EXECUTIVE SUMMARY

Coastal Sand Management Plan

Santa Barbara / Ventura County Coastline

Prepared for BEACON

Beach Erosion Authority for Control Operations and Nourishment

July 14, 1989

NOBLE CONSULTANTS

COMPREHENSIVE SAND MANAGEMENT PLAN

EXECUTIVE SUMMARY

Prepared for BEACON

July 14, 1989

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EXECUTIVE SUMMARY

1. INTRODUCTION

BEACON was formed by a joint powers authority on July 1, 1986 to foster coordination and cooperation by public and private agencies with respect to protection, maintenance and enhancement of the beaches and coastline in Santa Barbara and Ventura Counties. The member agencies comprising the organization include the cities of Carpinteria, Oxnard, Port Hueneme, Santa Barbara and San Buenaventura, as well as Santa Barbara and Ventura Counties. A number of ex-officio members are part of BEACON as non-voting parties. These members include local legislators, Federal and State agencies, and private homeowner groups.

The BEACON Board of Directors authorized the preparation of a comprehensive shoreline sand management plan for the Santa Barbara and Ventura Counties coastline on September 3, 1987 with the purpose to produce a document that would address the organization's goal of implementing optimum sand management techniques and policies for mitigating coastal beach erosion within the region. This report presents a recommended strategy for beach management consisting of a phased implementation of beach renourishment alternatives coupled with the continued monitoring of shoreline changes. The plan considers the availability of sand resources, the relevant processes which govern their littoral movement, and the technical, economic and environmental ramifications of implementation.

It is intended that this document serve as the impetus for a regionally coordinated program of beach protection measures that address the diverse needs and concerns of the BEACON membership. In so doing, it is hoped that lasting solutions to beach erosion problems can be developed which ensure sustained recreation, property protection, and navigable harbors.

The plan was developed from an assessment of historical shoreline behavior, an inventory of present day beach conditions, and a projection of future scenarios given a status quo posture. The study focused on the availability of sand resources for beach nourishment use and the associated technical, economic and environmental feasibility issues.

2. FINDINGS AND CONCLUSIONS

The following findings and conclusions were reached as a result of the comprehensive sand management study:

Shoreline Conditions

From Ellwood in Santa Barbara County to the Ventura River in Ventura County -

- The shoreline is sediment source limited, resulting in narrow but relatively stable beaches fronting a slowly eroding coastal bluff.
- Local streams are a principal source of sediment for this area, accounting for approximately 70 percent of the littoral sand budget.
- Bluff erosion averages between 0.5 and 1.0 feet per year for this area and accounts for the remaining 30 percent of the littoral sand budget.
- Coastal storm damage is principally the result of development encroachment towards the shoreline.
- The Sandyland/Carpinteria beach area has been preferentially eroded during recent times.
- The primary need for beach enhancement and storm protection throughout this region is related to the existing narrow beach widths.
- Beaches downcoast of Santa Barbara Harbor are closely dependent on the continued dredging of the harbor.

East of the Ventura River to the Mugu Submarine Canyon -

- The Ventura and Santa Clara Rivers are the primary sources of sand for this area. The historically abundant supply of sand from these rivers resulted in broad beaches backed by extensive sand dunes.
- The construction of dams and continued sand mining activities on the Ventura and Santa Clara Rivers have dramatically reduced the rate of fluvial sand supply to the coast.

- The resulting imbalance in the littoral sand budget implies that serious beach erosion will occur beginning in the mid-1990's.

- The beaches in this area are further dependent on continued dredging at Ventura and Channel Islands Harbors.

Sand Management Strategy

- A beach management strategy combining a comprehensive beach nourishment program with public policy measures was found to best accomplish BEACON's stated objectives.

- Large deposits of beach quality sand exist just offshore of Goleta, Santa Barbara, Carpinteria and Oxnard for use in renourishing adjacent beaches.

- Existing dredging technology is capable of recovering the offshore sand and transporting it to the beach. Hydraulic dredges have been used in similar projects to pump sand ashore.

- Significant cost savings may be possible if hopper dredges can be used to dump the sand in shallow water, allowing natural wave action to bring the sand ashore.

- Four levels of beach nourishment action were formulated and are listed below in decreasing order of cost and benefits:

  - Plan 1: Regional Recovery
  - Plan 2: Reduced Regional Recovery
  - Plan 3: Reach Recovery
  - Plan 4: Feeder Beach Injection

- Total plan costs range from a high of $764 million for Plan 1 to a low of $101 million for Plan 4.

- From a strict benefit/cost standpoint, Plan 4 is the best plan; however, Plan 3 provides a significantly wider range of benefits with only a small reduction in the overall benefit/cost ratio.

- Five potential demonstration projects were defined as a means of evaluating different aspects of the proposed sand management program. Listed below, in order of decreasing cost, these projects include:

- Beach Nourishment Pilot Project
- Hopper Dredge Bottom Dump Test
- Control Groin Demonstration
- Dune Stabilization
- Debris Basin Recapture

o Continued coastal monitoring is needed to better define existing and future erosion rates. This is particularly true in the Ventura/Oxnard area. The monitoring program should include:

- Tracking of erosion/accretion trends
- Tracking of littoral sediment delivery
- Anticipation of future shoreline changes
- Periodic input for updating the comprehensive sand management plan

o Public policy can be used to enhance natural sediment supply, insure that harbor bypassing practice is maintained and mitigate shoreline development.

3. RECOMMENDATIONS

The following recommendations are provided based on the findings and conclusions of the comprehensive sand management study:

Long-Term Plan

o A regional beach nourishment program should be implemented to combat ongoing and future beach erosion.

o Plan 3, Reach Recovery, is the recommended level of action as it represents the best balance between total benefits and costs.

o Public policy is recommended to address the following items:

- Mitigation of decreased sediment supply to compensate for future bluff erosion protection

- Strict management of the Ventura and Santa Clara Rivers sediment supply to maximize natural sediment delivery

- Management of debris basin desilting to maximize natural sediment delivery

- Requirement for perpetual commitment to harbor sand bypassing

- Refined environmental criteria relating to practical beach nourishment techniques

- Development of regionally-consistent setback criteria and building code provisions for shore protection structures

o The present coastal beach profile monitoring program should be continued and expanded to include:

- Wave data collection
- Fluvial sand discharge
- Aerial shoreline photography
- Dredging records review

Short-Term Demonstration Project

In order to demonstrate overall project feasibility and validate critical program assumptions, one or more demonstration projects should be implemented as a first step.

o The hopper dredge bottom dump project is recommended as the highest priority project by virtue of its potentially high payoff. This high risk project, if proven successful, would reduce long-term program costs by as much as two-thirds.

o If funding is available, BEACON should also implement the control groin and offshore sand renourishment demonstration projects.

Implementation

The recommended sand management program should be implemented in the following manner:

1. Develop and implement a regional funding program.

2. Select, design, and construct one or more demonstration projects.

3. Review the selected long-term sand management plan for consistency with the identified level of available funding.

4. Perform a detailed survey of relevant offshore sand borrow sites to quantify construction sand volumes.

5. Design and construct the recommended long-term plan.

6. Continue and expand the recommended comprehensive coastal monitoring program.

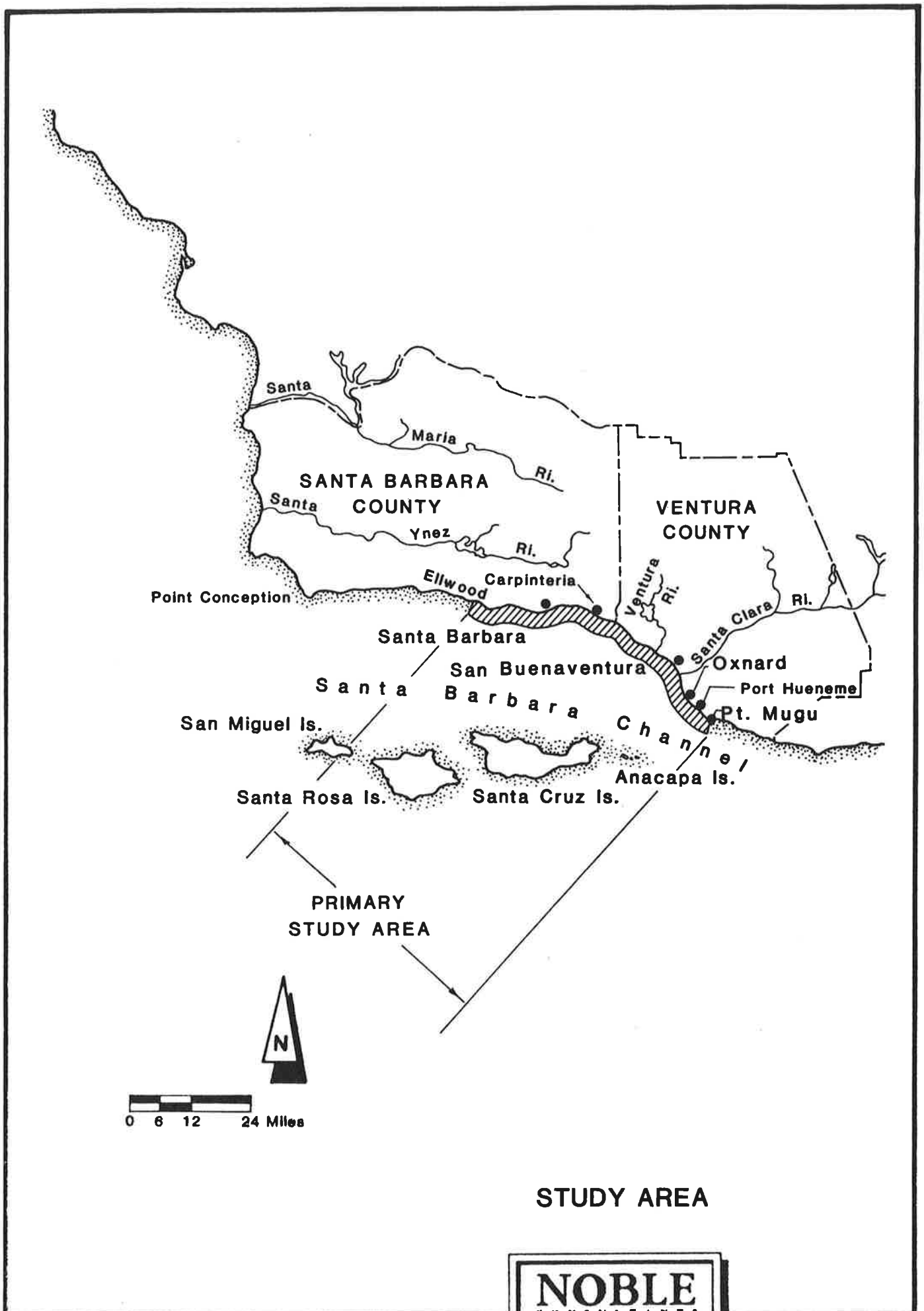
4. SHORELINE SETTING

Figure 1 illustrates the shoreline alignment stretching between Ellwood in Santa Barbara County eastward to Point Mugu in Ventura County. The beaches within the populated area of Santa Barbara and Ventura Counties may be described as two distinct segments which vary in their morphology and character. From Ellwood to the mouth of the Ventura River, the beaches are generally narrow and consist of relatively thin veneers of sand. The high bluffs which back them are periodically exposed to wave action and episodic erosion in the winter when the beaches are most depleted. The segment appears today much as it looked 60 years ago. Activity by man, in the form of property and infrastructure development, has encroached on this fragile shoreline and has been exposed to erosion effects and storm damage. Santa Barbara Harbor, constructed between 1927 and 1930, has required a regular program of sand bypassing to maintain the navigation channel and the natural littoral drift of beach sediments.

East of the Ventura River, the shoreline opens into the broad expanse of the Oxnard alluvial plain. Dominated by the presence of two major rivers, three harbors and two submarine canyons, the beaches in this area are relatively wide with low lying backshore land. Development interests, beginning as early as 1920, have stressed the area by constructing roads and dwellings close to the water's edge. The three harbors built between 1940 and 1964 have required a regular program of sand bypassing to maintain navigation channels and the natural littoral drift of beach sediments.

5. SEDIMENT BUDGET

In order to develop a viable coastal sand management plan, it is essential that the sediment budget be well defined. A sediment budget (or sand budget) is a volume balance of the sand being transported along the coastal shoreline under investigation, and is based on the quantification of sand transportation, erosion and deposition for a given control volume.



STUDY AREA

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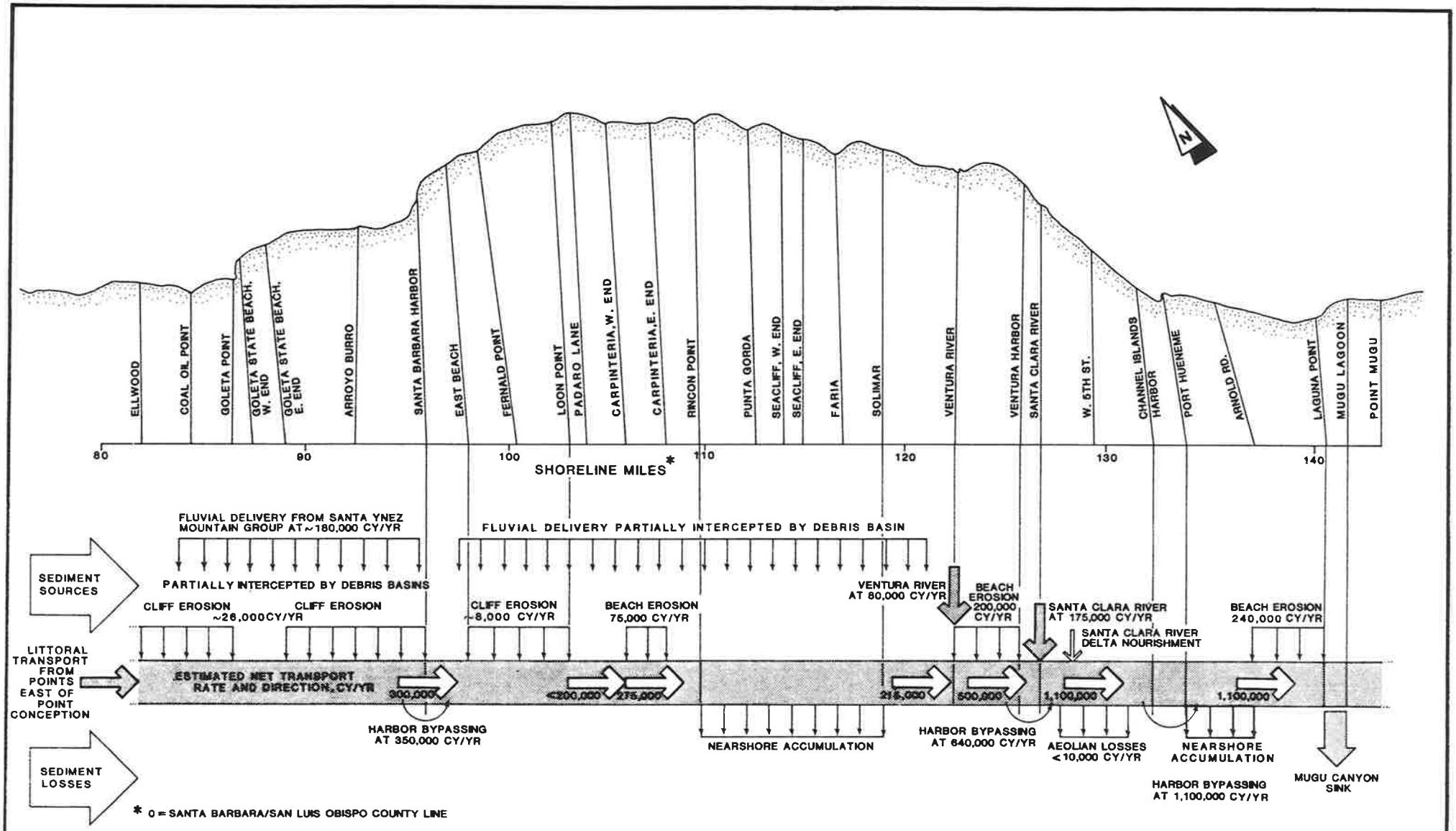
Figure 1

The sediment budget for the study shoreline was estimated by evaluating historical beach profiles, harbor maintenance dredging records, incident wave energy estimates and fluvial sand estimates. It is believed that the region is independent of beaches north of Point Conception with little or no sand passing around that promontory. Consequently, the main sources of natural sand supply to the area are contributions from cliff erosion and episodic delivery of sediment from the streams and rivers which discharge along the coast. Alongshore sand transport is almost unidirectional from west to east in response to the prevailing wave climate for the Santa Barbara Channel. The littoral cell ends at the Mugu Submarine Canyon where it is believed that all of the littoral sand transport is diverted down the axis of the canyon. An estimate of the sediment budget for this littoral cell, commonly referred to as the Santa Barbara Littoral Cell, is presented in Figure 2.

