

# Unified Corridor Investment Study

## **DRAFT Step 2 Scenario Analysis Report**

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**Table 39: New Public Investments for Operation and Maintenance Costs – Cost Estimates and Potential Funding Amounts by Project Scenario**  
 (All figures in year 2018, thousands of dollars)

NEW PUBLIC INVESTMENT – ANNUAL OPERATIONS & MAINTENANCE (O&M) (IN THOUSANDS)	Scenario A			Scenario B			Scenario C			Scenario E		
	Annual Cost-O&M*	Funding Potential-O&M	NEW Public Investment-O&M	Annual Cost-O&M*	Funding Potential-O&M	NEW Public Investment-O&M	Annual Cost-O&M*	Funding Potential-O&M	NEW Public Investment-O&M	Annual Cost-O&M*	Funding Potential-O&M	NEW Public Investment-O&M
<b>Highway 1 Projects</b>												
Buses on shoulders - (end point varies depending on aux lanes included)				\$3,500	\$3,500	\$0	\$3,500	\$3,500	\$0			
High occupancy vehicle lanes (HOV) & increased transit (Inc. Ramp Metering)	\$8,400	\$2,900	\$5,500							\$8,400	\$7,000	\$1,400
Auxiliary lanes to extend merging distance	\$1,200	\$1,200	\$0				\$1,200	\$1,200	\$0	\$1,200	\$1,200	\$0
Metering of on-ramps w/o HOV (including intersection/ramp improvements)				\$0	\$0	\$0						
Additional lanes on bridge over San Lorenzo River	\$23	\$23	\$23									
Mission St intersection improvements	\$0	\$0	\$0	\$0	\$0	\$0						
<b>Subtotal- Highway 1</b>	<b>\$9,600</b>		<b>\$5,500</b>	<b>\$3,500</b>		<b>\$0</b>	<b>\$4,700</b>		<b>\$0</b>	<b>\$9,600</b>		<b>\$1,400</b>
<b>Soquel Avenue/Drive and Freedom Blvd</b>												
Bus rapid transit lite	See cell below	See cell below	See cell below	See cell below	See cell below	See cell below	See cell below	See cell below	See cell below			
Increased frequency of transit with express service	\$14,300	\$11,100	\$3,200	\$14,300	\$8,000	\$6,300	\$14,300	\$4,200	\$10,100			
Buffered/protected bike lanes				\$170	\$170	\$0				\$170	\$170	\$0
Intersection improvements for bikes/pedestrians/auto	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Subtotal- Soquel/Freedom</b>	<b>\$14,300</b>		<b>\$3,200</b>	<b>\$14,500</b>		<b>\$6,300</b>	<b>\$14,300</b>		<b>\$10,100</b>	<b>\$170</b>		<b>\$0</b>
<b>Rail Corridor</b>												
Bike and pedestrian trail	\$606	\$606	\$0	\$606	\$606	\$0	\$606	\$606	\$0	\$606	\$606	\$0
Local rail transit with interregional connections**				\$16,200	\$12,500	\$3,700				\$14,700	\$13,300	\$1,400
Bus transit connections to rail transit				\$12,100	\$6,100	\$6,000				\$12,100	\$9,300	\$2,800
Bus rapid transit							\$10,000	\$9,600	\$400			
Freight service on rail							\$275	\$275	\$0	\$1,500	\$1,500	\$0
<b>Subtotal Rail ROW</b>	<b>\$606</b>		<b>\$0</b>	<b>\$28,900</b>		<b>\$9,700</b>	<b>\$10,900</b>		<b>\$400</b>	<b>\$28,900</b>		<b>\$4,200</b>
<b>SCENARIO TOTAL***(2018 dollars)</b>	<b>\$24,500</b>	<b>\$15,800</b>	<b>\$8,700</b>	<b>\$46,900</b>	<b>\$30,800</b>	<b>\$16,100</b>	<b>\$29,900</b>	<b>\$19,300</b>	<b>\$10,600</b>	<b>\$38,700</b>	<b>\$33,100</b>	<b>\$5,700</b>

\*Annual Operations and Maintenance includes costs for all new transit (rail/bus rapid transit/bus) service vehicle operations and vehicle maintenance. Also includes facility maintenance costs for trail projects, bus rapid transit on the Santa Cruz Branch Rail Line as applicable by scenario and passenger rail service. Facility cost maintenance for passenger rail service as assumed to be shared 50/50 between RTC and the Rail Operator when freight service is also provided. The annual cost of facility maintenance on state highways are allocated by Caltrans and facility maintenance on local roads are allocated by local jurisdictions. Therefore the annual maintenance cost estimated for projects included in the UCS within Caltrans and local jurisdictions right-of-way are fully funded by the these entities and the new level of public investment is zero for the purpose of the UCS.

