CHAPTER 7: COASTAL HAZARDS

SHORELINE EROSION

A. Policy Framework

Coastal Act**:** The Coastal Act requires that new development be sited and designed to minimize risk to life and property specifically in areas of high geologic, flood and fire hazard. Under the Coastal Act, development is required to be sited and designed to assure stability and structural integrity and neither create nor contribute significantly to erosion or require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs (Section 30253). Section 30235 of the Act allows the construction of shoreline protective devices where existing development is threatened from erosion and when designed to eliminate or mitigate impacts on shoreline sand supply. Further, the Coastal Act provides that development damaged or destroyed by natural disasters can be rebuilt in the same area, exempt from coastal permits, provided they are not expanded by more than 10% and conform to existing zoning requirements. Certain emergency actions are also exempt from permit review.

In carrying out these Coastal Act policies in permits, appeals and in certifying LCPs, the Commission has used a variety of development controls to implement these Coastal Act policies. These include such things as: ensuring adequate setbacks; limiting seawalls to protect existing *primary* structures at risk rather than ancillary structures; allowing placement of seawalls only where there is no less environmentally damaging alternative to protect the structure; ensuring that seawalls are designed to minimize impacts such as encroachment onto sandy beach, replenishing beach sand trapped behind walls, and restoring sand berms or dunes to provide alternative protection. Recently, based on new information about the increase in the amount of shoreline armoring occurring in California, the Commission has implemented measures to encourage resiting of new structures outside of hazardous areas and to avoid future armoring. In some cases, where an applicant's geologic assessment determines that new development is sited on vacant lands such that it will not need a seawall over the life of the structure, the Commission has required a condition waiving the right to such future armoring.

LCP Policies: To carry out the policies of the Coastal Act regarding shoreline hazards, the certified San Luis Obispo County LCP aims to protect the natural state of beaches and bluffs by imposing strict standards on bluff top and shoreline development.

Blufftop development: LCP Coastal Hazard Policies No. 3 and No. 7 require a detailed review of bluff top development by a Registered Geologist or Certified Engineering Geologist that provides conclusions about geologic stability and recommendations on structural design. Minimum setback distances in the Land Use Ordinances for new and expanding blufftop development (CZLUO Section 23.04.118) are required to ensure the structure will be safe from erosion and wave action without the need for a shoreline protective device for 75 years. A Certified Engineering Geologist determines setback distances based on evaluation of site stability. However, the CZLUO 23.07.082 exempts certain development from the geologic

report requirements, including certain single-family residences unless located in area subject to liquefaction or landslide and additions and alterations except where the site is adjacent to a coastal bluff.

Seawall development: LCP Coastal Hazard Policy No. 1 provides required standards that prohibit construction of new development on the beach, with the exception of coastal dependent uses and public recreation facilities. New development is to be located and designed to minimize risk to life and property and shall be designed so that shoreline protective devices will not be needed for the life of the structure.

Furthermore, LCP Coastal Hazard Policies No. 4 and No. 5 and CZLUO Section 23.05.090 provide specific requirements for seawalls, cliff retaining walls, revetments, breakwaters, groins and other shoreline protective devices. The LCP requires that they be designed by a registered civil engineer and limited to protecting existing development, public recreational areas, coastal dependent industry, and roads that provide access to public beaches and recreation areas where no alternative routes are feasible. Permits for shoreline protective devices may only be approved if: found to eliminate or mitigate impact to local sand supply; not preclude public access; be visually compatible with adjacent structures and natural features; minimize erosion impacts on adjacent properties; not adversely affect fish and wildlife; and if non-structural methods of protection have been proven to be impracticable or infeasible. LCP Policy No. 4 also provides that areas seaward of permitted shoreline protective devices shall be dedicated for public access.

Hazard Designations: In addition to the setback requirements on all development located adjacent to a coastal beach or bluff (23.04.118 discussed above), the certified LCP includes land use combining designations in areas of geologic hazard (GSA-geologic study area) and potential flood hazard (FH- Flood Hazard) to assure that development is sited and designed to minimize risks from coastal hazards. This zoning designation is applied to areas along the coast with coastal bluffs and cliffs greater than 10 feet in vertical relief that are identified in the Coastal Erosion Atlas, prepared by the California State Dept. of Navigation and Ocean Development (1977).

The GSA standards are applied to all land uses for which a permit is required except: (a) single family residences, not exceeding two stories, when not constructed in conjunction with two or more residences by a single contractor or owner on a single parcel or abutting parcels, unless the site is located in an area subject to liquefaction or landslide; and (b) Alternations or additional to any structure, the value of which does not exceed 50% of the assessed value of the structure in any 12 month period, except where the site is adjacent to a coastal bluff. All applications for projects located within the GSA except those exempt are required to submit a geologic and soils report.[1]

Area Plan standards: In the North Coast Area Plan, the Bluff Erosion GSA designation is applied in much of the area. This designation requires that "development is to be located so it can withstand 75 years of bluff erosion without the need for shoreline protective structures that

[1] SLO CZLUO pg. 7-12-13

would substantially alter natural landforms, affect public access or impact sand movement along the beach."[2] Additional standards for coastal setbacks are applied to lands designated Recreation. These standards generally require a 50-ft setback that can be reduced to 25 ft if recommended by a geology report.[3] In San Simeon Acres, the bluff setback is stated as a minimum of 25 feet.[4]

In the Estero Area Plan and San Luis Bay Area Plan, the shoreline is designated GSA for Bluff Erosion and Sensitive Resource Area designation (SRA) for scenic and access concerns. Under this combining designation as well as CZLUO 23.04.118, development is to be located to withstand 75 years of bluff erosion without the need for a shoreline protective device that would substantially alter the landform, affect public access or impact sand movement.[5] In addition, the specific Cayucos Urban Area standards in the Estero Area Plan require a minimum 25-foot setback unless a geologic report required under the GSA designation indicates a larger setback is necessary to withstand 75 years of bluff erosion.

In the San Luis Bay Area Plan the standards note general direction for various areas: improvements are to be designed with severe storms in mind; unnecessary or excessive structures should be avoided on beaches; and geology reports shall be required in areas of high risk and development located consistent with identified geologic concerns.[6]

B. Background

Since certification of the SLO LCP, the Commission has focused increased attention issues related to shoreline armoring. New information about the cumulative impacts of armoring on sand supplies and shoreline recreation was developed in previous ReCAP reviews and by the Commission staff Beach and Erosion Response Task Force. In more recent reviews of development proposals and LCPs, the Commission increased attention on ensuring that new development sited on vacant lands avoids the need for future armoring, and developed stronger mitigation measures where armoring is permitted. Erosion and armoring of the shoreline is an important issue both in SLO county as well as adjacent sites within the same littoral cells. Shoreline erosion has been raised in about 14.6 % of the appeals from permit actions along this stretch of coastline including the County and cities of Pismo Beach and Grover Beach.[7] It is important that the County's LCP reflect the newer information and mitigation measures designed to avoid and minimize the impacts of armoring along the coastline.

Shoreline Characteristics: The San Luis Obispo County coast is approximately 96 miles in length, roughly half of which is sandy beach and half rocky shoreline.[8] Estero Bay and San Luis Obispo Bay mark the otherwise linear NW/SE trending coast. There are two littoral cells along

[2] North Coast Area Plan Revised February 1994, pg.47.
[3] North Coast Area Plan Revised February 1994 , pg. 8-11
[4] North Coast Area Plan Revised February 1994 pg.8-50.
[5] Local Coastal Program Estero Area Plan,11/5/96 pg. 7-4
[6] San Luis Bay Area Plan March 1997 pg. 8-22
[7] Commission Statewide Appeals Database as of November 2000.
[8] California Department of Navigation and Ocean Development, Assessment and Atlas of Shoreline Erosion Along the California Coast, July 1977, pg. 25.

the coast- the Morro Bay cell and the Santa Maria cell (See Map 7-A). There are no significant submarine canyons to define the barriers between theses two cells. These two cells are divided by Morro Bay and a rocky section of coast between Point Buchon and Point San Luis.

The main source of sediment for the Morro Bay Cell is coastal streams such as Arroyo de la Cruz, Santa Rosa Creek and Chorro Creek. The dominant direction of sediment transport is to the south. The main sediment sinks are the dunes immediately south of Piedras Blancas, the Morro Dunes and the harbor at Morro Bay. Over centuries, there have been many millions of cubic yards of sand added to the dune features. No studies were found during this project effort that quantified the modern day accretion of the dunes. However, on average, 120,000 cubic yards of sand are dredged annually from the Morro Bay Channel[9], indicating the approximate volume of material that is being transported.

It is believed if sediment in the Morro Bay Cell is not trapped in the dunes or the Bay, it is transported further south and becomes a source of sediment for the Santa Maria Cell. Approximately 125,000 cubic yards of sediment is deposited onto the Pismo/Nipomo dune system annually. Sources for this sediment include 40,000 cubic yards from streams and the remainder is projected to come from offshore sources.[10] Historically the Santa Maria River was a major source of sediment to the Santa Maria Cell and the Guadalupe Dunes. About 66% of the river drainages have been blocked by dams[11], and the sediment supply from this river has been reduced dramatically from historical levels.