Fluvial sand supplies throughout the region are markedly reduced from former natural conditions because of dam construction, watershed improvements and river bed sand and gravel mining. For example, the Santa Clara River, which is the major source of sand for Ventura County beaches, is estimated to currently deliver only about one-fourth of its natural sand supply to the coastline.

The results of the sediment budget analysis show that several deficiencies, or erosion "hot spots", exist within the study shoreline. First, Carpinteria is observed to be eroding at an anomalous rate in comparison to neighboring reaches. This erosion is caused by a deficit in the sand supply amounting to approximately 75,000 cubic yards per year. Pierpont Bay beaches form another erosion "hot spot" where the deficit in sand supply is estimated to be 200,000 cubic yards per year. McGrath and Oxnard Shores beaches hold the potential for rapid future erosion due to the sharp decrease in sand delivery from the Santa Clara River. Currently, the 450,0000 cubic yards per year shortfall in the sand supply is being made up by remnants of deltaic deposits off the mouth of the Santa Clara River where the most notable contribution to these deposits occurred during the 1969 flood. However, model analysis suggests that this source may be nearly exhausted, implying future accelerated shoreline retreat in this area. Lastly, the sand budget analysis indicates that a deficit of about 200,000 cubic yards per year is responsible for the chronic erosion being experienced downcoast from Ormond Beach. Addressing these budget shortcomings constitutes the minimum level of action required by the comprehensive sand management plan.



ESTIMATED SEDIMENT BUDGET

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Figure 2

Figure 2

6. SAND MANAGEMENT STRATEGIES

BEACON has declared long-term objectives related to enhancement of beaches, reduction in storm damage losses, reduction of harbor shoaling, and establishment of policy and programs that control beach erosion without the proliferation of shoreline fortification. These goals are not necessarily compatible. For example, protection of property may be achieved through construction of seawalls and revetments to mitigate bluff erosion. However, cumulative fortification has some measure of impact to the natural delivery of sand to the beach to the detriment of the sediment budget. It therefore remains to determine the optimum strategy which maximizes each objective and accomplishes the foremost goal of preserving the valuable beach resource within the BEACON area.

From the standpoint of sand budget, specific needs and objectives may be stated which address sand management along the coastline and ways to preserve or increase the littoral supply. The following issues were developed from this perspective:

1) Progressive loss of beach width;

2) Bluff erosion and its sand source contribution;

3) The decline of fluvial sand supply to the shoreline due to stream regulation and sand mining; and

4) Maintenance of harbor bypassing to preserve the littoral transport regime.

These issues may also be addressed within the larger BEACON context of also improving protection to property and infrastructure. It was therefore assumed in this study that the strategy which satisfies the sediment budget issues and maximizes the development considerations would best achieve BEACON's major goals and objectives. In attempting to fulfill this study plan, sand management strategies considered consisted of the no-action alternative, engineering alternatives, public policy alternatives, warning systems alternatives, and relief, rehabilitation and insurance alternatives.

BEACON has clearly stated that a primary goal be the development of a regional plan for management of existing sand resources and to identify a similar approach to erosion mitigation and beach enhancement. Furthermore, it is the expressed desire of BEACON that a plan be developed which emphasizes non-structural methodology that is most consistent with environmental criteria of the member communities. Table 1 presents an evaluation of the alternative strategies.

Table 1
Alternative Strategy Evaluation

Alternative Strategies	BEACON OBJECTIVES AND ISSUES: Enhances Beaches?	Mitigates Bluff Erosion?	Addresses Progressive Shoreline Fortification?	Addresses Fluvial Sand Loss?	Maintains Harbor Dredging?	Reduces Storm Damages?
1. No Action	No	No	No	No	No	No
2. Engineering Techniques:						
Seawalls, Bulkheads, Revetmnts	No	Yes	No	No	No	Yes
Groins	No	No	No	No	No	Yes
Offshore Breakwaters	No	Yes	No	No	No	Yes
Beach Nourishment	Yes	Yes	Yes	No	No	Yes
Sand Scraping	No	No	No	No	No	Yes
Sand Bypassing	No	No	No	No	Yes	Yes
Dune Stabilization	No	No	Yes	No	No	Yes
3. Public Policy Techniques:						
Land Management Zoning	No	No	Yes	No	No	Yes
Shifting Easement	No	No	Yes	No	No	Yes
Building Code	No	No	No	No	No	Yes
Setback	No	No	Yes	No	No	Yes
Acquisition	No	No	Yes	No	No	Yes
Preferential Taxation	No	No	Yes	No	No	Yes
Building Moratorium	No	No	Yes	No	No	No
Transfer of Development Rights	No	No	Yes	No	No	No
Compensable Regulations	No	No	Yes	No	No	No
Permitting	No	No	Yes	Yes	Yes	No
4. Warning Systems:						
Public Eduation	No	No	No	No	No	No
Deed Disclosure	No	No	No	No	No	No
Real Estate Disclosure	No	No	No	No	No	No
Erosion Forecasts	No	No	No	No	No	No
Disaster Preparedness	No	No	No	No	No	No
5. Relief, Rehabilitation, and Insurance:						
Insurance	No	No	No	No	No	No
Relief and Rehabilitation	No	No	No	No	No	No
Relocation Incentive	No	No	Yes	No	No	Yes

Beacon Objective	Recommended Strategy
Enhance Beaches	Engineering Techniques
Mitigate Bluff Erosion	Engineering Techniques and/or Public Policy
Address Progressive Shoreline Fortification	Engineering Techniques and/or Public Policy
Address Fluvial Sand Source	Public Policy
Maintain Harbor Dredging	Engineering Techniques and/or Public Policy
Reduce Storm Damage	Engineering Techniques and/or Public policy

The no-action strategy does not fulfill any of BEACON's goals or objectives. It is therefore not recommended as a satisfactory plan given the fact that other positive alternatives are available for consideration.

Beach nourishment has been identified as an engineering alternative which achieves most of the objectives. Widening the shoreline with suitable sand sources not only enhances the recreational potential, but also mitigates shoreline erosion and storm damage and alleviates the concern for proliferation of coastal structure fortification. Other engineering alternatives consist of seawalls, bulkheads, revetments, groins, offshore breakwaters, sand scraping, sand bypassing and dune stabilization.

Seawalls, bulkheads, revetments, and offshore breakwaters can be used to reduce storm damage and alleviate bluff erosion. However, the measures are in conflict with the broader objective of trying to achieve solutions that lessen the need for fortification of the shoreline. Sand bypassing of existing harbor facilities is identified as a means to reduce storm damage by prevention of adverse effects from littoral drift interruption. Dune stabilization, on the other hand, affords a means to provide winter storm protection using a natural defense barrier that would substitute for hard permanent structures. However, its application is limited to relatively wide sandy beach areas and favorable wind conditions.

Several public policy alternatives (land management techniques) have been identified in Table 1. The selective use of land management techniques may be appropriate to deal with aspects of the shore protection issue, fluvial sand source depletion, harbor dredging and storm damage reduction. The first and last objectives may be managed through land development regulation. Updating of building setback criteria exemplifies one strategy plan from this suite of alternatives to deal with receding shorelines and achieve storm damage reduction without the need for additional shore protection structures. Furthermore, the issues of fluvial sand source depletion and continuance of harbor bypassing practice may best be addressed from a policy initiative.

The warning system strategies identified in Table 1 do not specifically address the BEACON issues. However, because of their general public informational nature, they represent incidental policy that may be beneficial for incorporation within local jurisdictions. Relief, rehabilitation and insurance strategies are also incidental measures that do not specifically mitigate sand management concerns. The economic burden associated with their implementation renders them impractical for local government sponsorship.

Table 1 clearly points toward a strategy which utilizes beach renourishment as a principal mechanism to fulfill the majority of BEACON's goals and objectives for increased regional beach widths by supplementing the sediment budget deficits (sand shortage) from offshore sand sources and through the recycling of existing littoral material. In doing so, beaches are enhanced, storm damage may be reduced because of the wider beach berm, and the need for additional shore protection structures is reduced. Furthermore, the problem of bluff erosion is mitigated in a way which compensates for any decrease in natural sediment supply lost by its stabilization.

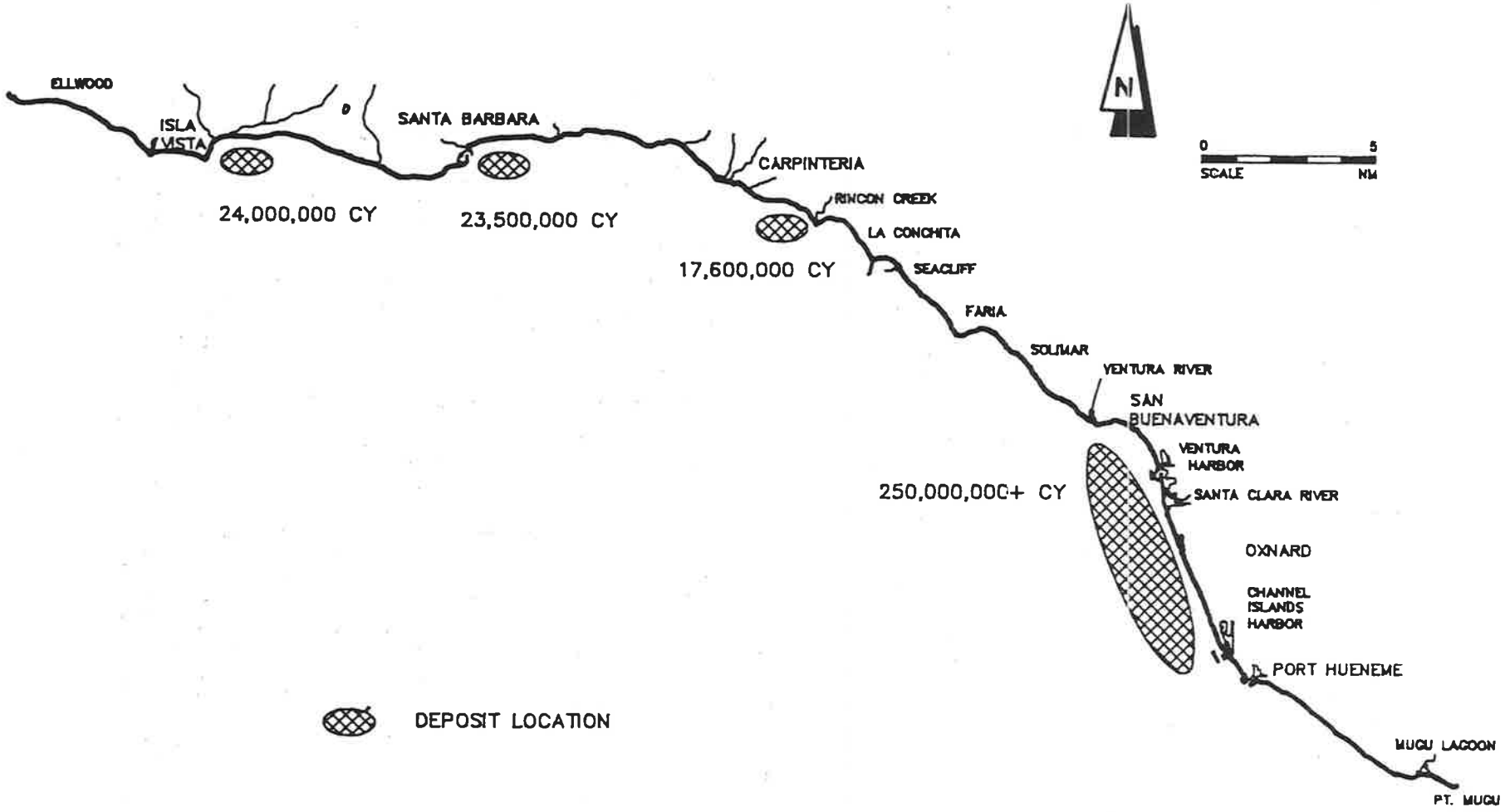
In addition to beach nourishment, the use of sand bypassing techniques and public policy is suggested to address the issues of harbor maintenance and fluvial sand supply which are not otherwise covered by other means. The use of the beach nourishment strategy, to properly manage the littoral sediment budget, can be applied as a regional approach to manage the regional beach widths. Beach nourishment is also recognized as one of the most acceptable forms of shoreline enhancement since it is the most compatible strategy with the overall environment. No other alternatives were identified which would derive beach enhancement benefits.

7. PLAN FORMULATION

A long-range sand management strategy is recommended which incorporates the concepts of beach nourishment, public policy measures and coastal monitoring as its principal elements. In addition, a near-term program of small scale demonstration projects is proposed which will serve to validate critical elements of the long-range program.

A total of four potential offshore sand deposits were identified in this investigation. These sites were studied in detail to determine the volume of sand available for beach nourishment purposes and the compatibility of this sand relative to the native beach sand characteristics. Three areas offshore of Goleta, Santa Barbara and Carpinteria contain an estimated 57.5 million cubic yards of sediment. A fourth deposit near the Santa Clara River mouth holds more than 250 million cubic yards of sediment. The locations and volumes of available sediment for these four offshore deposits are shown in Figure 3.

