RECORD PACKET COPY

STATE OF CALIFORNIA - THE RESOURCES AGENCY PETE WILSON, *Governor*

CALIFORNIA COASTAL COMMISSION
CENTRAL COAST AREA OFFICE
725 FRONT STREET, SUITE 300
NTA CRUZ, CA 95060
) 427-4863
EARING IMPAIRED: (415) 904-5200

M186

Filed: 5/13/98
49th Day: 7/1/98
180th Day : 11/9/98
Staff: JC(SC)
Staff Report: 5/20/98
Hearing Date: 6/8/98
Commission Action:

STAFF REPORT: AMENDMENT

APPLICATION NO.: 3-90-111-A2

APPLICANT: City of Santa Cruz
AGENT: Public Works Department, Tom Sharpe

PROJECT LOCATION: South side of West Cliff Drive at two locations: (1) Site CSC-SCRC-001, across from end of Columbia Street and (2) Site CSC-SCRC-006, 600 feet west of Columbia Street; APNs 004-203-03, 04,05, 06, Santa Cruz, Santa Cruz County

ORIGINAL PROJECT DESCRIPTION: 3-90-111 - Phase 1 shoreline protective works consisting of engineered rock revetments at ten locations along West Cliff Drive; 3-90-111-A five additional revetments along West Cliff Drive.

PROJECT DESCRIPTION: (1) CSC-SCRC-001 Construct engineered armor stone revetment structure from 0.0 msl to elevation 30.0, reconstruct pathway and parking area; revegetate with iceplant; (2) CSC-SCRC-006 Replace unstable concrete sack retaining wall and crib-type retaining wall with variable slope, buff-colored concrete faced, soil nailed retaining wall; construct armor stone revetment from 0.0 msl to elevation 30.0; reconstruct pathway and parking area; revegetate with iceplant.

Zoning District: Ocean Front Recreation
LUP Designation: Coastal Recreation

APPROVALS RECEIVED: City of Santa Cruz Appendix B, Coastal Permit; 4/1/98.
CEQA: Categorically Exempt Class 9a -Emergency Projects.

APPROVALS PENDING: Monterey Bay National Marine Sanctuary; Regional Water Quality Control Board Waste Discharge Permit or Waiver; U. S. Army Corps of Engineers Section 404 or Nationwide Permit; State Lands Commission Lease.

SUBSTANTIVE FILE DOCUMENTS: City of Santa Cruz certified Local Coastal Program, as amended March 1995; U. S. Army Corps of Engineers, Santa Cruz Harbor and Vicinity Shoaling Reconnaissance Report, January 1994; Final Report - West Cliff Drive Revetments Phase I Project Geological Engineering Services, Noble Consultants, June 9, 1988; Ecological Characterization of Intertidal Communities at Shoreline Repair Sites 98-4 and 98-5 Along West Cliff Drive, Santa Cruz, Applied Marine Sciences, Inc., May 1998; Letter West Cliff Drive Storm Disaster Repair Project (ornithological assessment), David L. Suddjian, Biologial Consulting Services, May 15, 1998.

SUMMARY OF STAFF RECOMMENDATION:

The staff recommends that the Commission **approve with conditions** the proposed shoreline protective works. The following table provides a brief synopsis of the staff recommendation.

Coastal Act Policy/CEQA	**Recommended Findings (Finding Number)**	**Recommended Conditions. (Condition Number)**
CA 30235: Shoreline protective works allowed when required to protect existing structures in danger from erosion. **CEQA 21080.5(d)(2)(i):** Development allowed when no feasible less environmentally damaging alternative is available.	Storm damage has eroded bluff and damaged existing recreational trail and parking areas and is undermining the road. Existing street, parking and trail structures are in danger from erosion. (1, 2, 3) No feasible short term alternatives to seawall structure. Sand replenishment for structure protection or road realign-ment not feasible in short term (4)	• Submit final plans (1.A) consistent with requirements of USACOE (4.A),. MBNMS (4.B), RWQCB (1.B). • Submit West Cliff Drive Integrated Development and Management Plan to address alternatives. (5)
Section 30235: Projects must be designed to eliminate or mitigate impacts on shoreline sand supply.	• Project design will impact sand supply. • Impacts to sand supply not quantified. Impacts to sand supply addressed in future West Cliff Drive Plan. (3,4)	• Submit West Cliff Drive Integrated Development and Management Plan to address alternatives to eliminate or mitigate impacts on shoreline sand supply. (5)
Section 30253: Minimize risks, assure structural stability, do not contribute to erosion.	• Located on eroding bluff subject to wave action. • Designed for structural stability. • Liability responsibility is City's. (6)	• Submit final plans (1.A) consistent with requirements of USACOE (4.A),. MBNMS (4.B), RWQCB (1.B) and annual monitoring/maintenance report (1D). • Construction monitoring. (2) • Final engineering report at project completion. (3)

Section 30210-14: Protect and maximize public access.	• Located on public trust lands (5) • Impacts to sand supply not directly mitigated in the short term; protection of bluff top recreational facilities is access mitigation. Shoreline Plan to balance impacts long term mitigation.(3,4,5)	• Submit State Lands General Lease (1.B.) • Submit West Cliff Drive Integrated Development and Management Plan to address shoreline protection and access within two years of Commission approval. (5)
Section 30230-31: Protect biological productivity and quality of coastal waters with special protection for areas of special biological significance.	Contiguous with MBNMS. Construction could impact water quality of marine environment.(7)	Construction monitoring to assure debris etc.does not enter water. (2). Submit evidence of MBNMS approval. (4.B.); Annual Monitoring and Maintenance Plan (1.C.); Shotcrete Management Provisions (4.C.)
Section 30244: Reasonable mitigation for adverse impacts on paleontological resources.	Located in sensitive paleontological area. No survey done. (8)	Submit survey and mitigation as required by State Historic Preservation Office standards. (1.D).

Table of Contents

Staff Recommendation..... 4
I. Approval with conditions..... 4
II. Standard conditions..... 4
III. Special conditions..... 5
IV. Findings and Declarations..... 7
1. Project Location, Description, Surrounding Development..... 7
2. Analysis of Danger from Erosion to Existing Structures..... 9
3. Alternatives to Shoreline Structures..... 11
4. Sand Supply Impacts and Mitigation 14
5. Public Access..... 23
6. Geologic Hazards and Structural Stability..... 26
7. Marine Resources and Water Quality.....28
8. Land Resources.....31
9. Archaeological and Paleontological..... 32
10. Scenic Resources.....32
11. Local Coastal Program/ CEQA.....34

Exhibits

Exhibit 1a - Location Map; Exhibit 1b - Noble Phase1 Revetment Location Map
Exhibit 2 - Cliff Erosion Map, City of Santa Cruz
Exhibit 3 - Site Plan and Parcel Boundaries
Exhibit 4 - Site Plan with Mean High Water Line
Exhibit 5 - Fixed Back Beach Graphic and Equation
Exhibit 6 - Sand Loss to Littoral System Graphic and Equation
Exhibit 7 - Beach Area Lost Due to Structure Graphic and Equation
Exhibit 8 - Santa Cruz City LCP Policies PR 1.7.6 and EQ 4.1.3

STAFF RECOMMENDATION:

The staff recommends that the Commission adopt the following resolution:

I. Approval with Conditions.

The Commission hereby grants a permit, subject to the conditions below, for the proposed development on the grounds that the development will be in conformity with the provisions of Chapter 3 of the California Coastal Act of 1976, will not prejudice the ability of the local government having jurisdiction over the area to implement its certified Local Coastal Program consistent with the provisions of Chapter 3 of the Coastal Act, is located between the sea and the first public road nearest the shoreline and is in conformance with the public access and public recreation policies of Chapter 3 of the Coastal Act, and will not have any significant adverse impacts on the environment within the meaning of the California Environmental Quality Act.

II. Standard Conditions

1. Notice of Receipt and acknowledgment. The permit is not valid and development shall not commence until a copy of the permit, signed by the permittee or authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.

2. Expiration. If development has not commenced, the permit will expire two years from the date this permit is reported to the Commission. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.

3. Compliance. All development must occur in strict compliance with the proposal as set forth in the application for the permit, subject to any special conditions set forth below. Any deviation from the approved plans must be reviewed and approved by the staff and may require Commission approval.

4. Interpretation. Any questions of intent or interpretation of any conditions will be resolved by the Executive Director or the Commission.

5. Inspections. The Commission staff shall be allowed to inspect the site and the project during its development, subject to 24 hour advance notice.

6. Assignment. The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

7. Terms and Conditions Run with the Land. These terms and conditions shall be perpetual, and it is the intention of the Commission and the permittee to bind all future owners and possessors of the subject property to the terms and conditions.

III. Special Conditions.

Note: Unless specifically altered by the amendment, all conditions of the previously approved permit and amendment, 3-90-111 and 3-90-111A , remain in full force and effect.

1. PRIOR TO ISSUANCE OF THE COASTAL DEVELOPMENT PERMIT, the permittee shall submit to the Executive Director for review and approval:

A. Final Plans: Final engineered plans for the seawall shall include bluff top drainage/erosion control plans showing drainage directed to the storm drain system. Construction specifications shall include protection of rebar from marine exposure. Recommendations made by the Monterey Bay National Marine Sanctuary and conditions of this coastal development permit shall be incorporated into the final plans.

The final plans shall include identification of the staging area, equipment, method of equipment access and operations. The plan shall provide a West Cliff Drive detour route plan and a construction schedule.

B. State Lands Commission: A copy of the State Lands Amendment to General Lease 2635 or other documentation from the State Lands Commission which allows the project to proceed.

C. Annual Monitoring/maintenance Plan: A copy of the City's annual monitoring and maintenance report. The report should be commensurate with the need, i.e., ranging from a single paragraph if there was no evidence of damage to a full analysis of damage and recommended action when applicable. The Executive Director shall determine whether repairs or improvements proposed in the plan will require an amendment to this permit.

D Paleontology: A paleontological survey report prepared by a qualified professional. If the survey report determines paleontological resources are present, the permittee shall have a qualified paleontologist on site during construction and permit reasonable halts of construction if and when a paleontological resource is discovered. Any paleontological resources retrieved from the site(s) shall be deposited into the collection of a recognized non- profit paleontological specimen repository with a permanent curator, such as a public museum or university.

A follow up survey report/letter by the paleontologist describing the resources and mitigation, if any, shall be submitted to the Executive Director within 60 days of completion of the project, for the Commission's administrative records.

2. Construction Monitoring: The project engineer will conduct site inspections during construction to ensure compliance with the final engineering reports and drawings as approved by the Executive Director. No concrete or construction debris shall be allowed to enter ocean waters. All construction materials and debris must be removed from the bluff/beach at the conclusion of the construction operation.

3. Final Engineering Report:

Within 30 days of completion of the project the applicant shall submit an engineering report by a qualified professional engineer verifying that the seawall has been constructed in conformance with the final approved plans.

4. PRIOR TO COMMENCEMENT OF CONSTRUCTION, the permittee shall provide to the Executive Director for review and approval:

A. U. S. Army Corps of Engineers Permit: A copy of a U. S. Army Corps of Engineers permit, letter of permission, or evidence that no Corps permit is necessary.

B. Monterey Bay National Marine Sanctuary Approval: Written evidence of approval from the Monterey Bay National Marine Sanctuary or documentation that no such approval is necessary.

C. Shotcrete Management Provisions: A copy of the the contractor's shotcrete managment plan.

Any modifications to the approved project may require, as determined by the Executive Director, an amendment to this permit or a separate coastal development permit.

5. West Cliff Drive Integrated Development and Management Plan. WITHIN TWO YEARS OF THE APPROVAL OF THIS PERMIT, the permittee shall submit to the Commission for review and approval a West Cliff Drive Integrated Development and Management Plan which will provide for integrated design, land use, recreation, cliff stabilization, and landscaping for the West Cliff Drive corridor consistent with Local Coastal Program Parks and Recreation Element Policy 1.7.6. The submittal shall include a schedule of implementation and shall identify funding sources. Subsequently, the City shall submit annual implementation status reports to the Executive Director by July 1 of each year.

IV. FINDINGS AND DECLARATIONS.

The Commission hereby finds and declares:

1. Project Location, Description and Surrounding Development.

Background: Several sections of the West Cliff Drive, its recreational trail and two parking bays are being undermined by coastal erosion. The road is threatened by growing seacaves. The City has closed areas of the trail and the parking bays. The road currently remains open. The City of Santa Cruz submitted a request to the Coastal Commission for an emergency coastal development permit to construct the two shoreline protective works and declared that the projects were categorically exempt (Class 9a) from CEQA because of the disaster declaration made by Governor Wilson. It was determined by Commission legal staff that the proposed projects did not qualify for an emergency coastal permit under the Coastal Act since "immediate action to prevent or mitigate loss or damage to life, health, property or essential public services" was not required or requested by the City and the rock revetments are not within the road right-of-way. Rather than installing unengineered riprap, the City is developing engineered plans for a long term solution to the bluff retreat. However, the necessity for prompt action both to prevent road failure and to restore the public walkway and parking areas for the summer season and to qualify for federal funding (West Cliff Drive Storm Disaster Repair Projects funded by Federal Disaster Relief funds) is clear. The Commission staff agreed to work with the City to attempt to meet a June 9, 1998 deadline for awarding a contract that would place the City in a good position to receive federal reimbursement.