\*\*For Scenarios B and E with rail transit, costs are for diesel multiple units. Operations and maintenance of an electric rail service is estimated to cost \$13.2million annually.

\*\*\*For Scenarios B and E with rail transit, costs are for diesel multiple units. Electrifying rail and operating electrical multiple unit vehicles would I be less than maintenance for diesel multiple units and would be \$11,800,000 annually.

Project	Table A-10: Passenger Rail Service		
<b>Limits</b>	Natural Bridges Drive to Pajaro Station		
<b>Description</b>	Passenger rail transit service provided between the Westside of Santa Cruz and Pajaro Station just south of the Santa Cruz County border in Monterey County. The costs for a diesel multiple unit (DMU) vehicle train service* and the cost to electrify rail service are both evaluated.		
<b>Scope</b>	Replacement of all rail on portions of the line between Santa Cruz with continuously welded rail using good-quality second-hand rail. Replacement of 2/3 of rail ties, improve or replace turnouts and switches. Implement new signal and positive train control system to monitor and control train movements. Install new active warning devices at nineteen crossings and quiet zones at all thirty-three public at grade crossings. Construct stations with platforms, ticketing machines, bicycle racks and lockers and shelter similar to a bus shelter. Implement recommended improvements to structures as identified in 2012 JL Patterson Report. Provide forty-one hours of passenger rail transit per day with thirty-minute headway during the weekday from 6am to 9pm serving ten primary stations (Westside Santa Cruz, Bay Street/California, Downtown Santa Cruz, Seabright, 17th, 41st, Monterey Avenue, Aptos Village and Downtown Santa Cruz in Santa Cruz County) and one station at Pajaro in Monterey County.		
<b>CAPITAL COSTS</b>			
Track			\$30,700,000
Signal			\$16,400,000
Train Control			\$60,400,000
Structures			\$5,100,000
Stations / Maintenance Facility			\$27,800,000
Rail Vehicles			\$62,500,000
Soft Costs (30%)			\$60,900,000
Contingency (30%)			\$60,900,000
<b>TOTAL PROJECT COSTS- CONSTRUCTION</b>			<b>\$324,700,000</b>
<i>Electrifying rail for passenger rail service between Santa Cruz and Pajaro is estimated to cost to \$474.4 million.</i>			
<b>OPERATION &amp; MAINTENANCE COSTS- RAIL TRANSIT</b>			
	Daily Revenue Hours	Operating Cost per Hour	Annual Operating Cost
Rail Transit Service (weekday)	42	\$573	\$6,100,000
Rail Transit Service (weekend and holiday)	26	\$573	\$1,700,000
Vehicle O&M - Soft Costs (40%)			\$3,100,000
Vehicle O&M - Contingency (20%)			\$2,200,000
		Scenario B	Scenario E*
Maintenance of right-of-way		\$2,200,000	\$1,100,000
Maintenance of right-of-way- Contingency (15%)		\$300,000	\$100,000
<b>TOTAL PROJECT COST-OPERATIONS (RAIL)</b>		<b>\$15,600,000</b>	<b>\$14,300,000</b>
*Operating electrical multiple unit vehicles is estimated to cost \$13.2 million.			
** Facility cost maintenance for passenger rail service is assumed to be shared 50/50 between RTC and the Rail Operator when freight service is also provided.			
<b>OPERATION COSTS- NEW LOCAL BUS TRANSIT CONNECTION TO RAIL</b>			

	New Daily Revenue Hours	Operating Cost per Hour	Annual Operating Cost
Route 55- increase service	16	\$200	\$800,000
Route 55 (weekend)- increase service	20	\$200	\$440,000
Route 66- realign & increase service	15	\$200	\$765,000
Route 68- increase service	15	\$200	\$765,000
Route 19- increase service	12	\$200	\$612,000
Route 22- increase service	15	\$200	\$510,000
Route 22- add year round service	30	\$200	\$510,000
Route 22- (weekend) - increase service	30	\$200	\$660,000
Route 57- increase service	45	\$200	\$2,300,000
Route 57 (weekend)- increase service	45	\$200	\$990,000
Route 65- increase service	15	\$200	\$765,000
Route 65 (weekend)- increase service	7.5	\$200	\$165,000
Contingency (30%)			\$2,800,000
<b>TOTAL PROJECT COST-OPERATIONS (BUS)</b>			<b>\$12,100,000</b>