For the most part, the offshore borrow sites were found to contain fine to very fine sand, implying that from 2 to 4 times the net placement volume will be required to achieve the desired beach fill widths, since the native beach sand is coarser in size. A larger volume of fine sand is required to restore the



OFFSHORE SAND DEPOSITS

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Figure 3

Figure 3

beach profile, since finer sands require flatter slopes to remain stable. The Santa Barbara deposit contains the coarsest sand of those areas surveyed and is thus the best deposit for utilization as a borrow material source.

Inland sources of sand are available from debris basin accumulations and river beds. However, these sources are more appropriate for small scale maintenance and emergency response fills. The costs associated with this source of sand is higher than the costs associated with the offshore sand sources. Potential beach sediment volumes from this source would normally be small, except after large flood events. The average annual accumulated sediment volume for all debris basins within the BEACON study area is estimated to be on the order of 100,000 cubic yards. In addition, sand characteristics from this source will vary from very fine to coarse sediments and will include various amounts and sizes of debris material.

Continued maintenance dredging of the four harbors, or the construction of fixed backpass/bypass plants, is essential to the "beach nourishment" sand management strategy in order to recycle the existing littoral sand material. The evaluation of harbor maintenance dredge records indicates the following average annual dredge volumes of accumulated harbor entrance sands for the four harbors:

- Santa Barbara Harbor - 350,000 cubic yards;
- Ventura Harbor - 640,000 cubic yards;
- Channel Islands Harbor - 1,260,000 cubic yards; and
- Port Hueneme Harbor - zero cubic yards.

This material is presently deposited on the beaches immediately east of the harbor entrances during periods of maintenance dredging to allow for its continuation in the littoral transport of sand. The "beach nourishment" strategy would continue to either bypass this harbor entrance sand to beaches east of the harbor's entrance or backpass this sand to beaches west of the harbor's entrance. Sand characteristics from this source are compatible with the beach sands since they come from the littoral movement of the beach sands.

Recovery costs for beach nourishment using offshore sand, harbor entrance sand and river debris basin sand sources can vary widely depending on the source, the distance from the source to the beach to be renourished, the size of the beach nourishment operation, the method of operation, etc. However, in general, the following range in unit costs would be expected:

- o Debris basin sand — $8 - $16/cubic yard
- o Harbor entrance sand — $2 - $4/cubic yard
- o Offshore sand (pumped onshore) — $3 - $8/cubic yard
- o Offshore sand (bottom dumped) — $1.30 - $3/cubic yard

Candidate Beach Nourishment Sites

Candidate sites for beach nourishment were reviewed using the following criteria:

1) Renourish areas with sediment budget deficits;

2) Restore non-existent or narrow beaches;

3) Enhance areas with high recreation potential and access; and

4) Provide storm protection buffer for backbeach property and infrastructure.

Figure 4 summarizes an appraisal of the study area shoreline in terms of the above criteria. This figure indicates the general shoreline segments where each criteria may be considered applicable. The main conclusion that may be drawn from the figure is beach nourishment is appropriate over most of the study shoreline for different reasons.

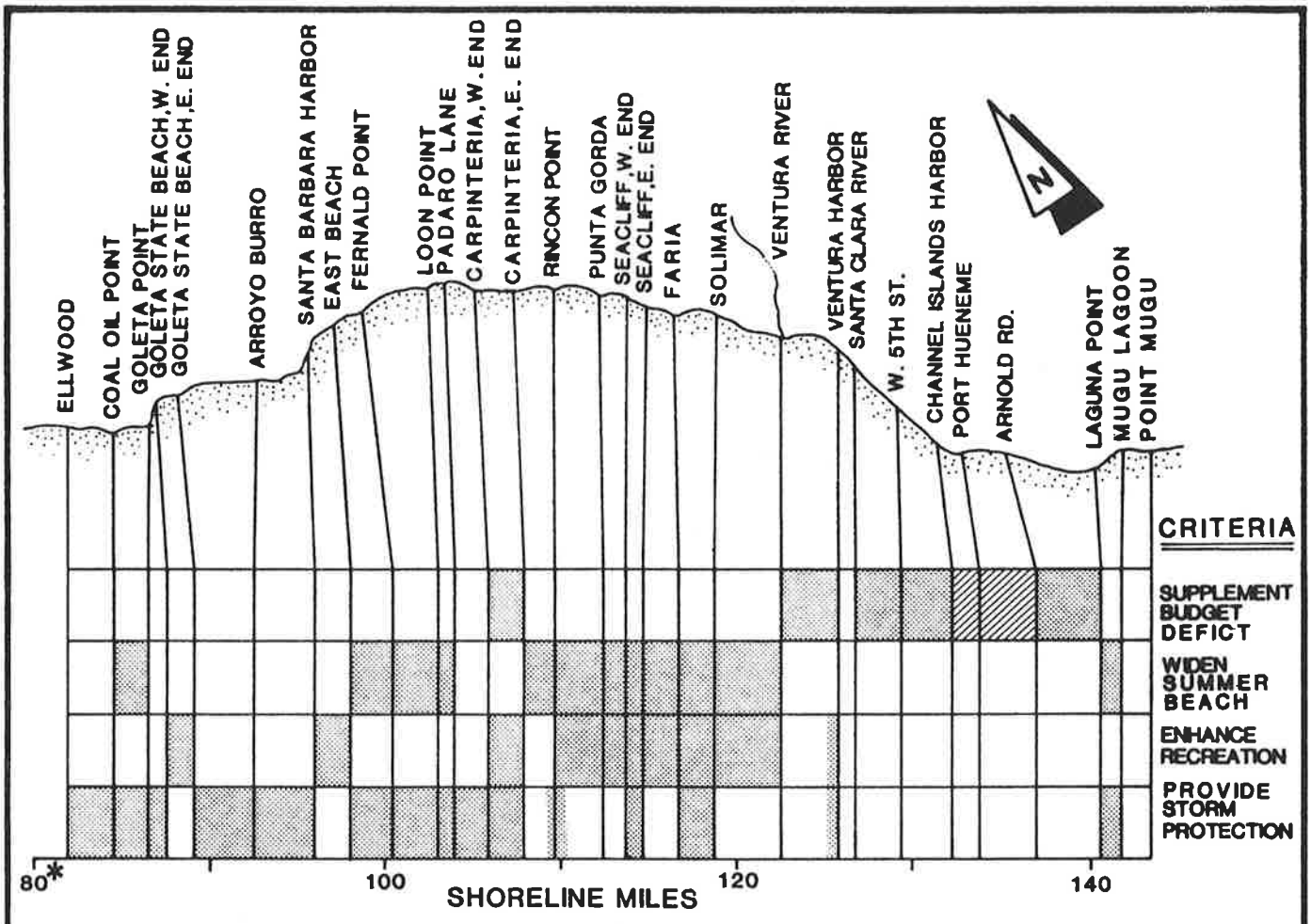
The sand management plan identifies four potential levels of action. These levels vary in their purpose from area-wide restoration to maintenance of status quo conditions. A public policy component is proposed for inclusion in all plans to address the issues of harbor dredging, bluff erosion and fluvial sand supply. The four levels of action include:

1) Regional recovery and maintenance (Plan 1);

2) Reduced regional recovery and maintenance (Plan 2);

3) Reach recovery and maintenance (Plan 3); and

4) Feeder beach injection (Plan 4).



CRITERIA DEFINITION:

BUDGET DEFICIT -SEDIMENT LOSSES EXCEED SOURCES

WIDEN SUMMER BEACH-EXISTING SUMMER BEACH WIDTH IS NON-EXISTENT OR VERY NARROW

ENHANCE RECREATION-GOOD ACCESS AREA MAY ACCOMMODATE BEACH WIDENING TO INCREASE USE

STORM PROTECTION- BACKBEACH EXPOSED TO RECURRING WINTER STORM DAMAGE

LEGEND

SHORELINE SEGMENT APPROPRIATE FOR BEACH NOURISHMENT TO SATISFY CRITERIA

RELATED BY HARBOR BYPASSING

*0 = SANTA BARBARA/SAN LUIS OBISPO COUNTY LINE

BEACH NOURISHMENT SITE SELECTION EVALUATION

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Figure 4

Plan 1: Regional Recovery

Regional recovery is the ultimate level of action given unlimited funds. Offshore sand would be pumped onshore to widen existing beaches everywhere along the 56 miles of coastline between Isla Vista in Santa Barbara County and Point Mugu in Ventura County. This would require about 134 million cubic yards of sand to widen the berm by 100 feet. Thereafter, sand would be periodically injected at various points along the coastline to feed and maintain the shoreline at a level commensurate with the longshore sand transport demand. A fill project of this magnitude would be extremely ambitious and of a scale never before attempted in the United States. Furthermore, the large initial fill volume would severely deplete the identified offshore sand sources, and would increase maintenance dredging volumes at Santa Barbara Harbor and Ventura Harbor.

Plan 2: Reduced Regional Recovery

The reduced regional recovery plan targets more specific project limits to achieve the following results:

1) Enhance public beach areas;

2) Derive secondary benefits of nourishment to neighboring private beach areas; and

3) Maintain existing conditions everywhere else.

The following Plan 2 components are proposed to achieve these results:

- Reconstruct and maintain a public beach at Isla Vista with secondary bluff erosion mitigation benefit.

- Enhance Goleta State Beach to increase recreation and provide a secondary downcoast benefit of beach widening to reduce bluff erosion problems.

- Enhance Santa Barbara's East Beach and restore beaches downcoast to Miramar for recreation and property protection objectives; provide a secondary benefit downcoast to Summerland as a result of the fill transport to that area.

- Restore and enhance beaches from Padaro Lane through Carpinteria for recreation and property protection purposes.

- Provide for small, periodic sand inputs along the Rincon Parkway to stimulate pocket beach growth and provide some measure of enhancement and structure protection to the segment.

- Reconstruct a sandy beach from Solimar through Emma Wood County Park for recreation enhancement.

- Construct three fixed sand backpass/bypass transfer systems at Ventura Harbor, Channel Islands Harbor, and Laguna Point to recycle littoral sand from Pierpont Bay to Mugu Canyon. Consider the optional construction of groin fields east of McGrath State Beach to reduce alongshore transport over the populated coastal sections and reduce the need for sand supplementation.

Plan 3: Reach Recovery

The reach recovery plan proposes smaller scale fills to restore erosion "hot spots" only. This plan is aimed more at maintaining the status quo by enhancing high use recreational beaches that are in jeopardy. The proposed components for Plan 3 differ from the Plan 2 components, listed above, in the following areas:

- The Goleta fill project is deleted.

- The East Beach portion of the Santa Barbara fill is deleted.

- Only Carpinteria Beach is restored.

- The three Ventura County fixed sand backpass/bypass plants are deleted, and a five-year cycle of sand supplementation from offshore is inaugurated to make up for projected erosion deficits.

Plan 4: Feeder Beach Injection

The minimum level of effort is the feeder beach program. Under this plan, only those beaches with identified sediment budget deficiencies would receive periodic injections of sand to satisfy the littoral demand and prevent further shoreline recession. This plan calls for a five-year cycle of periodic sand injection at the selected beach areas. The four following areas have been specified based upon the results of the sediment budget analysis:

- o Carpinteria
- o Pierpont Bay
- o Oxnard Shores
- o Ormond Beach

The selective use of structures in the form of control groins is suggested as a means of prolonging the life of individual renourishment projects in Plans 2 and 3. One or more terminal groin structures could be used to maintain minimum upcoast beach widths while allowing for necessary sand transport to downcoast beaches.

Figure 5 summarizes the sand management plan formulation. This figure shows the beach management objectives and plan level elements within individual segments of the coastline. The initial beach nourishment volumes and annual maintenance volumes of sand required for the four plan levels of action identified are tabulated in Table 2. Also, included within this table are estimates of initial project costs for beach nourishment and for recommended control structures, as well as estimates of project maintenance costs for beach nourishment and of total project costs over a 25 year life.

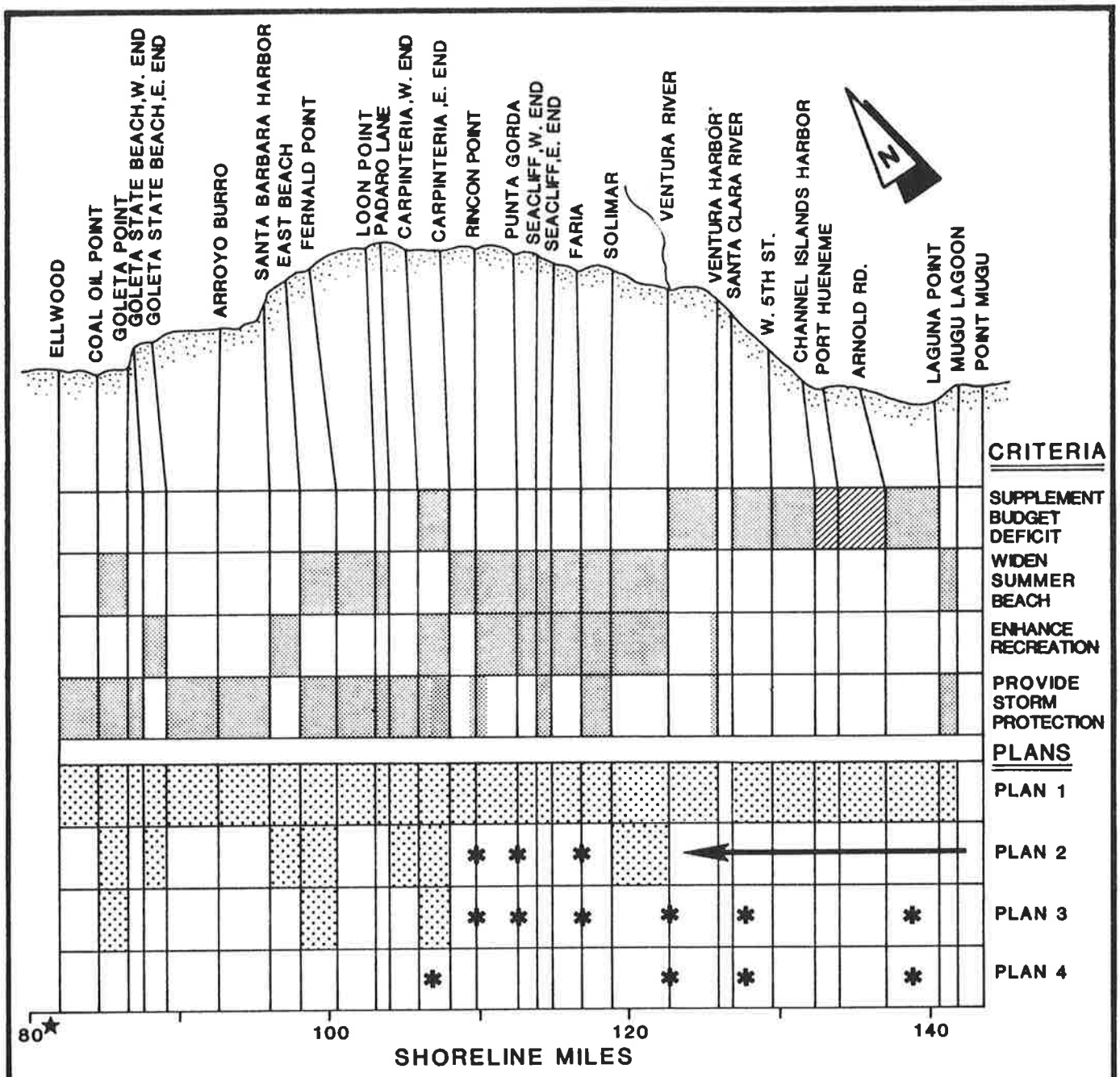
Public Policy

All four plan levels of action identified above require a public policy component which address the need to:

- o Continue harbor dredging;
- o Eliminate fluvial sand mining;
- o Bypass debris basin sediments;
- o Mitigate loss of bluff erosion as a sand source; and
- o Mitigate dam impacts.

