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State of California
The Resources Agency
Department of Fish and Game

SURVEY OF CALIFORNIA LEAST TERN NESTING SITES[1]

by

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ABSTRACT

The California least tern (Sterna albifrons browni) is an endangered species. Its population has decreased rapidly, particularly in the last decade, as a result of unrelenting human disturbance and development on its nesting sites. Fifteen nesting sites in California were used in 1969 or 1970. In 1970, an estimated 300 pairs used these sites. One site is in San Mateo County, 2 are in Orange County, and 12 are in San Diego County. Two San Diego County sites were not used in 1970. There are near-term plans for development on 10 of the sites, 6 of which are on private property. The least tern is remarkably adaptable; currently 9 sites are on man-made fill, and only 3 are natural beach sites. Two principal actions are recommended to prevent the extirpation of this species in California: (1) protection of existing sites from human disturbance, and (2) creation of new sites in areas that can be protected from disturbance and development.

1/ Supported by Federal Aid in Wildlife Restoration Project W-54-R, "Special Wildlife Investigations".

RECOMMENDATIONS

Based on the California least tern nesting survey reported herein, the following general recommendations are made. Specific recommendations regarding each colony are contained in Appendix A.

1. Major emphasis be placed immediately on preservation and protection of the two largest remaining least tern colonies. These are located at Sunset Aquatic Park and Mission Bay Park. These two colonies, in contrast with other known colonies in the state, produced significant numbers of young in 1970. Their preservation, therefore, is essential for the continued existence of the least tern in California.

2. Secondary priority be given to the protection and preservation of the colony on Bair Island, San Mateo County, and the colonies at the Santa Margarita River mouth and at Elijo Lagoon, San Diego County.

3. As third priority, efforts be made immediately to protect and preserve all remnant colonies wherever practical. Given adequate protection, it is reasonable to assume that some of these colonies could build back up to former numbers. This would be of utmost importance if disaster were to strike one or more of the few remaining larger colonies.

4. Experiments be conducted to determine if least terns can be lured to a new nesting site through use of decoys, artificial nest scrapes with eggs, and tape recorded calls. These methods should be tried with both colonies mentioned in Recommendation 1, and in other areas where suitable habitat exists or can be created, and adequate protection can be given.

5. A survey be made of all sites to determine whether rats are present. If so, control procedures should be initiated. Where other potential predators are present in the immediate vicinity of a colony, feasibility and advisability of control be investigated.

6. A survey be made of areas where colonies have not been recorded in recent years. These would be areas where least terns could reasonably be expected to nest and include the mouths of the Santa Ynez and Santa Maria Rivers, Santa Barbara County; mouth of the Santa Clara River, Ventura County; Point Magu area; less accessible areas of Long Beach Harbor; and Oceanside Marina and North Island Naval Air Station, San Diego County.

7. State Department of Parks and Recreation personnel assigned to state beaches in southern California be requested to furnish information regarding least tern nesting attempts, and changes in status or location of existing colonies on state property.

8. Department of Fish and Game and U. S. Fish and Wildlife Service law enforcement officers be advised of the location and status of nesting colonies and be requested to provide maximum protection during the nesting season.

9. Nesting sites be inspected annually before start of the nesting season to insure that vegetation does not cover more than 20% of the ground surface, and excess vegetation be removed wherever possible.

10. Each site be censused annually, with a minimum of one census in June and July. Wherever possible, censuses be taken with a spotting scope outside the colony. Additional counts be made in late july and early August in the vicinity of nesting colonies to determine adult/young ratios.

INTRODUCTION

The California least tern (Sterna albifrons browni) was placed on the U. S. Department of the Interior list of endangered species in 1966 because everywhere within its range in California its nesting sites were being developed or subjected to intolerable human disturbance. The least tern population in the state has declined drastically in the past 10 years, and many breeding colonies have entirely disappeared between Los Angeles and Monterey. The fact that it has survived as long as it has can be attributed to its remarkable adaptability to man-made sites, and its ability to nest successfully quite close to human activity. Understandably though, it is not able to nest successfully where there is repeated motorcycle, dune buggy, and pedestrian traffic on the nesting site itself. Considering its adaptability, tolerence and persistence, it is apparent that with a relatively minor expenditure of effort and money it should be possible to preserve the least tern. The present study was initiated to inventory active nesting sites and develop a management plan for the species in California

SCOPE AND PURPOSE

This study has been concerned primarily with nesting sites, not with the biology of the species or its population. Information has been collected regarding the location, physical characteristics, and ownership of each site known to have been used in 1969 or 1970. Information concerning the sites' historical use (particularly for the past two nesting seasons), various potential threats to the colonies, and possible means of protecting or preserving the colonies has been also gathered. The study was begun in October 1970 and completed in January and February 1971 so that this information would be available before the start of the 1971 nesting season, thereby permitting immediate action on the recommendations.

METHODS

Each colony, except Bair Island, was visited during the study. Information not obtainable through site inspection was provided by numerous individuals who have observed the sites during the nesting season.

RESULTS

Data collected about each nesting site are given in Appendix A. Each site is written up separately so that information can be readily up-dated and distributed separately to individuals interested in a particular area or site. Fifteen sites known to have bee used in 1969 or 1970 are described in Appendix A, plus two sites which have been proposed as alternate sites for the large colony in Mission Bay Park, San Diego. The 15 sites, with their approximate 1970 population, are listed in Table 1. A site on Bay Farm Island, Alameda County, was used in 1969 but is not included in this study because the site is no longer suitable for nesting. It appears that the colony has moved to Bair Island, San Mateo County.

TABLE 1

LEAST TERN NESTING SITES IN CALIFORNIA
KNOWN TO HAVE BEEN USED IN 1969 OR 1970

Site	No. of Pairs[1]
San Mateo County	
Bair Island	8 to 10
Orange County	
Sunset Aquatic Park	50 to 75
Huntington State Beach	12
San Diego County	
Santa Margarita River	19
Buena Vista Lagoon[2]	10 (1969)
Batiquitos Lagoon[3]	7 to 12
San Elijo Lagoon	15 to 20
Del Mar[3]	5 to 6
Los Penasquitos[3]	10 (1969)
Mission Bay #1	100
Mission Bay #2[3]	10
Mission Bay #3	3
San Diego Airport[3]	25
South San Diego Bay	2
Tia Juana River[2]	3 (1969)
TOTAL	256 to 294

1/ Population figures given are in some cases very rough estimates. Some estimates are based on the number of individuals seen in the vicinity of the site during the nesting season.

2/ No evidence of nesting in 1970.

3/ Sites which were not censused in 1970.

DISCUSSION

Former Nesting Areas

Least terns are reported to have disappeared as a nesting species in many areas along the coast. Former nesting sites include Moss Landing, Monterey County; Morro Bay, San Luis Obispo County; Santa Barbara; Marina del Rey and Terminal Island, Los Angeles County; and Silver Strand, San Diego County. There are, however, a number of other areas along the coast where terns may still breed. A few of these areas are remote and may be fairly well isolated from human disturbance.

Other possible nesting areas, based on personal correspondence of individuals shown in parentheses, include: Pismo Beach, San Luis Obispo County (Wilbur); mouths of the Santa Maria River, San Luis Obispo County, and Santa Ynez River, Santa Barbara County (Atwood and Smith); mouth of the Santa Clara River, Ventura, where one young tern was reported to have been seen being fed in 1970 (Metcalf); Pacific Missile Range, Point Mugu; somewhere near the Long Beach Marine Stadium, where about 30 terns were present all summer, 1970 (Massey); sewage pond dikes inland from the mouth of the Santa Margarita River, San Diego County (Fries and Helmers); Oceanside Marina, San Diego County, where a flock of about 100 were present July 24, 1970 (Fries); and North Island Naval Air Station, San Diego.

Relocation of Colonies

At least 10 nesting sites are on land which is scheduled for development within a few years. For most of these colonies, the greatest hope lies in creating suitable nesting habitat in the same general vicinity on property which is not likely to be developed and where the colony can be adequately protected. It is, of course, not possible to tell a tern colony where to move, yet their demonstrated willingness to accept man-made sites gives good reason to believe that this type of management can be successful. In several areas, terns are now nesting on what appears to be rather marginal habitat, quite unlike their former beach sites. Often they have no other choice. In such situations it is reasonable to believe they readily move if offered more suitable habitat.

Their preferred habitat is relatively flat, loose sand mixed with bits of shellfish shells. This offers the best background for eggs and young. This type of soil is commonly available from the dredgings of coastal lagoons and bays. Terns also seem to prefer to nest where there is some scattered low vegetation to provide cover for the young, although they generally do not nest where such vegetation covers more than 20% of the ground surface. An additional major requirement is that colonies be located reasonable close to feeding areas. Not being deep diving feeders, terns are most successful where there are extensive areas of shallow water, or where rapidly moving water swirls small fish to the surface (Longhurst, pers. corr.).

Use of Decoys

There are many situations where it would be desirable to induce terns to use a particular nesting spot. This includes artificial sites created specifically for them and other cases where suitable locations are available in a given area.

We might know better than the terns how to choose the best spot. This notion may at first seem incredible, but how are terns to know when scouting for nesting sites and April and May that a particular stretch of beach will be completely overrun with people by mid-June, or that motel construction will begin on a site as soon as the eggs are half incubated? Several people have suggested use of adult decoys and artificial nests, as well as tape recorded calls, to attract terns. Such methods may never have been used with least terns and may not be successful; however, they are worth trying.

Predation

In a normal wild population, predation is a healthy phenomenon, except in some cases where introduced predator species are involved. However, when a species - particularly a colonial species - is on the verge of extinction and nesting success is made minimal by frequent disturbance by man, predation can be disasterous. In such a situation some predator control, even of native species, is justifiable, at least until the colony regains a healthy population. Where extensive predation occurs, relocation of the nesting colony might be the preferred method of control.

There is considerable evidence of predation in some tern colonies; but in most cases the predator has not been positively identified. Old World rats (Rattus norvegicus) are almost certainly guilty of some predation, at least on eggs. On a former nesting site at Silver Strand in San Diego County, McCaskie and Craig found rat tracks leading to a half-buried automobile tire that contained numerous tern egg shells. At several other sites, remains of adult terns, usually wings or headless bodies, have been found in considerable numbers. Up to 30 at one site, in one season, were reported. Although tern predation has been attributed to a wide variety of mammalian and avian predators, this has usually been on the basis of little evidence.

ACKNOWLEDGMENTS

The author is very grateful to the many persons who generously supplied information regarding the various nesting sites and possible nesting area. Without their assistance it would not have been possible to accomplish the study. Especially helpful were: Dr. Alan R. Longhurst, whose pioneering 1969 study of San Diego County nesting sites laid groundwork for this study; Dr. Charles Collins and Mrs. Barbara Massey, who furnished much of the information pertaining to the Sunset Aquatic Park and Huntington State Beach colonies; and, Bruce G. Elliott who suppolied almost all of the information regarding the Bair Island site. In addition, these people have offered numerous suggestions which have been the basis for many of the recommendations contained in the report.

COOPERATORS IN THE STUDY

The following individuals have directly or indirectly provided information regarding one or more sites or areas:

Bay Area - William Anderson, Bruce Elliott
Monterey-Santa Barbara Area - Jon Atwood, Alan Baldridge, Eleanor Pugh, Stanford R. Wilbur

Southern California - Sam Bitting, John S. Bradshaw, Charles T. Collins, Pauline des Granges, Pierre Devillers, Michael Evans, Alice Fries, Ben Garland, Maurice W. Getty, Mr. and Mrs. John Helmer, Jerome A. Johnson, Jack L. Kimsey, Dan L. Leadlay, Alan R. Longhurst, Barbara Massey, Guy McCaskie, George G. McCleary, John McColm, Nelson Metcalf, Richard L. Miller, Arthur Morley, William F. Perrin, Martha Rosenquist, Steven Smith, Jeff Snider, Dan Thompson, Thomas L. Taylor, Jack Vaughan, Shirley Wells, Richard Webster, and Mr. Winegard.

APPENDIX

INVENTORY OF CALIFORNIA LEAST TERN NESTING SITES WITH RECOMMENDATIONS FOR THEIR PROTECTION AND ENHANCEMENT

Sites

1. Bair Island
2. Sunset Aquatic Park
3. Huntington State Beach
4. Santa Margarita River
5. Buena Vista Lagoon
6. Batiquitos Lagoon
7. San Elijo Lagoon
8. Del Mar
9. Los Penasquitos
10. Mission Bay Site No. 1
11. Mission Bay Site No. 2
12. Mission Bay Site No. 3
13. Mission Bay Alternate Site: San Diego River Flood Control Channel
14. Mission Bay Alternate Site: North Mission Bay Park
15. San Diego Airport
16. South San Diego Bay
17. Tia Juana River

CALIFORNIA DEPARTMENT OF FISH AND GAME
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BAIR ISLAND SITE

LOCATION

Southeast corner of Bair Island, South San Francisco Bay, San Mateo County. About 2½ miles north of Redwood City, 150 yards NNE of Redwood Creek boat landing.

