Cost-Benefit Analysis of Options for Sea Level Rise Adaptation

between Morro Bay and Los Osos, California

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1. Analysis Summary

			2 Lane Road + Bike Path on Fill	2 Lane Road + Bike Path on Fill With Retaining Wall	2 Lane Road + Bike Path on Causeway
Benefits	Without Waves	Windy Cove	$9,316,103	$9,316,103	$9,316,103
		Marina	$54,615,284	$54,615,284	$54,615,284
		South Bay Blvd	$552,686	$552,686	$552,686
		Total	$64,484,073	$64,484,073	$64,484,073
	With Waves	Windy Cove	$25,045,556	$25,045,556	$25,045,556
		Marina	$68,396,334	$68,396,334	$68,396,334
		South Bay Blvd	$2,951,610	$2,951,610	$2,951,610
		Total	$96,393,501	$96,393,501	$96,393,501
Costs			-$57,940,242	-$63,761,852	-$144,023,040
Net Benefits		Without Waves	$6,543,830	$722,221	-$79,538,967
		With Waves	$38,453,259	$32,631,649	-$47,629,539

Table 1 Summary of Results

Table 1 summarizes the benefit cost analysis of sea level rise adaptation measures in the Morro Bay-Los Osos region of San Luis Obispo County, California. The basic conclusions are:

- Under the assumptions and using the data available, as described below, the benefits of altering the road structures to accommodate expected sea level rise will exceed the costs for two of the three options. Elevation on fill or with a retaining wall pass a cost-benefit test, but it is a close result. Costs exceed benefits for a causeway elevation of the road.
- The take no action alternative is rejected. This conclusion is driven primarily by the benefits of retaining recreation opportunities in Morro Bay State Park.
- Additional benefits exist in maintaining the traffic along South Bay Boulevard, though these are not sufficient to justify the investments in adaptation on their own. This is due in large part because of the assumption that benefits do not start to accrue until the flood level for each stretch of road is reached. For South Bay Boulevard this is in 2073 based on the specified sea level forecasts.
- Benefits exceed costs with or without assumptions of wave run up, though the analysis including wave run up does yield significantly higher net benefits.
- The choice of discount rates affects the results and the determination of economically acceptable projects. For the base analysis, a discount rate of 1% is used on the basis of the long period over which benefits are measured. All project options fail the cost-benefit test if higher discount rates are used, meaning the outcome is sensitive to the assumptions used in the analysis.

The analysis described here is done in real (unadjusted for inflation) 2025 dollars. Adjustments for inflation, if done so as to use different rates of inflation for different cost and benefit components, will significantly complicate the calculation process. Present values are calculated at a discount rate of 3%. The results are **not** sensitive to the choice of discount rates.

2. Cost-Benefit Analysis Overview

Cost-benefit analysis is a way of comparing values gained and lost because of a proposed decision. In the private sector, the values of capital and operating expenditures are compared with the revenues to be gained from sales of goods and services. Sales are not a measure for public sector investors so alternate measures of value are chosen. In the present case, expenditures to alter the roads in Morro Bay to minimize the effects of sea level rise are compared with the values of recreation and transportation offered by the public infrastructure. The assignment of the terms “costs” and “benefits” is a function of the question being asked. The first question with respect to Morro Bay before any choice of adaptation strategy is made is “what are the consequences of taking no action”. It may be that the effects of sea level rise are not serious enough to warrant major expenses. The basic analysis discussed here is the consequences of the no action alternative. The effects on recreational users and travelers are costs and expenditures that might be made are benefits. They are benefits in the sense that the funds saved could be put to another purpose.

Once the no action alternative consequences are measured, the question can then be turned around: What will be the values gained (or losses avoided) if a decision is made to invest in road alterations to deal with sea level rise? In this case, the costs and benefits of the no action alternative are reversed. The result is what is shown in **Table 1**.

In other words, in the no action alternative, the costs to travelers and park users are larger than the benefits of not spending $54 million and $134 million. Taking action will be economically superior to taking no action. The question then becomes which of the three options being evaluated should be selected. The standard answer to the question is to pick the option with the largest net benefits, which in this case is the roadway elevated on fill.

3. Background Conditions

The extent of sea level rise specified for this study are 1.8 feet by 2060 and 6.3 feet by 2100 (**Table 2**). However, it is not possible to conduct an analysis with just two data points since the fundamental assumption in a cost-benefit study of an infrastructure investment is that expenditures up front will be repaid with a flow of future benefits. To appropriately structure the analysis, annual data must be used.

Without Wave Runup					
Location			Sea Level Rise		
			0 ft	1.8 ft	6.3 ft

	Road Elevation (ft NAVD)	Flooding Threshold (ft NAVD)	Avg Hrs. Closed per Year	Avg Hrs. Closed per Year	Avg Hrs. Closed per Year
State Park Road – Windy Cove	7.25	7.75	0.0	92.5	6589.3
State Park Road – Morro Bay State Park Marina to S Bay Blvd	7.5	8	0.0	46.5	6280.3
S Bay Blvd – Chorro Creek Bridge to Los Osos Creek Bridge	10	10.5	0.0	0.0	1505.2