The City of Santa Cruz has constructed shoreline protective structures along West Cliff Drive since the 1960's. Severe winter storms of 1977-78, 1979-80 and 1982-83 resulted in significant erosion damage and in the 1990's eight revetments were reconstructed and expanded and seven new rock revetments were constructed in a major erosion control effort by the City (coastal development permits 3-90-111 and 3-99-111-A). The heavy rain and storm waves of 1997-98 have again eroded away large sections of bluff in several locations and the City proposes two additional revetments under this amendment. Site specific geologic analyses were not done for the proposed projects. City and Commission staff have used the geology studies, geotechnical reports and environmental reviews prepared for the previous West Cliff Drive erosion control projects. In addition, the City prepared an alternatives analysis and contracted for current marine and land resource surveys.

Location and Description of Development: The City of Santa Cruz proposes to construct two seawall structures. The two shoreline sites are located on the oceanside of West Cliff Drive. West Cliff Drive connects Natural Bridges State Beach to the Santa Cruz Beach and Boardwalk area of Santa Cruz. The Drive which is approximately one and one-half miles long is developed with a multi-use bicycle and

pedestrian path with periodic viewing points, benches and parking bays. Lighthouse Point, approximately midway, is the site of international surfing contests. The inland side of West Cliff Drive is lined with private homes, interrupted only by the open space of Lighthouse Field State Park. (see Exhibit 1, Location Map).

The proposed shoreline protective structures would prevent collapse of the road and allow for repair of the damaged recreational pathway and two parking bays. See Exhibit 3, Site Plan and Sections.

At site CSC-SCRS-006 (600 feet west of Columbia Street) a short retaining wall at the top of the mudstrone terrace (± 20 ft. elevation) is being undermined and outflanked along the sides and the recreational trail and parking bay above are being undermined. The City proposes to install a 150-feet long, 5 to 19 feet high, concrete faced soil nail retaining wall. The wall would be keyed into mudstone at about elevation 27 feet.

The concrete wall would be approximately 18 inches thick, colored to match the surrounding bluff and reinforced with epoxy coated steel. The "nails" would be on four foot centers at three levels with as many as 40 per horizontal row. To prevent destabilization from hydrostatic pressure from ground seepage behind the wall, the City proposes installation of geocomposite drainage material at intervals of 4 or 5 feet with seepage discharge occurring through 2 to 3 inch diameter PVC pipe weep holes. The details of the design will be finalized in the final plans. At the foot of the wall and to the east a riprap rock revetment would be installed from sea-level to elevation 27 feet.

At site CSC-SCRC-001 (across from the terminus of Columbia Street) the recreational pathway and parking will be reconstructed and an armor stone revetment structure from 0.0 msl to elevation 30.0 will be installed.

For both rock revetments the bluff would be graded to a 2:1 slope; the graded soils would be redistributed to form the slope and no export of soil is anticipated. The slopes would be covered with filter fabric and three gradations of rock - 75 pound, 3/4 ton and 7 ton would be installed. Approximately 14,400 tons (8,500 cy) of rock would be installed.

According to the City since the existing recreational trail and parking areas are sloped to the West Cliff Drive gutter, surface runoff from impervious surfaces will flow to the existing storm drain system. Areas of the bluff where vegetative cover has been disturbed will be restored immediately following construction.

Staging and Construction Period: The installation of the seawalls and the repair of the parking area and recreational trail is estimated to take a maximum of 8 weeks. During that time West Cliff Drive between Columbia and Woodrow will be closed. Traffic will be detoured through interior streets for that segment. The project will be

staged on the road. The riprap will be delivered by truck; unloaded at the site and placed by crane. The concrete will be poured from above.

Commission Jurisdiction: The City of Santa Cruz has a certified Local Coastal Program and, therefore, has coastal development permit authority except in the Commission's original jurisdiction, i.e., below the mean high water line or within areas of public trust. The City has undertaken emergency repairs on several sections where the repairs do not extend below the mean high water line. The lower levels of the proposed structures, subject of this application, fall below the mean high water line and are within the Commission's original jurisdiction. The Coastal Act is the standard of review. Nonetheless, the City's certified Local Coastal Program policies provide both context and guidance for the staff recommendation and are quoted as appropriate.

Other Jurisdictions: Along the Central California coastline, the mean high water line is the boundary of the Monterey Bay National Marine Sanctuary. Lands below the ordinary high water line are also the sovereign lands of the State of California. The Monterey Bay National Marine Sanctuary is currently reviewing the applicant's survey (Exhibit 4 attached) to determine their jurisdiction and requirements. The coastal permit has been conditioned to require submittal of written evidence of the MBNMS approval. The State Lands Commission is also currently reviewing the proposal for use of the site. The State Lands Commission reports that they will use the Coastal Commission's permit review as the functional equivalent of CEQA. The coastal permit has been conditioned to require submittal of the State Lands Lease or evidence that the project may proceed pending completion of lease processing.

2. Analysis of Danger from Erosion to Existing Structures

Coastal Act policy 30235 governs construction of shoreline protective works or other such construction that alters natural shoreline processes:

> *Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.*

Santa Cruz City Land Use Plan Safety Element Policy 1.2.3 quotes Coastal Act Policy 30235 with the omission of the last sentence.

With the exception of new coastal-dependent uses, Section 30235 and the City of Santa Cruz Safety Policy 1.2.3. limit construction of shoreline protective works to those required to protect existing structures or public beaches in danger from erosion. The Coastal Act provides these limitations because shoreline structures, as a result of wave interaction, will seasonally and in the long term affect the configuration of the shoreline and the beach profile and will, when located on an eroding shoreline, have an adverse impact on the shoreline resulting in the ultimate loss of the beach. These impacts are discussed in detail in Finding 4. In general, though, beaches fit into one of three categories: (1) eroding, (2) equilibrium, or (3) accreting. As will be discussed below, it is clear that the two sites proposed for shoreline protection are located on an eroding shoreline.

The Santa Cruz coastal bluffs were assessed in *Living with the California Coast*, Gary Griggs and Lauret Savoy, editors, 1985. See attached Exhibit 2, MAP S-1 Cliff Erosion, which maps the cliff erosion areas along West Cliff Drive according to this source. The map identifies the area as High Risk Hazard and states:

> *West Cliff Drive subject to intense wave activity. Marine terrace only 25 to 45 feet high frequently overtopped during storms. Undercut and collapse of bike path and roadway is a recurring problem. Winters 1983 storms produced up to 40 feet of erosion of unconsolidated material lying atop the low bedrock terrace. Severe erosion at west side of Lighthouse Point.*

A major study, Final Report - West Cliff Drive Revetments Phase I Project Geological Engineering Services, Noble Consultants, June 9, 1988, was done for the multiple revetments and vertical walls undertaken for the 1990-1 coastal development permits (3-90-111 and 3-90-111A). The proposed projects fall within the "project" area, i.e, Columbia Street to Chico Avenue of the Noble study.

Site CSC-SCRC-001 (across from the terminus of Columbia Street) is at the same or adjacent to Site 10 of the Noble study and can be used for this analysis. The Noble study identifies the erosion rate on the bedrock of the eastern point at Site 10 (CSC-SCRC-001) as 4" per year. See Exhibit 1b, Noble Revetment Location Map, attached. The marine terrace erosion rate is between 9 inches and 12 inches a year.

Site CSC-SCRC-006 falls to the west of Site 10 approximately 600 feet. No site specific geology study was done for SCS-SCRC-006 and no specific erosion rates can be assigned. Nevertheless, there is adequate evidence including the current damage to the blufftop parking area and recreational pathway and seacaves at the foot of the bluff which extend under the road to conclude that the shoreline at the parcel is actively eroding and that the level of danger to these structures is immediate. See Exhibit 2, Map S-1 Cliff Erosion.

Given the history of major bluff failures in the immediate area, the existing damage done to the recreational trail and parking bays and the undermining of the road, and

the Commission staff field review and concurrence with the information submitted relating to bluff erosion rates and bluff stability, the Commission finds, as required for approval under Coastal Act section 30235, that the road, parking areas, and coastal access recreational trail are "existing structure[s]...in danger from erosion".

3. Alternatives to Shoreline Protective Structures

Although Section 30235 allows for the protection of structures in danger from erosion, seawalls are not allowed unless they are also the required solution, that is, there must be no feasible project alternative. In addition, Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives or feasible mitigation measures available which would substantially lessen any significant adverse effect which the activity may have on the environment.

Potential alternatives to the proposed rock revetments include (1) no project alternative; (2) an alternative design they may have fewer impacts, such as a vertical wall or a smaller wall; (3) relocation of threatened structures, in this case, a realignment of the blufftop structures, i.e., roadbed and the recreational amenities, to obviate the need for some or all shoreline protective structures; and (4) sand replenishment to prevent erosion.

No Project Alternative: The no project alternative would result in uncontrolled erosion, further damaging the recreational path and parking areas, and could eventually force closure or realignment of West Cliff Drive at many locations, possibly threatening access to some residential properties. As a short term alternative, allowing the continued unplanned eroding away of the recreational facilities and road would have significant impacts on public access and safety and is not a feasible alternative. In the long term, abandoning erosion control efforts in selective areas could be a component of an integrated plan for the West Cliff Drive recreational corridor and shoreline. See below.

Alternative Design: The cliffs in the project area expose three distinct rock units: (from oldest to youngest) Santa Cruz Mudstone, the Purisima Formation, and the Pleistocene marine terrace deposits. The subject sites require protection from wave induced erosion at the bottom of the bluff at about elevation sea-level up to the level where wave runup ceases to be erosive, between elevation 27 (ft.) and elevation 30 (ft.).

The proposed shoreline protective structures combine vertical walls with riprap revetments. At CSC-SCRC-006 a 150-feet long, 5 to 20 feet high, concrete-faced soil nail retaining wall will be installed at the top of the bluff to elevation 27 and a riprap rock revetment would be installed from sea-level to elevation 27. At CSC-SCRC-001 an armor stone revetment structure from 0.0 msl to elevation 30.0 will be installed.

The City has submitted an alternatives analysis addressing the design of the shoreline protective works. Several different vertical or near verticial retaining systems and engineered armor stone revetment structures were reviewed.

According to the City:

> *Retaining wall systems that rely on the weight of their backfill for stability such as a crib wall or reinforced earthwall retaining system require large excavations to construct the engineered fill. These alternatives have the disadvantage of being susceptible to removal of the stabilizing backfill material during wave attack. Retaining wall systems not as prone to backfill removal are cantilevered concrete retaining walls and concrete faced soil nail walls. While the cantilevered retaining wall requires large excavation, soil nail walls do not, giving it the advantage of allowing the street to remain open during construction. The largest disadvantage to any retaining wall systems is that they're all susceptible to undermining of foundation soils. At or near sea-level elevation, where any wall alternative would need to extend to, the foundation material is Santa Cruz Mudstone which is characterized as moderately friable. This friability is well documented by the undermining, tunneling and general bluff retreat,so well exhibited at the two project sites and all along West Cliff Drive...*
>
> *At some locations, where street improvements requiring protection are very close to the mud stone terrace edge, cantiliver and soil nail retainng walls...can be founded at the top of the mudstone terrace, about elevation 20. These shorter retaining walls are still susceptible to undermining of the mudstone and the softer unconsolidated terrace deposits along the sides of the walls. This is the problem that the City wishes to abate at site CSC-SCRC-006 where existing retaining walls founded at the top of the mudstone terrace are being undermined and out flanked along the sides.*
>
> *Engineered armor stone revetment structures have successfuly been utilized to retard coastal bluff erosion along West Cliff Drive. In 1991 and 1992 the City constructed over $3,500,000 of these types of structures along West Cliff Drive...*

According to Coastal Protection Structures and their Effectiveness (Fulton-Bennett & Griggs, 1988), concrete walls, in general, have proved to be the most durable type of protection structure within the Central Coast Region from San Francisco to Carmel. The two most critical problems observed in the structural stability of concrete wall designs are, first, preventing loss of fill from behind, around and underneath the wall, and second, maintaining the wall's stability and rigidity if such a loss does occur. The most current coastal development permits for seawall structures in Santa Cruz County and the City of Capitola have been for vertical seawalls. Vertical walls have the

advantage of minimizing encroachment onto the beach and if properly designed and colored can blend into the bluff. Nevertheless, different locations along the coastline may be better protected by one or the other design.

In this case, according to the city, the fundamental problem with full bluff height retaining walls in this area is that the mudstone is too friable to support a foundation and the seawalls will fairly rapidly erode at the base and sides. The area is prone to deep seacaves.

The armor stone revetments were determined to be the most appropriate for West Cliff Drive at the time of the previous CDP 3-90-111. However, the large "S" slope or flat berm rip rap revetment designs recommended by Noble Consultants in 1988 which would have covered 70% of several pocket beaches were not acceptable to the City. The City in consultation with the California Department of Boating and Waterways (funding source) reduced the scale of the structures because of the unacceptable loss of recreational resources. The proposed revetments are of the scaled-down design previously determined to be appropriate. According to the City, the existing revetments are stable and have performed well. Additionally, the cost of revetments is less.

Hence, the City has chosen vertical walls for the upper bluff where possible and riprap walls in the heavy wave run up area. The proposed design appears appropriate to the site geology and was determined to have the least impact of the alternative designs. Therefore, as to the question of alternative seawall designs, the proposed development is consistent with Section 30235 of the Coastal Act.

Relocation of Threatened Structures. Another potential alternative to construction of a shoreline protective work is the relocation of the threatened structures inland. In this case, relocation would mean realignment of West Cliff Drive and the recreational trail and parking bays. While this alternative is potentially feasible as part of a larger planning effort or in other areas of West Cliff Drive, at these two sites existing residential structures on the inland side of the road constrain moving the road inland. In addition, realignment for these two small sections could adversely impact the road alignment. Therefore, relocation of the road is not feasible for these projects, and the proposed development is consistent with Section 30235 of the Coastal Act in this respect.

Sand Replenishment: Another alternative to shoreline protective works would be to augment the local shoreline sand supply to reduce or eliminate erosion along the bluffs.