SITE DESCRIPTION

Salt flats with a cracked surface of mixed salt and silt. In 1970, nesting terns were found scattered (roughly 30-100 yards apart) over approximately 50 acres, and may have occupied other unsearched portions of the island as well. The size of Bair Island is approximately 1,500 acres. The nesting area is bare of vegetation.

OWNERSHIP

Leslie Salt Company, 505 Beach Street, San Francisco.

HISTORICAL USE

Least terns were first discovered nesting on Bair Island in July 1969, and at that time the population was estimated at 15 pairs (Anderson, Calif. Fish and Game, 56:136-137, 1970). In 1970, Elliott found a total of 19 nests, and at least 8 young were successfully fledged.

ELEMENTS OF THREAT

Human disturbance. The area is remote and is patrolled regularly by Leslie Salt Company and Pacific Gas and Electric Company; hence human disturbance is negligible. There was rather serious disturbance in 1970 due to touch-and-go landings on the nesting site by helicopters based at the Redwood City Airport. When informed of the problem, operators of the helicopters were cooperative and thereafter remained clear of the area.

Development. There are no known plans for development or other commercial use of this area in the near future.

Predators. On July 21, 1970, Elliott found 7 out of 10 egg clutches destroyed, and the remains of 5 adult terns (four pairs of wings and one headless body). Tracks near each nest site indicated that rats were responsible for at least the egg destruction. On the same date a short-eared owl was flushed from a spot where there was another pair of least tern wings and a fresh owl pellet. Subsequent analysis of the pellet revealed nothing but remains of meadow mice (Microtus). Rodenticide blocks (anti-coagulate bait containing 0.005% Diphacinone)

were put out the following day. While there was no direct evidence that these blocks were effective, neither was there any further predation.

POSSIBLE ACTIONS TO PROTECT SITE

The proposed South Bay National Wildlife Refuge now being considered by Congress would include Bair Island and would insure protection of this critical site. If a federal refuge is not established, the island should be acquired as an ecological area by the State.

The cracked silt and salt mudflat surface of this site is quite different from that of most other sites presently and historically used by least terns. A layer of sand on a portion of the nesting area might provide better camouflage and thereby increase the terns' nesting success. This measure might also encourage terns to return to this site each year rather than to attempt to nest on other more natural-appearing but less well protected sites in the Bay Area. Sand may be difficult to find close by, and even more difficult to deposit on the nesting site, but sand dredgings from elsewhere in the Bay may be obtainable.

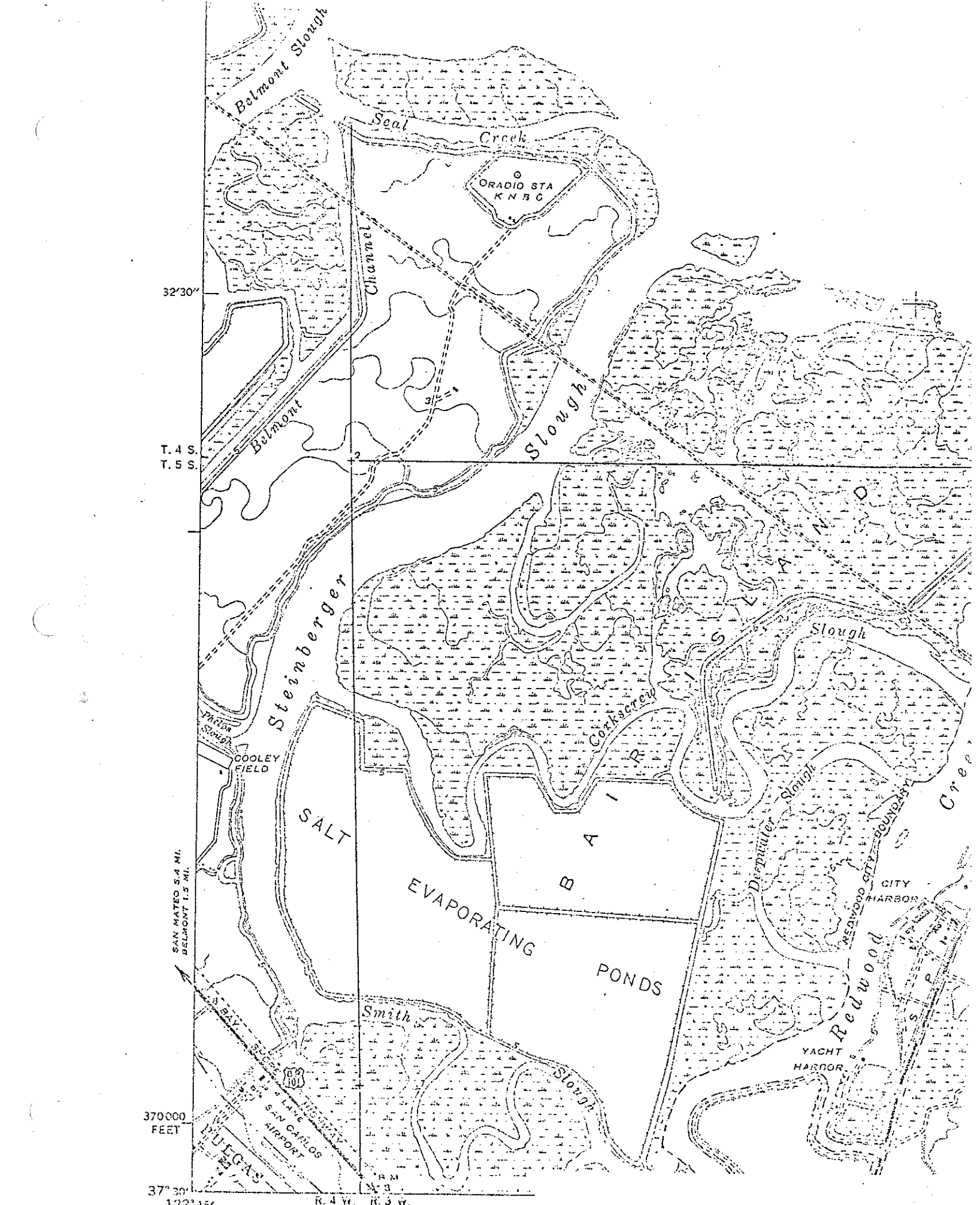
RECOMMENDATIONS

1. The Department of Fish and Game give continued strong support to the proposed South Bay National Wildlife Refuge. Congressional committees considering this proposal, officials testifying on behalf of the proposal, and California's representatives in Congress be advised that Bair Island is the site of the only known least tern nesting colony on the Pacific Coast north of Orange County.

2. In the event that the South Bay National Wildlife Refuge is not established in the near future, Department of Fish and Game acquire Bair Island as an ecological reserve. Such action would preserve the Island not only for the least tern but also for the Clapper rail, herons, and Caspian tern known to nest here.

3. In the 1971 nesting season a determination be made if the short-eared owls present in the area pose serious threat to the terns. If so, the owls should be trapped and transported to another area in the state.

4. Feasibility of depositing sand on or near the nesting area be explored.



Mapped by the Geological Survey
1946

FIGURE 1. Location of Bair Island Least Tern Nesting Site

SUNSET AQUATIC PARK SITE

LOCATION

Sunset Aquatic Regional Park, adjacent to south boundary of Seal Beach Naval Station, north of Huntington Harbor, Huntington Beach, Orange County.

SITE DESCRIPTION

Nesting occurs on about 15 acres of mud and sand fill (dredgings from Sunset Bay). The Eastern portion of this fill (10 acres) is interspersed with surface areas of preferred sand and broken shells and the less desirable uniform light brown soil. The western portion (5 acres) is an "island" surrounded on the east, south, and west sides by a small craft channel and on the north by salt marsh. It is connected to the mainland by a dike about 30' wide. This portion has extensive sandy areas, but much of it is heavily vegetated with various weeds, and in some sections, with Salicornia.

OWNERSHIP

Orange County; jurisdiction of Orange County Harbor District, 1901 Bayside Drive, Newport Beach.

HISTORICAL USE

The tern colony using this recently-filled area was first studied in 1969 by Collins (Seasonal Naturalist's Report, Huntington State Beach, 1969), who found 16 nests and banded 12 young. In 1970 the colony increased in size rather spectacularly. Massey (unpublished report) studied 73 nests throughout the nesting season and banded 110 young. Hatching success was 93% in 1970, and fledgling success, which is very difficult to determine, was thought to be at least 10-20%. Fifteen juveniles were seen flying at one time, and it is likely that considerably more young were successfully fledged.

It appears that this least tern colony is at least the second largest remaining in California, and is one of only two which presently appear capable of producing significant numbers of young.

ELEMENTS OF THREAT

Human disturbance. Actions by the Orange County Harbor District have effectively curtailed human disturbance of this colony. The area is conspicuously posted, a dirt berm was built up around the colony to discourage dune buggies and motorbikes, and the area is regularly patrolled by Harbor Police.

Development. This area is scheduled to be paved eventually for overnight camping. Additional fill is to be deposited on the site possibly before 1972. Orange County Harbor District has agreed to delay development of the site until 1972.

Predation. Harbor Police frequently observe rats near the nesting site, but Collins and Massey have seen no evidence of predation on the terns or their eggs.

POSSIBLE ACTIONS TO PROTECT SITE

Negotiations by Collins and Massey are now in progress (February 1971) with Seal Beach Naval Weapons Station to create on the Weapons Station an artificial fill area suitable for tern nesting. At this time it appears to be mainly a question of selecting the best spot and obtaining the fill. Dredging of Anaheim Bay and Huntington Harbor presently underway or planned for the near future is a likely source of fill. Ideally, this new site should be as close as possible to the present site. It should also be as close as possible to feeding areas and be surrounded by a deep channel to discourage mammalian predators. It should be located with minimum destruction of salt marsh habitat. Plans developed for this site will be reviewed by the Seal Beach Naval Weapons Station Scientific Advisory Committee.

Until this proposed new site is created, and a sizable colony established there, the present site should not be developed. If it is not possible to delay development of the entire area, then as a minimum the western portion should be left undeveloped. This portion could support a rather large colony, if most of the vegetation were removed. It is relatively easy to prevent disturbance of this area because it can be viewed from the Harbor Policy Office, and a fence could be placed across the dike that connects this portion to the mainland. Such a fence would make access to the area rather difficult without a boat.

The present tern nesting area was formerly federal property (Seal Beach Naval Weapons Station) which was transferred to Orange County with the stipulation that it be used for recreational purposes. In view of the recreational and educational value of an easily observed nesting colony of an endangered species, it seems reasonable that this stipulation could be satisfied by designating at least part of the area as a permanent nesting site (for as long as the terns continue to nest there). An observation platform could be constructed quite close to the nesting area without undue disturbance to the birds.

RECOMMENDATIONS

1. The Department of Fish and Game formally request the Orange County Board of Supervisors and the Orange County Harbor District to delay development of this area until a colony can be established on the Seal Beach Naval Weapons Station. Such a request has already been made locally by Collins and Massey, but this colony is so critical that its importance should be stressed repeatedly.

2. Orange County Harbor District be requested to bulldoze or in some other way remove weeds from the sandy-surfaced areas of the western portion of the colony. In addition, a fence be erected across the dike leading to it.

3. The Bureau of Outdoor Recreation, which was the federal agency which stipulated recreational use as condition for the transfer of the land to the County, be requested to advise the Orange County Board of Supervisors that such stipulation would be satisfied if part of the land were set aside as a permanent nesting site for least terns. This request should stress the recreational and educational values of an easily observable nesting colony of an endangered species.

FIGURE 2. Location of Sunset Aquatic Park Least Tern Nesting Site

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HUNTINGTON STATE BEACH SITE

LOCATION

Within the boundaries of Huntington State Beach, near the mouth of the Santa Ana River, approximately 3 miles south of Huntington Beach, Orange County.

SITE DESCRIPTION

Sand dunes with sparse, low vegetation. About one acre (200' x 250') is fenced on all sides as a tern sanctuary. This was accomplished about four years ago. An adjacent dune are to the north, of approximately the same size, is fenced on three sides but open on the ocean side.

OWNERSHIP

State of California (Huntington State Beach).

HISTORICAL USE

In past years many least terns nested on the beach dunes and in a narrow sandy strip between the State Beach boundary and Pacific Coast Highway (State Highway 1). In 1969 and 1970 no terns nested in the latter area, but a few nested within or, more commonly, just north of the fenced-in sanctuary. In 1969, Collins estimates 15-16 pairs were present, and found 25 nests (some representing second or third attempts). He found and banded 11 young terns. In 1970, 24 adults were counted, 12 nests were found, and 11 young banded (Bittings and Massey).

ELEMENTS OF THREAT

Human disturbance. The fenced area is essentially free from disturbance. The partially fenced area is supposedly closed to the public but people do wander in from the beach side occasionally. There is also some disturbance in the partially fenced portion by construction vehicles which must have access through this area.

Development. No development is likely in this area in the near future.