With Wave Runup					
	Road Elevation	Flooding Threshold (ft NAVD)	Sea Level Rise		
			0 ft	1.8 ft	6.3 ft
			Avg Hrs. Closed per Year	Avg Hrs. Closed per Year	Avg Hrs. Closed per Year
State Park Road – Windy Cove	7.25	7.75	0.4	441.9	7656.5
State Park Road – Morro Bay State Park Marina to S Bay Blvd	7.5	8	0.1	283.9	7428.5
S Bay Blvd – Chorro Creek Bridge to Los Osos Creek Bridge	10	10.5	0.0	2.6	6419.6

Table 2 Sea Level Rise and Effects Assumptions

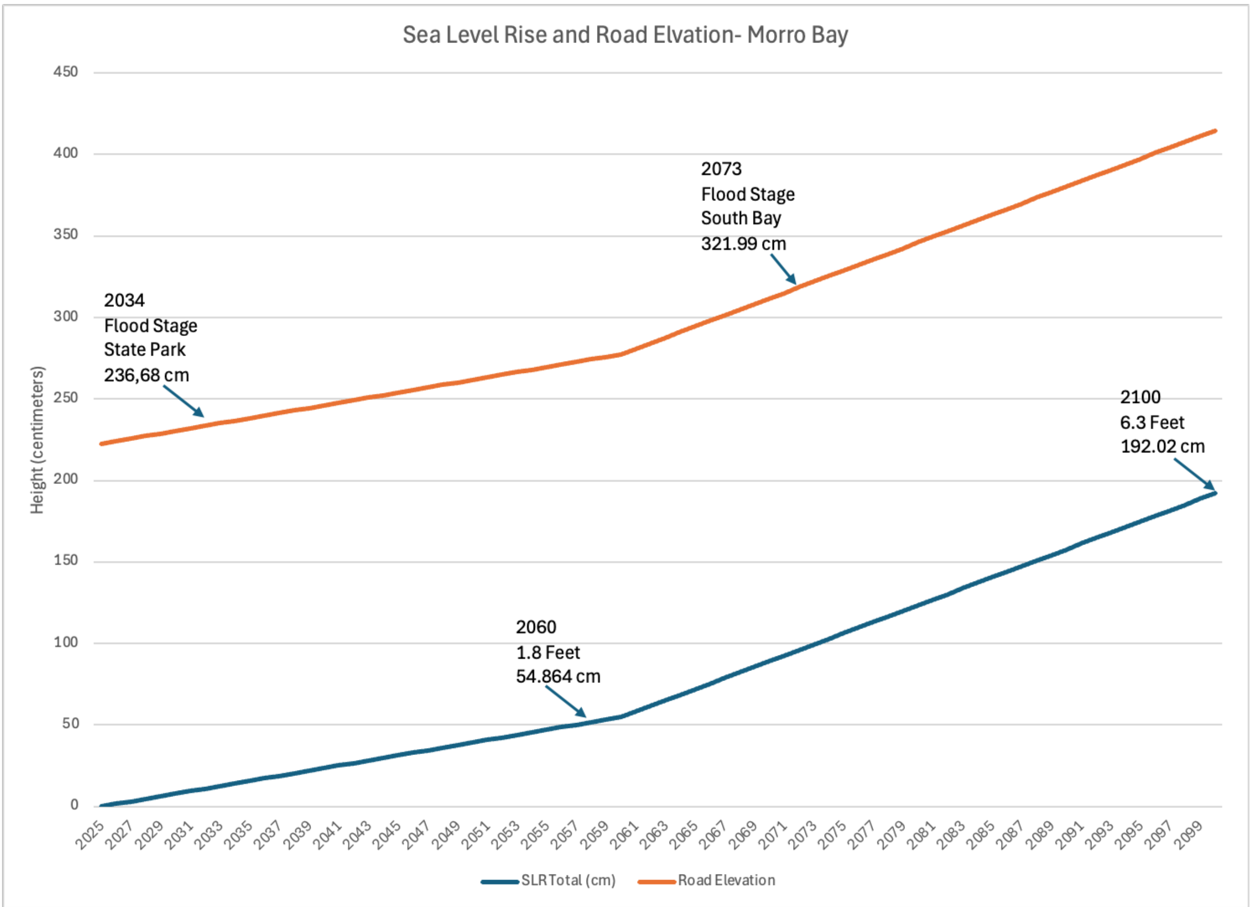

Figure 1 Sea Level Rise and Road Flood Exposure

The annual data are calculated as the simple interpolation of constraint change between 2025 and 2060 and then between 2060 and 2100. **Figure 1** shows the interpolated estimates for sea level rise and for the height of the road above NAVD from 2025 to 2100. The specified sea levels are shown in the bottom line, and the road height and specified flood levels and timing are shown in the upper line. The specified flood levels are assumed to be the year in which the benefits of investment in the road begin.