According to the U. S. Army Corps of Engineers Santa Cruz Harbor and Vicinity Shoaling Study, January 1994, the site is located within the Santa Cruz Littoral Cell which extends as far north as San Francisco and terminates downcoast at the Monterey Submarine Canyon, near the center of Monterey Bay. It is estimated that

coastal streams supply about 75% of the total littoral sand input to the cell, bluff erosion contributes about 20%, and the remaining 5% is from gully erosion and sand dune deflation. The sand is moved through the cell by wave-induced longshore transport. The seasonal change in wave energy causes a significant widening of the beaches during the summer and fall followed by the nearly complete stripping of sand from the beaches during winter. The northern end of Monterey Bay is an area of relatively high net littoral transport (between 300,000 and 500,000 cubic yards per year from west to east). This transport is the primary contributor of sand to the Santa Cruz City coastline.

The U.S. Army Corps of Engineers (COE) Report studied the area from the Santa Cruz Harbor downcoast to New Brighton State Beach and did not specifically address the West Cliff Drive area. However, as a general conclusion the COE found that an effective sand replenishment program that would actually protect the bluffs from erosion would require the participation of many private property owners and jurisdictions and was not at that time a viable option. In San Diego County and in the City of Capitola the Commission *has* initiated in-lieu fee programs for beach sand replenishment. These programs form the basis for the development of an effective sand replenishment program in these areas that could by replacing or augmenting sand supply in the littoral cell help protect public recreational beaches.

A sand replenishment program could not provide the immediate protection required to prevent the loss of the blufftop facilities and is, therefore, not a feasible alternative under Section 21080.5(d)(2)(A) of CEQA. Therefore, the proposed development is "required" for the protection of the existing structures consistent with Section 30235.

4. Sand Supply Impacts and Mitigation

Although the proposed seawall construction is consistent with the risk assessment and alternative analysis requirements of Section 30235, this policy also requires the seawall proposal to "eliminate or mitigate" adverse impacts on shoreline sand supply if it is to be approved.

(a) Impacts of the West Cliff Drive projects

The section 30235 mitigation requirement addresses increasingly well-documented impacts of shoreline structures on natural sand dynamics, sand supply to beaches, and direct and indirect impacts to public access resources. For example, it is now well established that the development of shoreline structures can affect the beach and its users in several ways: (1) by directly encroaching on the beach; (2) by changing the beach profile and reducing the area located seaward of the ordinary highwater mark; (3) by interfering with bluff erosion that supplies sand to nourish the beach; (4) by causing greater erosion on adjacent public beaches; (5) by interrupting longshore and onshore processes; and (6) for riprap designs, by creating future impediments by

riprap falling or moving out onto the beach. As recently discussed in the Staff Recommendation for 4-97-071 (Schaeffer, City of Malibu) approved by the Commission in November 1997 and 3-97-065 (Motroni/Bardwell, City of Capitola) these impacts occur for both vertical seawalls and riprap designs.[1]

The serious need to address these shoreline structure impacts was also well-documented in the Commission's recent evaluation of cumulative impacts in the Monterey Bay area, including the subregion at issue in this permit. The Commission's Regional Cumulative Assessment Project (ReCAP) Findings and Recommendations (1995) documented that large sections of the Monterey Bay shoreline were being armored through emergency and regular permits for individual site protection. The ReCAP findings and other staff work contributed to a growing body of evidence that armoring a bluff, in addition to encroaching onto the beach and preventing its further landward migration, will reduce the amount of sand and gravel entering the littoral cell, and will cause the narrowing of an eroding beach over time and reduction in the area of sand available for recreational use. While seemingly insignificant in the individual case, these projects will have significant cumulative impacts on beach systems over time.

For the West Cliff Drive sites SCS-CSRS-001 and 006, there are at least five major impacts to sand supply that are of concern, although only one of these can be quantified at this time. The five major impacts are discussed in detail below.

(1) Fixing the Back Beach

Experts generally agree that where a beach is eroding, as is the case with the West Cliff Drive bluffs, the erection of a seawall will eventually define the boundary between the sea and the upland. On an eroding shoreline fronted by a beach, a beach will be present as long as some sand is supplied to the shoreline. As erosion proceeds, the entire profile of the beach also retreats. This process stops, however, when the retreating shoreline comes to a seawall. While the shoreline on either side of the seawall continues to retreat, shoreline retreat in front of the seawall stops. Eventually, the shoreline fronting the seawall protrudes into the water, with the winter

[1] Even though the precise impact of a shoreline structure on the beach is a persistent subject of debate within the discipline of coastal engineering, and particularly between coastal engineers and marine geologists, it is generally agreed that a shoreline protective device will affect the configuration of the shoreline and beach profile whether it is a vertical bulkhead or a rock revetment. The main difference between a vertical bulkhead and rock revetment seawall is their physical encroachment onto the beach. Additionally, rock revetments, unlike the proposed seawall, dissipate the wave energy and typically result in less localized beach scour. However, it has been well documented by coastal engineers and coastal geologists that shoreline protective devices or shoreline structures in the form of either a rock revetment or a vertical seawall will adversely impact the shoreline as a result of beach scour, end scour (the beach areas at the end of the seawall), the retention of potential beach material behind the wall, the fixing of the back beach and the interruption of longshore processes. In addition, and not insignificantly, seawalls directly encroach on the beach.

mean high tide line fixed at the base of the structure. In the case of an eroding shoreline, this represents the loss of a beach as a direct result of the seawall.

In further support of this analysis, Dr. Craig Everts has found that on narrow beaches where the shoreline is not armored, the most important element of sustaining the beach width over a long period of time is the retreat of the back beach and the beach itself (Letter Report, March 14, 1994, to Lesley Ewing, California Coastal Commission, from Dr. Craig Everts, Moffatt and Nichols Engineers). This is particularly true where narrow beaches exist, as is the case here. He concludes that:

> Seawalls inhibit erosion that naturally occurs and sustains the beach. The two most important aspects of beach behavior are changes in width and changes in the position of the beach. *On narrow, natural beaches, the retreat of the back beach, and hence the beach itself, is the most important element in sustaining the width of the beach over a long time period.* Narrow beaches, typical of most of the California coast, do not provide enough sacrificial sand during storms to provide protection against scour caused by breaking waves at the back beach line. This is the reason the back boundary of our beaches retreats during storms [emphasis added].

Overall, Dr. Everts concludes that "[a] beach with a fixed landward boundary is not maintained on a recessional coast because the beach can no longer retreat."

It is highly likely that the placement of the proposed structures will halt the landward migration and "fix" the location of the back beach or bluff, at least for the useful life of the wall itself. The fixed position of the back beach will result in the narrowing of any beach to a smaller and smaller corridor between the ocean waves and the shoreline protective device and eventually, the waves will hit the shoreline protective device at all but the most extreme low tide events. This loss of beach occurs because the natural balance between landward movement of the fore beach and back beach or bluff has been changed by constuction of a more resistant back beach structure, preventing the landward migration of the back beach or bluff.

Finding 2 above presents sub-regional and adjacent site-specific data that establishes that the proposed seawalls are located on a recessional or eroding beach. However, the erosion rates for these specific sites has not been determined. In addition there are no usable beaches at these sites. The coves are inaccessible and below the mean low water level. Though the bluff and beach at the sites would gradually migrate landward if left to their own natural devices, there is no evidence that a usable "beach" would be created under these conditions.

(2) Retention of Potential Beach Material

Beach material comes to the shoreline from inland areas, carried by rivers and streams; from offshore deposits, carried by waves; and from coastal dunes and bluffs, becoming

beach material when the bluffs or dunes lose material due to wave attack, landslides, surface erosion, gullying, etc. Coastal dunes are almost entirely beach sand and wind and wave action often provide an on-going mix and exchange of material between beaches and dunes. Many coastal bluffs are marine terraces — ancient beaches which formed when land and sea levels differed from current conditions. Since the marine terraces were once beaches, much of the material in the terraces is beach quality sand or cobble, and a valuable contribution to the littoral system when it is added to the beach. While beaches can become marine terraces over geologic time, the normal exchange of material between beaches and bluffs is for bluff erosion to provide beach material. When the back beach or bluff is protected by a shoreline protective device, the natural exchange of material either between the beach and dune or from the bluff to the beach will be interrupted and, if the shoreline is eroding, there will be a measurable loss of material to the beach. Since sand and larger grain material is the most important component of most beaches, only the sand portion of the bluff or dune material is quantified as beach material.

A seawall, gunnite facing or revetment also will probably prevent some of the material above it from becoming beach material; however, some upper bluff retreat may continue unless the shoreline protective device extends the entire height of the bluff. Exhibit 7, shows several possible configurations of the bluff face, with a protective structure. The solid line shows the likely future bluff face location with shoreline protection and the dotted line shows the likely future bluff location without shoreline protection. The volume of total material which would have gone into the littoral system over the lifetime of the shoreline protective device would be the volume of material between the solid line and the dotted line, along the width of protected property.

The actual erosion cannot be predicted, so the total erosion of the bluff must be approximated by the average annual long-term erosion of the bluff multiplied by the number of years that the structure will be in place. Finally, since the main concern is with the sand component of this material, the total material lost should be multiplied by the percentage of bluff material which is beach sand, giving the total amount of sand which would have been supplied to the littoral system for beach deposition if the proposed device were not installed.

The Commission has determined a methodology to quantify this impact. Exhibit 6 provides the equation and a graphic illustration. However, in this case, the rates of erosion for the specific sites have not been documented.

(3) Encroachment on the Beach

Shoreline protective devices such as seawalls, revetments, gunnite facings, groins, etc. all are physical structures which occupy space. When a shoreline protective device is placed on a beach area, the underlying beach area cannot be used as beach. If the underlying beach area is public beach, the public will not be able to use the area the way it had prior to placement of the structure. This area will be altered from the time the protective device is constructed and the extent or area occupied by the device will remain the same over time, until the structure is removed or is moved from its initial location. (The only exception to this would be a structure which can spread or move seaward over time, such as a revetment.) The beach area located beneath a shoreline protective device, referred to as encroachment area, is the area of the structure's footprint.

The Commission has determined a methodology to quantify this impact. Exhibit 7 provides the equation and a graphic illustration.

The City proposes revetments that will cover approximately 3500 square feet of intertidal area. However, this area is below the mean low water line and at the base of a steep bluff that makes it inaccessible for public use. According to the City, it is likely that visitors will climb and sit on the future riprap revetment, and, hence, there could actually be an increase in public access.

(4) Scour/End Effects

End scour effects involve the changes to the beach profile adjacent to the bulkhead or seawall at either end. One of the more common end effects comes from the reflection of waves off of the seawall in such a way that they add to the wave energy which is impacting the unprotected coastal areas on either end. This causes accelerated erosion on adjacent properties, thereby, artificially increasing erosion hazards.

Scour is the removal of the beach material from the base of a cliff, seawall or revetment due to wave action. The scouring of beaches caused by seawalls is a frequently-observed occurrence. When waves impact on a hard surface such as a coastal bluff, rock revetment or vertical bulkhead, some of the energy from the wave will be absorbed, but much of it will be reflected back seaward. This reflected wave energy in combination with the incoming wave energy, will disturb the material at the base of the seawall and cause erosion to occur in front and down coast of the hard structure. This phenomenon has been recognized for many years and the literature acknowledges that seawalls, through this scouring action, have an effect on the supply of sand.

For example, according to *Saving the American Beach: A Position Paper by Concerned Coastal Geologists* (March 1981, Skidaway Institute of Oceanography), pg. 4: "Seawalls usually cause accelerated erosion of the beaches fronting them and

an increase in the transport rate of sand along them". Similarly, Robert G. Dean in 1987 *in Coastal Sediment Processes: Toward Engineering Solutions,* stated:

> Armoring can cause localized additional storm scour, both in front of and at the ends of the armoring...Under normal wave and tide conditions, armoring can contribute to the downdrift deficit of sediment through decreasing the supply on an eroding coast and interruption of supply if the armoring projects into the active littoral zone.

In addition, there is substantial evidence showing that a seawall, gunnite facing, or revetment will prevent the material directly landward of it from eroding and becoming beach material, particularly for eroding beaches. For example, the National Academy of Sciences found that retention of material behind a revetment may be linked to increased loss of material directly in front of the wall. The net effect is documented in "Responding to Changes in Sea Level, Engineering Implications" (National Academy Press, 1987) which provides:

> A common result of sea wall and bulkhead placement along the open coastline is the loss of the beach fronting the structure. This phenomenon, however, is not well understood. It appears that during a storm the volume of sand eroded at the base of a seawall is nearly equivalent to the volume of upland erosion prevented by the seawall. Thus, the offshore profile has a certain "demand" for sand and this is "satisfied by erosion of the upland on a natural beach or as close as possible to the natural area of erosion on an armored shoreline...

It is likely that the West Cliff Drive seawalls will cause both scour and end effects. However, such impacts are difficult to quantify.

(5) Interruption of Onshore and Longshore Processes

If a seawall is built on an eroding beach and the device eventually becomes a headland jutting into the ocean, the seawall can function like a groin and modify or interrupt longshore transport and cause the upcoast fillet of deposition and downcoast indenture of erosion which is typical of sand impoundment structures. Over the long run, it is possible that the West Cliff Drive seawalls will produce such impacts on the coastline. However, it is difficult to quantify these impacts.

Conclusion

The preceding discussion establishes distinct and identifiable impacts due to the City's proposed shoreline stuctures. However, the factors needed to quantify the impacts are not available, e.g., site specific erosion rates, percentage of sand in bluff material. The City has reported that the area of intertidal coverage (there is no beach

sand above mean high water) is 3500 square feet. In addition to direct encroachment on public trust lands (see below), the project will cause the loss of sand in the Santa Cruz littoral cell. This sand is a public access and recreational resource that must be protected under both section 30235 and sections 30210-214 (see below).