Predation. Collins noted in 1969 that many sets of eggs had disappeared. Crows, gulls, rats and ground squirrels are regularly present in the area and all are possible suspects. Man is also a likely suspect for predation upon nests outside of the fenced area.

POSSIBLE ACTIONS TO PROTECT SITE

Fencing of the area to the north of the present fenced sanctuary should be completed. About 250 feet of additional cyclone fence is needed. It is understood that construction equipment will have to have access through this area for several years. If gates are provided in the new fence somewhere along the west side, and vehicular traffic is confined to a narrow path through the area, disturbance to the terns should be tolerable. Huntington State Beach has requested approval for the additional fencing and, hopefully, it will be completed from the beginning of the 1971 nesting season.

RECOMMENDATIONS

1. Department of Fish and Game support efforts by Huntington State Beach personnel to complete fencing of the area just north of the present tern sanctuary. This fencing should be completed not later than the end of April.

2. Efforts be directed periodically to reduce vegetative encroachment into the nesting areas. This could be accomplished by mechanical means before the arrival of terns in early April.

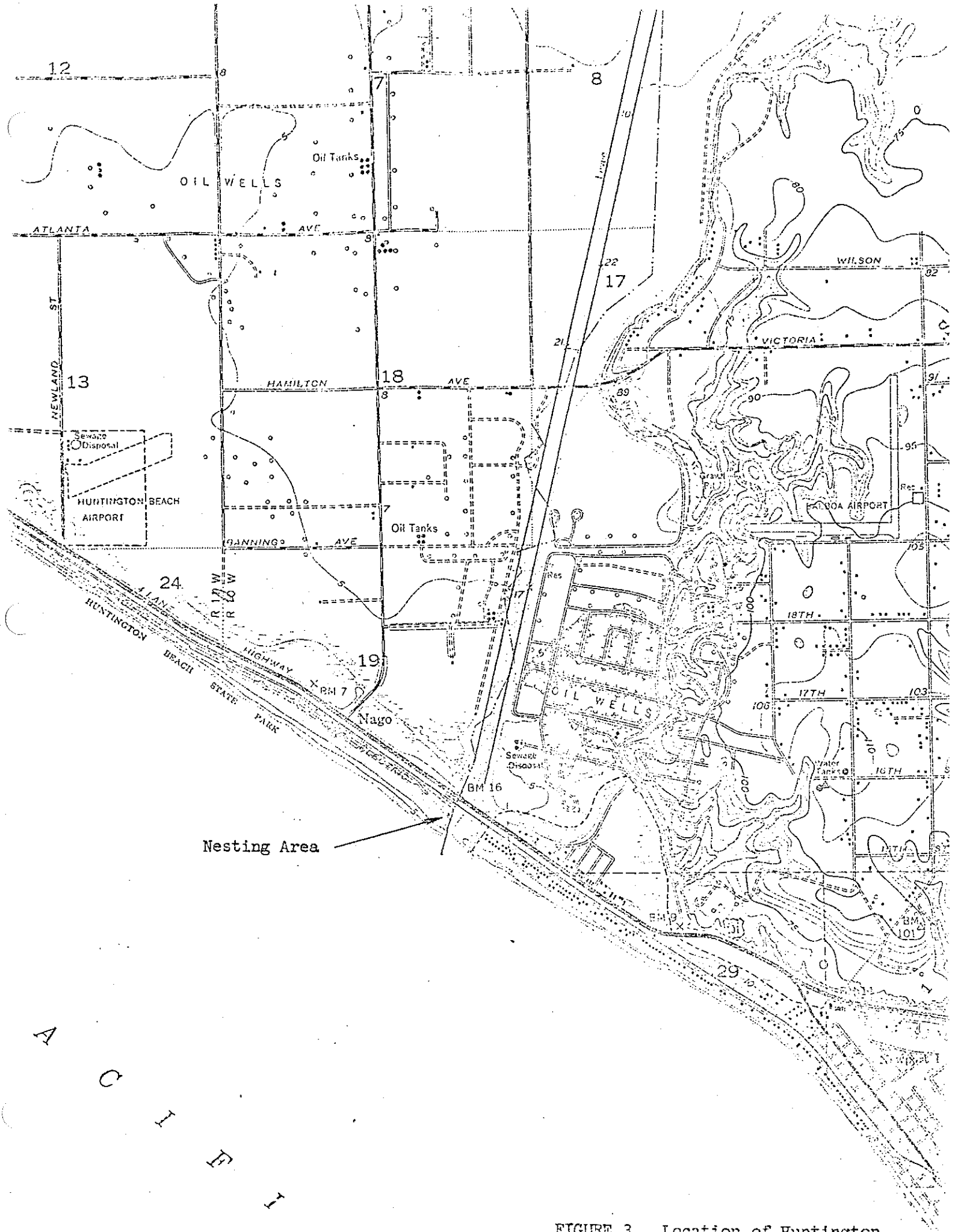

FIGURE 3. Location of Huntington State Beach Least Tern

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SANTA MARGARITA RIVER SITE

LOCATION

On sand dunes just north of the Santa Margarita River mouth, Camp Pendleton Marine Corps Base, San Diego County.

SITE DESCRIPTION

About 5 acres of sand dunes. In 1970 most of the terns were nesting in a rather flat area between the primary and secondary rows of dunes which parallel the beach. To the east and south of these dunes is an extensive shallow lagoon feeding area. In 1969 a large, open, sandy space south of the lagoon was also used.

OWNERSHIP

Federal; jurisdiction: Commanding General, Marine Corps Base, Camp Pendleton.

HISTORICAL USE

Other than the remnant colony at Huntington State Beach, this is the only California colony remaining on a natural site. It declined drastically in size during the past year. In 1969, Longhurst found 15 to 100 birds in the air over the sand dunes site, and an additional 30 to 50 birds on the site south of the lagoon. In 1970, Smith made monthly censuses and found a maximum of 38 adults and 10 young at the dunes site, and none on the sand flats south of the lagoon.

ELEMENTS OF THREATS

Human disturbance. The beach below the dunes nesting site is used regularly as an exercising area for tanks, tracked armored personnel carriers, etc. These vehicles have frequently and unnecessarily been driven through the nesting area. Longhurst brought this problem to the attention of the Base Commanding General in 1969. Signs were erected around the colony and these apparently lessened but did not entirely stop the traffic through the colony in 1970. Bathers use the beach below the colony - particularly just to the north - and probably occasionally stray into the nesting area.

Development. No known plans; not likely in the near future.

Predation. Smith found some evidence of predation of terns and their eggs in 1970. The marsh and willow growth east of the dune site probably harbors a wide variety of mammalian predators.

POSSIBLE ACTIONS TO PROTECT SITE

The Base Natural Resources Department is taking several positive steps to protect the terns. By the end of February 1971, telephone poles are to be sunk vertically into the ground west and south of the dunes nesting site to discourage vehicular traffic. Also planned are twelve 3' x 5' signs to be placed around the colony. These signs will state the nature of the area, the endangered status of the species, and prohibit trespass. In 1970, a program was initiated whereby men operating personnel carriers were informed of the location and importance of the tern nesting area. This indoctrination is to be continued in 1971.

The above steps should very significantly reduce disturbance in the dunes area, and should stop vehicular traffic, the primary danger to the colony. However, if human use of the adjacent beach increases and the signs become inadequate, it may be advisable to fence in the area.

The sandy area south of the lagoon, which was the site of a sizable colony in 1969 and prior years, is heavily traversed by vehicle tracks. If terns attempt to nest in this area again the site should, if feasible, be protected from vehicular traffic. Also, it may be feasible to dig a channel around at least part of this site. This would offer best protection against both human disturbance and mammalian predation.

RECOMMENDATIONS

1. The dune colony be observed regularly during the 1971 nesting season, particularly on weekends, to determine whether human use of the nearby beach poses serious threat to the colony. Such surveillance, with the permission of the Commanding General, could be a joint effort of Fish and Game personnel, concerned local birders, and the Base Security and Natural Resources Departments. Observations can easily be made from the bluff northeast of the dune area. If human disturbance is a serious problem, a request should be submitted to the Commanding General to have the area fenced.

2. If the terns attempt to nest again on the sandy area south of the lagoon, a request should be submitted to have this area protected - preferably by digging a channel around the nesting site.

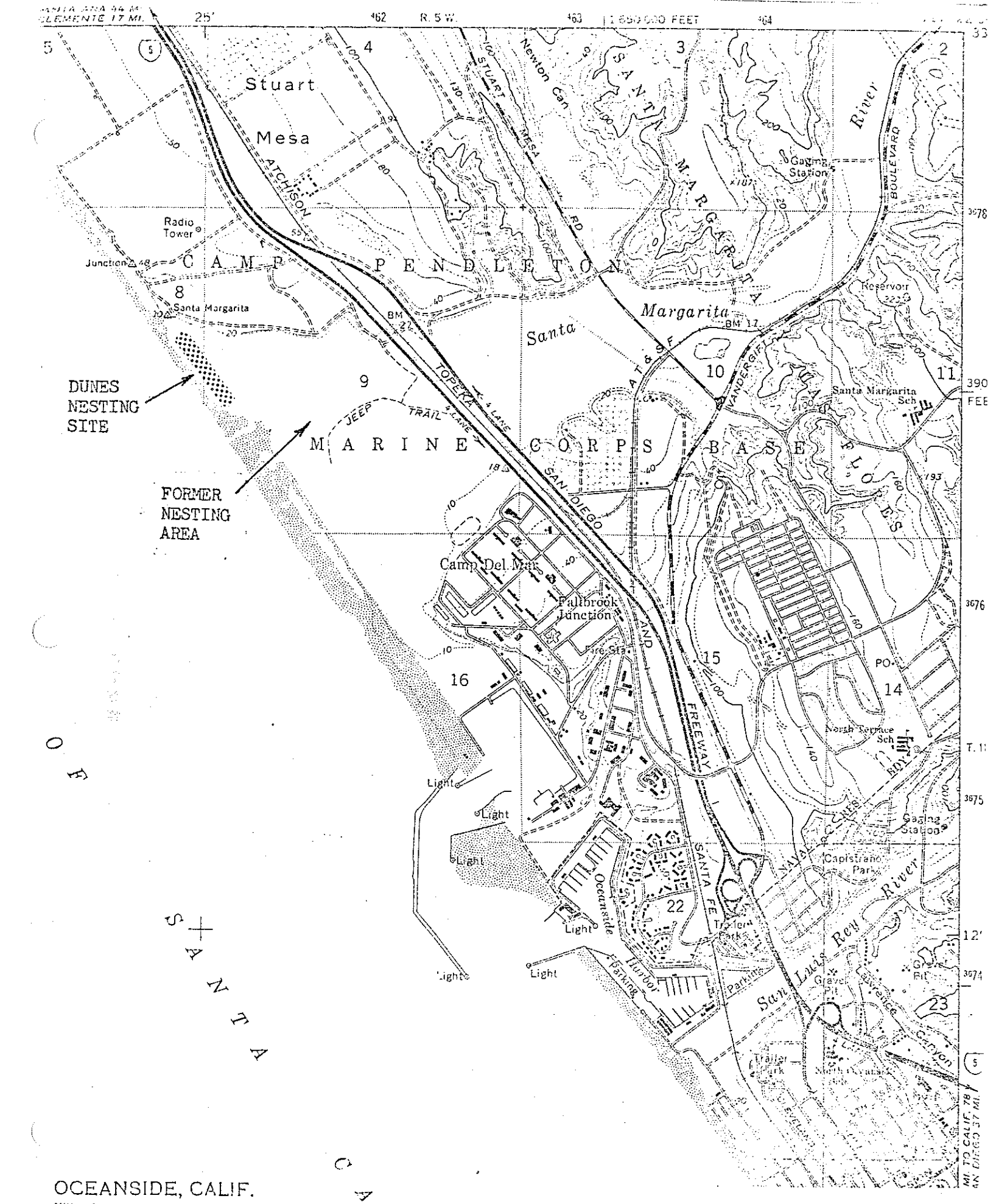


FIGURE 4. Location of Santa Margarita River Least Tern Nesting Sit and Former Nesting Area

BUENA VISTA LAGOON SITE

LOCATION

East of Buena Vista Lagoon, Carlsbad, San Diego County. On fill area located south of State Highway 76, between Jefferson Drive and a large shopping center.

SITE DESCRIPTION

Over twenty acres of flat sand fill now completely overgrown with weeds.

OWNERSHIP

Bernard Citron et al., 9713 Santa Monica Boulevard, Beverly Hills, California 90210.

HISTORICAL USE

Sand fill was deposited on this area in the winter of 1967-68. In 1969, Longhurst estimated that 10 pairs nested. In 1970, weeds were very dense on this site and no nesting activity was seen here or elsewhere around the lagoon, although a few terns (maximum of 10) were present at the lagoon May through July (Taylor and Fries).

ELEMENTS OF THREAT

Human disturbance. In 1969, Longhurst noted that the colony was subject to harassment by boys on motorcycles who raced back and forth through it, excited by the calls and dives of adult birds. The area is obviously still a favorite motorcycling area.