Based upon a review of the public policy techniques previously discussed and summarized in Table 1, the following alternatives are considered appropriate:

1. Land Management Zoning - Delineate coastal hazard or sand source zones to prevent future development from erosion damage exposure and/or to preserve bluff erosion and coastal stream sand sources.



CRITERIA DEFINITION:

- **BUDGET DEFICIT** – SEDIMENT LOSSES EXCEED SOURCES
- **WIDEN SUMMER BEACH** – EXISTING SUMMER BEACH WIDTH IS NON-EXISTENT OR VERY NARROW
- **ENHANCE RECREATION** – GOOD ACCESS AREA MAY ACCOMMODATE BEACH WIDENING TO INCREASE USE
- **STORM PROTECTION** – BACKBEACH EXPOSED TO RECURRING WINTER STORM DAMAGE

LEGEND

- RELATED BY HARBOR BYPASSING
- SAND INJECTION
- SAND BACKPASSING
- SHORELINE SEGMENT APPROPRIATE FOR BEACH NOURISHMENT TO SATISFY CRITERIA
- PROPOSED PLAN BEACH NOURISHMENT SEGMENT

SAND MANAGEMENT PLAN FORMULATION

★ 0 = SANTA BARBARA/SAN LUIS OBISPO COUNTY LINE

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Figure 5

Table 2

Sand Volumes and Costs

Item	Plan 1	Plan 2	Plan3	Plan 4
Initial fill volume-cy	134,300,000	20,900,000	9,900,000	0
Maintenance fill volume added-cy/yr	1,000,000	786,000	1,100,000	1,000,000
Harbor sand backpassing or bypassing required cy/yr	1,200,000[1]	2,700,000[2]	existing rates	existing rates
Initial fill cost	$528,000,000	$128,000,000	$58,000,000	$0
Control structure cost	$0	$ 55,000,000	$18,000,000	$0
Maintenance cost	$236,000,000	$262,000,000	$155,000,000	$101,000,000
Total Plan Cost	$764,000,000	$445,000,000	$231,000,000	$101,000,000

Note: All costs include 10% contingency, 4.5% engineering and design, and 4.5% supervision and administration.
1Additional bypassing required as result of initial fill
2Sand backpassing from Laguna Point to Pierpont Bay

2. Building Code - Develop uniform criteria and specifications for erosion protection structures and methods.

3. Setback - Review existing setback policies to protect development and/or preserve bluff erosion sand sources.

4. Permitting - Develop regulatory policy to maintain existing harbor sand bypassing operations, protect and enhance sand delivery from rivers and streams, and protect bluff erosion sand sources.

Coastal Monitoring

The erosional projections for the area, and the time-frame of their expectancy, are based on relatively limited data. As a consequence, it is recommended that the beaches continue to be monitored through annualized beach and nearshore profiling to confirm predicted trends, and through the collection of wave and hydrologic data. Long-term coastal monitoring methods are discussed within Section 9, "Plan Implementation" and the Main Report. Long-term collection of beach profile measurements will provide the basis for improved planning decisions and a timely response to rapidly changing conditions. In light of the magnitude of projected project costs, the cost of continued monitoring is a worthwhile investment.

Demonstration Projects

In addition to the four identified plan levels of action, one or more of five potential demonstration projects are proposed. These projects would cost between $100,000 and $2,800,000 per project and would test the viability of various technical aspects within the four plan levels of action. The five proposed demonstration projects include:

- Hopper dredge bottom dump test;
- Beach renourishment pilot project;
- Control groin demonstration;
- Dune stabilization; and/or
- Debris basin recapture.

These are short-term projects which can be implemented with a minimum amount of effort.

8. PLAN EVALUATION

The Plan 1 sand management Regional Recovery Plan involves widening the existing beaches for the entire 56 miles of coastline between Isla Vista and Point Mugu, while the Plan 2 Reduced Regional Recovery and the Plan 3 Reach Recovery Plans involve performing beach nourishment along 13 segments of coastline between Isla Vista and Point Mugu and along eight segments of coastline between Isla Vista and Channel Islands Harbor, respectively. The Plan 4 Feeder Beach Plan involves performing beach nourishment along four segments of coastline between Carpinteria and Point Mugu through sand injection at four locations.

The proposed coastline segments to receive beach nourishment and the methods of nourishment for the four plan levels are summarized in Table 3 and are illustrated in Figures 6 through 16. The total estimated costs to implement these four plan levels and maintain them over a 25 year project life are approximately $764 million for Plan 1, $445 million for Plan 2, $231 million for Plan 3, and $101 million for Plan 4. Clearly, the financial requirements of all four plan levels of action point to the need for State and Federal assistance to reduce the local share of debt service.

The four plan levels discussed above were evaluated based on an assessment of their technical, economic and environmental feasibility. A matrix summarizing this evaluation is presented in Table 4. Technical issues consist of the proposed methods to provide beach nourishment and their associated risks and uncertainties, while economic issues consist of the expected benefits derived from beach nourishment, the associated costs to provide this beach nourishment over a 25 year project life and the level of benefit to cost ratio. In addition, an estimate of environmental impacts associated with the proposed methods of beach nourishment was evaluated. The environmental assessment considered pertinent resource values, the relevant BEACON member policies and the proposed improvement. It is recognized that specific project details, such as aerial extent, schedule, and proposed construction methods, must be known to a greater extent before a more comprehensive assessment can be performed.

Technical Uncertainty

The sand management plan contains several elements which require further technical resolution to resolve technical risks.

Table 3

Summary of Beach Nourishment Plan

Level 1: Regional Recovery

Regional Recovery - 56 miles of beach fill from offshore dredge operation between Isla Vista to Point Mugu.

Level 2: Reduced Regional Recovery and Maintenance

1. Isla Vista	10,000 feet of beach fill from offshore dredge operation and construction of one control groin.
2. Goleta	7,500 feet of beach fill at Goleta State Beach from offshore dredge operation.
3. Santa Barbara	20,000 feet of beach fill from West Beach east past Miramar Beach from offshore dredge operation and construction of three control groins at West Beach, Biltmore and Miramar.
4. Carpinteria	20,000 feet of beach fill from offshore dredge operation and construction of one control groin.
5. Rincon Point	Sand injection at Rincon Point by hopper bottom dump from offshore dredge operation.
6. Punta Gorda	Sand injection at Punta Gorda by hopper bottom dump from offshore dredge operation.
7. Faria	Sand injection at Faria by hopper bottom dump from offshore dredge operation.
8. Emma Wood	16,000 feet of sand fill from offshore dredge operation and construction of four groins.

Table 3 (Continued)

9. Ventura	Beach nourishment along San Buenaventura State Beach from fixed backpass/bypass plant at Ventura Harbor.
10. Oxnard Shores	Beach nourishment along McGrath, Oxnard Shores, and Hollywood Beaches from fixed backpass/bypass plant at Channel Islands Harbor. Plus construction of 12 optional control groins along Oxnard Shores and Hollywood Beaches.
11. Silver Strand	Beach nourishment through fixed backpass/bypass plant at Channel Islands Harbor.
12. Ormond Beach	Beach nourishment along Ormond Beach and Hueneme Beach from fixed backpass plant at Laguna Point. Plus construction of 12 optional control groins along Ormand Beach and 14 optional control groins along Hueneme Beach. Extension of Port Hueneme South breakwater.
13. Mugu Lagoon	Beach fill from offshore dredge operat- tion plus construction of a submerged breakwater donated by the U.S. Navy.

Level 3: Reach Recovery and Maintenance

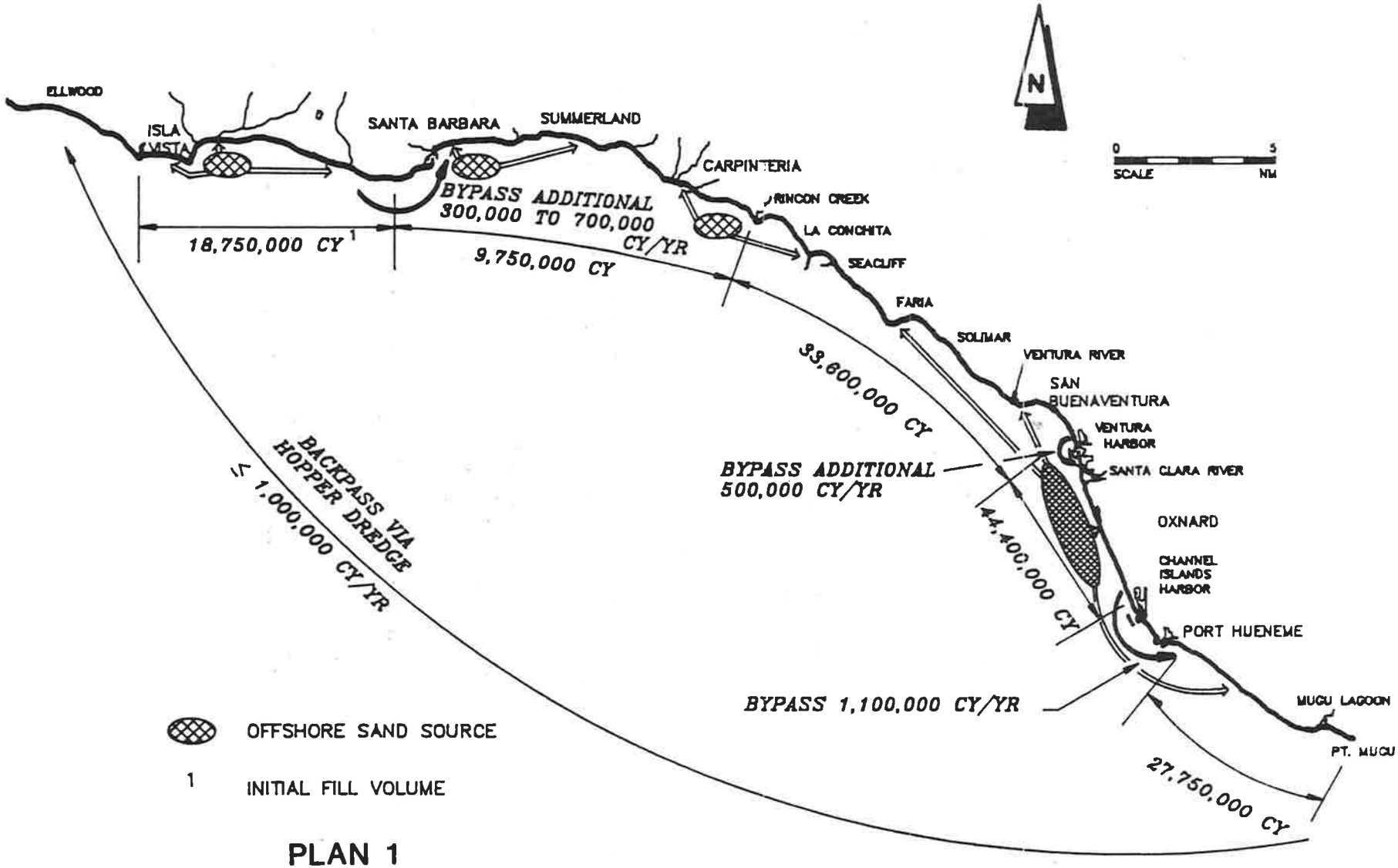
1. Isla Vista	10,000 feet of beach fill from offshore dredge operation and contruction of one control groin.
2. Santa Barbara	10,000 feet of beach fill from southern end of East Beach to Miramar beach from offshore dredge operation and construction of two control groins at Biltmore and Miramar.
3. Carpinteria	10,000 feet of beach fill from offshore dredge operation and construction of one control groin.

Table 3 (Continued)

4. Rincon Point	Sand injection at Rincon Point by hopper bottom dump from offshore dredge operation.
5. Punta Gorda	Sand injection at Punta Gorda by hopper bottom dump from offshore dredge operation.
6. Faria	Sand injection at Faria by hopper bottom dump from offshore dredge operation.
7. Ventura	Beach nourishment along San Buenaventura State Beach from existing dredge material at Ventura Harbor and offshore supplementation.
8. Oxnard Shores	Beach fill along McGrath, Oxnard Shores, and Hollywood Beaches from offshore dredge operation plus optional construction of 12 control groins along Oxnard Shores and Hollywood Beaches.

Level 4: Feeder Beach Injection

1. Carpinteria	Sand injection at Carpinteria Beach by hopper pump out from offshore dredge operation.
2. Pierpont Bay	Sand injection at Pierpont Bay Beach (San Buenaventura State Beach) by hopper pump out from offshore dredge operation and beach nourishment from existing dredge material at Ventura Harbor.
3. Oxnard Shores	Sand injection at Oxnard Shores Beach by hopper bottom dump from offshore dredge operation.
4. Ormond Beach	Sand injection at Hueneme Beach by hopper bottom dump from offshore dredge operation.