Project		Table A-11: Excursion Rail Service	
<b>Limits</b>	Davenport to Santa Cruz		
<b>Description</b>	Excursion rail service would be between Santa Cruz and Davenport seasonally on weekends and holidays.		
<b>Scope</b>	Adds new excursion passenger service on weekend and holidays between Santa Cruz and Davenport with four round trips per day. Rail transit cars used for passenger rail service from Santa Cruz to Pajaro will also be used for excursion rail service. Positive Train Control is not assumed for this section of track.		
<b>CAPITAL COSTS</b>			
Track			\$4,800,000
Signal			\$1,500,000
Train Control			N/A
Structures			\$721,000
Stations / Maintenance Facility			\$2,500,000
Rail Vehicles			N/A
Soft Costs (30%)			\$2,900,000
Contingency (30%)			\$2,900,000
<b>TOTAL PROJECT COSTS- CONSTRUCTION</b>			<b>\$15,300,000</b>
<i>Electrifying rail for excursion rail service between Davenport is estimated cost \$75.1 million.</i>			
<b>OPERATION &amp; MAINTENANCE COSTS- RAIL TRANSIT</b>			
	New Daily Revenue Hours	Operating Cost per Hour	Annual Operating Cost
Rail Transit Service (weekday)	0	\$490	\$-
Rail Transit Service (weekend and holiday)	16	\$490	\$78,000
Soft Costs (38%)			\$30,000
Contingency (20%)			\$22,000
		Scenario B	Scenario E*
Maintenance of right-of-way		\$400,000	\$200,000
Maintenance of right-of-way- Contingency (15%)		\$20,000	\$10,000
<b>TOTAL PROJECT COST-OPERATIONS</b>		<b>\$600,000</b>	<b>\$400,000</b>
<i>*Facility cost maintenance for passenger rail service as assumed to be shared 50/50 between RTC and the Rail Operator when freight service is also provided.</i>			