Development. A sizable shopping center has already been constructed at the east end of the site and development of the rest of the filled area is likely before long.

Predation. No information available.

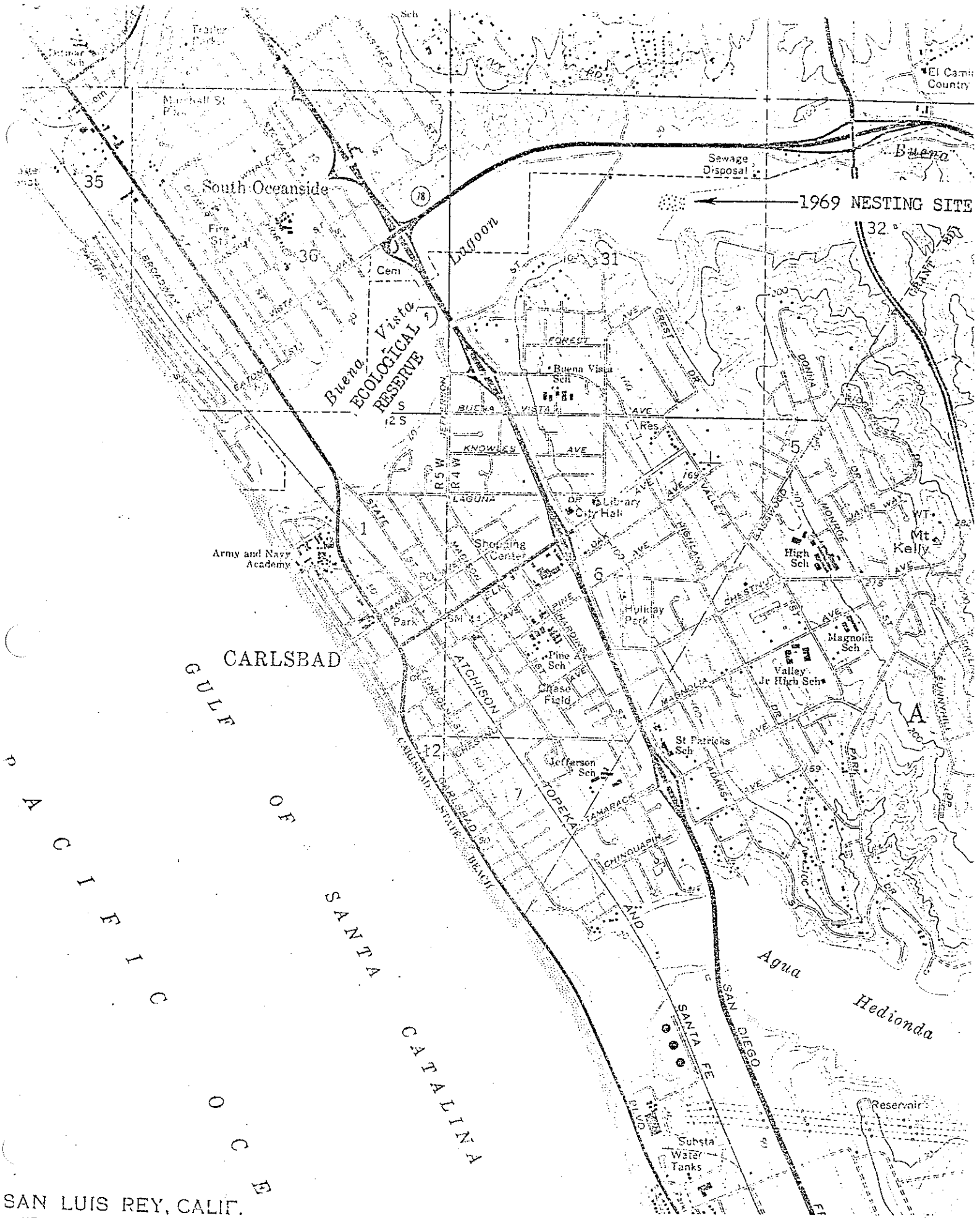
POSSIBLE ACTIONS TO PROTECT SITE

It might be possible to obtain permission from the landowners to remove the weeds from part of this site, thus making it suitable (from that standpoint) for use by the terns until the rest of the filled area is developed. Because of the size of the site, however, it would be very expensive to fence out motorcyclists. It would seem much better to create a nesting island in the

state-owned ecological reserve portion of Buena Vista Lagoon. The chances are probably very good that such an island would be colonized by terns that formerly nested near the lagoon or by other stragglers in the area (e.g., those observed around the Oceanside Marina).

RECOMMENDATION

The Department of Fish and Game create a sand-covered island in the state-owned portion of Buena Vista Lagoon. This island should be located close to a shallow water feeding area, preferably where the terns could be observed by the public with binoculars, and yet be subjected to as little disturbance as possible.



SAN LUIS REY, CALIF.
NE/4 OCEANSIDE 15' QUADRANGLE
N3307.5—W11715/7.5

1968

FIGURE 5. Location of Buena Vista Lagoon 1969 Nesting Site

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

BATIQUITOS LAGOON SITE

LOCATION

East end of Batiquitos Lagoon near La Costa, San Diego County.

SITE DESCRIPTION

Generally by mid-summer that portion of Batiquitos Lagoon which lies east of Interstate 5 (about 500 acres) is almost entirely dry. Least terns have nested on a very small area at the extreme east end of this salty sand flat, near the mouth of San Marcos Creek. Nests have been confined to small patches of wind-drifted white sand which were elevated several inches above the bed of the lagoon (Longhurst).

OWNERSHIP

Rancho La Costa; c/o Frank H. Ayres and Son, 6000 West Coast Highway, Newport Beach, California 92660.

HISTORICAL USE

In July 1969, Longhurst found a maximum of 15 adults, and in a random walk through the colony, 3 nests. It is not known whether they nested here in 1970, but 15 to 25 were seen together once during the summer (Helmers) with lesser numbers at other times.

ELEMENTS OF THREAT

Human disturbance. Situation not well known but perhaps not as serious a problem here as in some other sites since this is a rather unappealing area.

Development. A 1963 master plan for a residential-boating type of development of the entire east section of the lagoon exists, but approval of the development is far from certain.

Predation. Longhurst found many feathers and whole wings in the nesting area, and was of the opinion that gray foxes or house cats were responsible for the predation.

POSSIBLE ACTIONS TO PROTECT SITE

The overall aspect of this lagoon even when filled with water is often that of a biological desert. Its water is quite saline, particularly west of Interstate 5, and is heavily poisoned with pesticides. According to information

received by the Helmers from the County Department of Public Health, copper sulphate was applied in March 1970 for algae control to the western portion of the lagoon and Pramitol was applied to 40 acres in the eastern portion. In December 1970 the entire lagoon was treated with Pramitol at the rate of 8 to 10 pounds per acre. Compared with other southern California lagoons, Batiquitos supports few shorebirds and waterfowl. Hence, it is questionable whether efforts to save the remnant tern colony would be worthwhile without concurrent restoration of the lagoon to its natural tidal condition.

Batiquitos is a very shallow lagoon and therefore potentially ideal for least terns. Evidently there are still enough small fish present to support at least a small population of terns, and if an island nesting site were provided there might be some hope for the survival of this colony. If the lagoon were to be reopened to the sea, necessity for mosquito control would be eliminated and one could expect the terns to prosper if provided with a well protected site.

One possible location for a nesting island would be just offshore from the roadside rest on the east side of Interstate 5. At this location a colony would have greater educational and recreational value, and in the event of a boating or residential marina development, it might be easier to protect and preserve. The island should have deep channels around it to insure its isolation during summer low water periods. According to The Coastal Lagoons of San Diego County (Report of the Environmental Task Force, County of San Diego, Summer, 1970), there is ample sand under the lagoon, once the first foot of sludge is penetrated, to provide the surface for a nesting island.

RECOMMENDATIONS

1. Department of Fish and Game recommend to San Diego County Board of Supervisors that Batiquitos Lagoon be reopened to tidal action and that mosquito control operations be terminated.

2. The feasibility of creating a nesting island in the lagoon be investigated. Purchase of a small parcel of private land may be necessary.

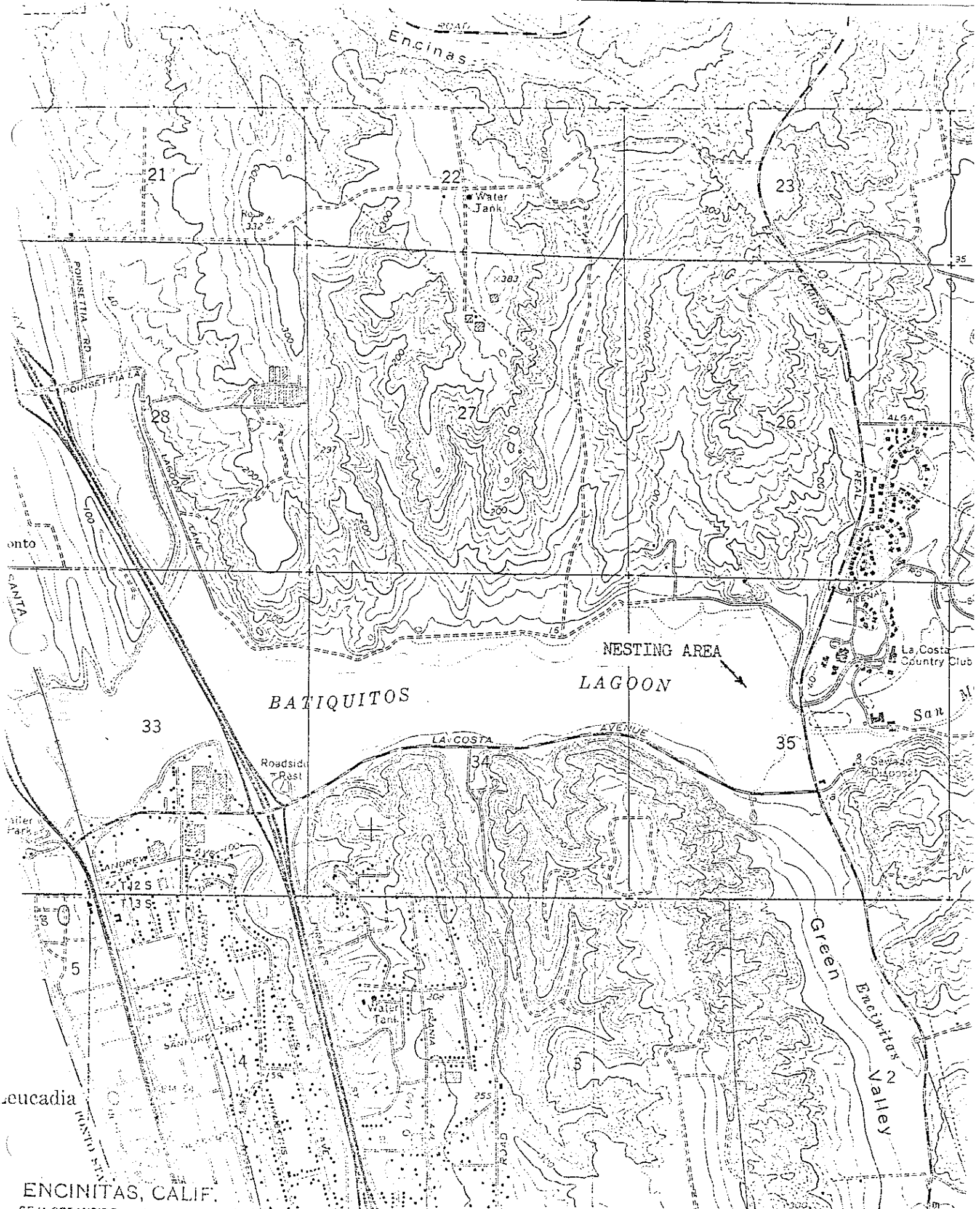


FIGURE 6. Location of Batiquitos Lago Least Tern Nesting Site

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

SAN ELIJO LAGOON SITE

LOCATION

Two nest sites exist in the northwest corner of San elijo Lagoon, San Diego County. One site is located on two dikes running WSW from the abandoned Cardiff Sewage Treatment Plant toward the Santa Fe Railroad tracks and the other is on salt flats on the north side of the lagoon about one-fourth of a mile east of Interstate 5.

SITE DESCRIPTION

In the northwest corner of the lagoon are two mud and sand dikes which are now completely surrounded with shallow water. Both dikes are about 500 feet long, one is about 40 feet wide, the other about 25 feet wide. Together they occupy about one acre, including the channel between them. Vegetation on both dikes is becoming increasingly dense.

The area of the salt flats east of Interstate 5 varies with the water level, but there is usually much more area available than was used by the colony in 1970 (four nests on an area about 20' x 15'). These mudflats are sparsely vegetated and are marginal at best as tern nesting habitat.

OWNERSHIP

Dikes: United California Bank, 600 South Spring Street, Los Angeles, and Dome Limited, c/o Berman Schwartz, North Bedford Avenue, Beverly Hills.