For purposes of the analysis, the area of concern is subdivided into three zones: Windy Cove; the area around the marina; and together comprise the State Park subsection. The area along South Bay Boulevard comprises the third (**Figure 2).**

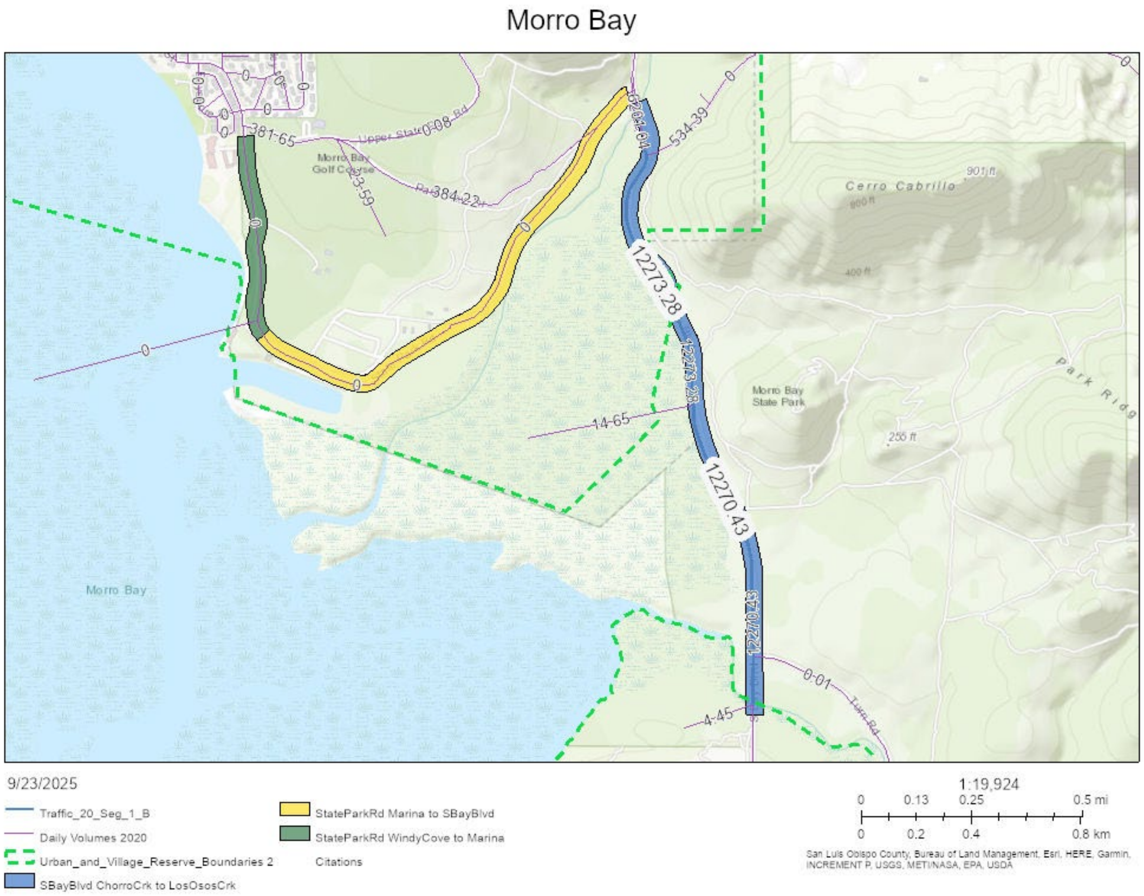

Figure 2 Study Area Subsections

Windy Cove is shown outlined in green; The Marina section is in yellow, while the South Bay Boulevard section is in blue. The traffic counts estimated by the San Luis Obispo Council of Governments transportation model are also shown. The South Bay Boulevard section has a traffic count of about 12,170 vehicles per day (both directions). The traffic count for the State Park segments is shown as zero because the State Park is excluded from the transportation model. For purposes of this analysis, the absence of traffic data requires relying on another source of benefits, as discussed in the next section.

4. No Action Costs- State Park Section

Table 3 provides a summary of the costs of no action estimated for the State Park section and the two subsections at Windy Cove and the marina. The estimates are presented with and without waves and assuming planning horizons to 2060 and to 2100. The costs in this section of the study are the losses in the value of recreation in the state park. Visitor use data from the Monterey Bay Natural Estuary Program are combined with the estimated values to visitors at various locations around coastal California. No direct measurement of recreation values at Morro Bay is available.

		Present Value to 2060		Present Value to 2100	
		Without Waves	With Waves	Without Waves	With Waves
State Park	Windy Cove	$95,244	$486,925	$9,316,103	$25,045,556
	Marina	$301,513	$920,750	$54,615,284	$68,396,334
	Total	$396,757	$1,407,675	$63,931,387	$93,441,891

Table 3 Summary of No Action Costs - State Park Section

Table 4 shows the data used to calculate the gross costs. The value per person per day is taken from studies of recreational values in the U.S. compiled by Rosenberger (2016). From this master list of over 3,000 studies, over 100 studies were selected of California recreation values. The preponderance of these studies were conducted of the marine sanctuaries in California. The database was updated to 2016 dollars and then further adjusted to 2025 dollars, which are shown in Table 4 as the value per person per day.

The columns labeled Windy Cove and State Park Marina show the daily use of each park area provided by the Morro Bay National Estuary Program (MBNEP). These are broken down by principal activity reported in a survey conducted by MBNEP. The use categories and values data bases did not match exactly so several more detailed categories in the data were grouped as "relaxing on the coastline" for purposes of calculating values.

Total value per day equals the value per person per day times the number of respondents. The Windy Cove distribution shows weights for each activity based on the number of respondents. These weights are then used to calculate a composite value per day. The value is $61.81 per person per day for Windy Cove and $72.22 per person per day for the State Park Marina.