The San Luis Obispo County coast is an open sea coast exposed to waves generated from a combination of both local winds and distant swells. Wave approach ranges from north-northwest to south with waves predominantly approaching from the northwest. Records from offshore wave buoys show 79.5% of wave heights recorded were between 0.76 m (2.5 ft) and 2.74 m (9 feet).[12] In large storms, wave heights reached over 6 meters (20 feet).[13] During El Niño winters, the most damaging waves approached from the west-southwest with wave heights recorded in excess of 6 m (20 feet). When these events are associated with particularly high tides and a large amount of heavy rainfall, it further enhances beach erosion. Along the west coast, large south swells significantly impact south-facing coasts by exposing these otherwise sheltered areas to direct wave attack. The communities of San Simeon, Cayucos and Avila Beach, generally sheltered by promontories from large northerly waves, are completely unprotected from large southerly waves.

The lithology along the county's coast contributes to variations in shoreline and bluff erosion. The coast is primarily composed of sedimentary rock and unconsolidated sediment (47% and

[9] Morro Bay National Estuary Program Management Conference & Staff, Turning the Tide for Morro Bay, Draft Comprehensive Conservation & Management Plan for Morro Bay, August 1999, pg. 30
[10] From John Meisenbach, 1974, Pismo State Beach and Pismo Dunes State Vehicular Recreation Area General Development Plan, California State Department of Parks and Recreation, April 1975
[11] Griggs, Gary and Lauret Savoy, eds. *Living with the California Coast*, Duke University Press, 1985, pg. 21.
[12] McClelland Engineers, Guadalupe Abalone Culture Facility Environmental Impact Report, for San Luis Obispo and Santa Barbara Counties, March 1987 pg. IV-14
[13] Gornitz, V., Beaty, T., and Daniels,R., *A Coastal Hazards Data Base for the U.S. West Coast, Oak Ridge National Laboratory*, Environmental Sciences Division, Publication No. 4590, December 1997.

38% respectively) which are typical of marine terraces and beach, dune, and alluvial deposits.[14] Gross long-term shoreline change analysis for the San Luis Obispo County coast indicates net accretion.[15] However, this conclusion may result from the large, accreting sand dune systems along the county's south coast. Erosion resistant plutonic and volcanic rocks outcrop throughout the region, but are found along less than 8% of the coast.[16] Moreover, erosion along a bluff or cliff is permanent, whereas beach erosion is dynamic. Sandy beaches are subject to erosion during the winter and accretion during the summer. Insufficient summer accretion or excess winter erosion may lead to long-term erosion.

Each of the four planning areas of the county has different shoreline characteristics and different development patterns exposed to shoreline hazards. The portion of the North Coast Area from the county line to Piedras Blancas Point is an extension of the Big Sur coastline and rocky shores, steep cliffs and pocket beaches, with some beaches backed by dunes typify the area. Much of this material has high resistence to erosion. Also, this coastline is only sparsely developed. Highway One is the structure most threatened from bluff erosion in this area. Existing bluff protection exists to protect the road from erosion at post mile 65.7.[17] In recent months, this stretch of Highway has again been threatened by erosion, and the Commission has issued emergency permits to Caltrans to address these concerns (see below for detail).

From Piedras Blancas Point south to Cambria, the shoreline is characterized by coastal terraces and bluffs behind sandy beaches and includes San Simeon State Beach. Development is generally located in San Simeon and Cambria. erosion and bluff erosion from high wave energy during storms occurs in Cambria primarily in the ocean bluff areas of West Lodge Hill and Park Hills. Eighty-six single family residential parcels exist in these areas and roughly 57 to 65 of these parcels are developed with residences. Roughly half of these (between 28 and 32) have some form of bluff protection, typically a seawall or rock revetment.

In the Estero Bay Area, Cayucos has bluffs fronting beaches and is an area where development is threatened by erosion. The waterfront area of Cayucos is built upon unconsolidated sediment of an ancient stream valley and is thus particularly vulnerable to shoreline erosion.[18] In summer, Cayucos has a wide sandy beach. During winter, the beach becomes narrow and direct wave action at the back of the bluff areas increases. Along Paso Robles Beach and Morro Strand State Beach, houses are threatened with erosion and significant amounts of riprap and shoreline protective devices have been placed.[19] Cayucos is subject to rapid bluff retreat. Over 20 feet of bluff was lost in some spots during storms in 1983 and homes which had been 30 to 40 feet from the previous bluff edge were threatened.[20]

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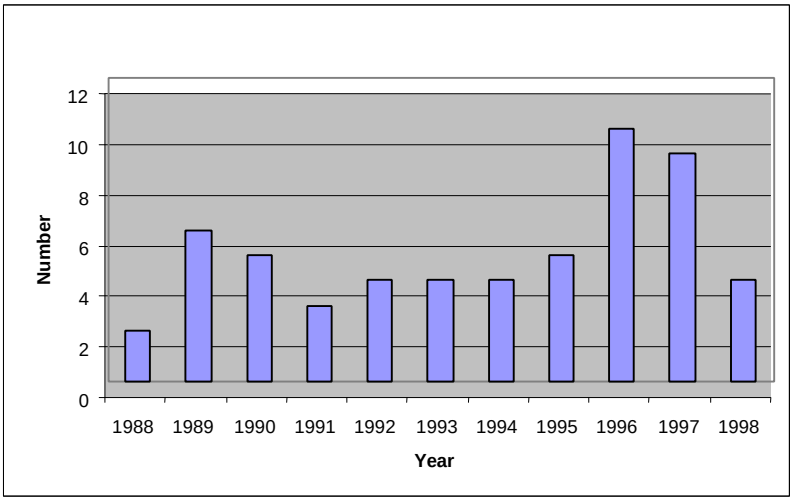
[14] Gornitz, Beaty, and Daniels, 1997
[15] Gornitz, Beaty, and Daniels, 1997
[16] Gornitz, Beaty, and Daniels, 1997
[17] CCC, Staff Recommendation North Coast Area Plan Update LCPA No. 1-97, January 12-16,1998, pg.172
[18] Parsons, Jef, "The Outer Coast: Point Pinos to Point Buchon" in *Living with the California Coast*, Gary Griggs and Lauren Savoy, eds.Duke University Press, 1985 pgs. 227-228.
[19] Parsons Pp. 224
[20] Parsons, p. 227

South of Cayucos, sand blown landward by the prevailing northwest winter winds and persistent onshore summer winds produce the smaller Morro/Los Osos dune system along the Estero Bay coastline. The second longest stretch of beach fronts the Morro Dunes extending from Cayucos southward 7.8 miles to Morro Rock. The harbor entrance interrupts the southward continuation of this beach which stretches another 7.6 km (4.6 miles) south to Montana de Oro and includes the sand spit enclosing Morro Bay and the beach fronting the Los Osos dunes. The existing power plant and harbor breakwater alter the littoral drift. South of Morro Bay, the shoreline includes Montana De Oro State Park and industrial property downcoast of Point Buchon.

In the San Luis Bay area and the South County area, the longest stretch of beach in the county fronts the Nipomo/Guadalupe Dune complex. It extends from Pismo Beach south 18.6 miles beyond the county boundary near the Santa Maria River mouth. The shoreline includes not only county area but lands within the jurisdiction of the cities of Pismo Beach and Grover Beach. From Point San Luis to the Santa Barbara County line the shoreline consists of marine terraces above beaches, long sandy shoreline and stretches of beaches backed by extensive sand dunes. Development occurs along the shores of San Luis Bay. From Fossil Point through Pismo Beach, seacliffs are subject to erosion and areas of shoreline protective devices protect development along the blufftops. The shoreline south of the city of Pismo Beach has limited development.[21]

Development Summary: Since certification in 1988, Commission records indicate that the County and the Commission have authorized 56 new or expanded shoreline protective devices as indicated in Figure 7-1 and Maps 7-B and 7-C. The County authorized 50 (89%) and the Commission authorized 6 (12%).

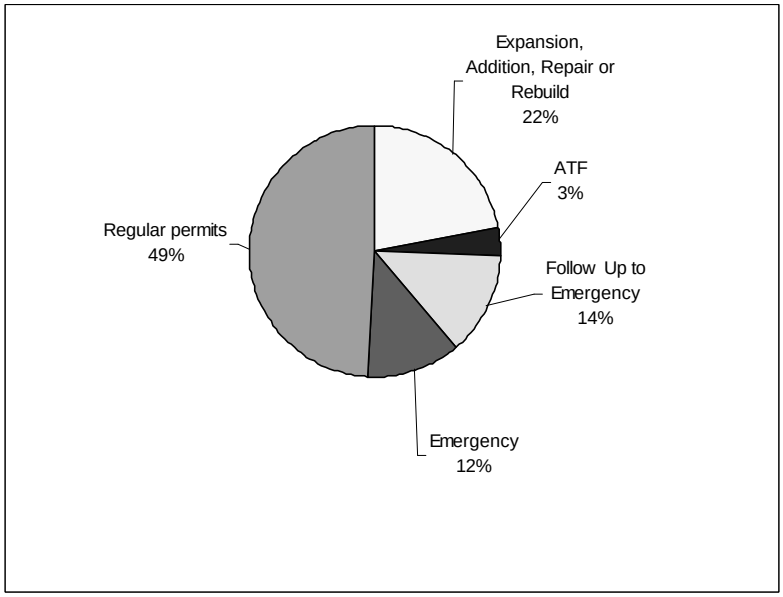
Figure 7-1 Number of SPDs authorized by CCC & County 1988-1998



[21] A. Orme, K. Mulligan, and V. Tchakerian , "Morro Bay to Gaviota" in *Living with the California Coast*, Gary Griggs and Lauret Savoy, eds.Duke University Press, 1985 pp. 231-240.