Mudflats: Dome Limited.

HISTORICAL USE

The dikes have been used by nesting least terns since at least 1966. The population has never been large in recent years and in 1970 it was estimated at 15-20 pairs (McCaskie and Fries). In June 1969, Longhurst saw 10 birds on the salt flats area and suspected that some of them were brooding, but found none on subsequent visits that year. McCaskie found four nests in the latter area in 1970.

ELEMENTS OF THREAT

Human disturbance. For the past two years dikes have been severed from the mainland by a channel, thereby reducing the likelihood of disturbance, but it is still not difficult to wade out to the dikes. The salt flat area is close to Manchester Road and very vulnerable to disturbance.

Development. The landowners have been seeking permission to develop a residential marina in the lagoon. This proposed development has met with considerable opposition from many sides. There is still hope that the land can be purchased by San Diego County for multiple recreational/wildlife uses. The landowners have permission to begin with the development on March 1, 1971, but there are many conditions still to be met. An opeb space land acquisition bond issue on the November 1970 ballot would have provided funds for the County to buy the land. This issue fell just short of the required two-thirds majority vote. County officials are now awaiting a decision by the U. S. Supreme Court as to whether a two-thirds vote is required.

Predation. No evidence has been noted. The dikes are probably relatively free of mammalian predators, with the possible exception of rats.

POSSIBLE ACTIONS TO PROTECT SITE

Prior to the 1971 nesting season, most of the vegetation from the tops of dikes should be removed. Landowner permission would be required. Hopefully, with more nesting space available, those few terns nesting on marginal habitat east of Interstate 5 would move to the dikes.

If the residential marina development goes through, there is no hope for the terns short of state purchase of a portion of the lagoon. If the County purchases the land for multiple wildlife recreational uses, there should be no reason why suitable nesting islands, either in their present location or elsewhere, could not be provided.

RECOMMENDATIONS

1. Department of Fish and Game request permission of the two landowners to remove vegetation from the top surface of the nesting dikes. Side vegetation should be left intact to prevent erosion of the dikes. This is to be done before the end of April.

2. Liaison be maintained with the Chief Administrative Office of San Diego County, to keep informed of the status of this lagoon. Appropriate action be taken as necessary to preserve this colony, depending upon the decision reached by the Supreme Court.

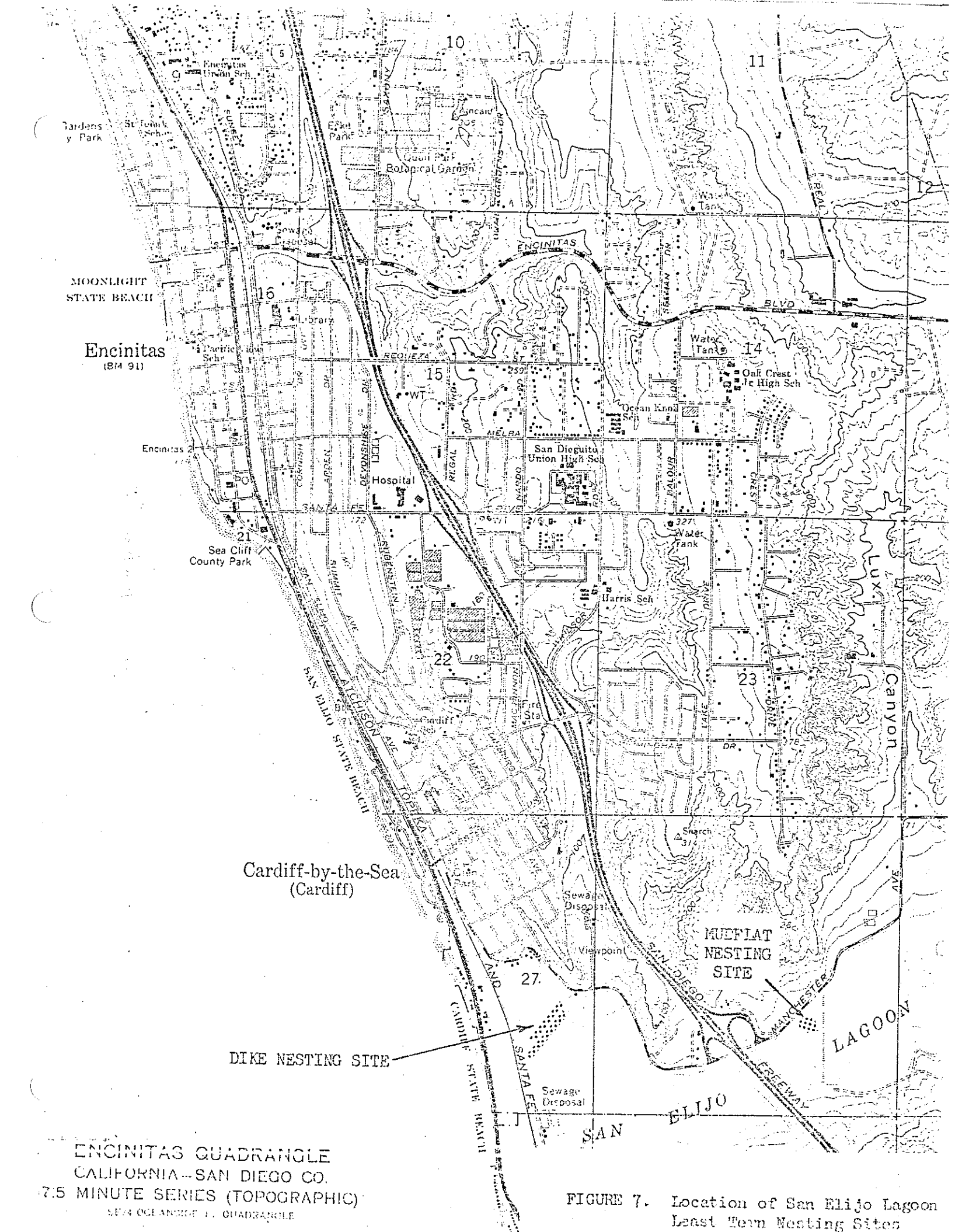


FIGURE 7. Location of San Elijo Lagoon Least Tern Nesting Sites

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

DEL MAR SITE

LOCATION

On a spit at the confluence of the San Dieguito River slough and a side slough, about 600 feet north of the intersection of San Dieguito Drive and Palm Lane, Del Mar, San Diego County.

SITE DESCRIPTION

A tiny (10' x 30') sand spit completely covered when the water level is high. Water is Heavily polluted from Del Mar sewage system.

OWNERSHIP

Baptist Church Loan Corporation, c/o A. B. White, 106 Baptist Building, Dallas, Texas 75201.

HISTORICAL USE

In 1969, Longhurst found 20 birds at nearby sewage ponds; 15 adults on the spot on July 4, and 10 adults with 3 almost fully-fledged young on July 12. No information is available on 1970 nesting activity, but monthly censuses of the area revealed 11 terns in May, 12 in July, and 31 in August.

ELEMENTS OF THREAT

Human disturbance. Not known, but in view of location perhaps not serious.

Development. A large residential marina and a smaller industrial park have both been proposed for Del Mar (San Dieguito) Slough. Both plans have been vigorously opposed. In any event, the whole area may be drained when the Del Mar sewage system is connected to the San Diego outfall. Such connection is imminent.

Predation. No available information.

POSSIBLE ACTIONS TO PROTECT SITE

If Del Mar Slough is drained, there is no hope for this small colony. Even if it is not drained, either of the proposed developments would probably destroy such a high percentage of the suitable feeding habitat that survival of a nesting colony would be unlikely. If the slough is left essentially as is, for which there is some slight hope, then creation of a nesting island, either at the present site or perhaps in the slough near the Southern California Exposition grounds (Del Mar Race Track) would undoubtedly benefit the colony.

RECOMMENDATIONS

1. No major action be taken at this site until the fate of the slough is decided.

2. The colony be observed during the 1971 nesting season to determine whether human disturbance or fluctuating water levels are a threat. If so, appropriate action be taken immediately to provide protection to nesting terns.

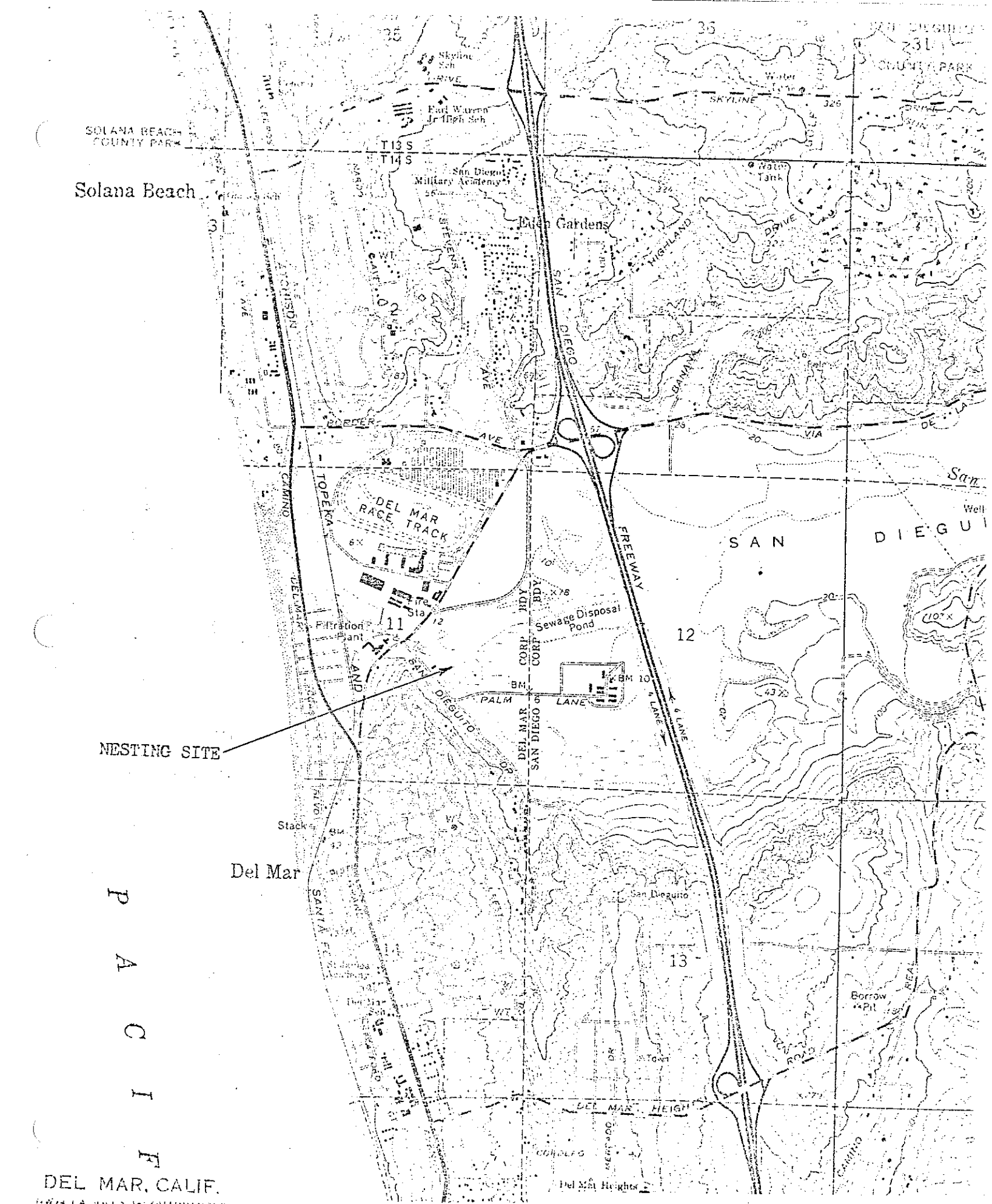


FIGURE 8. Location of Del Mar Least Tern Nesting Site

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

LOS PENASQUITOS SITE

LOCATION

In eastern portion of Los Penasquitos Creek marshes (also referred to as Soledad Valley and Sorrento Valley), about 0.1 mile south of Carmel Valley Road, 0.2 mile west of Interstate 5, and 0.3 mile east of Torrey Pines State Reserve boundary.

SITE DESCRIPTION

On dry open areas in Spartina salt flats (1-2 acres) and on 10-15 foot wide dirt and gravel shoulder of dirt road just west of these open areas.

OWNERSHIP

San Diego Gas and Electric Company, 101 Ash Street, San Diego, California 92101.

HISTORICAL USE

In 1969, Longhurst found about 10 pairs nesting at this site, with no evidence of success. No information available for 1970.

ELEMENTS OF THREAT

Human disturbance. In 1969 the area was subject to heavy jeep, motorcycle and dune buggy use, much to the detriment of the terns. Judging by tracks, this activity still persists.

Development. San Diego Gas and Electric wants to put a nuclear power plant and a commercial/industrial development on this site.

Predation. No definite evidence, but Longhurst noted that common ravens, marsh hawks, and white-tailed kites all nested successfully within a mile of the site and frequently flew over the area.