	Value Per Person Per Day	Windy Cove	Total Value Per Day	Windy Cove Distribution	Weighted Values Per Day
Relaxing on coastline	$65.69	22	$1,035	25%	$16.49
Kayak/SUP/Rowing	$150.77	4	$475	5%	$7.57
Walking or playing with pet(s)	$65.69	13	$662	15%	$9.63
Sitting in car	$65.69	10	$455	11%	$7.25
Fishing	$203.99	0	$0	0%	$0.00
Boating	$55.74	0	$0	0%	$0.00
Walking/Running/Exercise	$41.93	33	$977	37%	$15.57
Other	$65.69	6	$290	7%	$4.62
TOTAL		89	$3,894	100%	$61.14

	Value Per Person Per Day	State Park Marina	Total Value Per Day	State Park Distribution	Weighted Values Per Day
Relaxing on coastline	$65.69	31	$1,982	7%	$4.60
Kayak/SUP/Rowing	$150.77	85	$12,346	19%	$28.65
Walking or playing with pet(s)	$65.69	62	$3,964	14%	$9.20
Sitting in car	$65.69	31	$1,982	7%	$4.60
Fishing	$203.99	4	$879	1%	$2.04
Boating	$55.74	36	$1,922	8%	$4.46
Walking/Running/Exercise	$41.93	191	$7,770	43%	$18.03
Other	$65.69	4	$283	1%	$0.66
TOTAL		445	$31,129	100%	$72.22

Table 4 Recreation Value Calculation

To estimate the costs each year, the sea level rise estimates from Figure 1 are matched to a linearly interpolated time effect based on the number of hours specified in Table 2. The interpolation begins in the year in which flooding is projected to occur and continue to 2060 and is then re-estimated to 2100. The number of hours projected for a given year is then taken as a proportion of hours in the year and divided by two to reflect the fact that recreational activity in the park is unlikely to take place over 24 hours. This yields the proportion of time with flooding and, it is assumed, eliminated recreation. The proportion of flood time is then multiplied by the number of people in that section of the park.

The estimated population multiplied by the value per day provides the total recreation value per day. The population of recreationists is increased each year at a rate consistent with population growth in San Luis Obispo county. This growth rate was provided by the SLO Council of Governments. The total recreation value is then reduced by the SLR flooding hours as a percent to derive the annual loss in recreation. The percentage loss increases with sea level rise and the number of hours each year in which flooding occurs.

Figure 3 and **Figure 4** illustrate the results of the calculations for Windy Cove using the without wave runup assumption. Figure 3 shows the relationship between sea level rise and hours closed at Windy Cove. Figure 4 shows the growth in users at Windy Cove and the annual change in value lost due to flooding. The present value of the lost value in Figure 4 is reported in Table 3.