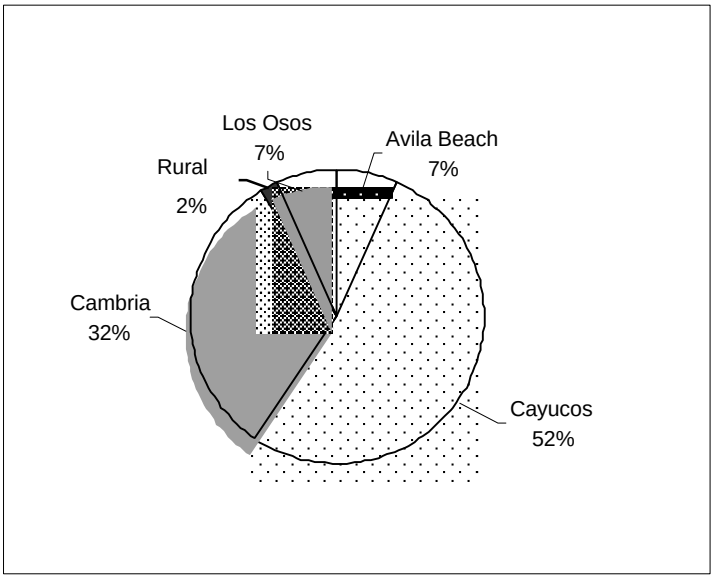
As Figure 7-2 shows, of these 56, most were new structures but approximately 22% were for repair and or expansion of existing structures. Emergency permits or permits following an emergency accounted for 26% of the authorizations.

Figure 7-2: Type of Permits, 1988-1998



The majority of armoring authorized since LCP certification (84%) has taken place in Cayucos and Cambria, as shown in Figure 7-3.

Figure 7-3: Location of Authorized SPDs 1988-1998



In addition to the shoreline armoring authorized, the large percentage of expansion and repairs to existing armoring indicates that significant shoreline armoring was put in place prior to certification of the LCP. From review of project information and background studies on the Cayucos area, it appears a substantial amount of armoring resulted from emergency actions following large storms in 1983. [22]

These 56 authorizations addressed armoring for only about 1700 to 2,700 feet of shoreline or less than 1/2 of a mile. Review of these actions indicate that riprap revetment is the most frequent type of shoreline armoring. Based on staff estimates for an average sized revetment, Commission staff estimates that since 1988 shoreline armoring has covered less than 1 acre of shoreline. [23] This is shoreline that is lost to recreational use and material lost to the littoral system. But when combined with the armoring that existed prior to LCP certification or placed without permits in emergency actions, a significant amount of shoreline in the developed areas of the county is affected by armoring.

C. Preliminary LCP Implementation Issues

C.1 Implementing Setback Standards.

Overview: The LCP standards authorized the stability and structural integrity of new development primarily through the use of setbacks. CZLUO 23.04.118 requires a setback for new development or expansion of existing uses proposed to be located adjacent to a beach or coastal bluff. The setback is to be determined by one of two methods, whichever yields the greater setback. These methods are: either 1) using a stringline between adjacent structures in situations where more than half the lots within a 300 foot area are developed, or 2) using a bluff retreat measure based on geologic engineering evaluation which sets development back sufficient to withstand erosion for a period of 75 years without construction of a shoreline protective device.

LCP implementation

Structures in Setbacks: Setbacks are the principle mechanism in the LCP to attempt to avoid or minimize future shoreline armoring. Since certification of the LCP, the County has approved about 46 new structures along the immediate shoreline in the North Coast and Estero and San Luis Bay areas. In addition, there are about 22 vacant oceanfronting lots where setback standards would apply if developed in the future.

It appears the County has generally tried to assure that new development is sited to provide at least a 25-foot setback, based on geologic evaluations. For example, of 26 new shorefronting residential projects authorized in Cambria and Cayucos, development was either setback or

[22] Parsons, pg.227-228
[23] Length estimated both from FLANs where available and from GIS. Width extending onto shore estimated from average dimensions of armoring noted in FLANs.

conditioned to be setback in 19 of the cases (73%)[24]. Most also contained conditions to require drainage plans to minimize bluff erosion and requirements to blend the structures to minimize visual impacts.

As discussed below, while setbacks called for in the LCP were generally required, some of the implementing actions do not assure that future armoring will be avoided or minimized. In conjunction with expansions and remodels of existing structures and some new development, some accessory structures including stairs, architectural features of the primary structures such as bay windows and eaves, and at-grade decks were approved within the setback area. In some cases variances to setback requirements were granted, and the setback standards themselves may not be adequate to assure that no future shoreline protection devices is needed for new development.

The LCP standards allow shoreline protective devices to protect some accessory structures, not just the primary structure. CZLUO 23.05.090 provides that SPDs are allowed to protect "existing coastal development". CZ 23.04.118(c) allows fences, steps (but not decks or other solid structures) and roof and building projections up to 30 inches to encroach into the setback area. When combined with CZLUO 23.05.090 outlining when shoreline protective devices are allowed, the LCP could allow construction of armoring to protect these accessory structures in the future.

Review of County authorizations for new shore and bluff development found several cases where ancillary structures were permitted to encroach on the setback area. While the County conditioned some permits to assure that the ancillary structures excluded solid structures, it did permit at-grade decks, steps, and architectural features of the principal structure within setback areas. It also granted limited exceptions for existing nonconforming structures within setback areas.[25] It does not appear that the County has yet authorized new shoreline structures to protect such encroachments and in a few cases denied shoreline protective devices to protect ancillary facilities or required removal as a permit condition.[26] But in a few cases, it has permitted expansions and repair and maintenance of *existing* shoreline protective devices where structures such as decks are located within the setback area.[27]

Allowing encroachment of ancillary structures within setback areas may increase the possibility of future shoreline armoring unless LCP standards governing allowable bluff and shoreline protection specifically preclude armoring to protect these structures. If ancillary structures are allowed to be placed within setback areas, it can establish a pattern of siting the primary structure as close as possible to the setback line, thus discouraging more landward siting. Such patterns can increase exposure of structures to hazards and possibly result in additional demand for shoreline armoring, especially if the encroachments are architectural features of the primary

[24] In Cayucos setbacks were 25 feet; in Cambria setbacks were for 20 feet to 50 feet, depending on location.
[25] See for example 3-SLO-96-029; 3-SLO-94-062; 3-SLO-96-022 and 3-SLO-96-132, 3-SLO-94-060.
[26] 3-SLO-95-155(Fairfield); 3-SLO-96-109 (Goodin); 5-SLO-89-98 (Cavalle)
[27] 3-SLO-029(Allen/Clark) 3-SLO-93-149.

structure. The Commission has found in other areas of the coast that some requests for armoring are based in part on the desire to protect these ancillary structures from erosion. [28]

A further concern about the encroachment of ancillary structures into the setback areas is that these structures could alter the overall stability of the bluff. Ancillary structures can involve site grading, irrigation, landform alteration and surface disturbance. These activities can modify erosion patterns and slope stability and accelerate the timeframe in which the primary structure will be at risk.

In order to ensure that armoring is avoided in the future, all accessory structures (e.g. decks, patios, gazebos, etc.), should be limited within setback areas and should not be considered structures for the purposes of allowing shoreline protection. Without further clarification in the CZLUO standards that shoreline protective devices will not be permitted to protect existing ancillary development, the implementation of the current LCP does not assure stability and structural integrity without the need for protective devices as required by Section 30235 and 30253 of the Coastal Act.

Alternatives exist to address accessory structures. If allowed, in addition to prohibiting solid or structural uses, the County could require that all future accessory structures be constructed in such a manner so that, once threatened, the structure is required to be relocated or removed. For existing accessory structures within the setback area, the county should consider whether the structure represents a substantial economic investment and whether relocation or removal of accessory structures is feasible and less environmentally damaging than constructing a shoreline protective device.

Variances to Setbacks: Another issue related to avoiding future shoreline armoring is the issuance of variances. The LCP CZLUO Section 23.01.045(d) requires that variance can be granted if certain findings are made:

> 1. *The variance authorized does not constitute a grant of special privileges inconsistent with the limitations upon other properties in the vicinity and land use category in which such property is situated; and*
> *2. There are special circumstances applicable to the property, related only to size, shape, topography, location, or surroundings, and because of these circumstances, the strict application of this title [the Coastal Zone Land Use Ordinance] would deprive the property of privileges enjoyed by other property in the vicinity that is in the same land use category; and*
> *3. The variance does not authorize a use that is not otherwise authorized in the land use category; and*
> *4. The variance is consistent with the provisions of the Local Coastal Program; and*
> *5. The granting of such application does not, under the circumstances and conditions applied in the particular case, adversely affect public health or safety, is not*

[28] California Coastal Commission, Procedural Guidance Manual: Beach Erosion and Response, December 1999, pg. 102.

> *materially detrimental to the public welfare, nor injurious to nearby property or improvements.*

The County granted variances to the required blufftop setback in 4 cases of new development of residential structure in the Cayucos. While this is not a large number, it is roughly one-third (28.6%) of all new shorefront approvals or reconstructions in Cayucos [29]. The Commission overturned one of these actions on appeal (A-3-SLO-98-074 (King)). In its action, the Commission required a 25-foot minimum setback and prohibited construction of a future seawall unless the proposed project was part of an area wide solution to bluff erosion. In its action the Commission found that the variance was not consistent with the LCP and also noted that the County did not consider alternatives that could include a smaller house design and building footprint that could be sited outside the bluff setback.

