroville Monterey Segment**	**16.0**	**2,100,000**	**13.1**	**27,600,000**	**$0.25**	**$6,900,000**
26	**Castroville – Salinas/ N. Monterey Co.**	**11.0**					
27	San Jose – Salinas/N. Monterey Co. residents	11.0	300,000	11.0	3,300,000	$0.25	$825,000
28	Salinas – Monterey local trips	11.0	200,000	11.0	2,200,000	$0.25	$550,000
29	**Total, Castroville – Salinas/N. Monterey Co.**	**11.0**	**500,000**	**11.0**	**5,500,000**	**$0.25**	**$1,375,000**
30	**Grand Totals** (multiple segments combined)		**4,159,000**	**56.9**	**216,240,000**	**$0.255**	**$55,139,500**
31	Estimated Operating Margin				**+29.7%**		**$12,635,250**

Figure A-2 Notes

- Existing Caltrain diesel trains from San Jose to Gilroy would be replaced by BEMU service to/from the Monterey Bay Area. Thus, local Gilroy to San Jose passengers would be counted in the passenger totals, with higher ridership expected due to proposed 17 daily round trips vs. the 3 provided by Caltrain in 2022.
- Passenger Fare Revenues totals shown in Figure A-2 do not include additional fare revenues that would be generated on connecting services, e.g., Caltrain and the Capitol Corridor north of the San Jose Caltrain/Amtrak station.
- Revenues in Figure A-2 also do not include ancillary revenues such as parking charges, station or on-train advertising, station concessions, etc.
- Figure A-2 shows estimated passenger volumes by each travel market on each segment. For example, there is an estimated total of 600,000 annual one-way trips by visitors from San Jose and points north to Santa Cruz County. These 600,000 trips would use the San Jose-Pajaro segment, and the Pajaro-Santa Cruz segment. Trips by Monterey Peninsula residents to San Jose would use the Monterey-Castroville, Castroville-Pajaro, and Pajaro-San Jose segments. Local passengers traveling between downtown Monterey and downtown Santa Cruz would use the Monterey-Castroville, Castroville-Pajaro, and Pajaro-Santa Cruz segments.
- Estimated passenger-miles on each segment were calculated by applying locations of likely highest patronage on each segment, e.g., for example, not all visitors from San Jose will travel to Santa Cruz, but instead to Aptos, Capitola, or elsewhere; this means an average trip length less than the full length of the Santa Cruz segment.
- Local trips remaining within the Monterey Bay Area between Monterey, Pajaro/Watsonville and Santa Cruz were calculated from the "Around the Bay" rail service as discussed in the *Monterey Bay Area Network Integration Study*, page 13 of ridership forecasting chapter. Estimate for 2032. This market is served on the Santa Cruz-Pajaro, Pajaro-Castroville, and Castroville -Monterey segments, plus connecting shuttle from Salinas at Castroville station. https://www.tamcmonterey.org/files/2b7b66782/TAMC+Ridership+Forecasts_20210322_withSchedules_Final.pdf
- Figure A-2 also assumes that San Jose trains in both directions meet at Pajaro at the same times, facilitating cross-platform connections for local Santa Cruz County–Monterey County travelers. This would also allow major operating cost savings by eliminating need for operation of separate trains to provide local Santa Cruz-Pajaro-Castroville-Monterey service, which would cost another $12-$15 million per year on top of the estimates here.
- The estimate for local passengers between Monterey/Seaside, CSU Monterey (Fort Ord), Marina, Castroville and Salinas are based on current bus ridership on Monterey-Salinas Transit Route 20 between Monterey and Salinas, which averages approximately 2,000 daily trips. This market is served by the Castroville-Monterey and Castroville-Salinas rail segments. It is assumed that Route 20 patronage will recover to its pre-Covid peak by the time rail service is implemented.

Average trip lengths for each rail segment listed in Figures 13 and A-2 were estimated as follows:

- San Jose – Gilroy: 50% of the "local" passengers between San Jose and Gilroy board at Morgan Hill and San Martin.
- San Jose – Pajaro: About 10% of passengers board at three south San Jose stations, reducing average trip length slightly.
- Pajaro – Santa Cruz: About 30%-40% alight at beaches in Aptos, Capitola, and East Santa Cruz. Premium fare on this segment due to direct service to beaches.
- Pajaro – Castroville: No stations on this segment, so 100% of passengers travel the full length.
- Castroville – Salinas: 2.0 trips per year per capita for Salinas, population 150,000.
- Castroville–Monterey: About 10% of riders board/alight in Marina, 7 miles from Castroville. About 20%-30% use Seaside station, 4 miles from downtown Monterey.
- Santa Cruz – Watsonville – Monterey: The Network Integration Study predicts 924,000 annual passengers in the "Around the Bay" market by 2050.

A.5. Potential Local Rail Ridership: Santa Cruz, Watsonville, and Monterey

In addition to visitor and local traffic on S.F. Bay Area–Monterey Bay Area trains, there is potential local ridership within the Monterey Bay Area. The *Network Integration Study* estimated that there would be 506,300 local trips via 17 daily express bus round trips (60-minute headways) between Santa Cruz, Watsonville, Castroville, and the Monterey Peninsula in 2032. The study estimated that buses would attract about 2/3 of potential ridership of rail. Thus, TRAC estimates that about 759,000 passengers would use 17 local round trips between Santa Cruz, Watsonville, Castroville, and the Monterey Peninsula (506,000 plus 50%) (Figure A-2, Rows 12 + 18 + 23).

A.6. Potential Local Rail Ridership: Monterey -- Castroville -- Salinas

In addition, there is the potential for local rail ridership between Salinas, Castroville, and the Monterey Peninsula. Monterey-Salinas Transit (MST) Route 20 between Salinas and Monterey currently serves about 2,000 daily riders. This figure is used to estimate local rail ridership on this route (Figure A-2, Rows 24 + 28); many passengers are likely to transfer to/from the remaining MST Route 20 segment between Marina and downtown Salinas.