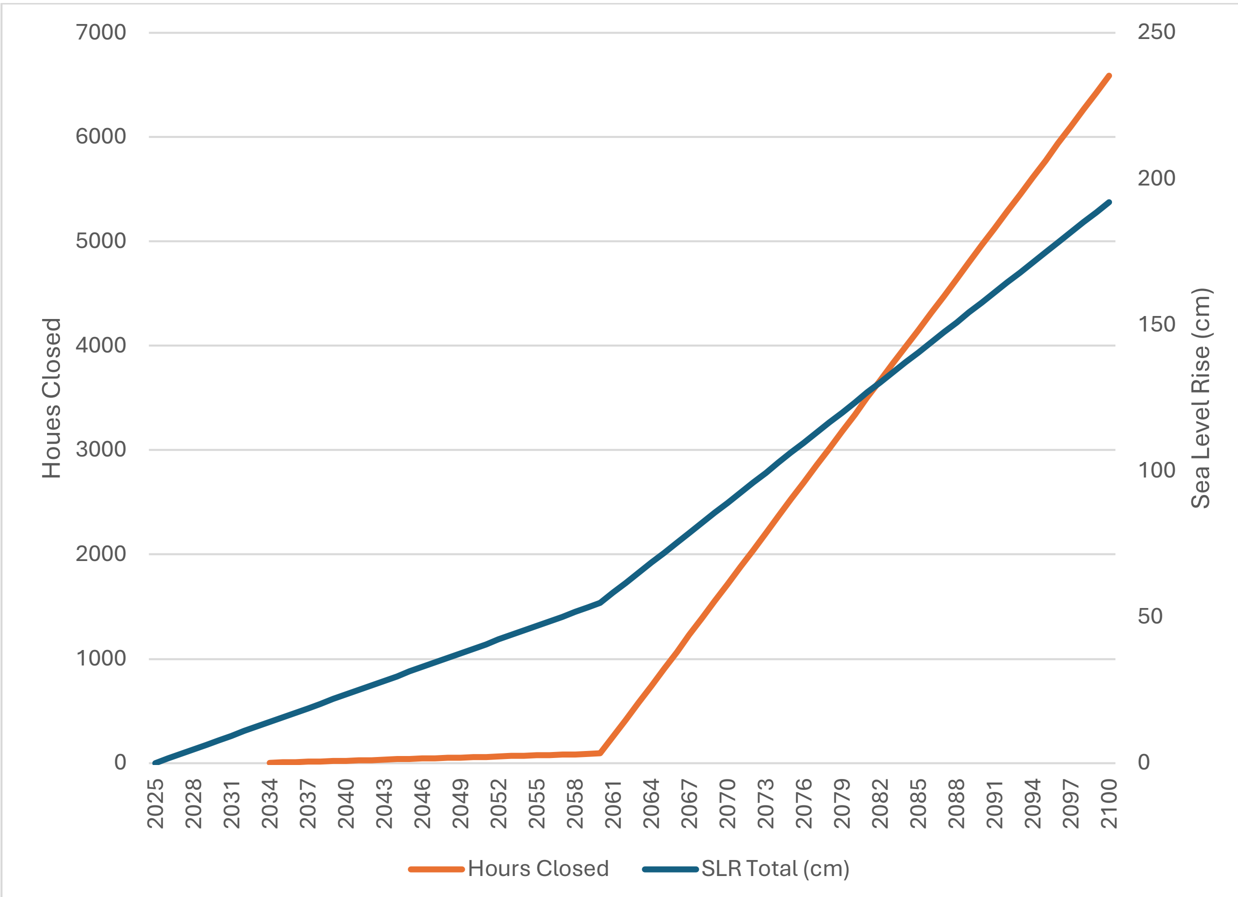

Figure 3 Sea Level Rise and Hours Closed at Windy Cove

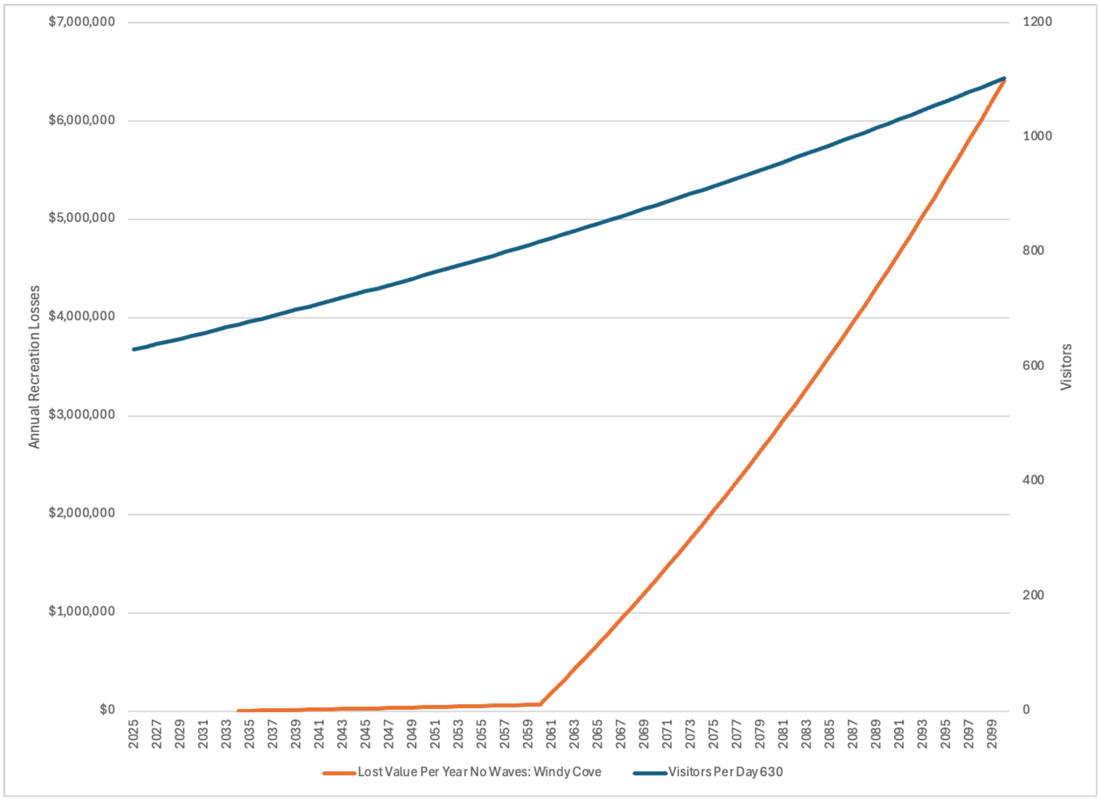

Figure 4 Number of Visitors and Lost Value at Windy Cove

5. Economic Change in the South Bay Boulevard Section

The methodology for assessing the economic effects of highway construction or modification is well established and is described in a framework published by the Federal Highway Administration (White, 2016). The framework defines the economic values affected by highways as consisting of the value of time for users and vehicle operating costs. A cost-benefit analysis should identify changes in the value of time and in vehicle operating costs. Increases in the time spent travelling and in vehicle miles traveled are counted as costs. Costs are the result of increases in time and distance. In this case, the value of time and operating costs can be expected to increase significantly if flooding eliminates travel on South Bay Boulevard. Taking action to avoid these increases in costs creates benefits as avoided costs.

Table 5 summarizes the present value of no action costs for the South Bay Boulevard section of the study area. Before discussing these results, the method of calculation requires explanation. South Bay Boulevard is a highly vulnerable road partly because of the length of roadway that could be flooded and partly because it is the only road connecting Morro Bay and Los Osos over a short distance. If it is no longer passable due to flooding, there are no quick alternative routes between the two commnities without a significant detour because of the topography and placement of roads.