In the four variances reviewed, the County record did not appear to document consideration of alternatives of reducing the allowable structural area or footprint of the structure in order to site it more landward and outside of the required setback. In some cases the structures approached the maximum square footage allowable under the zoning. Variances authorized resulted in the maximum allowable sized structures located within areas subject to high erosion hazard. This may provide a strong economic incentive for a future shoreline protective device. Also, examination of the variances indicates that some considered issues of private (not public) ocean views or existence of remnants of old prior revetments on the site in granting the variance.

Unless adequate setbacks are maintained, more property will be at risk from shoreline hazards and more and expanded shoreline armoring is likely to result. This in turn will result in greater impacts to recreational shoreline areas and scenic and visual resources along the shoreline. It is important that variances not be granted unless there are no feasible resiting or redesign alternatives that would maintain the setbacks. The actions of the County to allow variances from required setbacks without considering all feasible alternatives does not minimize risk as required by the Coastal Act. It also does not assure that development will be located in manner that avoids future construction of protective devices as required by Section 30253 of the Coastal Act.

Adequacy of Setback Standards: The LCP policies generally result in a setback of 25 feet from the edge of the bluff in areas such as Cayucos. However, while the county has in most cases required this setback as noted previously, the setback standard itself and the method for determining the setback may need to be strengthened in order to assure that development not require future armoring.

Bluff setbacks in SLO County, based on the certified LCP, have generally reflected a projected erosion rate of 2 to 3 inches per year and an economic life of a structure of 75 years. However, some geologic evaluations note erosion rates at 6 to 9 inches per year in some areas of Cayucos[30]. As the Commission found in findings on the North Coast Area Plan Update, at an

[29] Setbacks unknown for two of the 14 actions.
[30] Parsons, pg. 224-225

average erosion rate of 2 to 3 inches/year that is estimated to occur in Cambria, a 75-year economic life of structure would result in erosion of 12.5 to 18.75 feet. At 100 years, erosion of about 17 to 25 feet is expected to occur. [31] A 6-inch/year erosion rate would necessitate a setback of 37.5 feet to protect the structure for 75 years and 50 feet to protect the structure for 100 years. Setbacks based on average annual rates also do not take into account the episodic nature of erosion. The Commission also has experience with varying setback determinations on the same properties, illustrating the inherent uncertainty in geologic setback analyses. This scientific uncertainty further underscores the need to require setbacks that will be adequate over the long run.

Also, setback standards often do not fully convey the use of a setback. The construction of ancillary structures in the setback can compound this misunderstanding. A setback on an eroding coastal bluff is an estimate of the amount of land that can be lost over time and not jeopardize the stability of development on the site. Unlike inland property, this is not a "backyard" that will always be there; it is a temporary buffer between development and the erosive forces of the ocean. Since erosion can be both episodic and chronic, sudden and unexpected bluff retreat should be expected within the setback area.

Consistency Analysis: Since certification of the LCP the Commission has continued to develop new information on the management of coastal shoreline hazards and the effects of shoreline armoring. The determination of "adequate" setback distances, relying greatly upon historic erosion information, has not always resulted in siting of new development to avoid future armoring. Several geologic evaluations in support of county authorizations noted significant bluff failures in the Cayucos area in 1986 and 1992 and 1994. One report noted that the Studio Drive bluffs eroded 20 feet from 1982-1987 due to the 1983-1984 storm season[32]. The 1986 storm year saw significant erosion and as a result much emergency armoring was placed. Ongoing gradual erosion as well as greater erosion during storm events would argue for setbacks greater than the 25 feet minimum established in the LCP.

Reviews of County authorizations also show the inadequacy of a 25-ft. setback in avoiding future armoring. For example, staff reviewed cases where the geologic evaluation in support of a proposed engineered shoreline protective device indicated that the structure was needed to protect an existing residence located 20 feet from the bluff. In another case such shoreline protective device was to protect a residence 25 feet from the bluff. [33] While the County has generally been consistent in implementing its LCP setback policies, it appears the standards may need to be improved in order to assure stability and structural integrity consistent with the Coastal Act Section 30253.

The County LCP Policy # 1 mirrors the Coastal Act policy objectives, stating that "Along the shoreline new development (with the exception of coastal dependent uses or public recreation facilities) shall be designed so that shoreline protective devices (such as seawalls, cliff retaining

[31] CCC Revised Findings , LCP Amendment 1-97, January,1998. Page 178.
[32] See 4-SLO-91-049 (Rogers)
[33] For example, see 3-SLO-97-052 (Wheat); 3-SLO-96-086.

walls, revetments, breakwaters, groins) that would substantially alter landforms or natural shoreline processes, will not be needed for the life of the structure". The Coastal Act section 30253(2) says new development may not "in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs." Shoreline protective devices can and do substantially alter natural landforms by greatly reducing erosion of the bluffs behind the device and accelerating erosion of the beach seaward of the device and of the bluffs on either side of the device. In addition, construction of shoreline protective devices can involve substantial grading of the bluff.

In order to achieve the Coastal Act and LCP policy objectives and avoid future armoring standards should ensure that new development would not need a shoreline protective device for the duration of its economic life. While the Coastal Act does not define the economic lifetime of a structure, prior studies by the Commission[34] have shown that structures will generally remain in good condition with regular repair and maintenance for at least 75 years after construction. And, even when a full 75-year setback is used as the county has done in implementing its LCP, the value of coastal land and the lack of alternative coastal locations makes it unlikely that structures along the coast will be retired after 75 years or the completion of their theoretical economic life. The 75-year economic life may not reflect the actual lifetime of a structure or the length of time a coastal site will be occupied. All along the coast the Commission has reviewed major residential renovation projects on existing structures which have the effect of extending the economic life of the structure. When structures are setback using a 75-year economic life, they can be expected to "outlive" their setbacks and eventually require armoring for long-term protection from erosion.

If new development continues to be permitted in high hazard areas, setbacks should be sufficient enough to allow for natural processes to continue without the adverse impacts that would be associated with the introduction of hard protective devices. If an economic lifetime of 75 years is resulting in additional shoreline armoring, as it appears is happening in some areas of San Luis Obispo County, standards for setbacks should be increased. By instituting a setback based upon a greater economic lifetime and greater episodic erosion events, shoreline armoring will be unnecessary with the removal of these structures at the end of their economic lives. If erosion in San Luis Obispo County averages 3 inches/ year to 6 inches/year over 100 years this would result in 25- 50 feet of shoreline eroded. If potential large erosion events were taken into account a setback much larger than 25 feet would be needed to avoid future armoring. Further, these erosion rates do not reflect consideration of the impacts of an accelerated rate of sea level rise that would warrant inclusion of the additional safety factor into the determination of any setback.

The existing LCP as well as proposed updated Estero Area Plan continues the determination of setbacks based on a 75-year economic life of structures or 25 feet minimum. Review of the permits authorized indicates that almost all proposals and conditions placed on development adhere to the minimum setback. As discussed, this may not avoid future shoreline armoring consistent with the Coastal Act. The siting of new development to avoid exposure to hazards is

[34] CCC Beach Erosion and Response and CCC, ReCAP, Monterey Bay Region Monterey.

critical. Once built, pressures may emerge to protect these structures even though they were constructed after the Coastal Act prohibition on new development requiring shoreline protection was in place. This is particularly true where geologic studies underestimated the geological risk when the structure was first approved. Therefore, in order to reduce construction of shoreline protective devices new development must be sited so that it will not be subject to future hazards from erosion. The use of greater setbacks, an increase in the estimated economic life of a structure and consideration of reduced standards for maximum structural area and lot coverage to allow more flexibility is siting development combine to help avoid the need for future armoring.

Preliminary Policy Alternatives :
There are a variety of measures that the County could incorporate into its LCP to avoid or minimize future armoring:

Preliminary Recommendation 7.1: Modify CZLUO 23.05.090(a) to define more specifically what existing structures are for purpose of allowing future armoring. For example, as follows: "*existing coastal development" for purposes of this section shall consist only of the principle structure and shall not include accessory or ancillary structures such as garages, decks, steps, eaves, landscaping, etc. No shoreline protection device shall* be *allowed for the sole purpose of protecting the accessory structure(s).*

Preliminary Recommendation 7.2: Revise Coastal Policy 6 to change setbacks to require that they be based on a projected 100-year economic life.

Preliminary Recommendation 7.3: Revise CZLUO 23.04.118 : Eliminate the stringline method for determining setbacks, section (a). Modify section (b) to base setback on a projected 100 year economic life of structure. Add requirement for determining a safety factor either as a multiplier or as a set distance. For example, if the rate of erosion is determined to be 3 inches per year, the economic life of the structure is 100 years, and the safety factor is 1.2, then the minimum setback is 30 feet (3 in. x 100 yrs. = 300 in., 300 in. = 25 feet, 25 feet x 1.2 = 30 feet). If the safety factor were a set distance of, say, 10 feet, and the rate of erosion and economic life of the structure were the same as in the preceding example, then the setback would be 35 feet. The safety factor should be based on shoreline change data and the size or magnitude of extreme erosion events. This setback distance establishes the likely future landward retreat of the shoreline and established the future shoreline condition that should be the basis for the new structure.