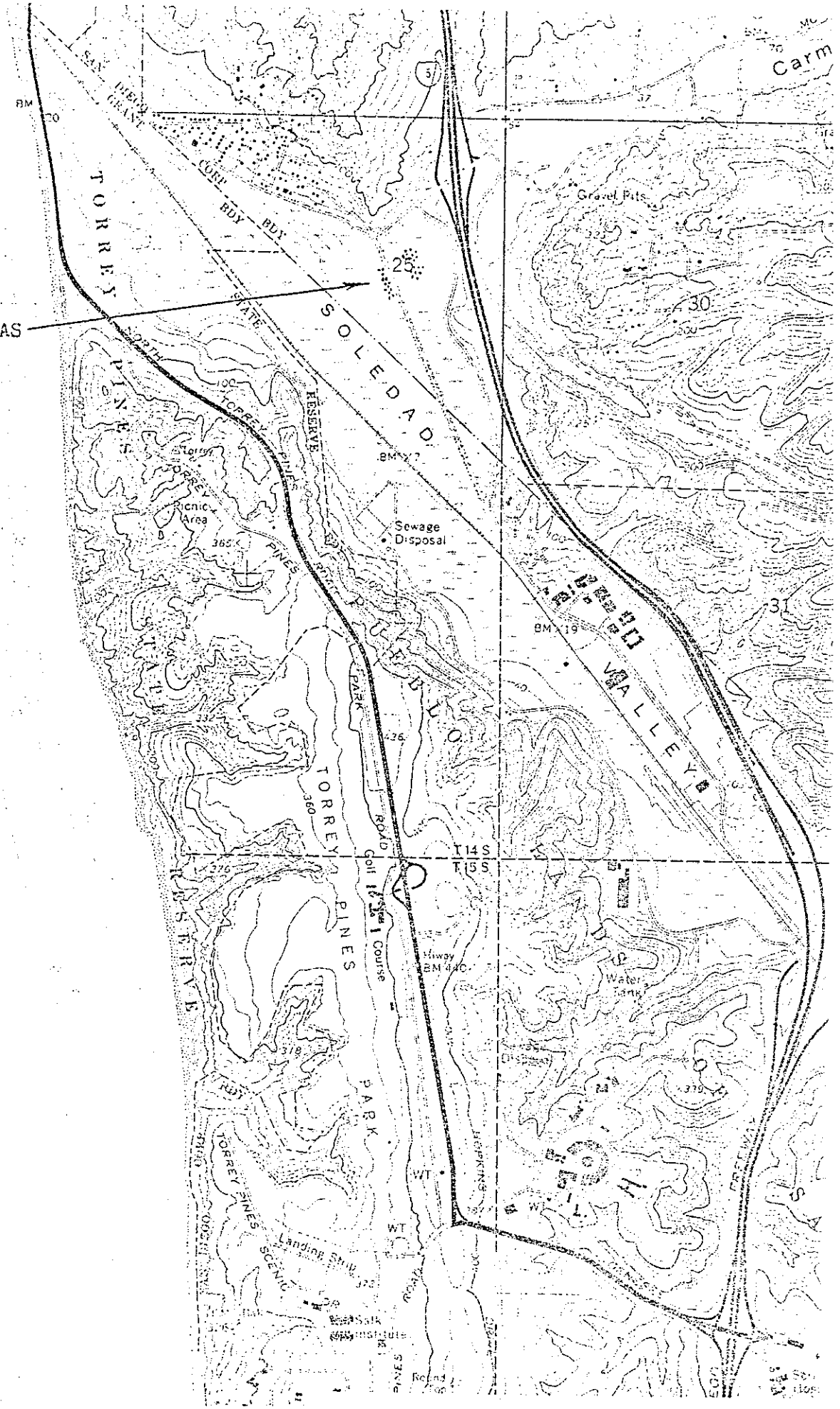
POSSIBLE ACTIONS TO PROTECT SITE

Jeep and dune buggy traffic, and perhaps some of the motorcycle traffic, could be stopped by putting a locked gate or chain across the entrance to the dirt road at Carmel Valley Road. This would be a worthwhile temporary measure if terns continue to nest at this site. For the long term, since development of some sort is probably inevitable, the only hope for a colony in this area is to create a sand fill nesting site somewhere within the Torrey Pines State Reserve portion of the marsh. A site can probably be selected such that little if any of the prime salt marsh would be disturbed.

RECOMMENDATIONS

1. If terns attempt to nest on this site in 1971, a request be made to the San Diego Gas and Electric Company by the Department of Fish and Game to have the dirt road closed to public traffic.

2. The feasibility of creating a nesting site somewhere in the Torrey Pines State Reserve portion of the marsh be investigated.



DEL MAR QUADRANGLE
CALIFORNIA - SAN DIEGO CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

FIGURE 9. Location of Los Penasquitos Least Tern Nesting Site

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

MISSION BAY SITE #1

LOCATION

Southeast corner Mission Bay Park, San Diego. Bounded on the north by Fiesta Island Road, on the east by Interstate 5, on the south by Friars Road and San Diego River Flood Control Channel, and on the west by Sea World Drive.

SITE DESCRIPTION

Nest sites are located on approximately 20 acres of mud and sand fill dreged from Mission Bay. About 8 acres have a fairly flat surface of sand and broken shells, and the density of low vegetation that apprently characterize preferred nesting habitat. Most of the remaining acreage was disturbed by earth-moving equipment during the 1970 nesting season. This portion has no vegetation now and about one-third of it has a mud surface. The remaining sand-covered portion is still in suitable, though perhaps less than ideal, condition to serve as a nesting area.

OWNERSHIP

City of San Diego, area is within the boundary of Mission Bay Park.
Jurisdiction: San Diego Recreational Department, 202 C Street, San Diego, California 92101.

HISTORICAL USE

This area was originally salt marsh bordering Mission Bay and was subsequently the site of a dump and an airport. The present fill was depositdd about five years ago. It is not known when least terns first nested on this fill, but in 1969, Longhurst recorded a colony of about 50 birds, and noted successful fledging of young. In June 1970, Devillers discovered that the colony had increased to about 200 adults, but was being threatened by fill removal operations in conjunction with the realignment of Sea World Drive. At the request of Richard F. Coleman, U. S. Game Management Agent, city officials postponed further fill removal until after the nesting season. To avoid unnecessary disturbance in the colony, no attempt was made to make an actual count of nests or to determine precisely nesting success. However, the number of flying young present in and near the colony towards the end of the nesting season indicates that there was reasonably good success. A flock of approximately 90 young at the mouth of the San Diego River Flood Control Channel on August 17, 1970, most likely came from this colony.

ELEMENTS OF THREAT

Human disturbance. Because of its remoteness from residential areas, and because it is surrounded on all sides by heavily travelled roadways without parking areas, this site is subjected to relatively little human disturbance. However, there is occasional use of the area by motorcyclists. The publicity this nesting site has received will undoubtedly result in greater human activity unless the area is completely fenced. It is already fenced along the Interstate 5 side.

Development. Tentative long-range plans of the City of San Diego include commercial development of this site for motels or similar uses.

Predation. There was no evidence of predation on this site in 1970, and judging by the breeding success, it was not a significant problem. Rodent tracks have been observed on the Interstate 5 side of the colony, but due to the isolation factors discussed above, control should be relatively simple if it is determined that rats are present.

POSSIBLE ACTIONS TO PROTECT SITE

In the summer of 1970, a number of individuals and conservation organizations in San Diego proposed that this section of Mission Bay Park be fenced off and set aside as a nesting area for least terns. In July, the Mission Bay Committee, a citizens' subcommittee of the San Diego Park and Recreation Board, unanimously endorsed the proposal. In September, the Park and Recreation Board failed to endorse this proposal but did recommend that no commercial development be permitted on the site for two years. In the meantime, two alternate sites in or near Mission Bay Park be made suitable for the terns. The alternate sites, one between the San Diego River Flood Control Channel and State Highway 109 and one at the north end of Mission Bay adjacent to the University of California salt marsh, are discussed separately in this report.

RECOMMENDATIONS

1. Department of Fish and Game support efforts of local organization to have this area set aside as a least tern nesting area until and unless other nesting colonies of adequate size (i.e., supporting approximately equal numbers of terns) can be established elsewhere in the immediate vicinity of Mission Bay.

2. Department of Fish and Game recommend to the City of San Diego that the remaining three sides of this site be fenced. If City or other local funds cannot be obtained to finance the fencing, consideration be given to providing state or federal assistance.

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

MISSION BAY SITE #2

LOCATION

Southeast tip of Fiesta Island, Mission Bay Park, San Diego (opposite Sea World Aquatic Park).

SITE DESCRIPTION

About 9 acres, roughly triangular, of entirely unvegetated flat sand and shell fill, bounded on two sides by rock breakwater and on the third side by sewage settling ponds, plus a strip of high sandy beach running about 1,000 feet northwest from this area. The specific part of this total area used by nesting terns is not known, as the area is closed to the public.

OWNERSHIP

City of San Diego; jurisdiction: San Diego Utilities Department and Recreation Department, City Administration Building, 202 C Street, San Diego, California 92101.

HISTORICAL USE

In both 1969 and 1970, about 10 pairs were observed from a distant viewpoint in the area and were believed to be nesting (Longhurst and Devillers). A few more pairs may have nested, or attempted to nest, elsewhere on Fiesta Island, based on reports of non-birding citizens.

ELEMENTS OF THREAT

Human disturbance. This tip of the island is fenced so only access is by boat, of which there are hundreds on Mission Bay. Boaters probably rarely land along the rock-breakwater portions. Along the sandy beach portion running northwest from the main fill area there is nothing to prevent them from landing, and people using this access undoubtedly wander over the entire area, even though it is officially closed to the public.

Development. As money becomes available, the undeveloped portions of Mission Bay Park, including Fiesta Island, are to be developed for recreational purposes.

Predators. A small flock of nonbreeding gulls roosts in the vicinity of this site, and may be a problem for a small colony of terns.

POSSIBLE ACTIONS TO PROTECT SITE

The site seems to have considerable potential for a large tern colony and might be important in the future. There has been pressure to have this part of Fiesta Island opened to the public, but City officials want to keep it closed because of the sewage settling ponds. The presence of a tern colony might help justify keeping it closed. Additional fencing, or at least posting, would be advisable along the sandy beach portion. Fencing could be placed far enough back from the waterline to allow public use of the lower beach while still protecting the suspected tern nesting area.

RECOMMENDATIONS

1. Observations be made in the 1971 nesting season to determine the size and location of the suspected nesting colony in this area, and the extent of predation, if any, by the roosting flock of gulls.

2. If nesting is confirmed, the Department of Fish and Game recommend to the City of San Diego that this area be kept closed to the public and that the existing fence be extended parallel to the waterline just above the high tide line, along the northwest shore of this point down to the beginning of the rock breakwater.

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

MISSION BAY SITE #3

LOCATION

Southwest corner, Mission Bay Park, San Diego. East of the Carribean Motel, on the north bank of the Mission Bay entrance channel.

SITE DESCRIPTION

An unvegetated sand spit approximately 600' x 250' (3 acres), with a peripheral access road.

OWNERSHIP

City of San Diego; jurisdiction: Recreation Department, Cit Administration Building, 202 C Street, San Diego, California 92101.

HISTORICAL USE

Longhurst has cited information provided by Perrin that in 1968 this site held over 25 pairs, and that young were reared. On June 22, 1969, Longhurst found "a single perturbed bird on ground" and noted dune buggy and motorcycle tracks over the entire area. In 1970, Devillers investigated the site on several occasions, observed a maximum of 3 adults, and found one young.

ELEMENTS OF THREAT

Human disturbance. This area is in close proximity to a densely populated residential area and is therefore subjected to very heavy human use; picnicking, sunbathing, motorcycling, etc.

Development. No known plans for development.

Predation. Not known, but dogs are regularly exercised in this area, and rats undoubtedly live in the rock breakwater surrounding the spit, and in the nearby residential area.

POSSIBLE ACTIONS TO PROTECT SITE

It is probably neither practical nor advisable to attempt to protect the remnant population. It seems likely that the bulk of the former colony has relocated to Mission Bay Site #1.

RECOMMENDATION

This site be annually observed early in the nesting season and protection be provided if significant numbers of terns are attempting to nest. Fencing of the nesting area would be required.

MISSION BAY ALTERNATE SITE: SAN DIEGO RIVER FLOOD CONTROL CHANNEL

LOCATION

On south side of San Diego River Flood Control Channel, about one mile west of Interstate 5, just east of Midway Drive Bridge and just outside of Mission Bay Park south boundary. Bounded on south by Midway Drive off ramp of State Highway 109, and on north by levee of flood control channel.

SITE DESCRIPTION

A long (about 1,000 feet), narrow (90-130 feet) depression between levee and freeway off ramp (about 2 acres). Surface is presently dirt with some gravel and low weeds.

OWNERSHIP

State of California; jurisdiction: California Division of Highways, 4075 Taylor Street, San Diego, California.