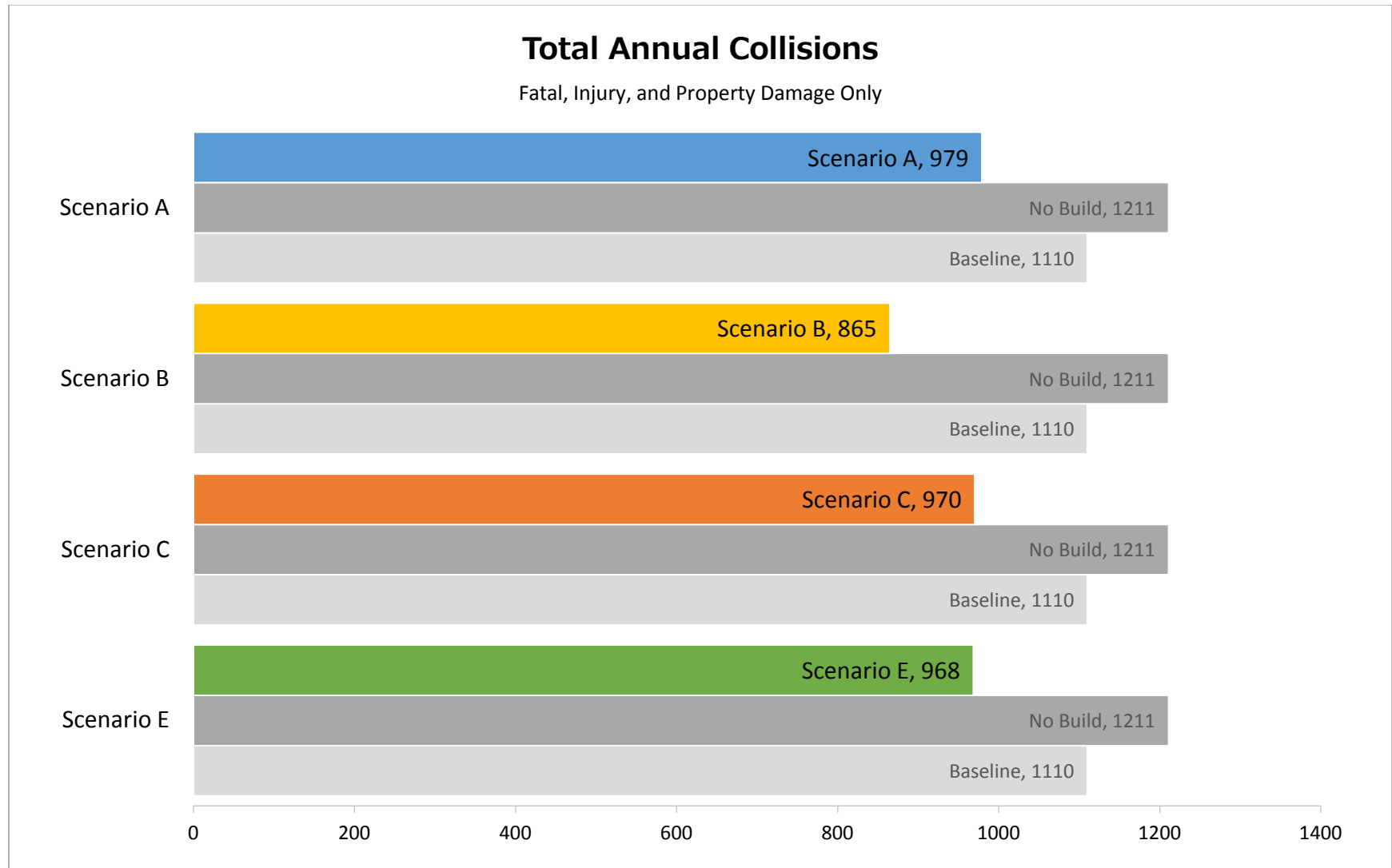
<b>Project</b>		<b>Table A-12: Bus Rapid Transit Watsonville to Santa Cruz on Rail Right of Way with portions of route on parallel roadways</b>	
<b>Limits</b>	Watsonville Transit Center to Shaffer Rd on West side of Santa Cruz		
<b>Description</b>	Two-directional bus rapid transit between Watsonville Transit Center and Shaffer Rd on Westside of Santa Cruz utilizing a combination of the rail right-of-way, Highway 1, and local streets. BRT on rail right of way from State Park Dr. in Aptos to Shaffer Rd on west side of Santa Cruz with portions of route on parallel street network.		
<b>Scope</b>	BRT buses would travel on Highway 1 between Watsonville Transit Center and State Park Drive. Buses utilize the rail ROW between State Park Dr. and Shaffer Rd for two directional travel where feasible or one-directional travel on rail ROW with reverse direction on parallel local streets. Bus Rapid Transit is on 8.5 miles of the rail ROW with a combination of two-way (2.4 miles) and one-way (6.1 miles) with reverse direction on parallel local streets. Service on bridges is one way and transit signals are utilized on the rail bridges to hold one direction of travel while transit in the other direction travels through. Buses are prioritized at at-grade roadway crossings. Bus Rapid Transit service will be branded and transit service and vehicle amenities are designed to be equivalent to those provided by rail transit to the extent possible. Provide one hundred and eighty-two hours of new bus transit service between Santa Cruz and Watsonville at fifteen-minute frequency's during peak periods to stations on the rail ROW and on parallel streets. Includes signal, on-street improvements and communication/lighting/electrical.		
<b>CAPITAL COSTS</b>			
Earthwork and Pavement			\$18,000,000
Drainage			\$5,000,000
Retaining Wall & Fencing			\$15,000,000
Rail Removal			\$2,000,000
Platforms & Stations			\$25,000,000
Signals, Signal Priority & Que Jumps			\$17,000,000
Amenities			\$11,000,000
Contingency (50%)			\$58,800,000
Structures			\$4,000,000
Articulated Buses	12	\$1,400,000	\$16,800,000
Other*			\$25,000,000
Soft Costs (30%)			\$67,100,000
<b>TOTAL PROJECT COSTS- CONSTRUCTION</b>			<b>\$265,000,000</b>

\*Other includes cost associated with traffic control, construction mobilization, supplemental work, state furnished materials, and environmental cost identified using the Caltrans Cost Estimating Tool.