Preliminary Recommendation 7.4: Modify section (c) to eliminate part (3) and to provide: "The minimum setback requirements of this section do not apply to the following *provided the structures are designed to be removed or relocated in the event of threat from erosion.*

Preliminary Recommendation 7.5: Reexamine regional average annual erosion rates. Recent studies of the area for individual shoreline protection have shown that the estimate that the shoreline will retreat only 25 feet during the next 75 years is often low. The minimum

setback distances use this value for siting new development and the minimum distance should be revised to better reflect current shoreline changes.

C. 2. Avoiding or Mitigating the Cumulative Effects of Seawall Development in Existing Developed Areas.

Overview: The shoreline in the urbanized areas of Cayucos and Cambria is already affected by the presence of shoreline structures. The implementation of the LCP should maximize protection of the remaining unarmored sections of shoreline and address resiting structures outside of hazard areas upon redevelopment.

Since certification, the major issue raised in post certification actions related to shoreline hazards has been shoreline and bluff erosion in the urbanized areas of Cayucos and Cambria. Both of these areas have significant shoreline development and the urbanized shoreline of Cayucos has a large number of lots armored with shoreline protective devices. But there are few remaining vacant parcels in Cayucos. Many of the structures are older and redevelopment and reconstruction is likely to continue to occur. Of the shoreline residential structures authorized since certification in the Cayucos area at least 25 % were expansions and renovations. Although some of the armoring in these developed areas occurred prior to the Coastal Act, much of the development has occurred during heavy storm years, particularly 1982-1983 El Nino year, prior to certification of the LCP. As indicated previously, of the actions by the county and the commission authorizing shoreline protective devices, Cayucos and Cambria accounted for more than 80% of all armoring authorized.

LCP Implementation: LCP Policy 1 and the CZLUO allow shoreline protective devices only to protect existing development. Review of County authorizations noted a few cases where shoreline protective devices were authorized to protect new development being proposed on vacant infill lands. In these cases the County interpreted the LCP as allowing such armoring or permitted a variance. Review of County actions indicates that in some cases the armoring was allowed in order to provide the residence with siting and private views comparable to neighboring properties. And, some armoring was determined to be infill between existing revetments and infill armoring was permitted to minimize erosion from existing seawall. In other cases the county found that small old remnant revetments allowed replacement and expansion of a shoreline protective device accompanying development on a vacant parcel.[35]

> Infill development as applied in past Commission permit actions referred generally to one or two lots, vacant or made vacant through demolition, between existing developed lots and served with existing infrastructure.

[35] A-3-SLO-98-074 (King).

Consistency Analysis: As the Commission found in the King Appeal where a revetment was denied as part of construction of a new residence, the LCP Hazards Policy 1 and CZLUO 25.05.090 and Coastal Act allow shoreline protective devices only to protect existing development, not new development on vacant lots. Also, the Commission noted that some of the existing armoring based upon infill determinations, roughly in excess of 20 seawalls, was illegally constructed in response to large storms in 1983. While subsequent permits were received for some walls, enforcement actions remained outstanding on many.

Many of the area's vacant parcels within urban areas consist of infill development.[36] Without standards to site new development as far landward as possible and standards to assure continual setback on vacant or redeveloped sites, areas of existing development will eventually be built-out based on site development as near to the shoreline as possible. Under this scenario, infill projects allowed in high hazard areas based upon historical land use decisions will eventually require the same level of shoreline armoring as their neighbors.

The County's proposed Estero Area Plan Update suggests changes to the LCP to allow construction of new development and shoreline protective devices on vacant or developed lots in infill situations- that is, where seawalls exist on both sides of the proposed development. Given the pattern of existing vacant lots and the potential for redevelopment of older homes, implementation of such an infill policy would result in the remainder of the Cayucos shoreline and a portion of the Cambria shoreline being armored. The implementation of this policy would also be complicated by the fact that many shoreline protective devices may have been installed or expanded in emergency conditions and/or without proper permits, albeit some time ago. Given the history of shoreline structure development in Cayucos, and the need to plan for redevelopment in this area, a program should be developed to comprehensive assess existing seawalls and determine the appropriate planning standards for this area over the long run. For example, in the King action, the Commission discussed the possibility of allowing a future seawall, if accomplished within a comprehensive planning and redevelopment context that accounted for shoreline structures and resource impacts in the surrounding vicinity.

The actions by the County to allow construction of shoreline protective devices in conjunction with new development on vacant lots, even in infill situations, is not consistent with the policies of the Coastal Act to avoid or minimize shoreline protective devices. However, since most of the shoreline area in Cayucos and Cambria are already development and only scattered vacant lots remain, minimizing future armoring must be accomplished primarily through resiting of development as older structures redevelop.

Redevelopment of Existing Developed Shoreline Areas

As noted in the previous discussion, structures along the shorefront are likely to continue to undergo reconstruction and renovation which extends the economic life of the structure. The LCP standards CZLUO 23.07.082 provides that alterations and additions are not exempt from

[36] Infill development as applied in past Commission permit actions referred generally to one or two lots, vacant or made vacant through demolition, between existing developed lots and served with existing infrastructure.

GSA combining district standards on blufftop sites. Therefore, under the certified LCP, demolition and reconstruction of structures along the bluffs and shoreline would require a coastal permit and could be reviewed for alternatives to avoid the construction or continued maintenance of shoreline armoring.

Section 30253 of the Coastal Act includes provisions to minimize risks and to assure that new development not require construction of protective devices that would substantially alter natural landforms along bluffs or cliffs. Section 30235 allows shoreline armoring when required to protect existing development and when designed to eliminate or mitigate adverse impacts. The determination of whether armoring is required to protect existing development is usually a case by case determination. With a few exceptions, as long as structures are located in areas subject to wave hazard or bluff erosion, under Section 30235, past permit actions in the project area show that there is a likelihood they will eventually be armored.

In areas such as Cayucos that are substantially built out, the greatest opportunity to avoid or minimize additional armoring is in cases where such major demolition and redevelopment is likely to occur. However, the Commission recognizes that even with a comprehensive policy to enforce greater setbacks on redevelopment, planned retreat is not assured, since property owners could choose to renovate structures in place instead of demolishing them, thus avoiding more inland resiting.

However, as properties are developed or redeveloped on a lot by lot basis, it is likely that more requests for variances to setback and shoreline protective device standards will occur. In review of county actions, staff found comments from owners of older Cayucos houses in support of variance requests which noted the desire when they rebuild to also "move forward" to maximize the potential of the lot.[37] In order to avoid armoring of the shoreline or reclaim shoreline area as properties recycle in existing developed areas, it may be necessary to address the problems on an area-wide basis for equity concerns and to achieve resiting of structures outside of hazardous areas.

A comprehensive area wide approach to minimizing shoreline armoring could be based on identifying shoreline areas with similar geologic conditions; orientation to wave energy and erosion potential. An area wide solution could incorporate a package of measures that would apply to all properties. These could include: revised setback requirements, revised site coverage maximums to facilitate resiting and resizing upon redevelopment, along with removal of existing armoring; reduction of building footprints while maintaining height restrictions to protect visual resources; mitigation programs to minimize erosion from inland drainage; mitigation programs to pay for beach nourishment where appropriate, consideration of access and recreation needs and even possible acquisition of areas subject to high hazards. Such an approach implemented through the LCP Area Plans could not only provide greater equity to all properties within the area but could minimize the potential for variances and continued armoring based on infill.

[37] 3-SLO-97-129

In its action on the LCPA 1-97 on the North Coast Area Plan Update, as well as in permit and appeal actions, the Commission has continued to recommend developed of such area-specific solutions in order to carry out Coastal Act policies. Unless a comprehensive approach is taken to management of the shoreline in Cayucos, as well as other high erosion hazard areas along the county's coastline, the shoreline in the urbanized areas as well as in places along scenic Highway 1 will likely be fully armored. Such actions cumulatively will result in substantial impacts to shoreline resources and public access in consistent with the goals of the Coastal Act.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.6: Add new Policy standards Prohibit new subdivisions or lot splits or lot legalization that create new lots in high wave hazard areas.

Preliminary Recommendation 7.7: Strengthen Measures to ensure no future armoring Modify standards for new development on vacant lots or for demolition and rebuilding of structures subject to beach or cliff erosion, inundation, wave uprush, etc. in areas subject to hazards. The modified standards should require as a condition of new development that the applicant assumes the risk of building in the hazardous areas without assurances that future armoring will be allowed. This could be implemented by modifying and expanding the GSA combining designation to identify specific areas where no future shoreline armoring will be permitted.

Preliminary Recommendation 7.8: Adopt as a program in the LCP: Implement an area wide shoreline erosion and bluff retreat management plan for Cayucos and Cambria

As part of this plan, specific sections of these coastline areas should be assessed based on factors including, but not be limited to, geology, wave conditions, and sand budget. The management plans should include, but not be limited to:

- Standard engineering plans defining the specific types of armoring which would be acceptable for specific areas, and where appropriate, identification of the types of armoring that should never be considered for certain areas.

- Standard alternatives feasibility analysis worksheet that would be a required element of all hazard response projects and that would require applicants to go through a series of steps to assure that hard protective devices were only created as a last resort. The analysis may require, but not be limited to, the use of technical evaluations of the site (geotechnical reports, engineering geology reports, etc.), an examination of all other options (removal, relocation, “do nothing”, sand replenishment, etc.), and a conclusion that a shoreline protective device would be the “best option” (most protective of the public trust, best long term solution, etc.) for the subject site.