While the amount of sand lost to the littoral cell has not been quantified, it would be small when compared to the overall volumes of sand transported in the cell (at least 300,000 cubic yards/year). The impact is nonetheless significant when considered in relation to all other existing and future shoreline structures in the littoral cell. Coastal Act Section 30250 requires that new development not have significant adverse cumulative effects. Again, as documented by the Commission's Regional Cumulative Assessment Project, some 25 acres of beach have already been lost in the Monterey Bay region to shoreline structures; and this is simply the direct encroachment impact.

In short, though not quantified, beach sand lost is a significant resource impact in the context of cumulative impact resource management.

(b) Required Mitigation of Adverse Impacts

No direct mitigation has been provided in the project for the impacts that the proposed seawall will have on sand supply. As discussed at length above, these impacts cannot be eliminated if the protective structures are to be constructed. In the past, the Commission has mitigated the direct impacts of shoreline structures by requiring redesign of seawalls, use of vertical walls rather than rip-rap, requiring public access lateral easements, sand replenishment programs, or in-lieu fee programs for sand replenishment programs, and other such measures to meet the requirements of section 30235.

In this case, the City of Santa Cruz owns and manages almost all of the shoreline in the City, beaches and blufftop, as a public recreational resource. In the long term, within a planning context, there are potentially feasible alternatives that could avoid or mitigate the adverse effects of shoreline structures on sand supply.

Intentionally allowing continued erosion in some areas, the use of vertical walls in others, riprap revetments where appropriate, realignment of the road, or managing traffic and parking in new ways such as one-way traffic, are all elements which if developed in a planning context may provide feasible alternatives which could result in a less environmentally damaging alternative to protecting the shoreline of the City. What role, if any, a sand replenishment program would have in the overall management of the City's shoreline recreational resources should be evaluated within the context of a comprehensive plan.

The City of Santa Cruz recognizes this potential and the Commission is also guided in these findings by LCP Parks and Recreation Element Policy 1.7.6 which states in part:

1.7.6 Develop and implement an integrated design, land use, recreation, cliff stabilization, and landscaping plan for West Cliff and East Cliff Drives to enhance public access, safety and recreational enjoyment in these areas...

- *Monitor the beach profile and recreational use of beaches to obtain baseline information for analyzing riprap proposals and their recreational impacts and establish criteria for a maximum permitted coverage of sandy beaches by seawalls...*

- *Develop design criteria for shoreline structures (e.g., minimize amount of material and coverage; emphasize use of non glare non-reflective, natural or natural appearing materials, incorporation of access facilities.)...*

- *Examine the feasibility of periodic street closure or limiting vehicular access along the length of West Cliff Dirve and consider opening West Cliff Drive between Washington and Beach Streets to bicycles and pedestrians only.*

See Exhibit 8, attached for full citation.

LCP Environmental Quality Policy 4.1.3. states:

Require coastal protective structures, signs and public facilities to be sensitive to the natural setting and minimize the alteration of the natural shoreline.

The City is working on components of an integrated plan. A West Cliff Drive Task Force was appointed by the City Council in March 1997 to identify user groups, use conflicts and recommendations on how best to improve the public's recreational experience on West Cliff Drive. The conclusion of the Task Force was to accommodate future growth in recreational uses of the pathway and to discourage automobile use on West Cliff Drive. Other conclusions were to keep West Cliff Drive two-way traffic, expand the pathway for multiple uses and preserve aesthetic value of the Drive in designing facilities and signage. The Task Force was not asked to examine the role of shoreline erosion on the use of West Cliff Drive.

The Commission finds that in the short term, the great value of the blufftop facilities for public access on balance outweighs the potential loss of beach sand supply created by the revetments. Nevertheless, the potential cumulative effects of shoreline protective works must also be addressed. The City's LCP Parks and Recreation Policy 1.7.6 provides the vehicle for determining the most effective approach to preserving and maximizing public access by requiring a comprehensive plan of West Cliff and East Cliff Drives. A comprehensive West Cliff Drive Integrated Development and Management Plan may conclude that there are alternatives to shoreline protective structures, at least in some cases, that will allow the City to minimize, if not eliminate, the impacts on shoreline sand supply and shoreline access. In addition,

the comprehensive plan could address the feasibility of a sand replenishment program as mitigation.

Therefore, mitigation of certain minor (but cumulatively significant) impacts can be provided through completion of a West Cliff Drive Comprehensive Plan which leads to implementation of an integrated public access/shoreline erosion strategy. In particular, the cumulative impacts on available recreational beach area and on sand supply need to be addressed. Reliance on such "programmatic" mitigation is appropriate because:

1) as opposed to privately-developed seawalls, e.g., 3-97-065 Motroni/Bardwell, the proposed revetments are completely located on public land or public easements and are exclusively for public benefit purposes;

2) in contrast to a private developer, the City has the capability and legal authority to implement such a comprehensive plan;

3) the City already has a policy to pursue such planning for West Cliff Drive in their certified LCP; and, has commenced the initial steps in such planning through the establishment of a planning Task Force for West Cliff Drive corridor;

4) the City has an established track record and experience with developing and implementing similar plans, notably the City's Beach Management Plan; and,

5) this permit is conditioned to require submittal and review not only of the plan itself, but also an implementation schedule and identification of potential funding sources.

It should also be pointed out that Section 21080.5(d)(2)(A) of CEQA prohibits a proposed development from being approved if there are feasible alternatives which would substantially lessen significant adverse environmental effects. As discussed in Finding 3, the Commission has reviewed alternative means of protection and finds that they are not feasible in the short term and, therefore, that the proposed shoreline protective structures are required to protect the recreational facilities and roadway. The Commission also finds though, that there are feasible alternatives that could address the cumulative and long term effects of the shoreline protective works on the West Cliff Drive shoreline and that have the potential to avoid or mitigate adverse effects. In particular these effects are proposed to be addressed under Santa Cruz City Local Coastal Program Parks and Recreation Element Policy 1.7.6. The Management Plan resulting from this policy, when implemented, can mitigate for cumulative impacts on shoreline sand supply.

Accordingly, this permit has been conditioned to require that the applicant submit to the Commission for review and approval a West Cliff Drive Integrated Development and

Management Plan which will provide for integrated design, land use, recreation, cliff stabilization, and landscaping for the West Cliff Drive corridor consistent with Local Coastal Program Parks and Recreation Element Policy 1.7.6. The submittal shall include a schedule of implementation and shall identify potential funding sources. Subsequently, the City shall submit annual implementation status reports to the Executive Director by July 1 of each year.

In summary, as conditioned, to complete and submit the West Cliff Drive Integrated Plan, the project may be found consistent with section 30235 of the Coastal Act.

5. **Public Access**

The project is located between the first public road and the sea. Sections 30210-30214 of the Coastal Act state that maximum access and recreation opportunities be provided, consistent with, among other things, public safety, the protection of coastal resources, and the need to prevent overcrowding.

Section 30210 of the Coastal Act states:

> *In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.*

Section 30211 of the Coastal Act states:

> *Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.*

Section 30212 of the Coastal Act states in part:

> *(a) Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where:*
>
> *(1) it is inconsistent with public safety, military security needs, or the protection of fragile coastal resources,*

West Cliff Drive extends from Natural Bridges State Beach to the Santa Cruz Beach and Boardwalk area of Santa Cruz. The Drive which is approximately one and one-

half miles long is the City's premier coastal recreational corridor developed with a multi-use bicycle and pedestrian path with periodic viewing points, benches and parking bays. Lighthouse Point, approximately midway along the road, is the site of international surfing contests. See Exhibit 1, Location Map. The 35-foot high bluffs along this area of shoreline are deeply indented into coves, sand beaches are present in the intertidal area of some of these coves. Some of these beaches are accessible; others are not.

Public Trust Issues. In addition to publicly owned beach parks, the public has ownership and use rights in the lands of the State seaward of the ordinary high-water mark (public trust lands) and may have rights landward of the ordinary high water mark through historic public use (public prescriptive rights).

By virtue of its admission into the Union, California became the owner of all tidelands and all lands lying beneath inland navigable waters. These lands are held in the State's sovereign capacity and are subject to the common law public trust. The public trust doctrine restricts uses of sovereign lands to pubic trust purposes, such as navigation, fisheries, commerce, public access, water-oriented recreation, open space and environmental protection. The public trust doctrine also severely limits the ability of the State to alienate these sovereign lands into private ownership and use free of the public trust. Consequently, the Commission must avoid decisions that improperly compromise public ownership and use of sovereign tidelands.

Where development is proposed that may impair public use and ownership of tidelands, the Commission must consider where the development will be located in relation to tidelands. The legal boundary between public tidelands and private uplands is known as the ordinary high water mark. (Civil Code, 830.) In California, where the shoreline has not been affected by fill or artificial accretion, the ordinary high water mark of tidelands is determined by locating the "mean high tide line". The mean high tide line is the intersection of the elevation of mean high tide with the shore profile. Where the shore is composed of a sandy beach whose profile changes as a result of wave action, the location at which the elevation of the mean high tide line intersects the shore is subject to change. The result is that the mean high tide line (and therefore the boundary) is an "ambulatory" or moving line that moves seaward through the process known as accretion and landward through the process known as erosion.

Consequently, the position of the mean high tide line fluctuates seasonally as high wave energy (usually but not necessarily) in the winter months causes the mean high tide line to move landward through erosion, and as milder wave conditions (generally associated with the summer) cause the mean high tide line to move seaward through accretion. In addition to ordinary seasonal changes, the location of the mean high tide line is affected by long term changes such as sea level rise and diminuation of sand supply.

The Commission Must Consider a Project's Direct and Indirect Impact on Public Tidelands. In order to protect public tidelands when beachfront development is proposed, the Commission must consider (1) whether the development or some portion of it will encroach on public tidelands (i.e., will the development be located below the mean high tide line as it may exist at some point throughout the year) and (2) if not located on tidelands, whether the development will indirectly affect tidelands by causing physical impacts to tidelands.

Direct Encroachment on Public Tidelands: The Santa Cruz City Public Works Department site plan for the proposed project shows that portions of both projects fall below the mean high water level and hence will encroach on public trust lands (see Exhibit 4, attached). The State Lands Commission has issued general leases for previous shoreline works below the mean high water line along the Drive and the City has requested that the lease be amended to include these projects. The coastal permit has been conditioned to require submittal of the State Lands Lease or evidence that the project may proceed pending completion of lease processing.

The proposed revetments will cover small sections of two sandy coves, almost all of which are below the mean low water (elevation1.89) and only exposed at very low tides (see Exhibit 4, Location of Mean High Water Line, attached). In addition, these small areas are at the foot of steep bluffs and are not accessible. The deposition of riprap at these locations will encroach on public trust lands but it will not directly affect beach access.

Other Impacts on Public Lands. Though the State Lands Commission reports that a General Lease will be issued to the applicants, the structures will continue to affect the public's ownership and use rights as the shoreline protective structures retain coastal bluff sand preventing it from reaching the littoral zone where it moves downcoast (in this area) and may contribute sand to beaches which support public recreation, e.g., Cowell Beach, and by changing the beach profile and by causing greater erosion on adjacent public beaches (see finding 4). This is inconsistent with Sections 30210-211 of the Coastal Act.

Nevertheless, the proposed project is specifically being undertaken by a public entity to preserve existing significant public coastal access and recreational facilities on the blufftop. As discussed in Finding 3 above, a comprehensive West Cliff Drive Integrated Development and Management Plan may conclude that there are alternatives to riprap revetments that will have fewer impacts on the shoreline sand supply and shoreline access which could include a sand replenishment program. Such a plan can address the potential cumulative impacts of shoreline protective works.

However, pending the completion of the plan, the value of the blufftop facilities for public access on balance outweighs the potential loss of beach sand supply created

by the revetments. In this case, the Commission finds that the maximum public access achievable at this time is by the repair of the existing facilities.

Therefore, as conditioned, the proposed development maximizes public and recreational opportunities and is consistent with the access policies of the Coastal Act.

Temporary Impacts on Public Access: The undermined bluff has required closure of two parking areas and portions of the recreational trail. Construction of the seawall will further temporarily impact access along West Cliff Drive. Vehicular and pedestrian access will be rerouted for approximately 8 weeks. Completion of the project will return the West Cliff Drive recreational path and road to its full pre-storm accessibility. To assure minimal disruption of access areas and peak visitor periods, the permit has been conditioned to require submittal of plans for the staging area and a construction schedule. Nevertheless, the construction must take place as soon as possible and thus will impact summer recreationalists. As conditioned, the short term construction impacts on public access are not significant.

The coastal development permit has been conditioned to require that the applicant submit to the Executive Director for review and approval staging area plans and a construction schedule and written evidence of the State Lands permission to allow the construction of the seawall on public trust lands.

Therefore, as conditioned, the proposed development will allow for prompt restoration of coastal access facilities but provide for a long term commitment to develop a plan to balance the various public access opportunities. The proposed development will maximize access while protecting public safety and fragile coastal resources and is consistent with the public access policies of the Coastal Act.

6. Geologic Hazards and Structural Stability

Section 30253 of the Coastal Act states:

> *New development shall:*
> *(1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
> *(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.*

The Santa Cruz City coastline has been subject to substantial damage as a result of storm and flood occurrences and geological failures. As discussed in the preceding findings the site of the proposed project is subject to these hazards. The Commission

must find that the proposed seawall will be structurally stable and, hence, that it will provide the protection for which it has been designed.