**Table 31: Collision Forecasts by Scenario (Fatal, Injury, and Property Damage Only)**

Location	Annual Average 2011- 2015 Collisions	2035 No Build Annual Collisions	2035 Annual Collision Reductions			
			Scenario A	Scenario B	Scenario C	Scenario E
<b>Highway 1</b>						
HOV lanes (between San Andreas Rd and Morrissey Blvd)	317	297	-34	0	0	-37
SR 1 auxiliary lanes (between State Park Drive and San Andreas Road)	88	92		0	-18	
Ramp metering (between San Andreas Road and Morrissey Blvd)	317	297		-108	0	
San Lorenzo River Bridge Widening	14	14	-3	0	0	0
Mission St Intersections	30	30	-2	-3	0	0
<b>Soquel Ave/Drive and Freedom Blvd</b>						
Buffered bicycle lanes	30	45	0	-33	0	-33
Soquel/Morrissey/Poplar, Soquel/Frederick, Soquel/41st, Soquel/Bay-Porter, Soquel/Robertson, Freedom/Green Valley, Freedom/Airport, Freedom/Buena Vista	61	76	-15	0	-12	0
Intersection improvements for bicycles and pedestrians	24	36	-14	-5	-14	-5
<b>Rail Right of Way</b>						
Bicycle /Pedestrian Trail with Rail or BRT	33	50	0	-45	-45	-45
Bicycle /Pedestrian Trail Only	36	53	-48	0	0	0
<b>Overall Project Area</b>						
Bicycle and pedestrian Improvements	87	130	-13	-13	-13	-13
Bike share and transit amenities	87	130	-6	-6	-6	-6
Multimodal transportation hubs	263	394	-20	-20	-20	-20
Education and enforcement	1110	1211	-76	-114	-113	-84
<b>Total</b>			<b>-232</b>	<b>-346</b>	<b>-241</b>	<b>-243</b>

Figure 29: Comparison of Total Collisions in Study Area by Scenario





**Table 42: Costs Associated with the Number of Collisions by Project and Scenario**

Location	2015 Collisions	2035 No Build Collisions	2035 Collisions Scenario A		2035 Collisions Scenario B		2035 Collisions Scenario C		2035 Collisions Scenario E	
			Reductions	Savings	Reduction	Savings	Reduction	Savings	Reduction	Savings
<b>Highway 1</b>										
HOV lanes (between San Andreas Rd and Morrissey Blvd)	317	297			0	-	0	-		
SR 1 auxiliary lanes (between State Park Drive and San Andreas Road)	88	92	-34	\$7,527,787	0	-	-18	\$4,087,826	-37	\$8,193,973
Ramp metering (between San Andreas Road and Morrissey Blvd)	317	297			-108	\$24,171,047	0	-		
San Lorenzo River Bridge Widening	14	14	-3	\$767,276	0	-	0	-	0	-
Mission St Intersections	30	30	-2	\$456,393	-3	\$648,792	0	-	0	-
<b>Soquel Ave/Drive and Freedom Blvd</b>										
Buffered bicycle lanes	30	45	0	-	-33	\$7,399,549	0	-	-33	\$7,399,549
Soquel/Morrissey/Poplar, Soquel/Frederick, Soquel/41st, Soquel/Bay-Porter, Soquel/Robertson, Freedom/Green Valley, Freedom/Airport, Freedom/Buena Vista	61	76	-15	\$3,420,459	0	-	-12	\$2,585,566	0	-
Intersection improvements for bicycles and pedestrians	24	36	-14	\$3,119,810	-5	\$1,013,938	-14	\$3,119,810	-5	\$1,013,938
<b>Rail Right of Way</b>										
Bicycle /Pedestrian Trail with Rail or BRT	33	50	0	-	-45	\$10,026,234	-45	\$10,026,234	-45	\$10,026,234
Bicycle /Pedestrian Trail Only	36	53	-48	\$10,751,022	0	-	0	-	0	-
<b>Overall Project Area</b>										
Bicycle and pedestrian Improvements	87	130	-13	\$2,905,863	-13	\$2,905,863	-13	2,905,863	-13	\$2,905,863
Bike share and transit amenities	87	130	-6	\$1,452,932	-6	\$1,452,932	-6	\$1,452,932	-6	\$1,452,932
Multimodal transportation hubs	263	394	-20	\$4,409,127	-20	\$4,409,127	-20	\$4,409,127	-20	\$4,409,127
Education and enforcement	1109	1211	-76	\$17,060,033	-114	\$25,401,517	-113	\$25,274,985	-84	\$18,846,481
<b>Total</b>			<b>-232</b>	<b>\$51,900,000</b>	<b>-346</b>	<b>\$77,500,000</b>	<b>-241</b>	<b>\$53,900,000</b>	<b>-243</b>	<b>\$54,300,000</b>

Figure 34: Costs Associated with Collisions