			Change in Time of Travel Valued At:	
South Bay Blvd			Without Waves	With Waves
	Present Value in 2030-2060	SLO County Wage	$6,654	$393,937
		California Wage	$92,308	$394,551
		Change in Vehicle Operating Costs	$243,848	$1,042,279
		Total Change @SLO	$250,502	$1,436,216
		Total Change@ CA	$336,156	$1,436,830
	Present Value in 2073-2100	SLO County Wage	$10,727	$635,115
		California Wage	$148,821	$636,105
		Change in Vehicle Operating Costs	$393,138	$1,680,390
		Total Change @SLO	$403,865	$2,315,505
		Total Change@ CA	$552,686	$2,951,610

Table 5 Costs of Flooding Disruptions on South Bay Boulevard

Figure 5 shows the current route and the alternative route selected for analysis. The flood-risked portion of South Bay Boulevard is shown in blue. If South Bay Boulevard is not in service, then the connection between the two communities must take place using Highway 1. This detour is shown in green. For this analysis, the intersection of Market Street and Morro Bay Boulevard was chosen as a centroid for Morro Bay. The corresponding centroid for Los Osos is at 4th street and Santa Maria Avenue.

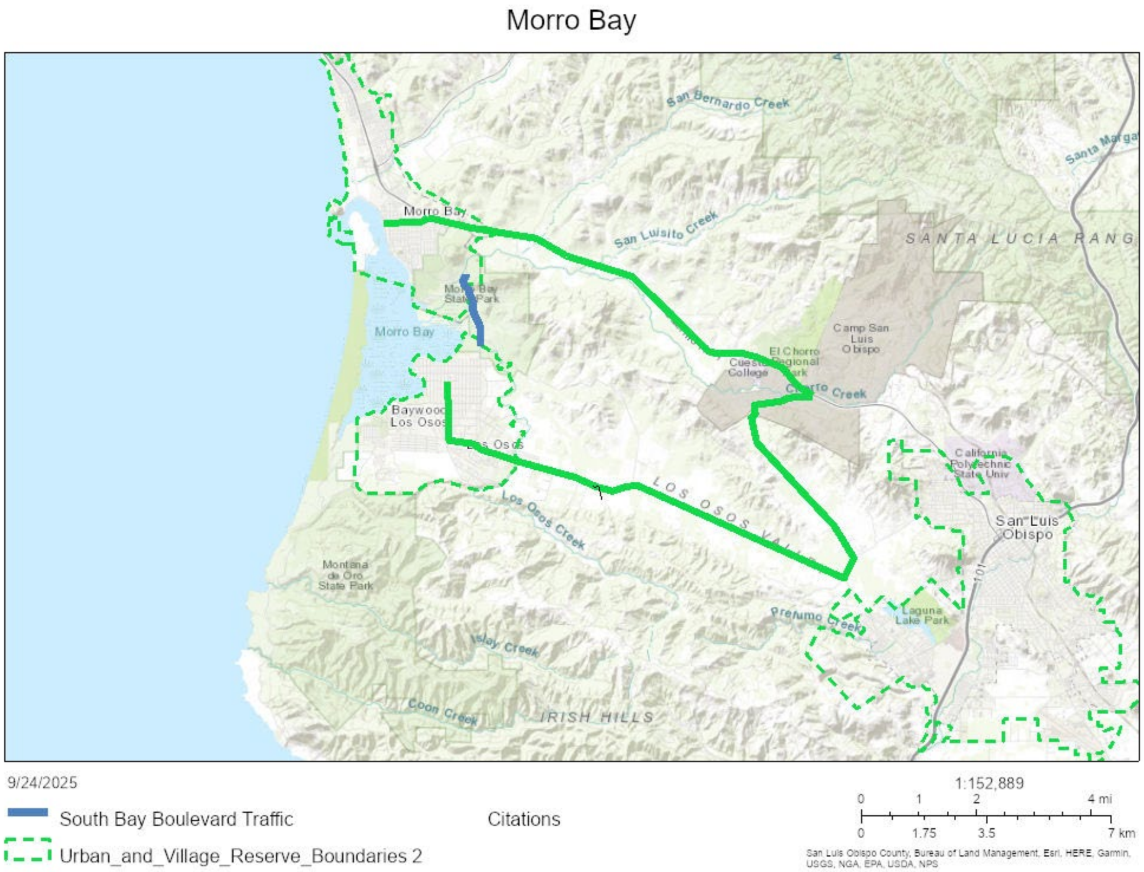

Figure 5 Direct and Indirect Road Connections Morro Bay and Los Osos.

The costs for South Bay Boulevard are the increases in time and vehicle operation from having to take the longer route if South Bay is flooded. For this analysis the calculations are set out in **Table 6** and **Table 7**. Table 6 shows the costs and covers the calculations for South Bay Boulevard assuming no flooding. Table 7 shows the calculation for the alternate route. Each table is divided into four sections for ease of explanation.

1			Avg Weekly Wage	Average Hourly	50% Average
		CA Avg Wage	$1,773.00	$50.66	$25.33
		SLO County Avg Wage	$1,179.00	$33.69	$16.84
2	Miles	Time (in minutes at 30 mph)	Hours Employee-related travel	Employee-related travel Costs	Non Emp -N
	4.6	9.2	467	$23,632	1,400
	4.6	9.2	467	$15,715	1,400
3		Employment %	Other %	Daily Traffic	Person Hours
	CA Avg Wage	25%	75%	12,170	1,866
	SLO County Avg Wage	25%	75%	12,170	1,866
4		Non Emp $	Total Value	Total Vehicle Miles	Total Vehicle Cost
	CA Avg Wage	$35,449	$59,081	55,982	45,905
	SLO County Avg Wage	$23,572	$39,287	55,982	45,905