Seawall Design: The City of Santa Cruz developed the proposed designs from coastal engin.eering studies previously developed for West Cliff Drive that calculated the maximum design wave and the extent of erosive wave runup, and determined the size of the armor stone that is stable during the design storm event.

The designs of the structures have been described in detail in Finding 1, page 8, and the appropriateness of the designs for the sites are reported in Finding 3, page 11, where alternative designs are evaluated.

To assure structure stability consistent with Section 30253 of the Coastal Act, the permit has been conditioned to require that the final plans be submitted to the Executive Director for review and approval prior to transmittal of the permit. The final plans shall incorporate the recommendations of the Monterey Bay National Marine Sanctuary and the Regional Water Quality Control Board as reviewed and approved by the Executive Director, and the conditions of this coastal development permit. In addition, the permit has been conditioned to require that upon completion of the work, the City shall submit an engineering report by a qualified professional engineer verifying that the revetments have been constructed in conformance with the final approved plans and detail prepared by the Santa Cruz City Public Works Department.

Monitoring and Maintenance: In addition, the effective life of a seawall will be determined by the severity and frequency of storms and the types of maintenance and repair provided. Though the seawall has been designed for longevity and stability, on an eroding shoreline any protective structure built to withstand direct wave attack is subject to deterioration. Armor stone revetments require periodic maintenance. According to the applicant this is generally limited to repositioning toe stones that shift from their design position by wave energy and such maintenance is usually deferred until there is sufficient work to warrant mobilizing a crane. The City performs annual monitoring of the revetment structures built in the early 1990's. Unraveling detected to date was found to be insignificant. The proposed revetments would be included in the City's revetment monitoring and maintenance program.

To assure the continued stability of the seawall and to minimize the risk to bluff top recreational facilities consistent with Section 30253, the permit has been conditioned to require that a copy of the annual monitoring and maintenance report be submitted to the Executive Director for review and approval. The report should be commensurate with the need, i.e., a single paragraph would be adequate if there was no evidence of damage. On the other hand, a full analysis of damage and recommended action would be needed if, for example, substantial unraveling or end scour were detected.

Assumption of Risk: Finally, the Coastal Act recognizes that new development, such as the proposed seawall may involve some risk and that the constructed wall itself is subject to wave attack and erosion and as such involves risk. The Coastal Act policies require the Commission to establish the appropriate degree of risk acceptable for the proposed development and to determine who should assume the risk. When development in areas of identified hazards is proposed, the Commission considers the hazard associated with the project site and the risk potential to the public, as well as the individual's right to use his property.

As a means of allowing development in areas subject to these hazards while avoiding placing the economic burden on the People of the State for costs arising from continued damage to shoreline development, the Commission has regularly required that the applicant agree to waive any claims of liability on the part of the Commission for allowing the development. Since the project is funded by the federal government and sponsored by the City, a waiver of liability condition is not required -- liability is assumed by the City. While the Commission has found the project consistent with the Coastal Act, it makes no claim as to the engineering reliability of the design other than that it appears to be a reasonable approach based on previous experience in this area of Central California.

Therefore, as conditioned, to require submittal to the Executive Director for review and approval of (1) final plans for the seawall, (2) post construction evaluation by a qualified professional engineer, and (3) continued annual monitoring and maintenance, the Commission finds that the proposed shoreline revetments will be constructed and maintained to assure the integrity of the structure and the stability of the site and will minimize risks to life and property consistent 30253 of the Coastal Act.

7. Marine Resources and Water Quality

Coastal Act Section 30230 states:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*

Section 30231 of the Coastal Act states:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum*

> *populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

The shoreline bluff will be lined with an armor stone revetment consisting of 7 ton quarry stone. Approximately 3500 square feet of the intertidal zone below mean high water level will be covered with rock revetment. The quantity of fill in the intertidal zone is estimated at 800 cubic yards. Each seven ton stone will be individually placed with a crane (Caltrans Method "A" Placement). According to the applicant quarry stone has few fine sediments and coupled with the placement method will not appreciabily increase the turbidity of the receiving waters.

An Ecological Characterization of Intertidal Communities at Shoreline Repair Sites 98-4 and 98-5 Along West Cliff Drive, Santa Cruz, was prepared by Applied Marine Sciences, Inc. (May 1998). The survey of the development sites found that due to the geography of the region the project sites receive a significant amount of wave energy from prevailing swells during both summer and winter months. Both sites have steep vertical faces which extend from the upper to lower intertidal zones. The mudstone substrate is soft and friable and highly erosive. Because of the high wave energy and erosive substrate, both sites are characterized by low species diversity and low abundances of most species.

The study compared the project sites with nearby rip-rapped sites and observed that the abundance and diversity of marine plants and animals at the rip-rapped sites was substantially higher due to higher surface area for colonization, a harder, less erodible substrate, and an increase in wave protected areas. The report concluded that the proposed rip-rap materials will support intertidal communities similar to those existing but with higher species diversity and abundances.

Nevertheless, the natural habitat will be altered. In this case, the alteration will not have significant impacts because of the similarity in recolonizing species. There will also be a temporary decrease in species diversity and abundance during the construction process and pending recolonization of the rocks. However, this is a short term impact that will not have significant impacts on the marine environment.

Regarding the potential for contamination of the intertidal area and waters of Monterey Bay from the construction of the shotcrete-faced soil nail retaining wall, the City reports:

> *Due to the configuration of the work site, concrete is not likely to flow in to the water. The concrete mix used for shotcrete has a lower slump and is more*

viscuous than regular concrete, and therefore, does not flow readily. The bottom of the wall is set back an average of 4 feet from the edge of the bedrock and any concrete that escapes won't likely reach the edge.

The City has amended its shotcrete specifications to require:

Prior to placement of shotcrete, the contractor shall submit a plan for preventing shotcrete from over-spraying and escaping the work area for the engineers review and approval. Contractor shall remove and dispose of any concrete that is placed outside the limit of work.

The coastal development has been conditioned to require submittal of the contractor's shotcrete managment plan to the Executive Director for review and approval prior to commencement of construction.

In 1992 the waters to the mean high water line lying adjacent to the Central California coastline were designated the Monterey Bay National Marine Sanctuary (MBNMS). The area was designated by the Secretary of Commerce as a marine environment of special national significance to ensure comprehensive management and protection. Discharges into Sanctuary waters require review by the MBNMS. The applicant has submitted the project plans to the Sanctuary for review and approval. The coastal development permit has been conditioned to require evidence of approval and implementation of recommendations from the MBNMS subject to the review and approval of the Executive Director.

The Regional Water Quality Control Board has issued a letter which is the "equivalent to a waiver of water quality certification" and will require no further review unless the project changes.

The permit has been conditioned to require construction monitoring which provides that no concrete or construction debris shall enter ocean waters and that all construction materials and debris must be removed from the beach/bluff at the conclusion of the construction operation; submittal of a plan to prevent contamination from concrete work; and the approval of the Monterey Bay National Marine Sanctuary. Therefore, as conditioned with these safeguards, the proposed development will not significantly impact the water quality and biological productivity of the coastal waters and is consistent with Sections 30230-1 of the Coastal Act.

8. Land Resources

Section 30240 of the Coastal Act states:

(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.

(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.

The blufftop is generally vegetated with ice plant and grasses. The steep bluffs provide limited habitat for land animals. The bluffs are, however, potential nesting and roosting sites for birds. In particular, pigeon guillemots (*Cepphus columba*) and black swifts (*Cypseloides niger*) have been known to nest along the West Cliff Drive bluffs. Studies in the late 1980's for the previous series of revetments found black swift nests in a sea cave located between two construction sites. A seacave used by the swifts was closed by a vertical seawall. The swifts returned two years later to nest above the seawall.

The black swift was been identified as a "species of special concern" by the California Department of Fish and Game. David L. Suddjian, Biologial Consulting Services, investigated (May 15, 1998) avian resources at the West Cliff Drive proposed seawall sites and evaluated nesting habitat for the pigion guillemot and the black swift. Also "other species and other sensitive uses (e.g., roosting)" were evaluated.

The investigation found that there was no suitable nesting substrate for pigeon guillemots at either site. There are two small sea caves at the western Columbia Street site (CSC-SCRC-006). The caves were low enough that they would be inundated at higher tides and would not be viable for nesting. Swifts had not been observed to nest at these sites in previous years (Santa Cruz Bird Club records). The report concluded that no significant impacts to any birds would occur and that further biological monitoring would not be necessary.

Therefore, as conditioned, the proposed development will not impact land habitat resources and, in that respect, is consistent with Section 30240 of the Coastal Act.

9. <u>Archaeological and Paleontological Resources</u>

Section 30244 of the Coastal Act provides:

Where development would adversely impact archaeological or paleontological resources as identified by the State Historic Preservation Officer, reasonable mitigation measures shall be required.

Land Use Plan Cultural Resources Policy 1.2 states:

> *Identify sensitive archaeological and paleontological sites early in land-use planning and/or development process so archaeological and paleontological resources can be given consideration during the conceptual design phase of private or public projects.*

Santa Cruz City's Coastal Zone contains an important fossil record. Land Use Plan Map CR-2 Sensitive Archaeological and Paleontological Areas identifies the entire bluff along West Cliff Drive as a sensitive paleontological resource area.

Under coastal development permit 3-90-111 and amendment 3-90-111A paleontological field reconnaissance was done at each site and reasonable mitigation undertaken as required. The upper bluff of the Woodrow site was surveyed at that time. The City has retained a project paleontologist (Frank Perry, Paleontologist) to do paleontological resources assessments for both project sites and to recommend reasonable mitigations if resources are discovered.

The permit has been conditioned to require that prior to issuance, the applicant shall submit to the Executive Director for review and approval and shall subsequently implement the recommendations of the paleontological survey report that provides for reasonable mitigation, if needed, consistent with the State Historic Preservation Office standards.

Therefore, as conditioned, the proposed development is consistent with Section 30244 of the Coastal Act and with provisions of the Santa Cruz City Local Coastal Program.

10. Scenic Resources

Section 30251 of the Coastal Act states:

> *The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas. New development in highly scenic areas such as those designated in the California Coastline Preservation and Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.*

The West Cliff Drive shoreline is a scenic corridor characterized by a near vertical 35-foot high bluff broken by small sandy coves and pocket beaches and with panoramic

views of Monterey Bay. As discussed previously several sections of the shoreline have been stabilized and reinforced with vertical retaining walls and riprap revetments over the years. Motorists have almost unbroken views across the bay but are less likely to view the bluff and beaches. Pedestrians, bicyclists and beach users have more direct views of the bluff and beaches and can clearly see existing shoreline structures. The incremental alteration of the shoreline is having a cumulative adverse impact on the visual character of the shoreline.

The proposed shotcrete wall and riprap will have a negative visual impact reaching well into the visual range of recreational path users. Approximately 400 lineal feet of bluff will be riprapped by the two projects, some extending into intertidal area. See Exhibit 4, attached.

To soften the effects of the unnatural shapes the City will color the concrete to match the bluffs and will use granite, weathered basalt, or franciscan rock for the riprap according to availability. Dolomite, a crystalline bright, white rock would look out of place so will not be used. As discussed in Finding 3, Alternatives to Proposed Shoreline Protective Structures, because of the friability of the mudstone at the base of the bluff, a vertical wall is not feasible. In addition, the riprap wall is as small as possible to reduce intertidal/beach coverage. Hence, though the proposed structures will have a visual impact, they have been designed to minimize the alteration of natural land forms and to be as visually compatible with the character of surrounding areas as feasible and are, therefore, consistent with Section 30251 of the Coastal Act as a single project.

The Santa Cruz City Land Use Plan also has several policies regarding protection of scenic resources and planning goals to limit and mitigate the visual impacts of shoreline structures.

Environmental Quality Policy 4.1.3. states:

> *Require coastal protective structures, signs and public facilities to be sensitive to the natural setting and minimize the alteration of the natural shoreline.*

As discussed In Finding 3, the alternatives analysis, the City's Land Use Plan provides for an integrated approach. Parks and Recreation Element Policy 1.7.6 states:

> *Develop and implement an integrated design, land use, recreation, cliff stabilization, and landscaping plan for West Cliff and East Cliff Drives to enhance public access, safety and recreational enjoyment in these areas...*
>
> - *Develop design criteria for shoreline structures (e.g., minimize amount of material and coverage; emphasize use of non glare non-reflective, natural or natural appearing materials, incorporation of access facilities.)*

Finding 3 establishes that the proposed structures are the best feasible alternative available at this time. Hence, with the exception of the color or the materials and revegetation, the visual impacts are unavoidable. However, the Commission finds that the cumulative impacts of unplanned shoreline structures are not consistent with the scenic resource policies of the Coastal Act, and only, as conditioned to require the development of a comprehensive plan for West Cliff Drive that integrates design, land use, recreation, cliff stabilization and landscaping can the proposed shoreline protective works be found consistent with Section 30251.

11. Local Coastal Program/Original Jurisdiction/CEQA

The City of Santa Cruz Local Coastal Program was initially certified in July 1981 and the City assumed coastal development permit authority in the coastal zone with the exception of City lands within the Commission's original jurisdiction, i.e., tidelands, submerged lands, and public trust lands. The City completely revised the General Plan/ Local Coastal Program in 1993 and effectively received a recertification upon Commission approval of the major amendment in 1994.