PLAN 1

REGIONAL RECOVERY AND MAINTENENCE
ISLA VISTA – PT. MUGU

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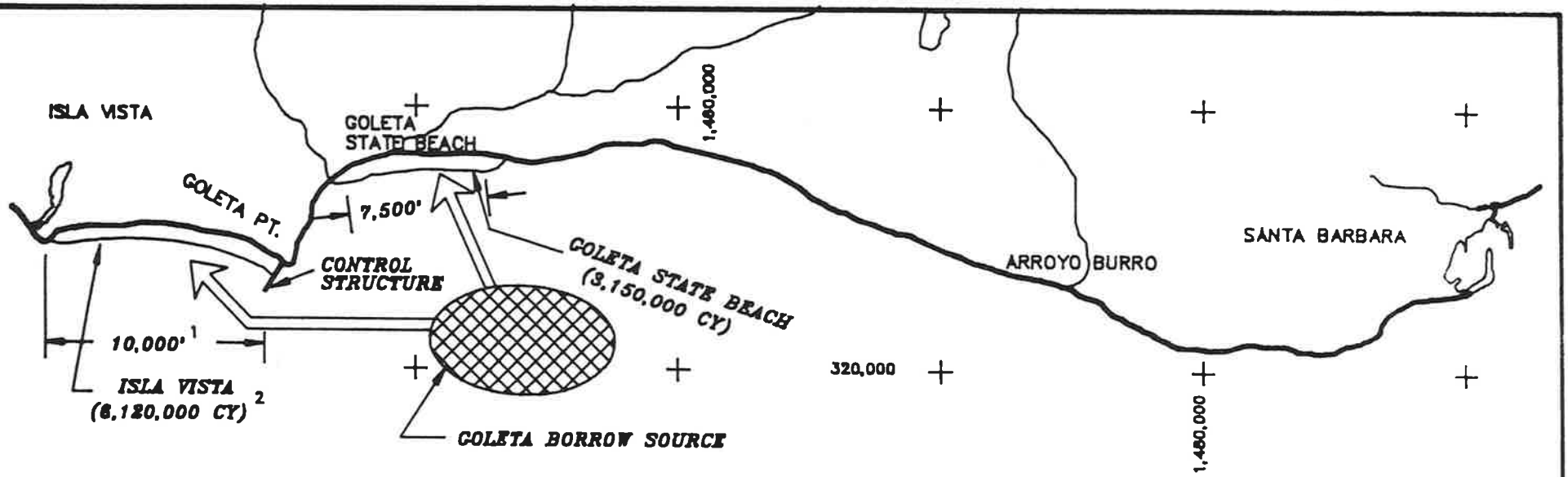
Figure 6

Figure 6



1 FILL LENGTH

2 INITIAL FILL VOLUME

N

5,000 0 5,000

SCALE FEET

NOTES :

1. COORDINATES ARE CALIFORNIA STATE GRID ZONE 5.

PLAN 2

REDUCED REGIONAL RECOVERY AND MAINTENANCE ISLA VISTA -SANTA BARBARA

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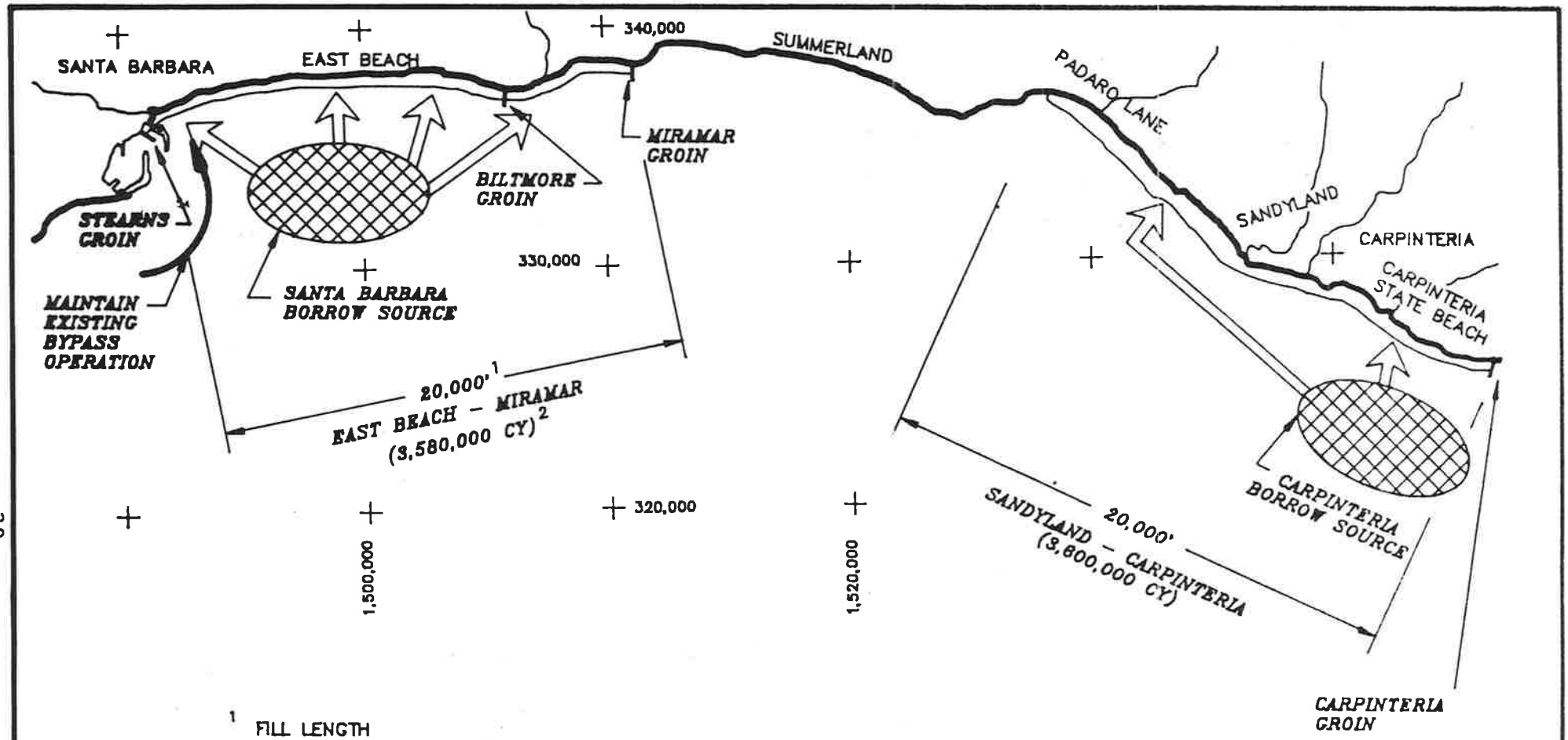
Figure 7

Figure 7



NOTES :

1. COORDINATES ARE CALIFORNIA STATE GRID ZONE 5.

PLAN 2

REDUCED REGIONAL RECOVERY AND MAINTENANCE SANTA BARBARA-CARPINTERIA

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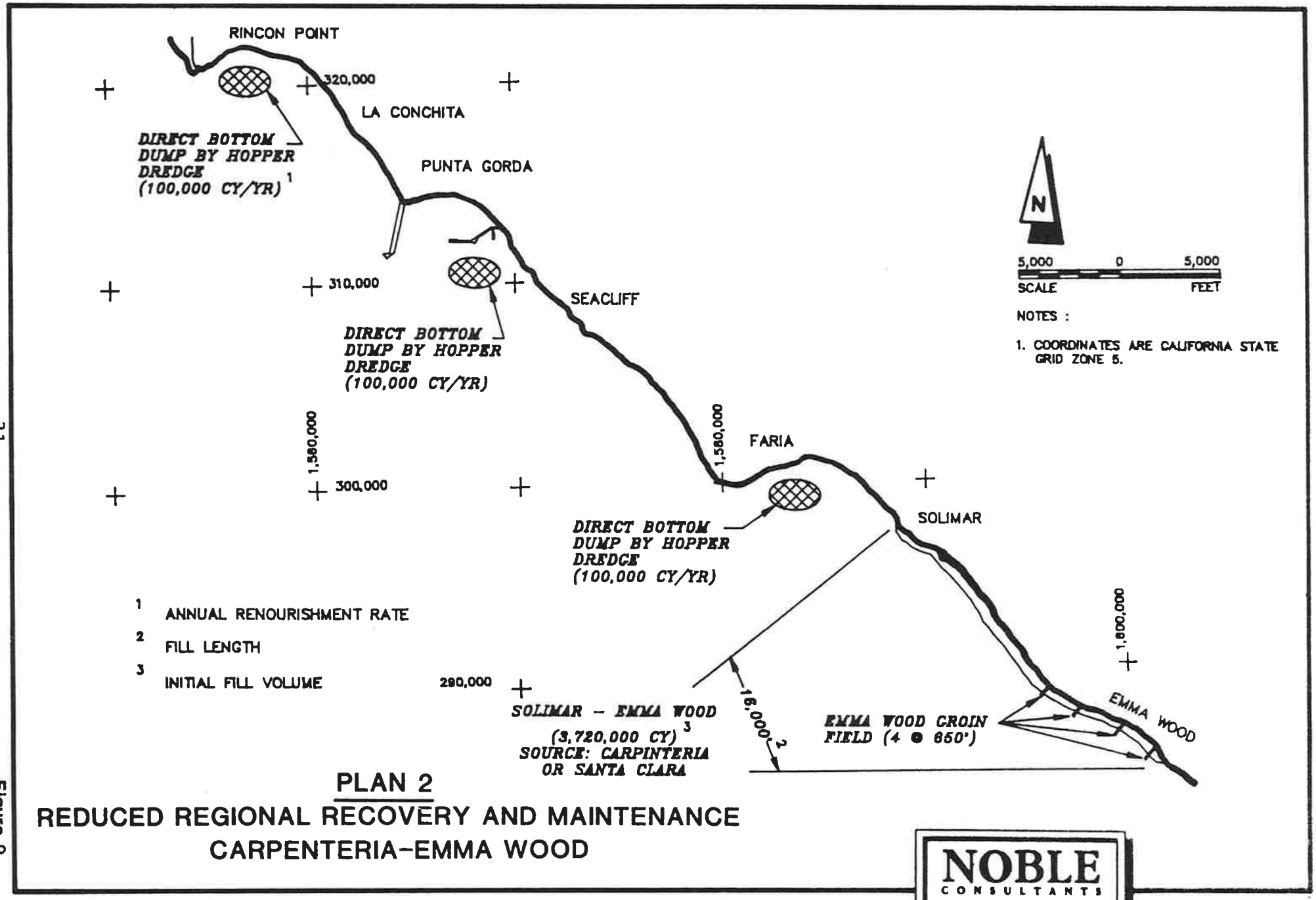
Figure 8

Figure 8



PLAN 2

REDUCED REGIONAL RECOVERY AND MAINTENANCE CARPENTERIA–EMMA WOOD

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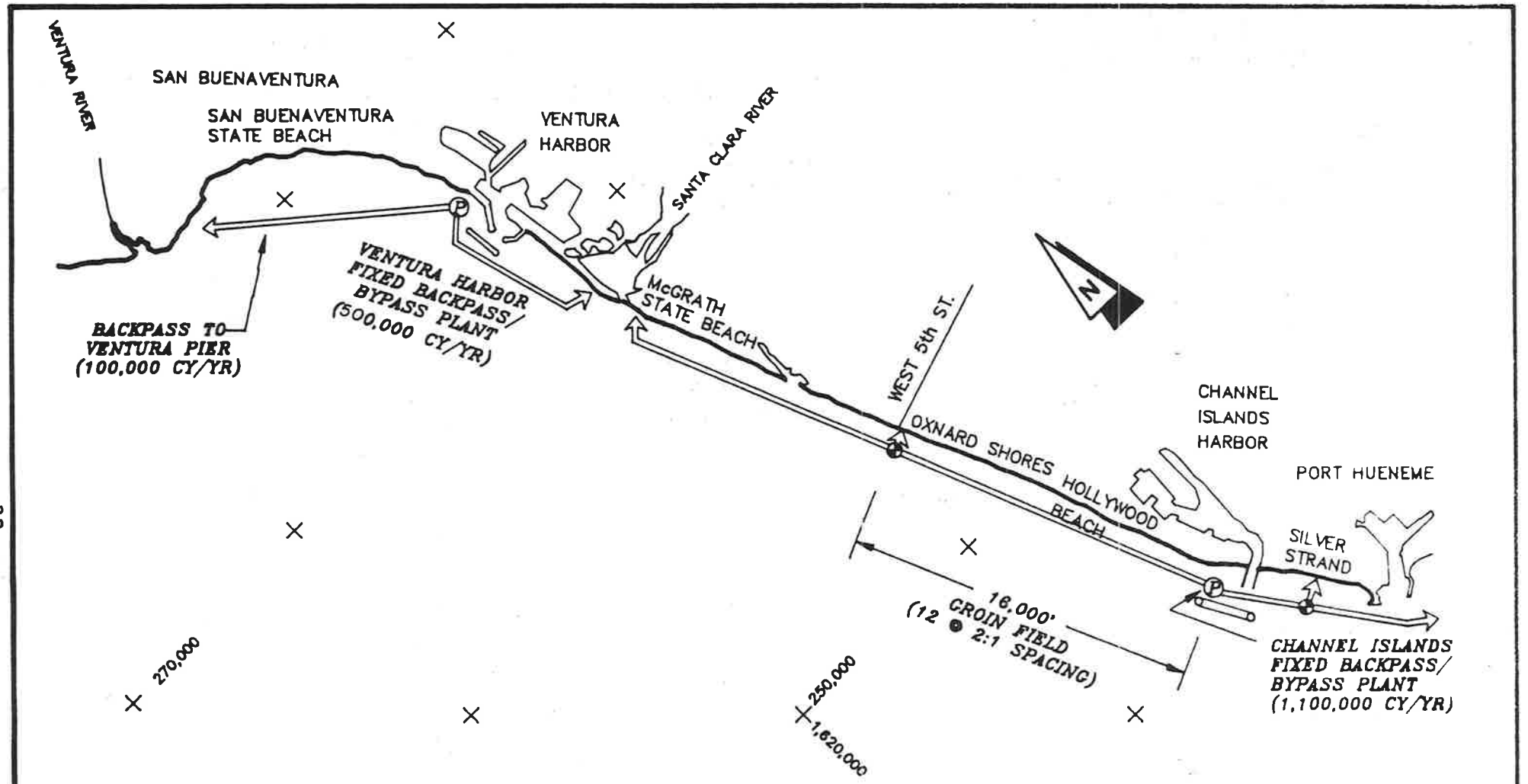
Figure 9

Figure 9



PLAN 2
REDUCED REGIONAL RECOVERY AND MAINTENANCE
EMMA WOOD – SILVER STRAND

NOTES :