Table 6 Unobstructed South Bay Boulevard

1		Urban Miles	Urban Minutes	Highway Miles	Highway Minutes	Total Miles	Total Minutes
		4.6	9.2	19.1	21	23.7	25.6
		4.6	9.2	19.1	21	23.7	25.6
2		Avg Weekly Wage	Average Hourly	50% Average	Employment %	Other %	Daily Traffic
	CA Avg Wage	$1,773.00	$50.66	$25.33	25%	75%	12,170
	SLO County Avg Wage	$1,179.00	$33.69	$16.84	25%	75%	12,170
3	Person Hours	Hours Employee-related travel	Employee-related travel Costs	Occupancy	Non Emp -N	Non Emp $	Total Cost
	4,807	1,502	$95,124	1.25	2,929	$74,196	$169,320
	4,807	1,202	$50,604	1.25	3,605	$60,725	$111,328
4	Net Change in Cost of Time	Total Vehicle Miles	Total Vehicle Cost	Vehicle Operating Change	Total Value Change		
	$110,239	288,429	236,512	$190,607	$300,846		
	$72,041	288,429	236,512	$190,607	$262,648		

Table 7 Alternate Route to Santa Bay Boulevard

The FEMA standard for estimating the value of travel time is based on the average wage for a given region. The FEMA standard is to use the U.S. average wage, but the Morro Bay area, particularly the State Park and South Bay Boulevard road segments are more appropriately viewed as local or regional segments. For this analysis, the average wage for San Luis Obispo County and California are both tested as shown in Table 6, Row 1. The average hourly wage is calculated at the weekly wage divided by 35 (the length of a full-time work week). The value of time is assigned at the full hourly wage. All other uses are assigned a value at less than the full wage. The value is generally 50% for general travel and 30% for leisure travel. However, trip purpose data were not available and 50% was used.

In Table 6, Row 2 sets out the distance and time elements. The current route over South Bay Boulevard is 4.6 miles between Morro Bay and Los Osos (assuming the centroids defined above). Travel time is estimated at 30 miles per hour for a trip time of 9.2 minutes. The assumption shown in Row 3 is that 25% of travel is employment-related. The number of person hours of travel as the total vehicles (12,170 from the SLOCOG travel model) times 9.2 minutes. This assumes single occupancy vehicles because no more detailed information is available. The number of employee-related trips is estimated at 467, and non-employment as 1,400. The results for travel related value of time ranges from $15,715 at the San Luis Obispo average wage and $23,632 at the California average wage.

In Table 6, Row 4 shows the non-employment values, the total value (sum of employment and non-employment related values of time). The total vehicle miles (4.6 times 12,170) are calculated. The operating cost is estimated at $0.82 per mile, the standard vehicle operating value for the IRS. This is the standard value used.

Table 7 shows the calculations for the alternate route plus the change between the alternative and the present route. The calculations are essentially the same as in Table 6, with two exceptions. First, the route is now extended to 23.7 miles from Morro Bay to Lake Osos. This route is subdivided into an urban portion within each community and a highway portion along Highway 1. Travel is assumed at 30 mph in the urban section and 60 mph on the highway section. With these adjustments, total time, distance, and values are constructed assuming the same level of total vehicles.

In Table 7, Row 4 shows the total changes in value of time and operating costs calculated using both the San Luis Obispo County and California. These are used to calculate the present value of costs. However, there is an important issue in the calculation of the present values for the South Bay Boulevard portion of the analysis. The flood stage for South Bay Boulevard is projected at 10.5 feet (see Table 2). This water level is not projected to occur until 2073 using the interpolated estimates. This places the start of costs from maintaining access to South Bay Boulevard nearly 50 years in the future. At that distance in time the discounting process reduces the economic effects substantially, which is why in the final summary the South Bay Boulevard costs are shown as small relative to the recreation benefits, which are estimated to begin in 2034. The reason is that for this analysis, costs and benefits are assumed to occur in the same time period. That is adaptation projects are built to become effective approximately a decade from now and benefits begin immediately for the State Park area but are delayed substantially for South Bay Boulevard. The costs to users of the State Park area will likely be sufficient to justify the investments in adaptation if they can be avoided.

An alternative analysis could delay construction of the South Bay Boulevard section until the 2060s in anticipation of hitting flood stage in 2073. This would allow a more realistic comparison of costs and benefits. But in this case a separate South Bay project cost would be needed, and it is likely that calculation of benefits would have to extend beyond 2100, which is the end of the current planning horizon.

A note should be made about the benefits of a proposed bicycle path, which is included in the planning of all versions of the adaptation project. A bicycle path will undoubtedly increase the benefits from an adaptation project. But it cannot be determined at this time how much that increase will be because it is unknown how many people will use the bike path. There are undoubtedly people who currently travel along South Bay Boulevard by bike, but the road in the vulnerable area has a narrow shoulder and currently is likely used only by experienced cyclists. A bike path, particularly one with some form of protection from the road would be used by a much wider range of cycling skill level and of ages.

5. Adaptation Construction Costs

Table 8 shows the construction expenditure calculations.[1] In the no action alternative, these projects are not undertaken and the funds that would have been allocated to them can be repurposed to generate benefits elsewhere. Three projects are evaluated. All three consist of maintaining a two-lane road and adding a bike path. The differences lie in how the road/path will be protected against sea level rise. The least expensive option would simply raise the road on fill. The second option would add a retaining wall to protect the roadways from flooding. The third would elevate the roadway onto a causeway. This would be the most expensive option owing to the costs of drilling and constructing piles on which the road would be set.