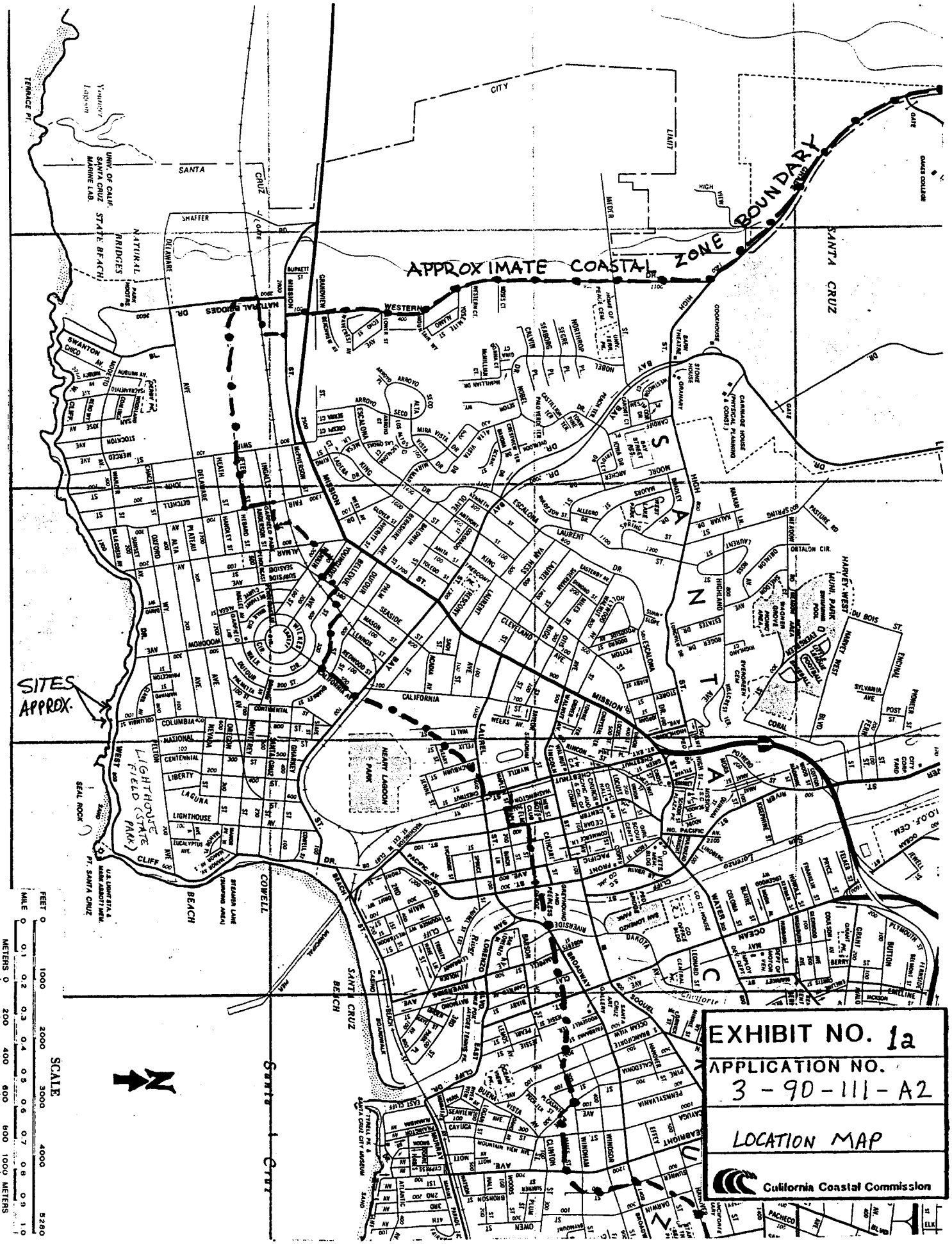
The proposed projects fall both within the Commission's original jurisdiction and in the City's coastal development permit jurisdiction. The Commission's coastal development permit applies to portions of the project within the Commission's jurisdiction. Within the Commission's original jurisdiction, LCP policies are advisory and provide guidance for the Commission. Nevertheless, shoreline protective works are integrated structures that often cross these paper boundaries as in this case. The upper portions of the proposed riprap revetments (above the mean high water line) could not be constructed without the lower portions of the revetment (below the mean high water line) to support them. Hence, the preceding findings analyze the entire project and refer to relevant Santa Cruz City LCP policies as well as the Coastal Act.

The City of Santa Cruz submitted a request to the Coastal Commission for an emergency coastal development permit to construct the two shoreline protective works and declared that the projects were categorically exempt (Class 9a) from CEQA because of the disaster declaration made by Governor Wilson. It was determined by legal staff that the proposed projects did not qualify for an emergency coastal permit under the Coastal Act or other state laws since "immediate action to prevent or mitigate loss or damage to life, health, property or essential public services" was not required or requested by the City. In addition, the revetments are not within the road right-of-way but are located on private lands over which the City has a public recreational easement (see Exhibit 3, Site Plan and Parcel Boundaries, attached). However, the necessity for prompt action both to restore the public walkway and parking areas for the summer season and to qualify for federal funding (West Cliff Drive Storm Disaster Repair Projects funded by Federal Disaster Relief funds) was clear. The Commission staff agreed to work with the City to attempt to meet a June 9,

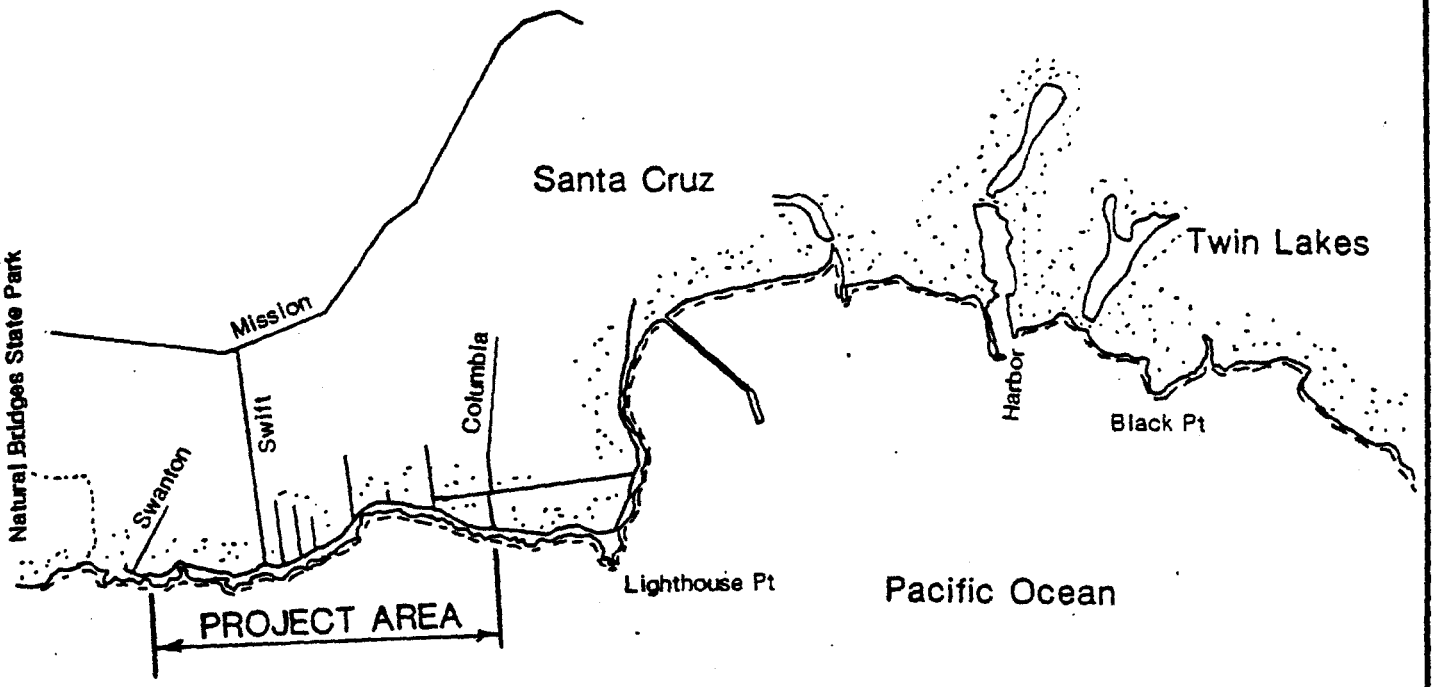
1998 deadline for awarding a contract which would place the City in a good position to receive federal reimbursement.

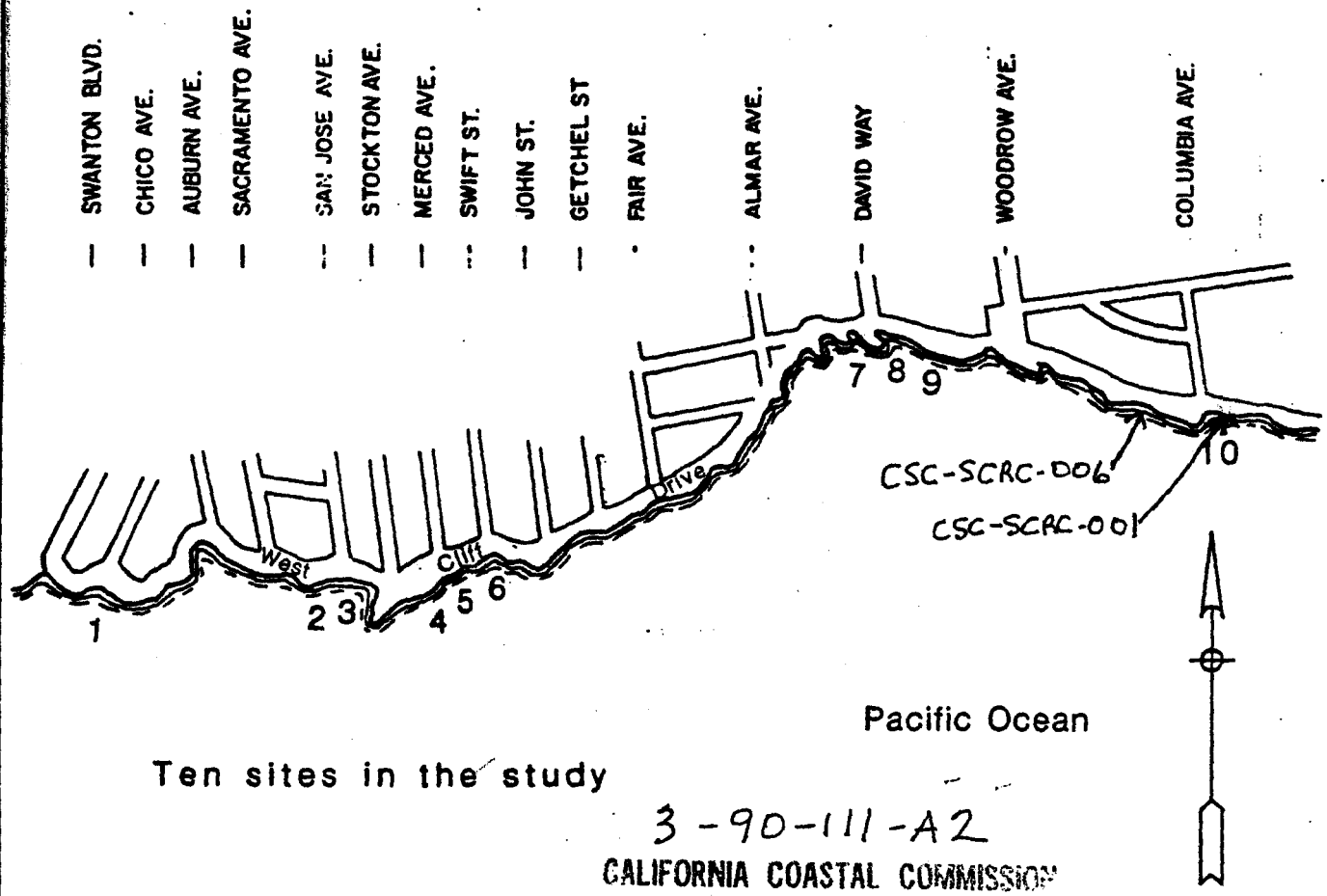
The Executive Director determined that the application could be processed as an amendment to the City's West Cliff Drive shoreline stabilization program approved by the Commission as 3-90-111 and 3-90-111-A in the early 1990's. The background documents for those projects including the Negative Declarations of 7/17/90 and 8/18/91 evaluate most aspects of the proposed projects but provide no site specific analysis for CSC-SCRC-006. The Commission staff requested and received further analysis of marine and land resources for both sites to allow for a more complete environmental analysis.

The proposed shoreline structures, as conditioned, will be consistent with the Santa Cruz City Local Coastal Program and the California Coastal Act. There are no feasible alternatives or feasible mitigation measures available, other than those imposed, that would substantially lessen any significant adverse impact and, as conditioned, the proposed project will not have significant adverse effect on the environment, within the meaning of the California Environmental Quality Act.