1. COORDINATES ARE CALIFORNIA STATE GRID ZONE 5.

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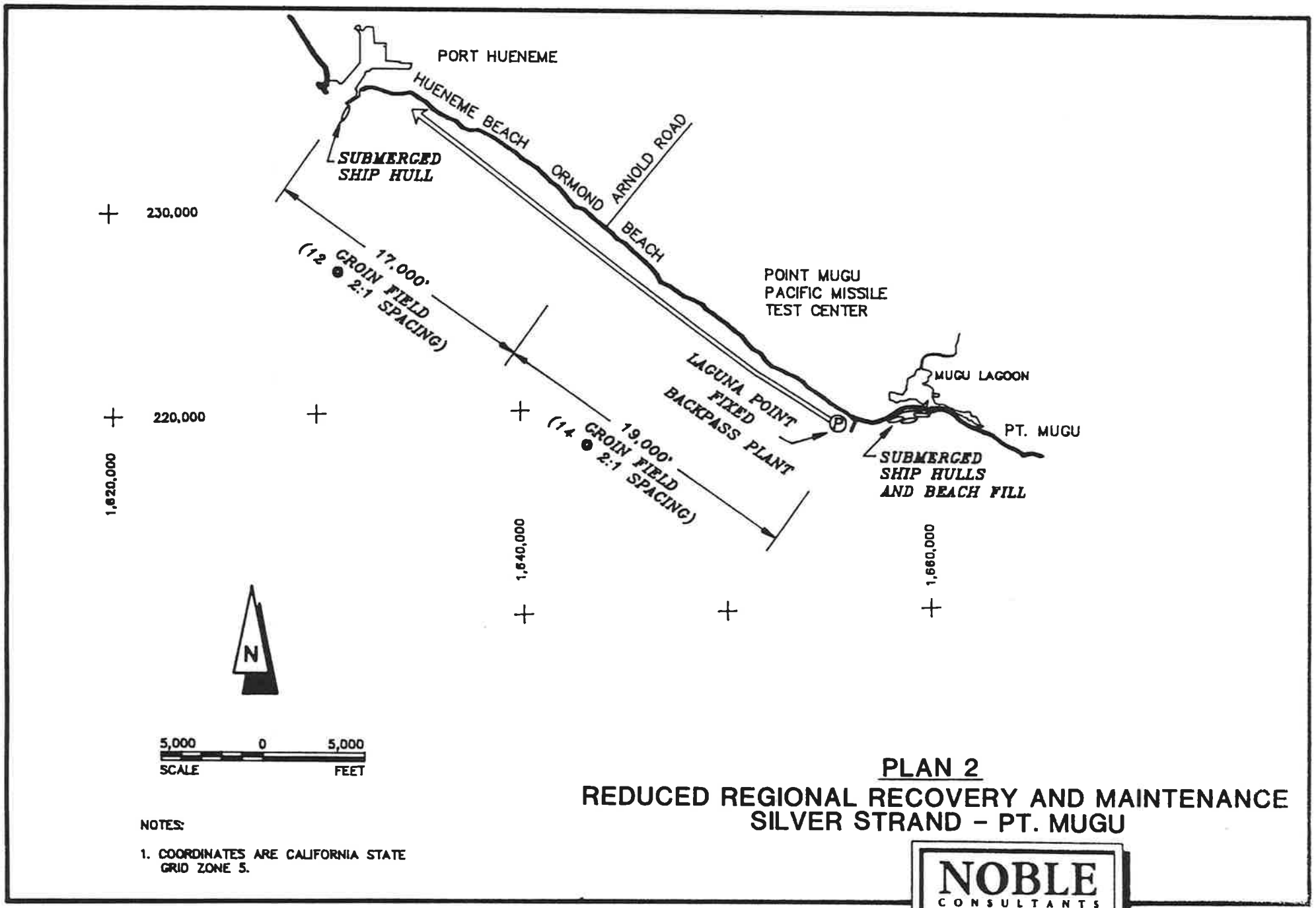
Figure 10

Figure 10

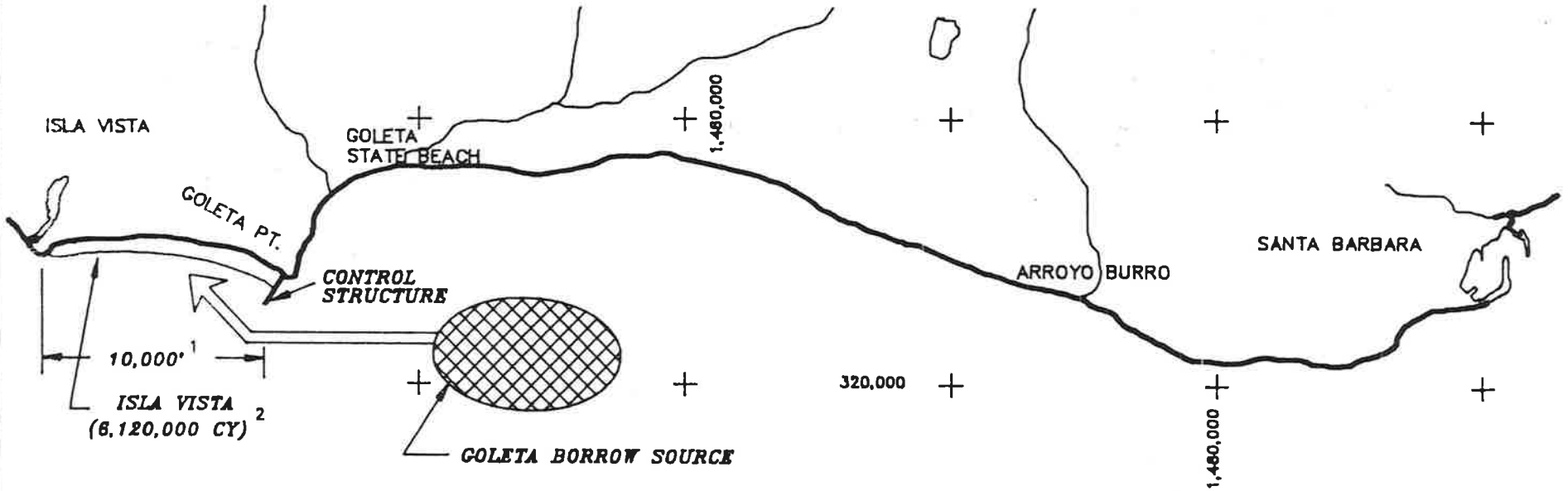


PLAN 2
REDUCED REGIONAL RECOVERY AND MAINTENANCE SILVER STRAND – PT. MUGU

NOBLE CONSULTANTS

Figure 11

Figure 11



1 FILL LENGTH

2 INITIAL FILL VOLUME

N

5,000 0 5,000

SCALE FEET

NOTES :

1. COORDINATES ARE CALIFORNIA STATE GRID ZONE 5.

PLAN 3
REACH RECOVERY AND MAINTENANCE
ISLA VISTA – SANTA BARBARA

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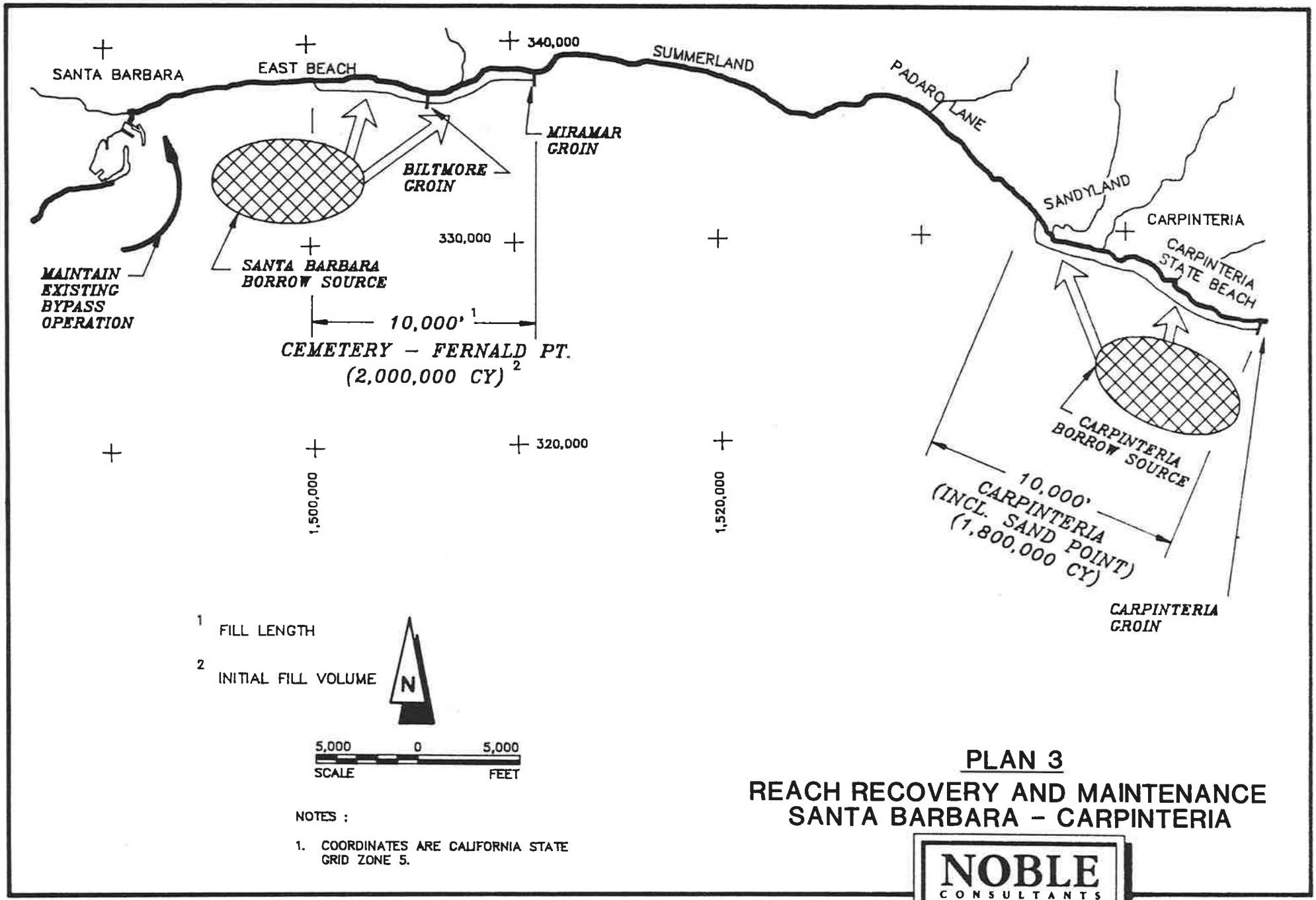
Figure 12

Figure 12



PLAN 3
REACH RECOVERY AND MAINTENANCE
SANTA BARBARA - CARPINTERIA

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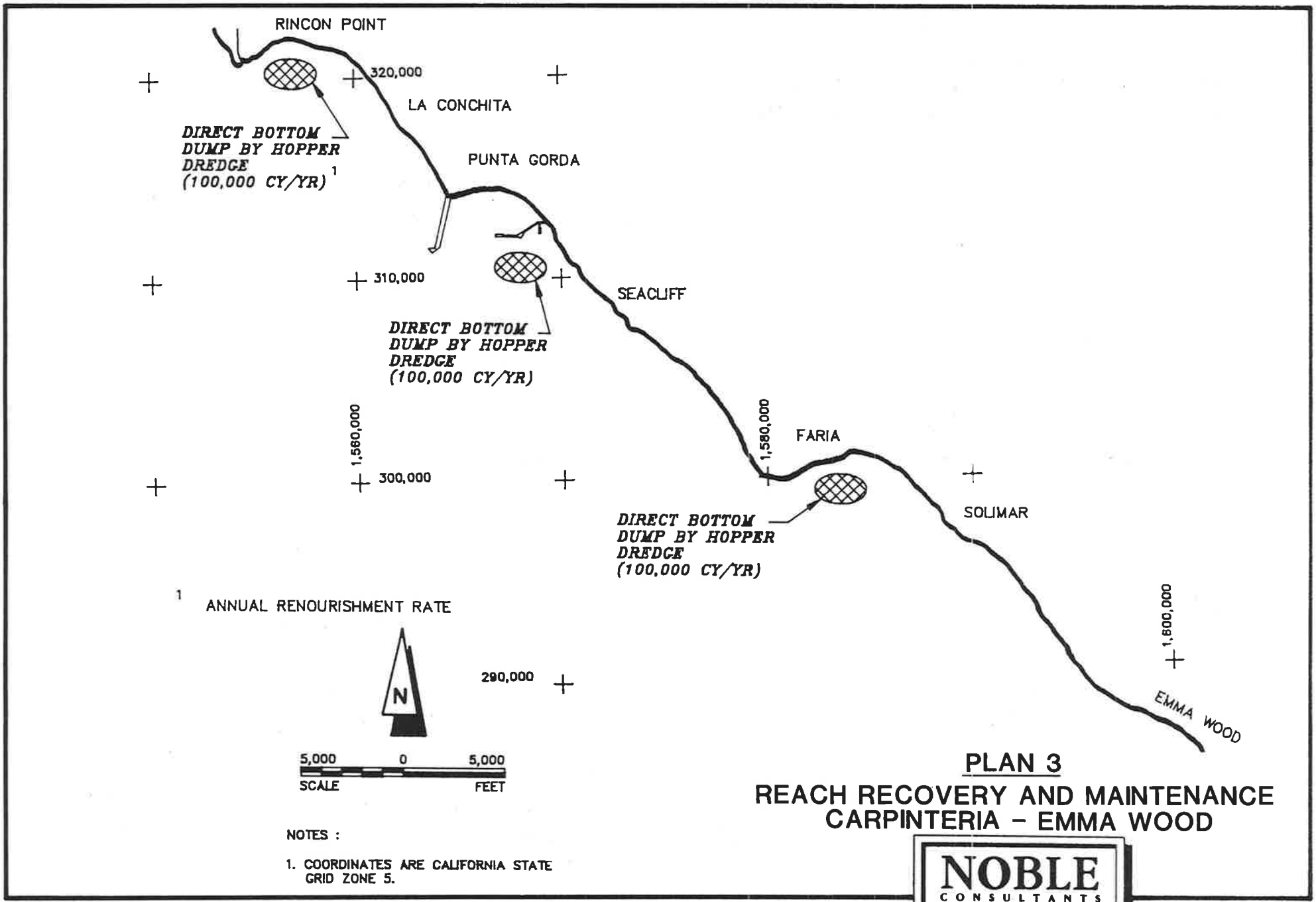
Figure 13