- Standard conditions and monitoring requirements that may include discussion of mechanisms to ensure shoreline protection effectiveness and public safety with

provisions for the removal of ineffective or hazardous protective structures as well as programs to address beach replenishment and sand supply.

C.3. Mitigation of Access Impacts from Shoreline Armoring

Overview: The shoreline of the project area is a source of public access and recreational opportunities for residents of and visitors to one of the state's most scenic areas. As noted elsewhere in this report, it is also a source of significant revenues from tourism to the local economy. The development of shoreline protective devices can result in loss of public access by directly affecting public tidelands. The mitigation for development of shoreline protective devices, if not implemented, can also result in a loss of public access.

The LCP Hazard policy 4, implemented as a standard ensures protection of public access. It requires, in part, that where a shoreline protective device is necessary, siting shall not preclude public access to and along the shore and shall be sited to minimize visual impacts, erosive impacts on adjacent unprotected property, encroachment onto the beach and to provide public overlooks where feasible and safe. The area seaward of the protective devices shall be dedicated for lateral public access. The CZLUO 23.04.420 requires that access be provided in new development between the first public road and the sea.

LCP Implementation: Where shoreline protective devices have been authorized the County has generally been consistent in mitigating access impacts by requiring dedications of lateral access easements (OTDs). Of the 56 approvals of shoreline protective devices in the project area, 15 cases reviewed had requirements for access mitigation, all for lateral access.

However in many cases, shoreline protective devices were authorized to protect private property but appeared to be located on state lands, including state park lands.[38] In a few cases, the County required a redesign to place armoring on private property but since no determination of public ownership was made in these cases, it is likely many of the walls encroached on public lands and many of the OTDs may have been recorded on public lands. While the County has been consistent in carrying out the mitigation required in the LCP, if such OTDs are located on what is already public land, it may not fully mitigate the impacts from placement of revetments that occupy shoreline area that would otherwise be available for public recreation. The Commission recognizes that documenting public ownership of lands can be time consuming for individual lots. Consideration of the location of public shoreline lands is another aspect that could be considered in an area wide plan for managing shoreline development suggested in recommendation 7-8. To assure mitigation is carried out, the County should accept any remaining shoreline easements not yet accepted, to assure that mitigation is fully realized and not lost.

[38] For example, 9-SLO-88-101; 3-SLO-052 (Wheat); 3-SLO-94-042 (Peltzer/Pace); 5-SLO-89-098.

Another challenge facing the county is to assure that once accepted, the easement areas dedicated as mitigation remain free of future encroachments including expansions of shoreline protective devices. According to reports of the staff of the statewide Access program, instances have been found where shoreline protective devices have encroached into existing easement areas, especially as a result of emergency actions. [39] Such encroachments would result in additional loss of shoreline recreation area and would be inconsistent with the policies of the Coastal Act that public access be maximized and that development not interfere with the public right of access.

The LCP CZLUO 23.04.420 provides for CCC review of recorded documents. However, those documents are frequently just legal descriptions and do not contain accurate maps of the easement location on the property. Monitoring of the location of easements in order to assure the proposed development will not be sited in an area reserved for public access will prevent loss of access mitigation. While the LCP requires filing of the location of access easements in conjunction with Plot Plans, it does not require it in conjunction with Minor Use Permits. The shoreline protective devices reviewed were almost all processed as Minor Use Permits.

Also, while the County required lateral access easements, in at least two cases language of the conditions required the easement "if applicable to the site". Such conditions do not assure that mitigation will be implemented and as such the access policies of the LCP are not being carried out consistent with the Coastal Act.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.9: Modify CZLUO 23.04.420 (g) to ensure that the easements are protected against further encroachment by requiring that the easements be mapped in detail in conjunction with recordation.

Preliminary Recommendation 7.10: Modify CZLUO 23.02.033 ((a)(8) Public Access Locations. Applications for projects between the ocean and the nearest public road shall include the locations of nearest public access points to the project *and the mapped locations of any existing public access easements or recorded offers to dedicate public access easements.*

Preliminary Recommendation 7.11: Revise condition language for requiring access easements to clarify that phrases such as "if applicable" should not be part of access requirements.

C.4. Emergency Armoring of the Shoreline

Overview: Shoreline protective devices can be engineered and designed to be the minimum necessary to address hazards, to be visually unobtrusive as possible and to be located as far landward as possible to minimize access impacts. Yet, if shoreline protective devices are placed

[39] (Locklin,L. CCC Public Access Program Manager, pers. communication).

during emergency conditions, the County often lacks the opportunity to consider alternative design and siting criteria.

LCP Implementation: The LCP and Section 30624 of the Coastal Act allow an emergency permit to be issued when immediate action is required to prevent or mitigate loss or damage to life, health, property or essential public services. Certainly, rapid response is of particular importance in an emergency situation. However, because the regular permitting process is bypassed, an emergency structure can be constructed with minimal engineering review and often no review for alternatives or mitigation of impacts on coastal resources. Under current County provisions, CZLUO 23.03.045(b)(6) applicants for emergency authorizations are notified and agree with the requirement that a regular permit application be submitted within 30 days of the issuance of the emergency permit to retain the structure.

As the Commission found in previous Commission evaluation of shoreline armoring:[40]

> *significant cumulative impacts to shoreline beach resources have occurred as a result of the application of the policies and procedures for emergency permitting. There are three aspects of the problems of emergency permitting of SPDs: (1) applicants often fail to submit follow-up permits; (2) once constructed, few if any emergency structures are removed; and (3) the emergency permit process leads to incremental, haphazard armoring of the coast without mitigation for the impacts to sand supply. For all practical purposes, if armoring is installed in emergencies, it remains in place, often with sub-standard engineering review and without mitigation for impacts to coastal resources.*

Areas of SLO County have been subject to significant damages from large storms in 1983, 1995, and 1997-98. For example, in the winter of 1997-98 erosion threatened Highway 1 in the Piedras Blancas area, storm damage occurred at Port San Luis and erosion occurred along the shoreline in the City of Pismo Beach. State Parks at Pismo Beach SB and Montana de Oro were affected by flooding and erosion of roads. Erosion of stairs and a ramp occurred at Hearst Memorial State Beach Pier. [41] During this period, the Commission authorized at least 3 emergency permits for shoreline armoring. Review of County actions shows 4 emergency authorizations and 8 subsequent authorizations for projects which were follow up permits for armoring that was already placed during an emergency. Emergency shoreline armoring appears to have occurred in earlier storm years, prior to the certification of the LCP. Commission staff reviews indicate that significant emergency armoring in Cayucos was placed as a result of major storm events in 1983-1984.

The Commission's enforcement experience shows that assuring that the emergency armoring is removed, or a follow up permit is obtained which addresses alternatives and mitigation of

[40] California Coastal Commission, *Regional Cumulative Assessment Project, Findings and Recommendations, Santa Monica Mountains/Malibu Area*, June 1999, pg. 79.
[41] CCC, Coastal Zone Damage Index- Storm Event Winter 1998; California Dept. of Parks and Recreation Storm Damage Report, Updates Through February 16,1998; CCC, Coastal Impacts of the 1997-1998 El Nino and Predictions for La Nina, August 28, 1998.

impacts, remains a significant problem. Of the 56 statewide enforcement cases identified in SLO since 1980, close to half (46%) involved shoreline armoring. And of those, 80% involve expired emergency permits for riprap for which no follow-up permit was obtained. In addition, since 1988, about 8 of the 56 applications for shoreline armoring (14%) were noted as after-the-fact permits (ATFs) to permit emergency armoring. It is unclear how much armoring remains unpermitted.

Consistency Analysis: Review of these actions also shows that the armoring placed in an emergency usually remains, although in most cases mitigation is required. Given the current provisions of the Coastal Act, the emergency authorization of armoring can be expected to continue. El Niño conditions are expected to occur every 2-7 years[42]; with the high erosion in some developed areas of the county, the demand for emergency permits is likely to continue. As more of the shoreline is armored, the demand will increase for maintaining or expanding existing armoring. While developing guidance for emergency permitting to reinforce the temporary nature of the development is possible, in most cases even placement of riprap and rock intended to be temporary is rarely removed.

Commission staff did not have data to evaluate the effects of County enforcement of emergency follow-up permits. But given the Commission's experience with emergency armoring, it is likely to be a continuing area of concern. In addition to continued attention in monitoring emergency permits, steps can be taken to minimize the likelihood of future enforcement cases. For example, procedures can be established for coordination with property owners and for field inspections before and after storm seasons. Through preparation of shoreline management plans, the County can provide advance information on the location of easement areas to assure emergency structures are not occupying public easements; provide for inspections to identify shoreline protective structures built without permits; and assure emergency structures are removed or regular permit follow-up is completed within the 30 day period.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.12: As part of shoreline management plans noted in Preliminary Recommendation 7.7, include procedures to address emergency armoring. Include procedures for coordination with property owners and for field inspections before and after storm seasons. Include guidance for types of temporary structures preferred and a provision for removal of temporary structures if no follow up permit is filed within 30 days.

C.5. Mitigating the Impacts of Armoring Pacific Coast Highway.