HISTORICAL USE

None.

ELEMENTS OF THREAT

Human disturbance. There should be relatively little disturbance at this site. There is a fence along the north side and east end, and only emergency parking is allowed on the freeway (south) side.

Development. None is likely.

Predation. Rats probably live in the rock levee of the flood control channel, but control should be relatively easy. Other mammalian predators are unlikely in the area.

POSSIBLE ACTIONS TO PROTECT SITE

Despite its narrowness, this alternate site has a number of advantages. It is very close to the terns' primary feeding ground in the flood control channel and is isolated from most predators. Also, it should be relatively easy to prevent human disturbance, and it could be easily observed by the public from the flood control channel levee.

The San Diego City Recreation Department has requested permission from the San Deigo District Office, California Division of Highways, to deposit sand on the site, but as of this writing, permission has not been received. Highway officials have not definitely refused permission, but have expressed reluctance because of the possibility of sand blowing on the freeway. The east end of the site, where the prevailing winds would deposit any blown sand, is at least 10 feet below the level of the highway, so this should not be a problem. There is a drain at the bottom of the depression and it would have to be built up to the level of the deposited sand, perhaps one foot above its present level.

The west end of this site should be fenced to prevent pedestrians from entering via Midway Drive.

RECOMMENDATION

The Department of Fish and Game recommend to the Division of Highways that the City of San Diego be given permission to deposit sand on the site and the area be fenced.

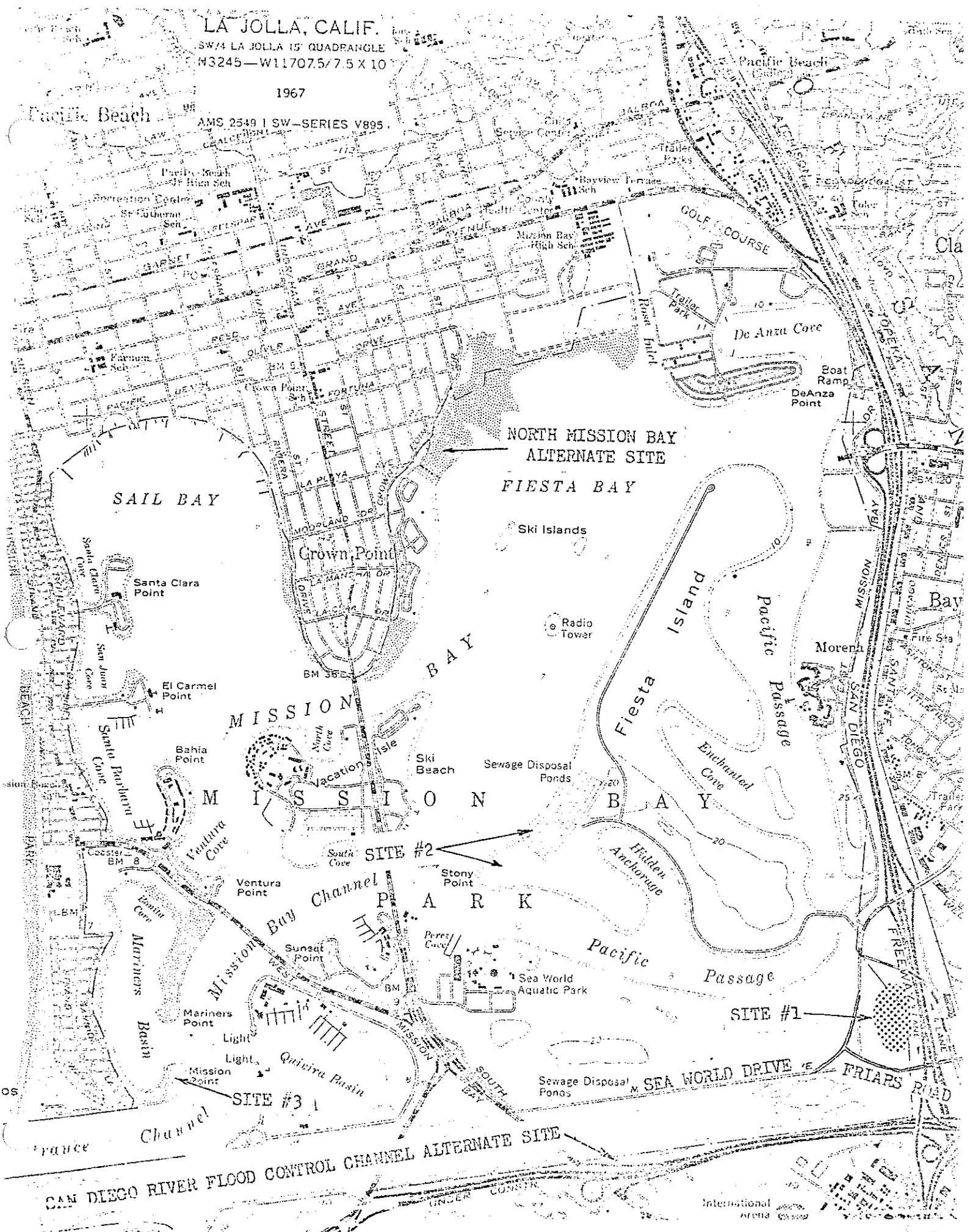


FIGURE 10. Location of Mission Bay Least Tern Nesting Sites

SAN DIEGO AIRPORT SITE

LOCATION

On the north side of the main runway, San Diego International Airport (Lindbergh Field); south and east of airport fire station and control tower. About one-half mile inland from San Diego Bay.

SITE DESCRIPTION

Approximately 2 acres of mixed gravel, sand, and broken shells in two marrow strips (the widest about 100 feet wide) adjacent to runway, plus several very small areas nearby with similar surface where asphalt pavement has deteriorated. Very widely scattered weeds were present during the 1970 nesting season, but area in February 1971 was entirely devoid of vegetation.

OWNERSHIP

San Diego Unified Port District, P.O. Box 488 (3165 Pacific Highway), San Diego, California 92112.

HISTORICAL USE

In 1969, Longhurst observed terns flying (some carrying fish) from San Diego Bay to Lindbergh Field, but found no evidence of nesting. The site, however, is not visible from areas which are readily accessible to the public. As far as can be determined, no ornithologist has been on the site during the nesting season, but in 1970 several individuals who work in the area provided estimates of the colony size ranging from 25 to 200 pairs. On the basis of the best available information, it is believed that the actual population was not more than 50 pairs. Some young were fledged in 1970.

ELEMENTS OF THREAT

Human disturbance. There is very little pedestrian or vehicular traffic on the nesting area. Emergency vehicles occasionally cross the site, but fire station personnel have indicated considerable interest in and concern for the terns, and evidently disturbance has been avoided insofar as possible. Disturbance of the adults by nearby aircraft is certainly frequent and unavoidable, but how serious this factor is could not be ascertained. According to Fire Captain Vaughn, the chicks tend to cluster around the runway lights, probably for lack of other cover, and at times are blown around violently by blasts from jet engines.

Development. American Airlines has an option to lease a portion of the airport property, including this site, and has tentative plans for airplane parking and washing facilities. Thes would require paving the small remaining unpaved tern nesting areas. American Airlines' proposed merger with Western Airlines may delay or alter these plans, but in any case paving before 1972 is unlikely.

Predation. In 1970, a pair of sparrow hawks were observed preying on the young terns. Mammalian predators are probably not a problem at this site.

POSSIBLE ACTIONS TO PROTECT SITE

It may be difficult to justify actions to preserve this colony in its present location since the terns must fly over the runways to get to feeding areas in San Diego Bay. The possibility that least terns, which are very lightweight and which do not fly in dense flocks, could cause an airplane accident is probably extremely remote; nevertheless, this possibility does exist. If possible, it would seem better both from the safety standpoint and for the terns, to provide a nesting area for them elsewhere in the north San Diego Bay area.

RECOMMENDATIONS

1. Feasibility of creating a new nesting area somewhere at the north end of San Diego Bay be investigated. Areas which might be considered include: (a) the west end of Lindbergh Field, on the bay side of the runways to avoid the safety hazard; (b) the east end of Harbor Island and its adjacent cover; (c) North Island, in locations which are not close to North Island Naval Air Station flight patterns; and (d) the area near the west end of the Coronado Bridge.

2. The colony be censused during the 1971 nesting season to determine if, as the doubtful reports of some individuals have indicated, it is one of the three largest colonies remaining in California.

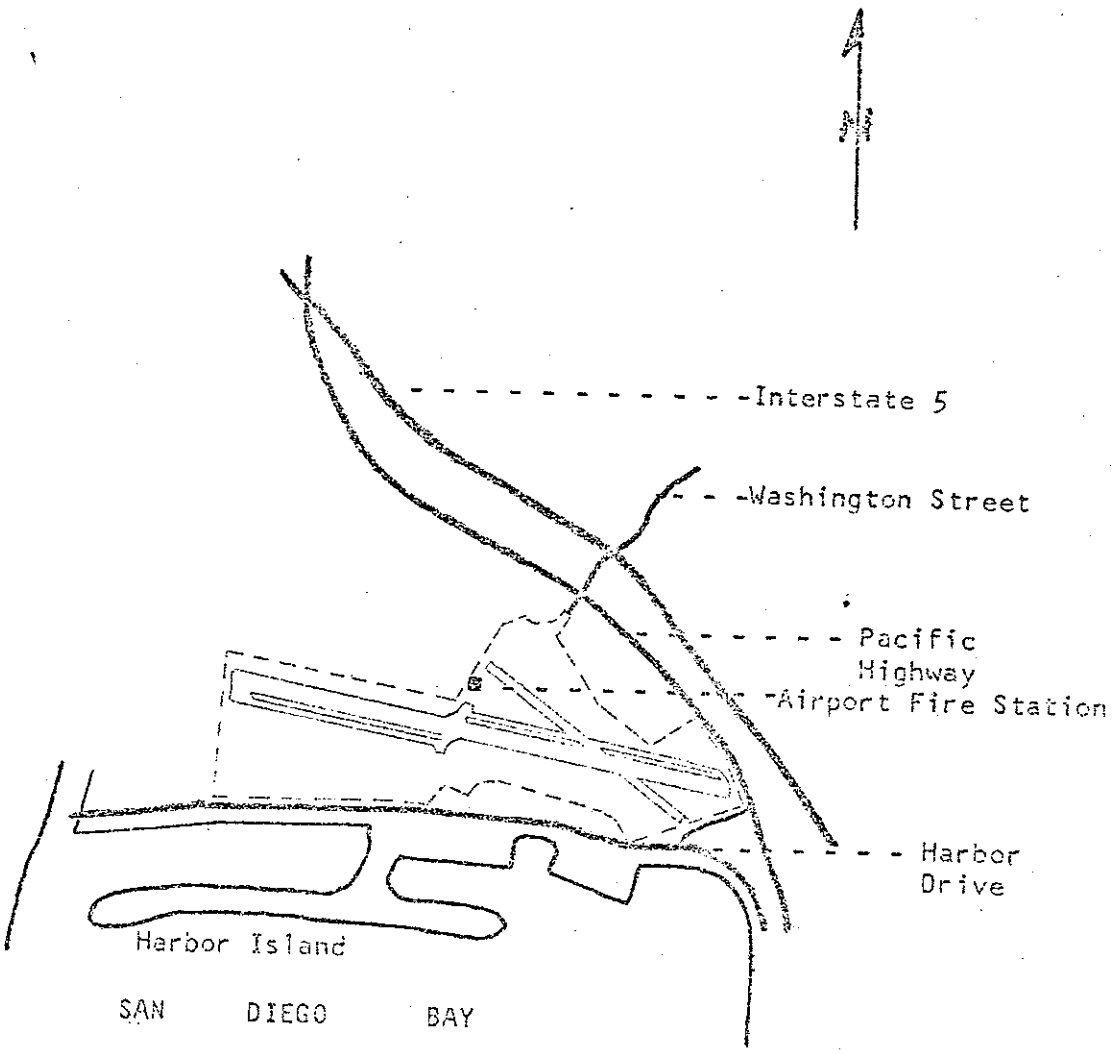


FIGURE 11. Location of San Diego Airport Least Tern nesting site. In 1970 terns nested at edge of runway just south of Airport Fire Station.

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

SOUTH SAN DIEGO BAY SITE

LOCATION

Within the city limits of San Diego at the south end of San Diego Bay, between the cities of Imperial Beach and Chula Vista.

SITE DESCRIPTION

This area consits of approximately 2,100 acres of salt evaporating ponds. Over the years the terns have nested in widely scattered places on dikes between the ponds, and on low islands which are present in a few of the ponds. The total land area utilized for nesting in any one year has probably been not more than one or two acres. Nesting has generally been restricted to portions of the dike with fairly smooth dirt or sand surface, and very little or no vegetation.

OWNERSHIP

About one-half of the total salt evaporating area is owned by Western Salt Company, 720 West Washington Street, San Diego, California 92103, and the remainder is leased by that company from the San Diego Unified Port District.