SANTA CRUZ CITY - WEST





Ten sites in the study

3-90-111-A2
CALIFORNIA COASTAL COMMISSION
EXHIBIT 1b

LOCATION MAP

By: H. Morgan Noble Date:	NOBLE CONSULTANTS	Project: WEST CLIFF DRIVE REVETMENT PHASE 1 PROJECT No.: 802-01

Figure 1

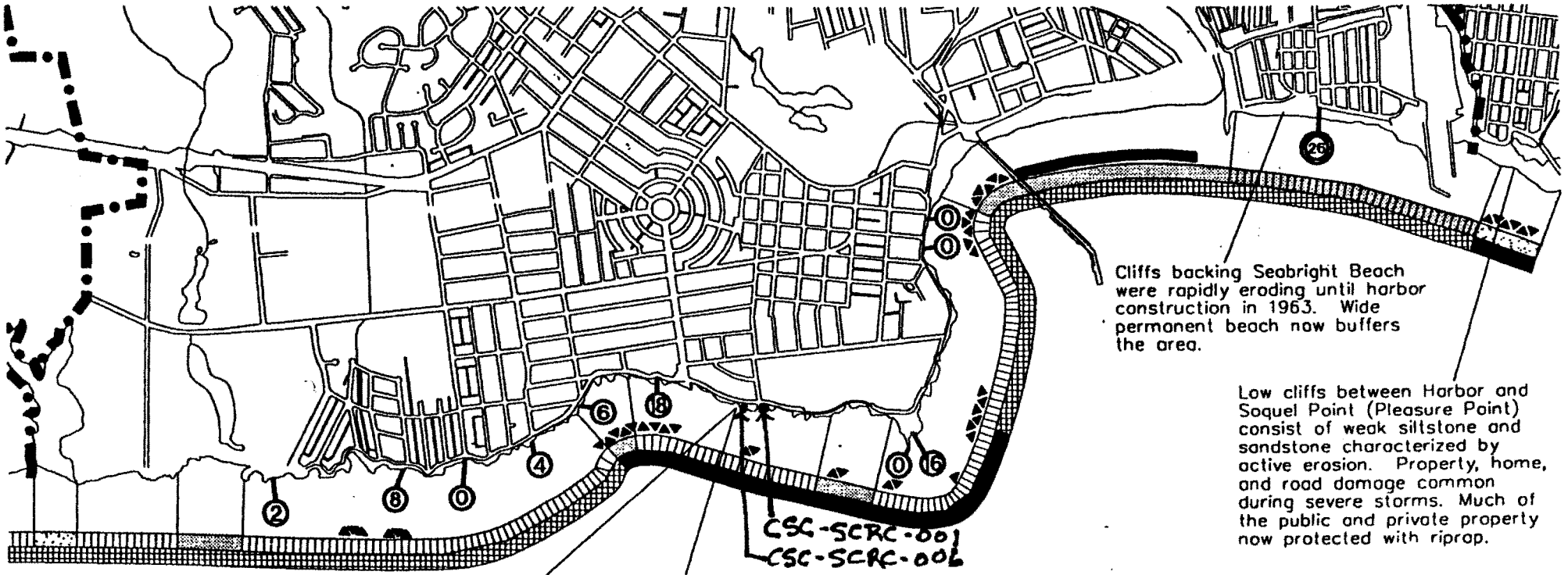
MAP S-1: CLIFF EROSION

The City of Santa Cruz, California

LEGEND

- SANDY BEACH
- BEACH BACKED BY MARSH
- CLIFF PROTECTED BY BEACH
- UNPROTECTED CLIFF
- CAUTION - MODERATE RISK
- HAZARD - HIGH RISK
- (0) EROSION RATE IN INCHES/ YEAR
- (26) EROSION RATE BEFORE PROTECTION IN INCHES/ YEAR
- RIPRAP
- SEAWALL

Source:
Living with the California Coast,
Gary Griggs and Lauret Savoy, editors,
Sponsored by the National Audubon Society
Duke University Press,
Durham, N. Carolina 1985.



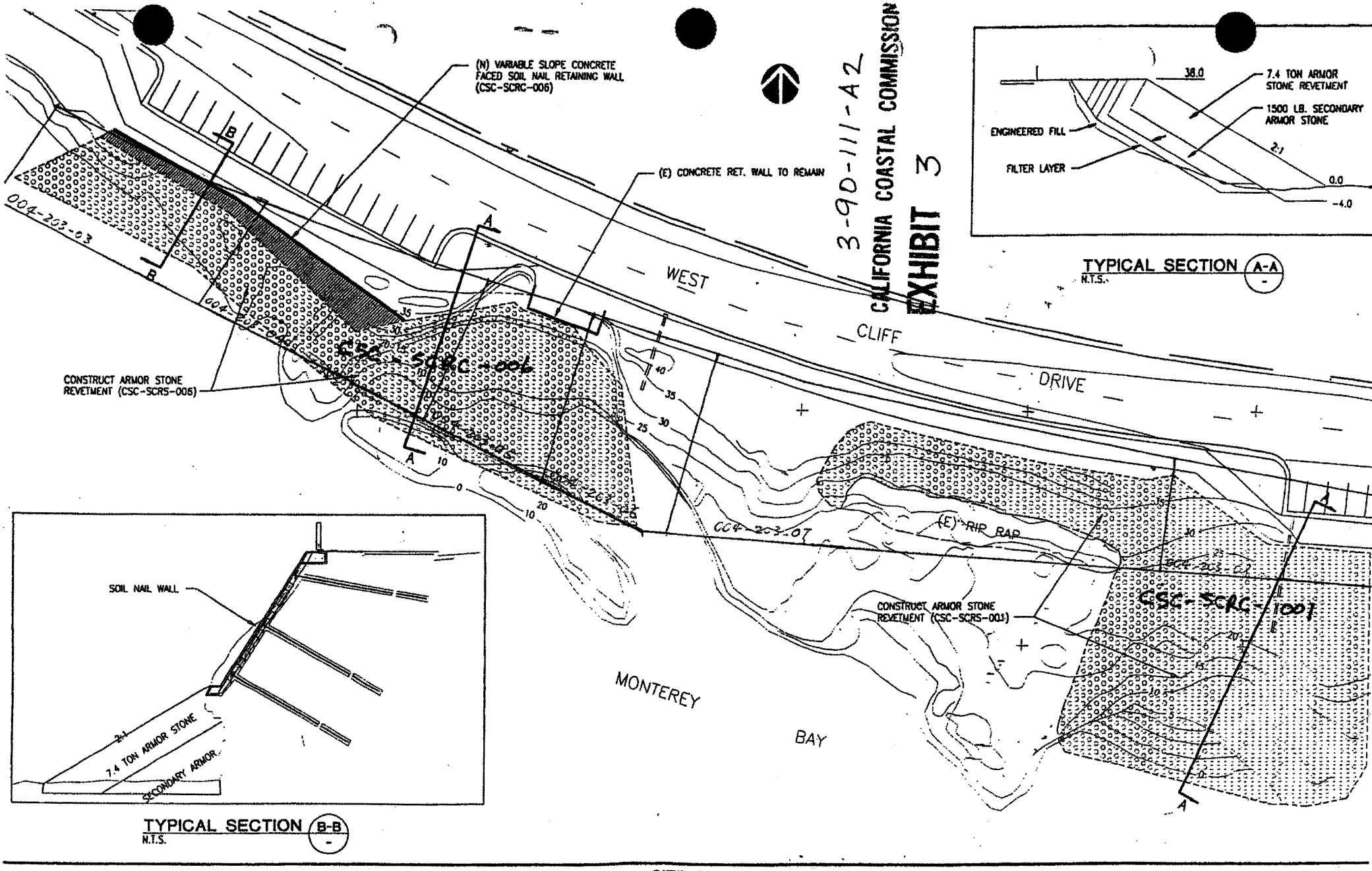
Cliffs backing Seabright Beach were rapidly eroding until harbor construction in 1963. Wide permanent beach now buffers the area.

Low cliffs between Harbor and Soquel Point (Pleasure Point) consist of weak siltstone and sandstone characterized by active erosion. Property, home, and road damage common during severe storms. Much of the public and private property now protected with riprap.

West Cliff Drive subject to intense wave activity. Marine terrace only 25-45 feet high frequently overtopped during storms. Undercut and collapse of bike path and roadway is a recurring problem. Winter 1983 storms produced up to 40 feet of erosion of unconsolidated material lying atop the low bedrock terrace. Severe erosion at west side of Lighthouse Point.

1000 FEET

3-90-111-A2
CALIFORNIA COASTAL COMMISSION
EXHIBIT 2



TYPICAL SECTION (A-A)
N.T.S.

TYPICAL SECTION (B-B)
N.T.S.

SITE PLAN

CITY of SANTA CRUZ
PUBLIC WORKS DEPARTMENT

APPROVED:

INTERIM DIRECTOR OF PUBLIC WORKS

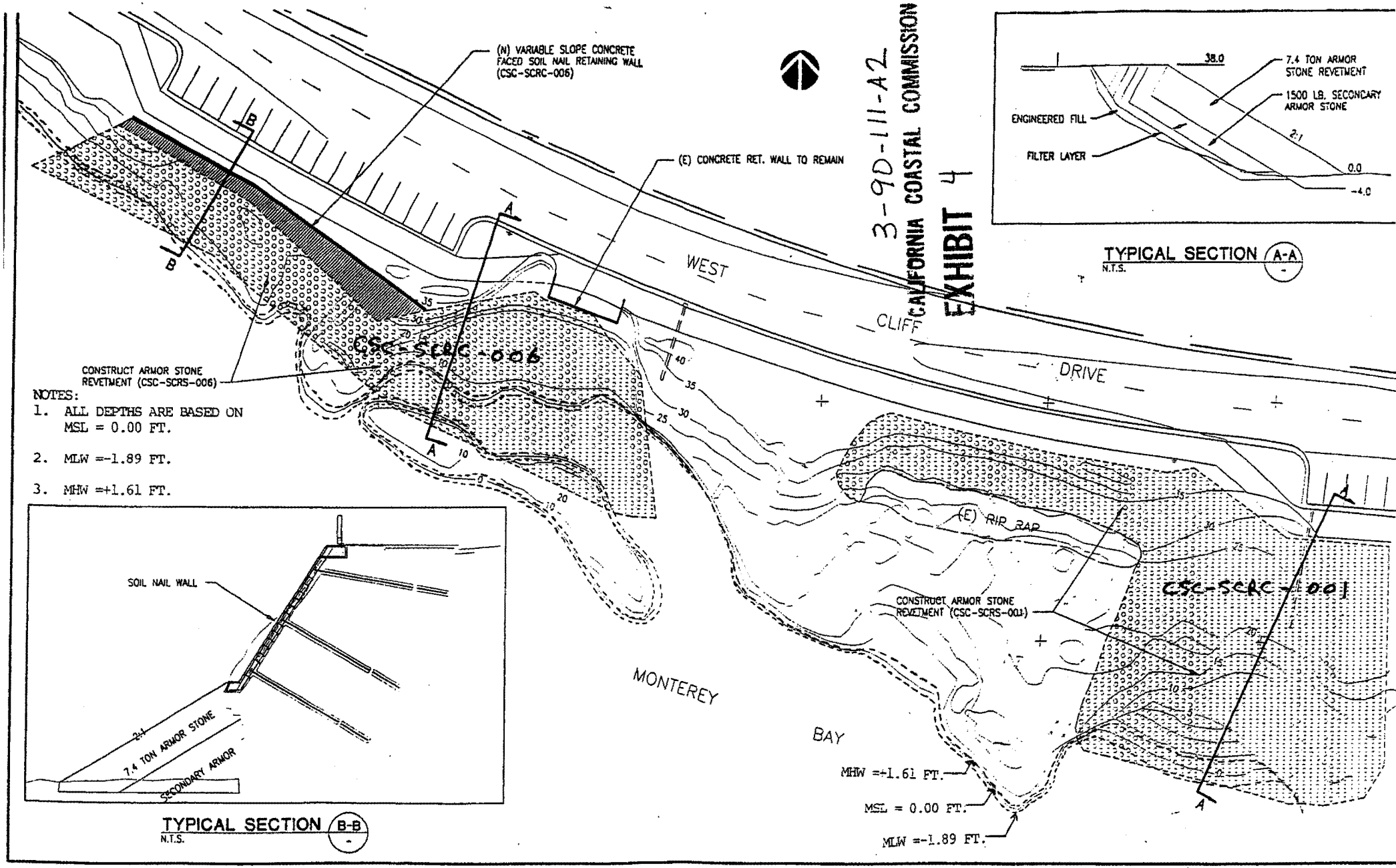
WEST CLIFF DR. DISASTER PROJECT
EROSION REPAIR
IMPROVEMENT PLAN

REFERENCE

DRAWN A. BECKER
DESIGN T. LAU
CHECKED T. SHARP

DATE 03/31/98
SHEET 3 OF 3

SCALE AS SHOW
VAULT NO. #



TYPICAL SECTION (B-B)
N.T.S.