Overview: Highway One is the major access road to and along the coast in much of the county and is adjacent to coastal bluffs at various locations. It is a major recreational feature that provides spectacular ocean views and access to public beaches and the Big Sur Coast. However,

[42] Cayan, Daniel R., "Weather Effects of an El Nino Along the California Coast." In *Proceedings of a Workshop of the Potential Coastal Impacts of an El Nino Winter*. Scripps Institution of Oceanography Reference Series No.97-10. September 1997. Page 4.

the maintenance of this important piece of public infrastructure has not been without cost to coastal resources. In places in the North Coast Area the erosion progressed such that the bluff edge was only about two feet from the highway edge. Since certification one permit has been issued for rock armoring to protect the roadway, for armoring 200 feet in length and 25 feet high. The Commission found in that action that additional areas of the highway could be threatened in the future, it conditioned the permit to require consideration for relocation of Highway one in order to avoid additional shoreline armoring.

While the protection of Highway One in an emergency is an important objective, impacts to shoreline resources also need to be addressed. The Commission has found that in other areas of the coastline, emergency armoring to protect Highway One is frequently not temporary and often not removed. And often there is no adequate consideration of alternatives or mitigation for impacts to sand supply and public access as a result of these projects.

LCP Implementation: Since certification of the LCP the County and Commission had approved, until recently, only one permit authorizing Caltrans to place rock at a point along the highway. [43] The County authorized the armoring noting that a Commission permit was required but did not appear to evaluate any alternatives to avoid armoring.

The Commission in its review of the permit conditioned the permit to ensure that permit was valid only until August 2002, with two possible extensions to 2007 and 2012, and required that Caltrans investigate alternatives to assure that shoreline armoring is the least feasible environmentally damaging alternative. These include different methods for bluff protection and potential road realignment to assure that the road is safe from erosion with future armoring for at least 100 years, as with residential structures.

Recently, three more road failures occurred north of Cambria near Arroyo del Oso. In two cases Caltrans was able to install temporary bypasses so that armoring was not required. But, in one spot, a bypass was not possible due to potential impacts on the creek. As a result the Commission granted emergency authorization for riprap. The Commission approved this emergency action because Caltrans is making progress in studying the realignment, consistent with the previous action. A request for extension of the 1997 permit is likely.

The Commission also adopted a modification to the NCAP in 1998 that would address the need to realign Highway One, rather than allow future shoreline protection along this scenic stretch of coast. The County has recently acknowledged this need in the revised Project Description for the NCAP (5-10).

Consistency Analysis: Coastal Act 32035 allows shoreline armoring to protect Highway One where there is no other feasible means of protecting the existing structure. But this must be viewed in conjunction with the whole of the Coastal Act, specifically, section 30211 that requires that development not interfere with public access, section 30240 that requires that

[43] 3-SLO-97-39

environmentally sensitive habitat be protected and section 3025q that requires protection of scenic and visual resources. As noted previously, shoreline armoring can impact shoreline resources by encroaching onto recreational shoreline areas, by altering sand movement, by affecting sensitive shoreline habitat areas and impacting the scenic views from the shoreline. The LCP in Hazards Policy 4 already contains requirements to assure that armoring is permitted only where no less environmentally damaging alternative exists. Other standards in the CZLUO require setbacks of development to avoid future armoring. In order to carry out the LCP consistent with the Coastal Act, the County should expand policy standards to require consideration of relocation alternatives such as those specified in the Commission's review of the Caltrans permit.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.13: Policy 6 should clarify that Highway 1 must comply with setback standards similar to other existing structures, establishing setbacks based on assuring highway will be safe from erosion without need for armoring for 100 years. Policy 4 should be expanded to clarify that consideration of alternatives should include possible relocation of the structure to be protected, including Highway 1.

Preliminary Recommendation 7.14: Amend NCAP to Provide Realignment of Highway One to Avoid Shoreline Protection

C.6 Improved Geotechnical Analysis

Overview: The LCP provides that in bluff areas subject to the GSA combining designation, setbacks and siting alternatives are determined based on a geologic evaluation by a Certified Engineering Geologist. The contents of the required site stability evaluation report are specified in CZLUO section 23.04.118 as follows:

> *The report shall accompany the land use permit application, and shall contain the following information:*
>
> *(1) Historic, current and foreseeable cliff erosion, including investigation of recorded land surveys and tax assessment records in addition to the use of historic maps and photographs, where available, and possible changes in shore configuration and sand transport.*
>
> *(2) Cliff geometry and site topography, extending the surveying work beyond the site as needed to depict unusual geomorphic conditions that might affect the site and the proposed development.*
>
> *(3) Geologic conditions, including soil, sediment and rock types and characteristics in addition to structural features such as bedding, joints, and faults.*

(4) Evidence of past or potential landslide conditions, the implications of such conditions for the proposed development, and the potential effects of the development on landslide activity.

(5) Wave and tidal action, including effects of marine erosion on seacliffs.

(6) Ground and surface water conditions and variations, including hydrologic changes caused by the development (e.g., introduction of sewage effluent and irrigation water to the groundwater system; alterations in surface drainage).

(7) Potential effects of seismic forces resulting from a maximum credible earthquake.

(8) Effects of the proposed development including sighting [sic] and design of structures, septic system, landscaping, drainage, and grading, and impacts of construction activity on the stability of the site and adjacent area.

(9) Potential erodibility of the site and mitigation measures proposed to minimize erosion problems during and after construction. Such measures may include but are not limited to landscaping and drainage design.

(10) The area of demonstration of stability shall include the base, face, and top of all bluffs and cliffs. The extent of the bluff top considered should include the area between the face of the bluff and a line described on the bluff top by the intersection of a plane inclined a 20-1/4 degree angle from the horizontal passing through the toe of the bluff or cliff, or 50 feet inland from the edge of the cliff or bluff, whichever is greater.

(11) Any other factors that may affect slope stability.

These requirements are extensive and ensure that significant geologic information is developed as part of a coastal permit application. Recently, as a result of the experience with shoreline erosion along the coast, the Commission has been identifying more comprehensive and specific data needs in order to assure adequate consideration of site stability and alternatives. For example, the Commission has recently identified guidance for conducting assessments of slope stability in geotechnical reports. This guidance suggests that in addition to the standards currently in the LCP, that the application requirements be expanded to provide a more quantitative analysis. For example, regarding slope stability, the contents for (4) and (11) above could specify that the likelihood of landslides should be addressed through quantitative slope stability analyses prepared and certified by a licensed geologist (RG) or Certified Engineering Geologist (CEG). The analyses should demonstrate a factor of safety greater than or equal to 1.5 for the static condition and greater than or equal to 1.1 for the earthquake-loaded condition. These factors of safety should be demonstrable for the useful economic life of the structure. In other words, not only should the setback line corresponding to a 1.5 factor of safety be established for the present condition, but a similar line should be established representing the

location behind which a 1.5 factor of safety can be assured following 100 years of bluff erosion and retreat.

Also, the specifics for undertaking slope stability analyses can be specified, for example:

> 1) All analyses should be undertaken through cross-sections oriented perpendicular to the slope. Analyses should include postulated failure surfaces such that both the overall stability of the slope and the stability of the surficial units is examined.
>
> 2) The effects of earthquakes on slope stability should be addressed through pseudostatic slope analyses assuming a horizontal seismic coefficient of 0.15g. If it can be demonstrated that the Maximum Credible Earthquake at the site would result in a horizontal ground acceleration at the site less than .15g, the lower value, supported by an appropriate attenuation model, may be used.
>
> 3) All slope analyses should be performed using geotechnical parameters (friction angle, cohesion, and unit weight) determined from undisturbed samples collected at the site. The choice of geotechnical parameters for each geologic unit examined shall be supported by direct shear tests, triaxial shear test, or literature references.
>
> 4) All slope stability analyses should be undertaken with potentiometric surfaces for the highest potential groundwater conditions.
>
> 5) If anisotropic conditions are assumed for any geologic unit, strike and dip of weakness planes should be provided, and geotechnical parameters for each orientation shall be supported by reference to pertinent direct sheer tests, triaxial shear test, or literature.
>
> 6) When planes of weakness are oriented normal to the slope or dip into the slope, or when the strength of materials is considered homogenous, rotational failure surfaces should be sought through a critical failure search routine to analyze the factor of safety along postulated critical failure surfaces.
>
> 7) If anisotropic conditions are assumed for units containing critical failure surfaces determined above, and when planes of weakness dip in the same direction as the slope, factors of safety for translational failure surfaces also should be calculated. The use of a block failure model should be supported by geologic evidence for anisotropy in rock or soil strength. Geotechnical parameters for such weak surfaces should be supported through direct shear tests, triaxial shear test, or literature references.

In updating the LCP Area Plans, the County should consider updating the requirements for undertaking geological evaluations. In addition, guidance developed by the State Department of Conservation, including "Guidelines for Engineering Geologic Reports"[44] and for sites that lie within an Alquist-Priolo Zone (i.e., near an active fault), guidelines for a fault-hazard report,

[44] http://www.dca.ca.gov/geology/publications/report_guidelines/engineering_geologic.html

could be considered.[45] The County should consider update its filing requirements for geotechnical evaluations in order to continue to reflect more current knowledge and to ensure adequate site stability in conformity with the Coastal Act.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.15: Modify CZLUO section 23.04.118 to update required contents of geologic evaluation reports within the GSA combining designation.