Figure 13



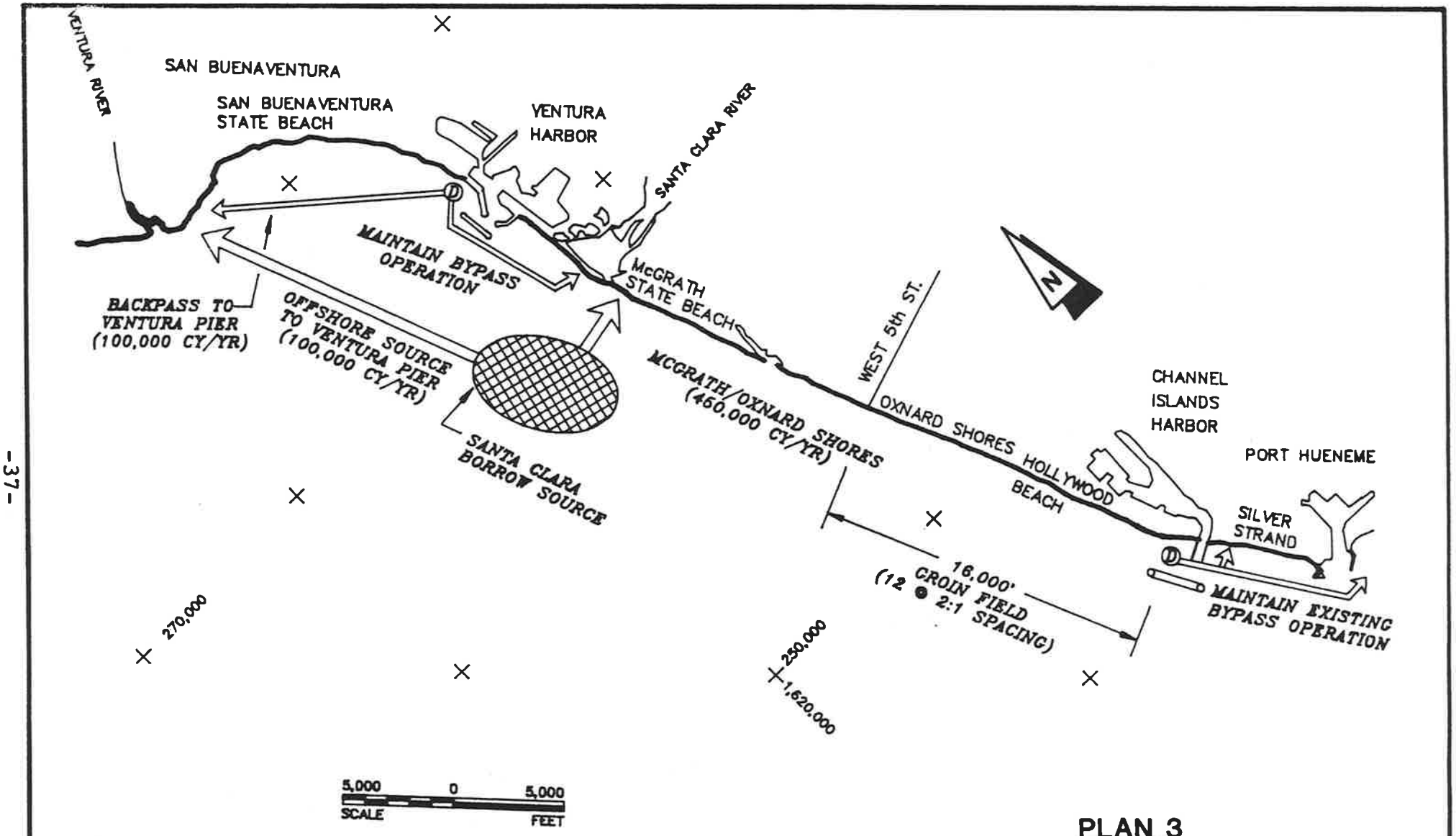
PLAN 3

REACH RECOVERY AND MAINTENANCE
CARPINTERIA - EMMA WOOD

NOBLE CONSULTANTS

Figure 14

Figure 14



NOTES :

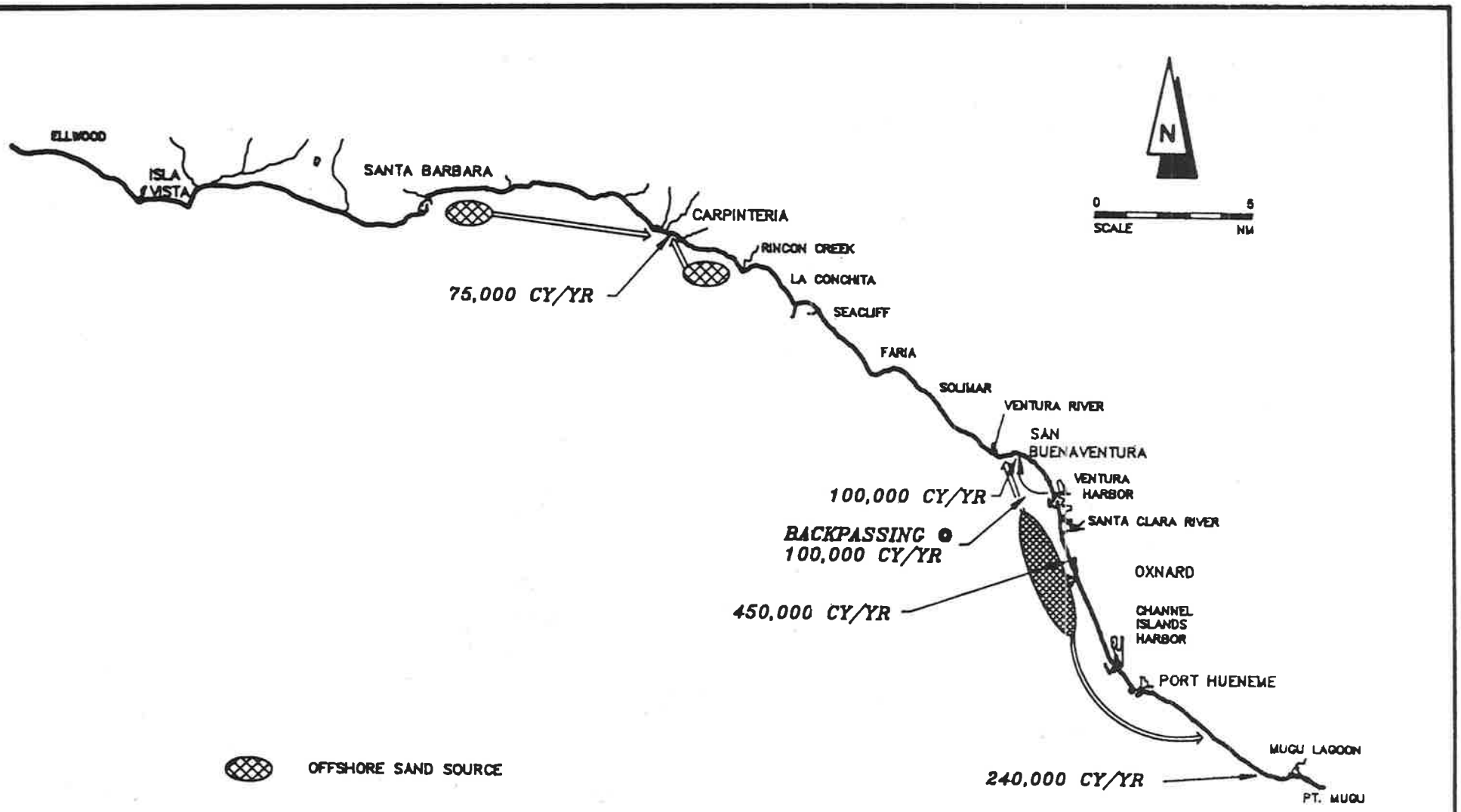
1. COORDINATES ARE CALIFORNIA STATE GRID ZONE 5.

PLAN 3
REACH RECOVERY AND MAINTENANCE
EMMA WOOD – SILVER STRAND

NOBLE CONSULTANTS

Figure 15

Figure 15



PLAN 4
FEEDER BEACH INJECTION
ISLA VISTA – PT. MUGU

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Figure 16

Figure 16

Table 4

Plan Evaluation Matrix

		TECHNICAL		ECONOMIC			ENVIRONMENTAL			
		Methods	Risks	Benefits	B/C	Cost Thres.	Estimated Impacts			
							Visual Resource	Rec.	Biol	Water Quality
Plan 1										
	Regional	BN(P)	HS,D	A,B,C,D	POOR	764	S	S	P	M
Plan 2										
	Isla Vista	BN(P)+CG(1)	FL	B,D	POOR	44	S	S	P	M
	Goleta	BN(P)	FL	C	LOW	30	S	S	P	M
	Santa Barbara	BN(P)+CG(3)	FL	C	OK	33	S	S	P	M
	Carpinteria	BN(P)+CG(1)	FL,B	A,C,D	GOOD	45	S	S	P	M
	Rincon Pt.	BN(D)	FL	B,C	POOR	12	S	S	P	M
	Punta Gorda	BN(D)	FL	B,C	POOR	14	S	S	P	M
	Faria	BN(D)	FL	B,C	POOR	14	S	S	P	M
	Emma Wood	BN(P)+GF(4)	FL	B,C,D	POOR	43	P	P	P	M
	Ventura	BN(FP)	V,B	A	EXECEL.	30	S	S	S	S
	Oxnard Shores	BN(FP)	V,B	A	POOR/GOOD	65	S	S	S	S
	w/ option	+GF(12)				13	P	P	P	M
	Silver Strand	BN(FP)	V,B	A	POOR		S	S	S	S
	Ormond Beach	BN(FP)	V,B	A	POOR	63	S	S	S	S
	w/ option	+GF(12&14)				30	P	P	P	M
	Mugu Lagoon	BN(P)+BK	FL	B,D	POOR	7	P	P	P	M
						445				
Plan 3										
	Isla Vista	BN(P)+CG(1)	FL	B,D	POOR	44	S			
	Santa Barbara	BN(P)+CG(2)	FL	C	OK	23				
	Carpinteria	BN(P)+CG(1)	FL,B	A,C,D	GOOD	34				
	Rincon Pt.	BN(D)	FL	B,C	POOR	12	S	S	P	M
	Punta Gorda	BN(D)	FL	B,C	POOR	14	S	S	P	M
	Faria	BN(D)	FL	B,C	POOR	14	S	S	P	M
	Ventura	BN(MD)	FL,B	A	EXECEL.	25	S	S	S	S
	Oxnard Shores	BN(P)	FL,B	A	GOOD	51	S	S	P	M
	w/ option	+GF(12)				13	P	P	P	M
						231				
Plan 4										
	Carpinteria	BN(D)	B	A	EXCEL.	12	S	S	P	M
	Pierpont Bay	BN(D&MD)	B	A	GOOD	21	S	S	P	M
	Oxnard Shores	BN(D)	B	A	GOOD	40	S	S	P	M
	Hueneme Beach	BN(D)	B	A	GOOD	28	S	S	P	M
						101				

Table 4

(Continued)

METHODS:

BN(P) = Beach nourishment from offshore dredge operation - pumped onshore
BN(D) = Beach nourishment from offshore dredge operation - bottom Dumped (sand injecton)
BN(MD)= Beach nourishment from maintenance dredge harbor bypass/backpass operation
BN(FP)= Beach nourishment from fixed plant bypass/backpass operation
CG() = Terminal control groin (# groins)
GF() = Control groin field (# groins)
RK = Offshore breakwater

BENEFITS:

A = Supplement budget
B = Widen beach
C = Enhance Recreation
D = Storm Protection

B/C:

Poor = 0-0.4 B/C
Low = 0.4-0.7 B/C
OK = 0.7-1.0 B/C
Good = 1.0-1.5 B/C
Excel.= >1.5 B/C

COST THRES.:

$ Millions for 25 year project cost

RISK:

FL - Fill life subject to borrow compatibility and success of control groin
HS - Increased harbor shoaling
V - Requires design verification of proposed methodology
B - Sediment Budget conclusion subject to data collection verification
D - Severely depletes borrow sources

ESTIMATED ENVIRONMENTAL IMPACTS:

S - Slight
N - Moderate
P - Potentially significant

The issues are:

1) Fill longevity;

2) Sand backpassing feasibility;

3) Maintenance method; and

4) Coastal processes uncertainty.

The first issue deals with the uncertainty of littoral transport west of the Ventura River after placement of large sand fills. The shoreline has traditionally been sediment limited, and the diffusion of sand within such environments should be verified. The validity and merit of downcoast control groins to offset tendencies for more rapid fill requires confirmation as well. The proposed sand backpassing/bypassing plants between Ventura Harbor and Mugu Beach also require further development. The technology has been demonstrated in Australia with success; however, the methodology needs to be expanded to address the scale and flexibility specified in the plan.

The method of periodic maintenance should be reviewed to explore the feasibility of direct bottom dump discharge methods which will affect sand delivery to the beaches. Contrary to renourishment by direct pipeline transfer, the method suggests that natural wave processes might achieve the desired end result at considerably less expense. This issue has significant impacts on the economic feasibility. Finally, the identified sediment budget deficit areas should be confirmed, particularly for areas east of the Santa Clara River. The consequences of the present uncertainty in the potential debit for beaches east of Oxnard Shores significantly affects the need for and extent of action called for by the sand management plan.

Benefit/Cost Analysis

The traditional way of evaluating flood control and other public projects of a similar nature is through a benefit/cost analysis - a comparison of the public and private costs and benefits of the proposed project. The estimated costs for differing levels of sand renourishment and control of beach erosion between Isla Vista in Santa Barbara County and Point Mugu in Ventura County are summarized in Table 4. Key benefits from the proposed projects include the enhancement or continuation of recreational usage of the beaches, the reduction of property loss resulting from beach and cliff erosion, and the reduction of valuable land lost to erosion.

A significant item which affects the benefit/cost analysis is the beach fill maintenance cost. Should direct bottom dump methods prove to be technically possible, the total project's cost for the beach enhancement sites will be reduced which will increase the project's benefit/cost feasibility. The analysis is also sensitive to assumed land values. For this study average data was utilized; however, given the volatile nature of oceanfront property in Southern California, it is recommended that land valuation be periodically updated.

Environmental Impacts

Analysis of the environmental aspects of beach erosion control requires very specific information on the location, schedule and construction methods planned for each project. The potential environmental impacts vary according to the project's proximity to sensitive biological resources and to the project's use of permanent shoreline structures for erosion control. For example, the use of sand fill in Carpinteria (Plan 4) and Goleta (Plan 2) is concluded at this point to be preferable from an environmental perspective over other plans proposing the use of groins.

Installation of sand bypass plants at Ventura Harbor, Channel Islands Harbor and Laguna Point (Point Mugu) is considered environmentally preferable to continued maintenance dredging in part because the method provides a continuous supply of sand to downcoast beaches at smaller discharge rates. The Carpinteria and Isla Vista beach widening projects are less desirable because of the use of single groins in areas of high recreational use. Sensitive habitats also occur in these areas. The Santa Barbara, Emma Wood and Oxnard Shores projects include the use of optional groin fields in high use recreational areas and, therefore, are considered the least desirable when including groin field construction. These are large scale projects with the potential for high negative impacts during construction.

Demonstration Projects

Five different small scale demonstration projects have been identified to test technical aspects of the proposed plans or to serve as prototype experiments to validate assumed project benefits. These five demonstration projects include:

1) Beach nourishment from an offshore borrow site using a direct bottom dumping hopper dredge;

2) Beach nourishment from an offshore borrow site using pumped shoreline placement methods;

3) Utilization of a terminal control groin structure to prolong the lifespan of a beach nourishment fill;

4) Dune stabilization methods to lessen wind driven losses and provide for natural storm barriers; and

5) Recapture of debris basin sediments, to augment beach nourishment from offshore borrow sites, by either truck haul or bypassing this sediment downstream of the debris basins for its natural continuation to the coastline.

The first three demonstration projects will test different technical aspects of the four plan levels, while the fourth project will assess a beach nourishment maintenance concept, and the fifth project will assess an untested beach nourishment concept. Table 5 summarizes an evaluation of these five alternative projects through a comparative rating of their applicability to the proposed sand management plans, their potential technical risk of failure, their potential benefit if proven successful and their associated cost to implement. The demonstration project testing the use of a direct bottom dumping hopper dredge appears to be the most desirable project for verifying its applicability in the proposed sand management plan, while the demonstration project to assess the recapture of debris basin sediments is the most desirable to assess a new beach nourishment concept at a relatively low cost.

Preferred Plan

The sand management plan consists of the following elements:

1) Beach nourishment;

2) Public policy;

3) Short-term demonstration project; and

4) Long-term coastal monitoring.