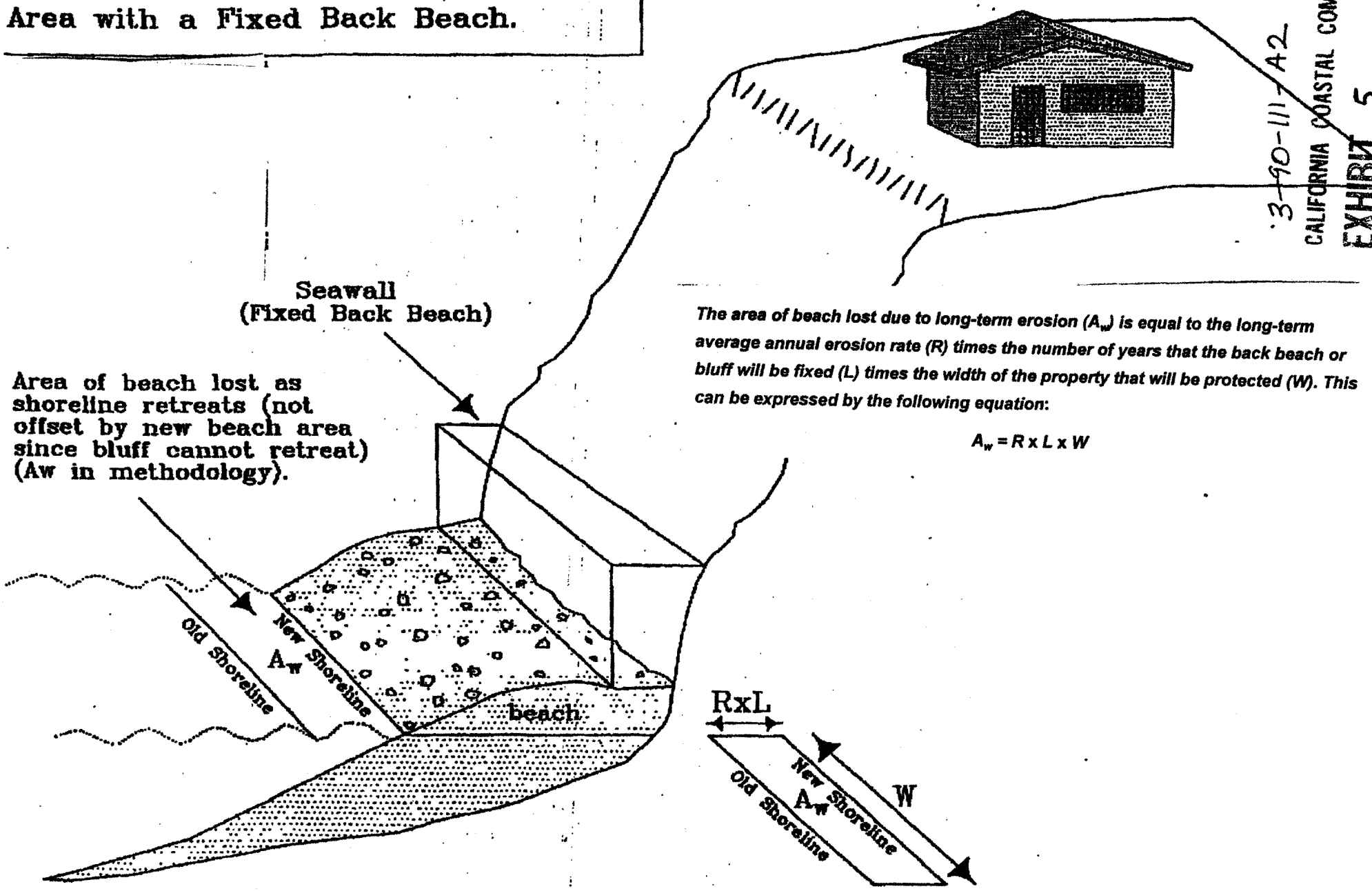
TYPICAL SECTION (A-A)
N.T.S.

3-90-111-A2
CALIFORNIA COASTAL COMMISSION
EXHIBIT 4

SITE PLAN WITH WATER ELEVATIONS

CITY of SANTA CRUZ PUBLIC WORKS DEPARTMENT	APPROVED: INTERIM DIRECTOR OF PUBLIC WORKS	WEST CLIFF DR. DISASTER PROJECT EROSION REPAIR IMPROVEMENT PLAN	REFERENCE	DRAWN A. BECKER	DATE 03/31/98	SCALE AS SHOWN
				DESIGN T. LAU	SHEET 3 OF 3	VAULT NO. #
				CHECKED T. SHARP		

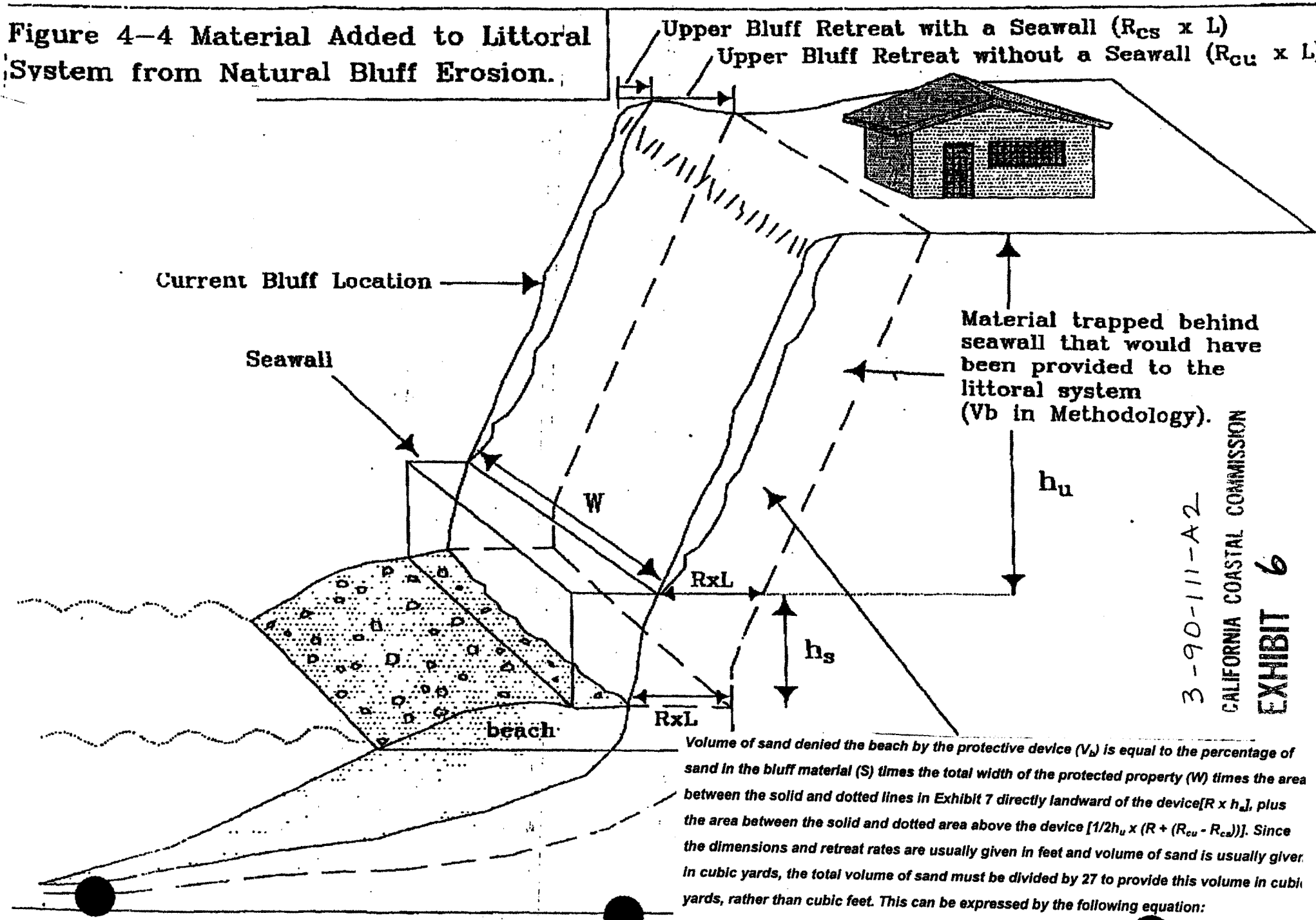
Figure 4–3 Long–term Loss of Beach Area with a Fixed Back Beach.



The area of beach lost due to long-term erosion (A_w) is equal to the long-term average annual erosion rate (R) times the number of years that the back beach or bluff will be fixed (L) times the width of the property that will be protected (W). This can be expressed by the following equation:

$$A_w = R \times L \times W$$

Figure 4–4 Material Added to Littoral System from Natural Bluff Erosion.

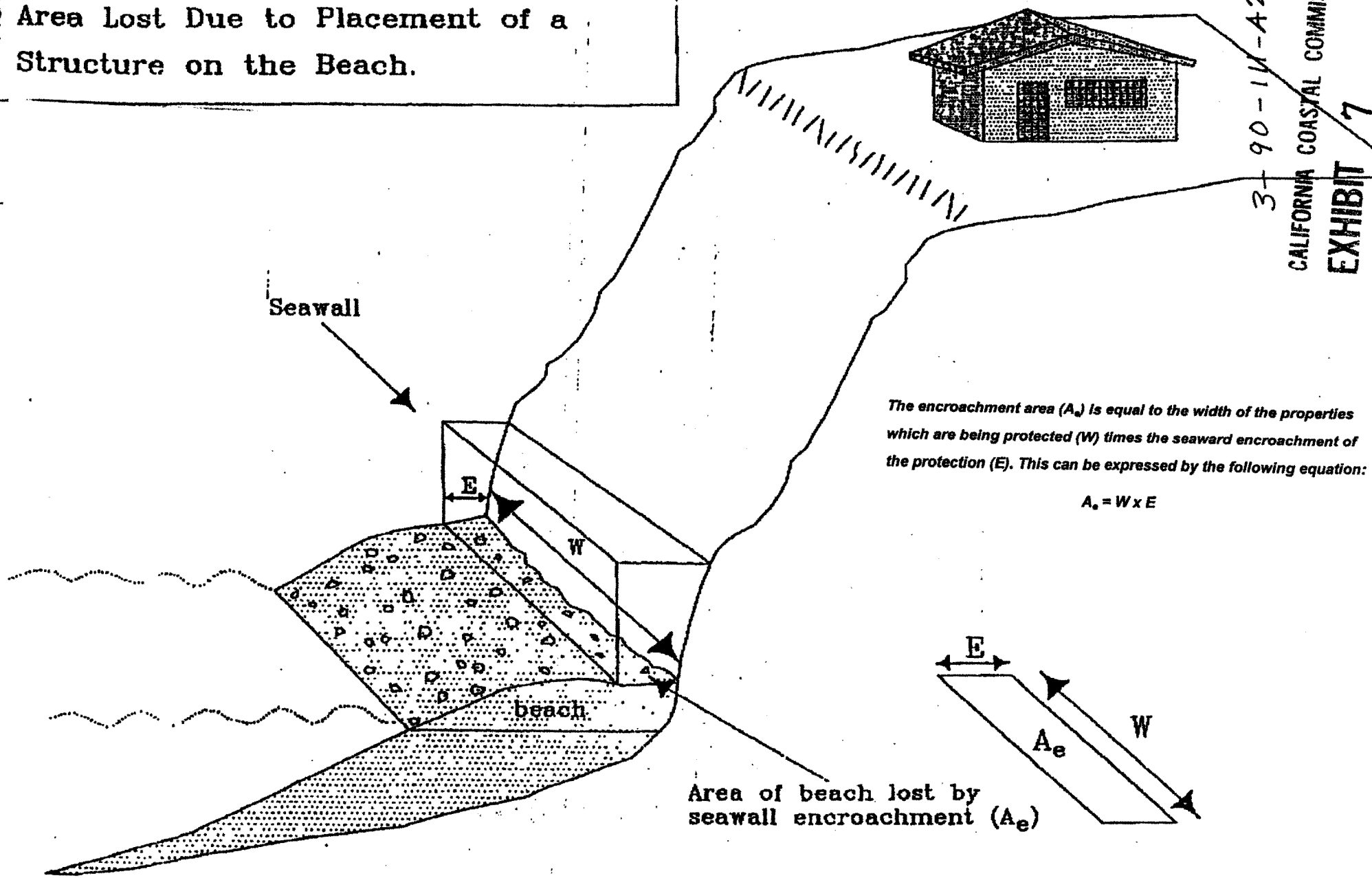


Volume of sand denied the beach by the protective device (V_b) is equal to the percentage of sand in the bluff material (S) times the total width of the protected property (W) times the area between the solid and dotted lines in Exhibit 7 directly landward of the device[R x h_s], plus the area between the solid and dotted area above the device [1/2h_u x (R + (R_{cu} - R_{cs}))]. Since the dimensions and retreat rates are usually given in feet and volume of sand is usually given in cubic yards, the total volume of sand must be divided by 27 to provide this volume in cubic yards, rather than cubic feet. This can be expressed by the following equation:

$V_b = (S \times W \times L) \times [(R \times h_s) + (1/2h_u \times (R + (R_{cu} - R$ ... 27

3-90-111-A2
CALIFORNIA COASTAL COMMISSION
EXHIBIT 6

Figure 4-2 Encroachment Area-Beach Area Lost Due to Placement of a Structure on the Beach.



The encroachment area (A_e) is equal to the width of the properties which are being protected (W) times the seaward encroachment of the protection (E). This can be expressed by the following equation:

$$A_e = W \times E$$

Santa Cruz City Local Coastal Program Parks and Recreation Element

1.7.6 Develop and implement an integrated design, land use, recreation, cliff stabilization, and landscaping plan for West Cliff and East Cliff Drives to enhance public access, safety and recreational enjoyment in these areas.

- Create a continuous pathway along the coast by enhancing physical linkages between West Cliff and East Cliff Drives and the Beach Promenade.
- Lay out criteria for maintaining riprap, protection of paleontoligical resources and bird nests, and trail maintenance.
- Monitor the beach profile and recreational use of beaches to obtain baseline information for analyzing riprap proposals and their recreational impacts and establish criteria for a maximum permitted coverage of sandy beaches by seawalls.
- Analyze facilities and the need for additional or rehabilitation of existing lighting, restroom, drinking fountains, artistic and landscape enhancements, benches, bike parking, directional and interpretive signs, acessways, stairways, overlooks, and improved safety proposals.
- Develop design criteria for shoreline structures (e.g., minimize amount of material and coverage; emphasize use of non glare non-reflective, natural or natural appearing materials, incorporation of access facilities.)
- Ensure continued monitoring of and possible remedial work for wastewater outfall protective rock (pursuant to Moffatt and Nichol's "Santa Cruz Outfall Monitoring Program").
- Develop locational and non-point source pollutant criteria for dealing with drainage discharges.
- Examine the feasibility of periodic street closure or limiting vehicular access along the length of West Cliff Dirve and consider opening West Cliff Drive between Washington and Beach Streets to bicycles and pedestrians only.

Environmental Quality 4.1.3. Require coastal protective structures, signs and public faciliteis to be sensitive to the natural setting and minimize the alteration of the natural shoreline.

3-90-111-A2

CALIFORNIA COASTAL COMMISSION

EXHIBIT 8