C. 7 Mitigating Scenic and Visual Resources

LCP policy 4 requires that shoreline protective devices minimize impacts to visual resources. Of the 56 authorizations for shoreline protective devices, roughly 14% raised scenic and visual issues. Many of the actions authorizing shoreline protective device contained conditions designed to assure that materials and engineering design of the armoring minimize visual impacts by blending the structure with the surrounding area. But by altering the natural landform, and developing piecemeal types of shoreline protective devices, armoring of the coast affects the scenic and visual experience of recreationists on adjacent beaches, public parks and coastal waters. Avoiding or minimizing armoring of the shoreline as discussed in the policy alternatives in section C.2. of this chapter can assure that landform impacts are avoided or mitigated consistent with Coastal Act section 30251.

Improving consistency in the types of materials used in shoreline armoring and especially in emergency actions and repair and maintenance can help minimize visual impacts. As the Commission found in prior studies, a consistent regional approach for areas prone to erosion can help minimze impacts. For example, in a case study in the Monterey Bay area, the Commission found that,

> *The existing situation in Live Oak, however, presents a piecemeal confusion of protective measures. From an engineering perspective, the weakest points in shoreline armoring are normally the ends and the junctions between different styles of protection (rock adjacent to concrete to gunite, for example). Such ends and junctions occur frequently in the Live Oak area, and while no engineering evaluation has been prepared, the potential for weaknesses in the protection would be greatly reduced by a regional approach to controlling erosion in the area. In addition, the general look and aesthetic of the area would change if adjoining properties had shoreline protection efforts with a similar visual effect…*

[45] http://www.dca.ca.gov/geology/publications/report_guidelines/geologic.html

> *Without a regional overview, the piecemeal approach to shoreline protective devices will continue to impact shoreline processes and resources. The attempt to minimize coastal hazards with various devices (seawalls and numerous rip-rap structures), combined with naturally occurring coastal processes, requires a closer examination of their cumulative impacts. Piecemeal solutions to coastal erosion problems are not generally effective and have the potential to create further problems. Often overlooked are the regional effects of such shoreline protection. Where a regional coastal erosion problem exists, a regional solution should be developed and implemented..*[46]

In review of armoring along Cayucos, staff noted that a variety of armoring occurs, for example, riprap, gunnite, concrete block, and wood retaining walls.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.16: The area wide shoreline retreat and management plan suggested for Cayucos and Cambria in Preliminary Recommendation 7-7 could also incorporate guidelines for identifying specific types of armoring that would be acceptable for specific areas to minimize visual impacts from armoring along the shoreline and water recreation areas.

C.8 Seismic and Landslide Hazards.

Through extensive research and modeling the California Conservation Division of Mines and Geology has classified the San Luis Obispo County Coast as a relatively low seismic hazard area in this highly seismic state[47].

The LCP Geologic Study Area (GSA) Combining District provides that special site specific evaluation occur to determine suitability of the site in areas of high risk potential outside urban reserve and moderate to high risk potential within urban reserve lines. CZLOU ordinance 23.07.080 provides that standards are applied to areas along the coast with coastal bluffs and cliffs greater than 10 feet in vertical relief that are identified in the Coastal Erosion Atlas, prepared by California DNOD (1977). In accordance with Hazards Policy No. 7 of the LCP the GSA combining district requires site evaluation addressing surface fault rupture, seismic shaking, liquefaction or landslide.

Seismic hazard issues were raised in less than 2% of the overall permits acted on by the County. And the 44 cases raising seismic hazards represented only 16% of the 273 permits that raised hazard issues. Almost half were located in existing developed areas of either Cambria or Cayucos. Only two, one in Avila Beach, were subdivisions. [48] Of the 44 cases, 18 (41%) were

[46] CCC, ReCAP Pilot Project, Findings and Recommendations: Monterey Bay Region, September 1995, pg.25.
[47] http://www.consrv.ca.gov/dmg/rghm/a-p/mapidx/county.htm#and
[48] 3-SLO-97-022; 3-SLO-93-124

conditioned to require submittal of geologic evaluation on site suitability. However, as the Commission found in LCPA 1-97, since LCP certification the State Geologist has designated the San Simeon-Hosgri fault as an active fault, a Earthquake Fault Zone subject to the Alquist Priolo Act, and there may be additional active faults that are part of the Arroyo Laguna Fault which are not yet mapped.

While the County's implementation of LCP policies do not appear to raise significant concerns regarding conformance with Section 30253, the Commission has noted that the policies and designation themselves may not reflect current up to date information on the presence of seismic hazards. The LCP should be modified to update seismic mapping and identification, that the GSA should be revised and applied to new faults identified and traces of faults pending complete geologic investigation. New development should be restricted in the Earthquake Fault Zones.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.17: Modify LCP to update seismic mapping and identification and extend GSA CD to new faults identified and traces of faults in order to require complete geologic investigation pending new development. New development should be restricted in the Special Studies Zones resulting from updated mapping.

Flooding Hazards

The coastal zone is subject not only to flooding along streams and rivers, but also wave induced flooding along the coast. Inundation potential is greatest at the mouth of a stream/river where development may be subject to both river flooding and wave flooding during storms incurring heavy rain and large waves. Stream/river flooding is dependent on rainfall, whereas coastal wave inundation may occur through a variety of mechanisms i.e. wind forcing, storm occurrence, or tsunami. When extreme tides coincide with large waves, the severity of wave inundation increases. Although flood hazard is mainly associated with inundation and water damage, destruction to development may result from large debris and felled trees along wooded streams carried by flooding streams and ramming into structures. The same effect occurs along the shoreline with waves ramming debris into coastal structures.

Only 45 of the County actions raised issues related to flooding, a third in Oceano and about 40% in Cambria. Two subdivisions occurred which raised flood hazard issues, one in Avila and one in Oceano .[49] LCP Amendment 3-92 approved by the Commission (in part 1993 and in part 1994) adopted revised FEMA 1985 100 year frequency flood area and coastal high hazard area maps and automatically incorporated any updates to the FEMA flood plain maps. However, the FH Combining designation on the certified LUE maps did not automatically change and would require LCP amendments as need arises. In approving the amendment the Commission found this consistent with Coastal Act.

[49] 3-SLO-93-033; 4-SLO-91-080

Since certification of the LCP, the Commission documented flooding problems in review of the North Coast Area update LCP Amendment 1-97, noting that the West Village area of Cambria has flooded several times, on average once every four to five years. Other areas of the North Coast also had flooding problems. The Commission found in its action that neither the NCAP nor the general LCP provided adequate policies for minimizing flooding. [50] The Flood Hazard Combining Designation (CZLUO 23.07.066) in general provides submittal of drainage plans and requires, in certain areas, that structures will not be located in the floodway or be subject to inundation of a 100-year storm. Construction standards also apply to new structures or an increase of 65 percent in square footage of existing structures that address protection of structures and prohibits construction which limits the capacity of the floodway. The ground floor of new structures are required to elevated above the 100-year storm flood profile and non residential construction is required to be elevated and floodproofed as certified by a registered civil engineer. Storage of certain materials is prohibited. The Commission found that no new development expect for public services, in the mapped flood hazard area should be approved until a comprehensive flood analysis and management plan for the mapped hazard area is certified and implemented. The purpose of the plan should be to limit flooding of the West Village. In other areas of North Coast, the Commission found that the LCP which prohibited new development in the 100-year floodplain in rural areas was consistent with the Coastal Act but that the FH Combining designation should be expanded to Arroyo del Puerto, Oak Knoll, Little Pico, Villa Creek and Ellysly Creek.

Therefore, while the implementation of coastal permits does not indicate problems carrying out the LCP policies, the Commission has found that the LCP policies themselves are lacking a comprehensive framework for flood management. Development and implementation of comprehensive flood management plans should be certified and implemented in order to conform to Section 30253(1).

Preliminary Policy Alternatives:

Preliminary Recommendation 7.18: Expand FH Designation to Arroyo del Puerto, Oak Knoll, Little Pico, Villa Creek and Ellysly Creek.

Preliminary Recommendation 7.19: For areas subject to FH Combining designation, in Cambria, no new development except public services shall be approved until the County has certified and implemented a flood analysis and management plan for the West Village.

Fire Hazards

Only 82 of the County actions raised issues related to fire hazards, half of them evenly divided between Los Osos and Cayucos. Of these the County required submittal of Fire Safety

[50] CCC, Revised Findings, North Coast Area Plan Update LCPA 1-97, January, 1998, pg.181.

Plan/Letters in 19 of them (23%). Only one subdivision in Avila Beach (3-SLO-97-022) and one lot line adjustment (3-SLO-93-124) raised this issue. While the County's implementation of LCP policies does not appear to raise significant concerns regarding conformance with Section 30253, the LCP may need to be strengthened to reflect stronger protections for habitat and recreation areas from fire hazard management measures. In recent years the Commission has seen an increase in impacts from fuel modification encroachment into sensitive habitat and park and recreation areas. This can be a particular problem at the urban/rural interface where the required area of vegetation clearance around structures can be significant, often 200 feet or more. The potential impacts to sensitive habitat from such vegetation clearance can be significant as detailed in Chapter 4. The County should consider improvements to measures to avoid or mitigate such encroachments.

Preliminary Policy Alternatives:

Preliminary Recommendation 7.20: Modify the CZLUO to provide standards that require siting new development to ensure that any required vegetation clearance will be done fully on the private property and will not encroach on any public lands or sensitive habitat areas. And, if development cannot be sited to avoid encroachments, to require a mitigation in-lieu fee to support habitat restoration programs.