Plans 1, 2, and 3 are beach nourishment and sand management plans which specifically address BEACON's goals and objectives; however, they differ in their extent of shoreline coverage and maintenance methods. Plan 4 maintains only the status quo conditions and contains no provisions for beach enhancement. Therefore, from a technical viewpoint, Plans 1, 2, and 3 are preferable. However, from an economic assessment, the costs associated with Plans 1 and 2 are substantially larger than their estimated benefits. Plans 3 and 4 have a more balanced benefit/cost ratio, especially if long-term maintenance can be achieved using hopper dredge bottom dump techniques. Therefore,

Table 5

Demonstration Project Evaluation

Alternative	Applicability to Sand Management	Risk	Benefit Potential	Cost
1. Hopper Dredge Bottom Dump Test	Regional	High	High	$780,000
2. Offshore Sand Renourishment	Regional	Moderate	Moderate	$2,800,000
3. Control Groin w/ Fill	Regional	Moderate	Moderte	$1,500,000 to $2,500,000
4. Dune Stabilization	Local	Low	Low	$330,000
5. Debris Basin Recapture	Regional	Low	Low	$100,000 to $200,000

Plans 3 and 4 are economically preferable. From an environmental perspective, Plan 4 is preferable due to its limited scope and non-use of coastal structures. The remaining plans are less favorable due to their use of control groins and their higher potential for impacting biological resources.

In summary, Plan 3 is recommended as the preferred beach nourishment plan element since it provides the optimum balance of satisfying the technical objectives, having a reasonable benefit/cost ratio, and resulting in solvable environmental impacts. In addition, the technical uncertainty and risk of failure are less for Plan 3 than for the other plans.

The preferred plan should incorporate public policy elements to address sand management issues, sand source preservation, and acceptable property protection/beach protection practices. The preferred plan should therefore incorporate land zoning permitting to:

- Continue harbor dredging;
- Eliminate fluvial sand mining;
- Bypass debris basin sediments;
- Mitigate loss of bluff erosion as a sand source; and
- Mitigate sand impacts.

Three of the five short-term demonstration projects have been formulated specifically to address technical aspects of the long-term plan. The hopper dredge bottom dump test stands to yield the largest economic payoff if it verifies the natural onshore migration of sand, while the control groin project will test a key element of the beach nourishment program identified in the preferred plan. The offshore sand nourishment demonstration project is the most viable and direct means to evaluate large scale fill design criteria. Therefore, these three demonstration projects are preferred due to their technical importance and potential cost saving implications.

The sand management plan recognizes that the database within the Santa Barbara Littoral Cell is limited and should be improved. Therefore, the long-term collection of annual and seasonal beach profile data, wave information, and hydrologic data is recommended to improve the technical understanding of the shoreline, confirm critical design assumptions, and allow for plan refinement.

9. PLAN IMPLEMENTATION

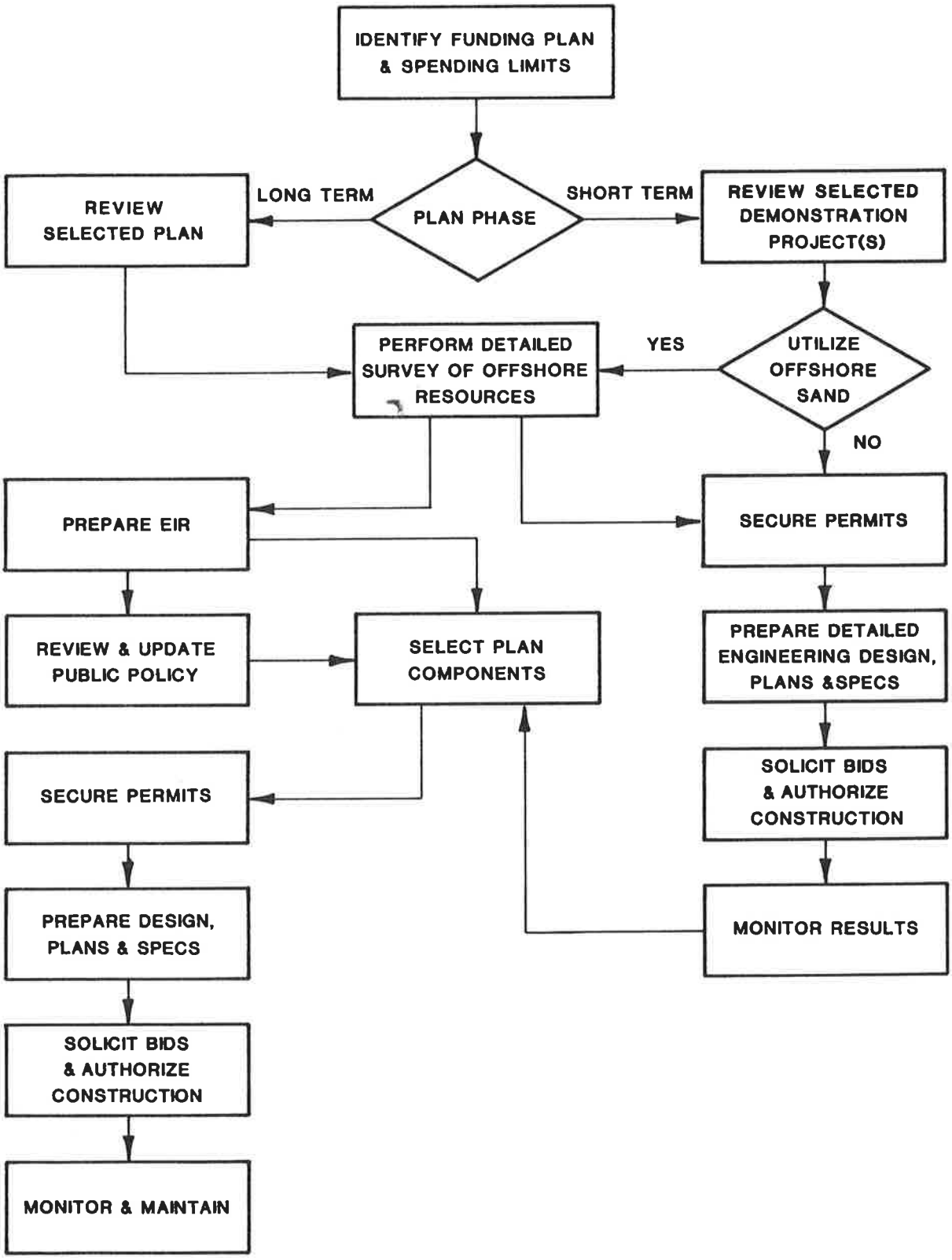
The comprehensive sand management plans presented in this Executive Summary constitute a regional strategy to deal with erosion concerns and sediment budget deficiencies. These plans should be refined and periodically updated as the database expands and the understanding of the controlling coastal processes improve.

The full implementation process should identify and develop all funding options, develop the selected beach nourishment short-term demonstration projects and preferred long-term regional plan, pursue regional permitting, prepare regional plans and specifications, and continue long-term coastal monitoring. This process should include the following elements:

- Pursue funding alternatives;
- Review selected demonstration projects;
- Pursue demonstration project permitting;
- Develop demonstration project plans and specifications;
- Implement the demonstration projects;
- Monitor results of demonstration projects;
- Refine preferred regional sand nourishment plan;
- Pursue regional plan permitting;
- Update public policy;
- Develop regional plans and specifications;
- Implement the regional plan;
- Monitor and maintain the regional plan; and
- Continue long-term coastal monitoring.

Plan Progression

Figure 17 presents a plan implementation flow chart which indicates a suggested sequence of action to implement the selected short-term demonstration projects and the ultimate preferred long-range plan. The development of an appropriate funding plan to underwrite the initial construction, maintenance, and engineering and administrative aspects of the program must first be resolved.



PLAN IMPLEMENTATION FLOW CHART

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Figure 17

The considerable costs associated with the candidate sand management plans imply that funding may be a major obstacle towards implementation of the preferred long-range plan. Consequently, the mechanism to financially support the plan will need to be developed in detail. Furthermore, it is very likely that the size and scope of the preferred plan will be limited by the extent of funding that can be raised to pay for it.

Once the funding mechanism has been established, the implementation process is recommended to follow two parallel paths of designing and constructing short-term and long-range projects. The short-term or demonstration pilot projects should include features of the regional plan. Such projects will demonstrate a particular aspect of the plan and serve as a prototype experiment to determine the potential benefit that might be realized from a concept that is unproven. The preferred public policy items listed in Section 7, Plan Formulation, should be reviewed and incorporated into the appropriate local codes, ordinances and guidelines. Where appropriate, BEACON should solicit policy concurrence and adoption by State and Federal agencies for overall consistency.

Development of the long-range plan should proceed by quantifying the construction limits of the identified offshore sand sources through deep vibracore drilling, permitting and detailed design phases. The permitting process will require additional consideration of environmental quality as required under CEQA guidelines. The lead agency for the CEQA process will normally be a single county. The lead agency prepares an initial study at its own expense to determine if the project is likely to have a significant effect on the quality of the environment. If the study indicates that significant consequences are likely, then a Notice of Preparation of an Environmental Impact Report (EIR) is issued, which formally initiates the CEQA process. If the study indicates that significant effects on the quality of the environment are not likely, a Negative Declaration is prepared. After a public review period, the Negative Declaration is reviewed and approved by an interagency decision making body and the project proceeds.

Coastal Monitoring

The ultimate purpose of a monitoring program is to track the amount of sediment delivered to the coast, its movement alongshore and the associated volume changes on the beach. Interpretation of the data on a regular basis would enable one to anticipate trends in shoreline response and take appropriate action and/or adjustment to sand management activity. It is also

possible that a shoreline response numerical model could be developed and connected directly with the field data input to serve as an indicator of immediate beach erosion activity and a forecast tool to flag potential trouble spots.

The essential ingredients of the proposed coastal monitoring program include:

1) Wave data collection;

2) Fluvial discharge and hydrologic measurements;

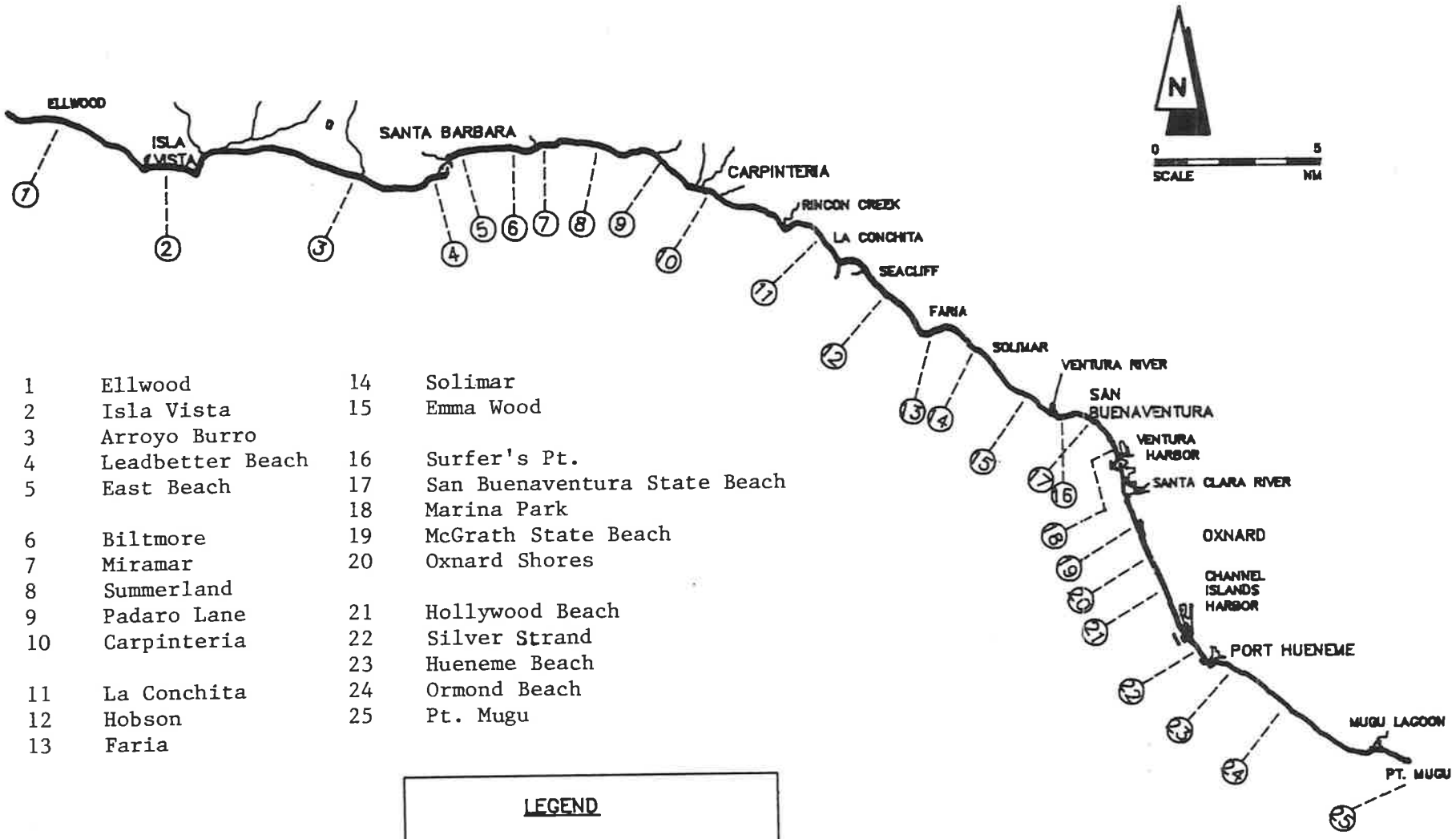
3) Beach profile surveys;

4) Aerial photography review; and

5) Dredging records review.

The recommended monitoring program is intended to be a relatively simplistic program to measure shoreline response directly and determine if correlations exist between wave energy, rainfall and man activity. It is also intended that the cumulative results of the program could be directly input into a more comprehensive technical study should Federal funding be extended to the BEACON study area.

A regular program of beach and nearshore profile monitoring is recommended as a prudent course of action to confirm projections of shoreline evolution prior to the commitment of substantial monies. Therefore, it is recommended, as a minimum course of action, that long-term monitoring be continued for the 25 beach profile monitoring stations, located as shown in Figure 18, which were established as part of the BEACON sand management study.



1	Ellwood	14	Solimar
2	Isla Vista	15	Emma Wood
3	Arroyo Burro		
4	Leadbetter Beach	16	Surfer's Pt.
5	East Beach	17	San Buenaventura State Beach
		18	Marina Park
6	Biltmore	19	McGrath State Beach
7	Miramar	20	Oxnard Shores
8	Summerland		
9	Padaro Lane	21	Hollywood Beach
10	Carpinteria	22	Silver Strand
		23	Hueneme Beach
11	La Conchita	24	Ormond Beach
12	Hobson	25	Pt. Mugu
13	Faria		

LEGEND

⑫ EXISTING BEACON BEACH PROFILE LOCATION

BEACON PROFILE LOCATIONS

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Figure 18

Figure 18