	2 Lane Road + Bike Path on Fill	2 Lane Road + Bike Path on Fill With Retaining Wall	2 Lane Road + Bike Path on Causeway
Expenditure Per Mile	$150,000	$170,000	$225,000
	$10,560,000	$11,616,000	$26,400,000
Total Expenditure for 5.6 Miles	$840,000	$952,000	$1,260,000
	$59,136,000	$65,049,600	$147,840,000
Nominal			
2030	$420,000	$476,000	$630,000
2031	$420,000	$476,000	$630,000
2032	$29,568,000	$32,524,800	$73,920,000
2033	$29,568,000	$32,524,800	$73,920,000
Discounted			
2030	$407,767	$462,136	$611,650
2031	$395,890	$448,676	$593,835
2032	$27,058,909	$29,764,799	$67,647,271
2033	$26,270,785	$28,897,864	$65,676,963
Present Value of Expenditure at 2030	$54,133,351	$59,573,475	$134,529,720

[1] For planning purposes, we have provided order of magnitude (Class 5) estimates to allow cost comparison of alternatives. These cost estimates are intended to provide an approximation of total project costs appropriate for the conceptual level of design. The opinion of probable construction costs for these alternatives are approximately -50% to +100% accurate and include a 50% contingency to account for project uncertainties (such as final design, permitting restrictions and bidding climate). These estimates are subject to refinement and revisions as the design is developed in future stages of the project. Please note that in providing opinions of probable construction costs, ESA has no control over the actual costs at the time of construction. The actual cost of construction may be impacted by the availability of construction equipment and crews and fluctuation of supply prices at the time the work is bid. ESA makes no warranty, expressed or implied, as to the accuracy of such opinions as compared to bids or actual costs.

Table 8 Adaptation Project Expenditure Calculations

For each project, the cost per mile is given and an assumption of 5.6 miles of road will be constructed. For purposes of the analysis, the project is broken into a two-year planning and permitting phase and a two-year construction phase for four total years of direct project expenditures. These periods may be extended, but so long as the extension does not increase the real expenditure significantly there should be no effect on the underlying conclusion about benefits relative to costs.

6. Summary of the No Action Alternative

			2 Lane Road + Bike Path on Fill	2 Lane Road + Bike Path on Fill With Retaining Wall	2 Lane Road + Bike Path on Causeway
Costs	Without Waves	Windy Cove	-$9,316,103	-$9,316,103	-$9,316,103
		Marina	-$54,615,284	-$54,615,284	-$54,615,284
		South Bay Blvd	-$552,686	-$552,686	-$552,686
		Total	-$64,484,073	-$64,484,073	-$64,484,073
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		Marina	-$68,396,334	-$68,396,334	-$68,396,334
		South Bay Blvd	-$2,951,610	-$2,951,610	-$2,951,610
		Total	-$96,393,501	-$96,393,501	-$96,393,501
Benefits			$57,940,242	$63,761,852	$144,023,040
Net Benefits		Tidal inundation (Without Waves)	-$6,543,830	-$722,221	$79,538,967
		Storm inundation (With Waves)	-$38,453,259	-$32,631,649	$47,629,539

Table 9 Costs and Benefits of the No Action Alternative

Table 9 summarizes the costs of taking no action to deal with sea level rise in Morro Bay and the benefits in the form of saved expenditures. It shows that taking no action results in significant net economic losses. Table 9 is the inverse of Table 1. That is, the no action alternative's costs become the benefits of choosing one of the adaptation options and the expenditures not made in the no action alternative and so benefits become the costs in the 'take action' case.

7. Discount Rate Discussion

The analysis shown in Table 1 uses a discount rate of 1%. In general, the expectation is that higher discount rates will be used for project evaluation. The U.S. Office of Management and Budget annually publishes discount rates to be used in evaluating Federal projects. For 2025, the maximum project evaluation period is 30 years, for which a real (unadjusted for inflation) discount rate of 2.3% is to be used.

The use of a 1% discount rate is justified by the long period of evaluation. High discount rates mean that benefits received decades hence are reduced to the point where they make little contribution to the results. However, the choice of discount rates is always a matter of judgment. A useful test is to calculate the internal rate of return, which is the discount rate at which the net present value of benefits exactly equals the present value of costs (the net present value equals zero).

Table 10 shows the estimated internal rates of return (IRR) for the options elevating the road on fill and on retaining wall. The option for elevation on a causeway fails the cost benefit test at any discount rate. The internal rate of return is assessed by comparing it to the discount rate. Dividing the analysis between with and without waves shoes that the highest IRR is for the road on fill including the effects of waves. This is closest to the federal standard and, when adjusted for the additional length of evaluation (out to 2100), it reinforces that this option has the best economic case.

Nonetheless, the discount rate analysis indicates that any of the projects are close between economic and noneconomic. Estimates that can reduce costs or expand benefits would solidify the positive evaluation of the fill and retaining wall options.

	2 Lane Road + Bike Path on Fill	2 Lane Road + Bike Path on Fill With Retaining Wall	2 Lane Road + Bike Path on Causeway
W/O Waves	1.188%	1.020%	
W/ Waves	1.9365%	1.757%	

Table 10 Internal Rates of Return