HISTORICAL USE

This area is known to have been used for many years, but no known attempt has been made until recently to determine the total nesting population. In 1968, Evans found 60 pairs were nesting on dikes, primarily between ponds 5, 7, 33, 34, 36, and 37. Numbers have declined drastically in the last two years, and in 1970 only two pairs were found by Evans. A flock of 12 least terns, including 9 young, found near the salt pond area at the south end of the Silver Strand in early July 1970 (Kinsey), probably came from another area.

ELEMENTS OF THREAT

Human disturbance. While many of the dikes in the area are remote and seldom visited by humans, others, including some which have recently been used for nesting, are subjected to frequent unauthorized motor bike travel. A few of the dikes are regularly traversed by salt company and brine shrimp fishermen's vehicles. The salt pond islands are rarely disturbed by humans, but are subject to flooding.

Development. There are no known plans for development at least until the expiration in 1984 of the current Western Salt Company lease; however, eventual development is very likely.

Predation. In 1968, Evans found the remains of 30 adult least terns on the dikes. The predator species involved was not determined, but skunks, opossums, dogs, and feral house cats, or their tracks, have been observed on the dikes. Rats are undoubtedly present as well. Evans suspected that an avian predator might be responsible. It is also possible that terns had been shot, and then the carcasses eaten by one of the aforementioned mammals. Illegal hunting, largely by individuals who will shoot anything that moves, is a frequent occurrence in the salt works area at all times of the year.

POSSIBLE ACTIONS TO PROTECT SITE

Protection in this area is difficult since terns have nested over such a large area. It is virtually impossible to predict the specific area they might choose for nesting, if they ever return in significant numbers. Nevertheless, protection of the area against unauthorized motor bike and pedestrian traffic would greatly increase the chance of successful nesting, and would likewise benefit the other species of nesting terns and shorebirds in the salt works. It appears that such protection could be provided by installing fences with lockable gates across the dikes at the south and northeast corners of Pond #1, and by keeping the existing gate opposite the end of Palomar Street locked. The San Diego Audubon Society and the San Diego Natural History Museum, with permission of the Western Salt Company, have posted the area as a wildlife refuge but the signs have been largely ignored.

RECOMMENDATIONS

1. A survey be made early in the nesting season to determine whether least terns are attempting to nest anywhere in the salt ponds area. If a significant number are present, it may be feasible to fence off the nesting site, providing that it is located where such action would not interfere with normal operations of the Western Salt Company.

2. The Department of Fish and Game maintain liaison with the San Diego Audubon Society and the San Diego Natural History Museum and support efforts to reduce human disturbance in this nesting area. Such efforts should include investigating the feasibility of installing fences to preven unauthorized pedestrian and motor bike access to the salt works.

3. Law enforcement in the area be intensified to reduce illegal hunting.

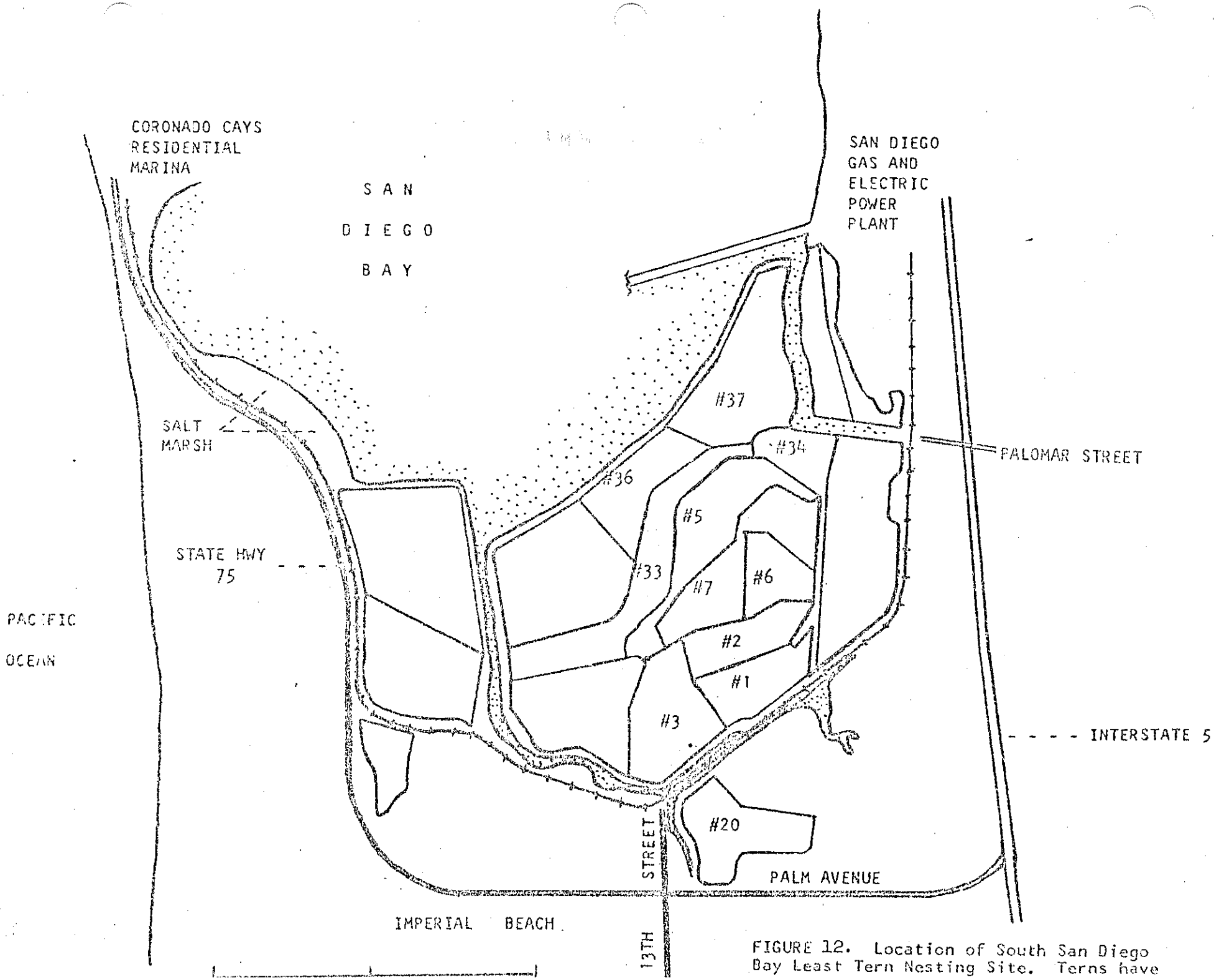


FIGURE 12. Location of South San Diego Bay Least Tern Nesting Site. Terns have

CALIFORNIA DEPARTMENT OF FISH AND GAME
CALIFORNIA LEAST TERN SURVEY - 1971

TIA JUANA RIVER SITE

LOCATION

Beach south of the mouth of the Tia Juana River slough, within city limits of Imperial Beach, San Diego County.

SITE DESCRIPTION

Natural beach dunes with scattered low vegetation. Area known to have been used by terns in recent years encompasses approximately 3 acres. Similar habitat continues, in a narrow broken strip, south about one and one-half miles to the Mexican border.

OWNERSHIP

Security Title Insurance Company, Trust Department, Third and A Streets, San Diego, California 92101.

HISTORICAL USE

According to McCaskie, at least 100 pairs nested on this site as recently as 1962 and 1963, but on July 13, 1969, he was able to find only 6 adults and 2 fledged young. In 1970 there was no evidence of nesting, although 3 to 5 individuals were seen by Rosenquist in the vicinity of the Tia Juana River marsh each month during the nesting season.

ELEMENTS OF THREAT

Human disturbance. Apparently this factor has been the primary cause of the decline in this colony, and human use of the area will certainly continue to increase.

Development. Plans exist for a residential marina development of the entire Tia Juana River estuary, including this site. This development has been delayed pending construction of the Tia Juana River Flood Control Channel.

Predation. No available information.

POSSIBLE ACTIONS TO PROTECT SITE

This area is just north of Border Field Naval Reservation, which is being considered for transfer to the State Department of Parks and Recreation. Conservationists are urgin that additional portions of the Tia Juana River be included in the proposed border park. Ther tern nesting site might logically be a part

of any such addition. In future years, terns may attempt to nest again in this area. If the area is within a park, the site could be fenced off, or an artificial nesting island could be created in the estuary a short distance inland. This latter alternative would permit full public use of the beach without threat to the least tern.

RECOMMENDATIONS

1. Observations be made annually in May and June to determine whether least terns will attempt to nest on this site.

2. The Department of Fish and Game strongly support any proposals to preserve additional portions of the Tia Juana River estuary, on the basis of the following:

   a. This area is historically an important nesting area for the species, and might well be recolonized if it is preserved, and protected from disturbance.

   b. The suitable feeding channels in the Border Field Naval Reservation are insufficient to support a tern colony of significant size as most of the channels in the Reservation are flooded only at extreme high tide. However, there are extensive shallow feeding areas between the Reservation's north boundary and the estuary mouth.

   c. This superb salt marsh, one of the few remaining on the coast of southern California, is a major stronghold of the endangered lightfooted clapper rail.

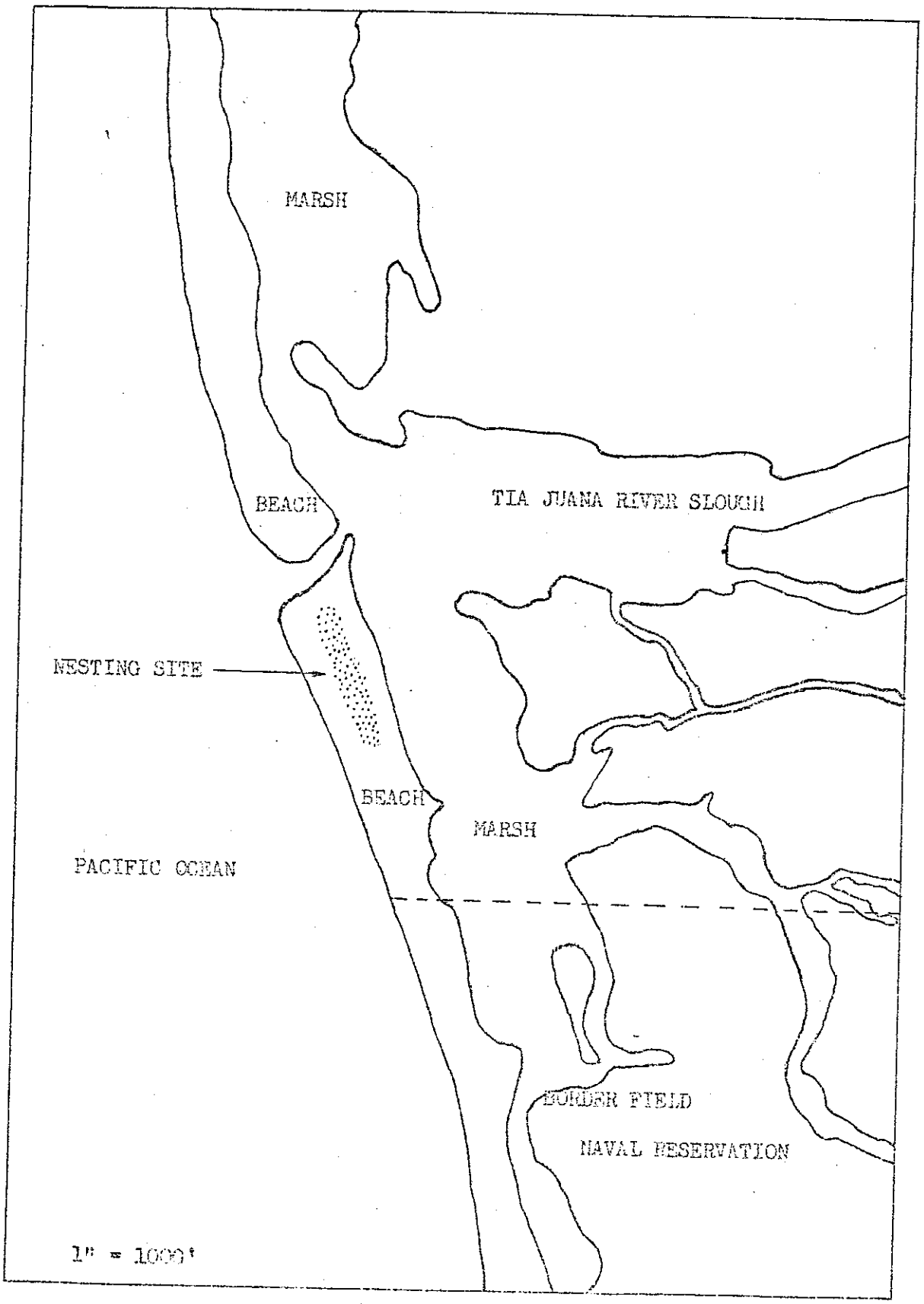


FIGURE 13. Location of Tia Juana River Least Tern Nesting Site