FINAL
ENVIRONMENTAL IMPACT REPORT

VOLUME II: APPENDICES

HEADLANDS DEVELOPMENT AND CONSERVATION PLAN

DANA POINT, CALIFORNIA

SCH#2001071015

Submitted to:

City Of Dana Point
Community Development Department
33282 Golden Lantern
Dana Point, California 92629

Prepared by:
LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, California 92614
(949) 553-0666

LSA Project No. HLR130

LSA

February, 2002

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The Final Environmental Impact Report for the Headlands Development and Conservation Plan is made up of the following four volumes:

Volume I: Environmental Impact Report

Notice of Availability
Notice of Completion
Chapter 1.0 Executive Summary
Chapter 2.0 Introduction
Chapter 3.0 Project Description
Chapter 4.0 Environmental Analysis
Chapter 5.0 Alternatives to The Proposed Project
Chapter 6.0 Long-Term Implications of The Project
Chapter 7.0 Mitigation Monitoring Program
Chapter 8.0 Organizations and Persons Contacted
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Appendix B – Air Quality Model Data*
Appendix C – Terrestrial Biological Resources Assessment And Related Documents
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* Some or all of Appendices B, F, G, and H are contained in Volume IIA (as noted in Volume II) to reduce printing costs.

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Findings of Fact and Statement of Overriding Considerations
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* Some or all of Appendices B, F, G, and H are contained in FEIR Volume IIA (as noted herein) in order to reduce printing costs.

APPENDIX A

INITIAL STUDY AND NOTICE OF PREPARATION

NOTICE OF PREPARATION

To: **Notice of Preparation Recipients (see attached distribution list)**

Subject: Notice of Preparation of a Draft Environmental Impact Report

From: Lead Agency

Lead Agency Name City of Dana Point

Street Address 33282 Golden Lantern

City/State/Zip Dana Point, CA 92629

Contact Mr. Edward M. Knight, Community Development Director

The City of Dana Point will be the Lead Agency and will prepare an Environmental Impact Report (EIR) for the project identified below. Pursuant to Section 21080.4(c) of the Public Resources Code, the Office of Planning and Research is being requested to assist the Lead Agency to identify responsible agencies. We need to know the views of your agency as to the scope and content of the environmental information that is germane to your agency's statutory responsibilities in connection with the proposed project. As appropriate, your agency may need to use the EIR prepared by our agency when considering possible future permits or other approval for the project.

The project description, location, and the potential environmental effects are contained in the attached materials. A copy of the Initial Study (:(is) is not) attached. The City of Dana Point has determined that an EIR will be required for analysis of potential environmental effects of the proposed project, and has included the potential environmental effects of the proposed project, based on the information known to date. This information is included in the environmental checklist responses. Through the receipt of comments on this NOP and the process of preparing the DEIR, additions, deletions, and/or modifications to these potential environmental effects may occur.

Due to the time limits mandated by State law, your response must be sent at the earliest possible date but ***not later than 30 days*** after receipt of this notice. Please send your response to Edward Knight at the City of Dana Point at the address shown above. We will need the name of a contact person in your agency.

Project Title: The Headlands Development and Conservation Plan (HDCP)
Project Location: **City:** Dana Point **County:** Orange
Property Location: Pacific Coast Highway (State Route 1) at Street of the Green Lantern

Project Description: The HDCP proposes development of 125 residential lots, a 65 room inn, and up to a 40,000 square foot visitor/recreation commercial use, 62 acres of public open space, including 30.3 acres of natural resources conservation and associated infrastructure on 121.3 gross acres of land in the west-central portion of the City of Dana Point. The Land Use Plan provides for the development and/or conservation of: 31.7 acres of Recreation Open Space that includes a trail system, public parks, and a public beach; 30.3 acres of Conservation Open Space that have public safety constraints, environmental resources, and/or scenic value, 4.9 acres of Visitor/Recreation Commercial land uses intended to attract local and regional visitors; and 52.1 acres of residential use providing a maximum of 125 residential lots. Project entitlements being requested of the Lead Agency include: General Plan Amendment, Planned Development District, Development Agreement, Amendment to the Zoning Code, Zone Change, Local Coastal Program Amendment, Tentative Tract Map(s), Master Coastal Development Permit(s), Coastal Development Permits, Master Site Development Permit(s), Site Development Permits, Public Financing District, Tract Maps and/or Parcel Maps, grading permits, street vacations, building permits, and various implementing permits and actions. Actions by Responsible Agencies and federal agencies are listed in the project description, attached.

Public Meeting: A public meeting for scoping of the EIR will be held on July 25, 2001, 6:30 p.m. at City Hall, Council Chambers, 33282 Golden Lantern, Dana Point

Project Applicant: Headlands Reserve, LLC
24849 Del Prado
Dana Point, CA 92629
Attention: Kevin Darnall

Date June 29, 2001

Signature Edward M. Knight

Title Director of Community Development

Telephone (949) 248-3567

PROJECT INFORMATION FOR THE PROPOSED HEADLANDS DEVELOPMENT AND CONSERVATION PLAN

I. PROJECT INFORMATION

Summary

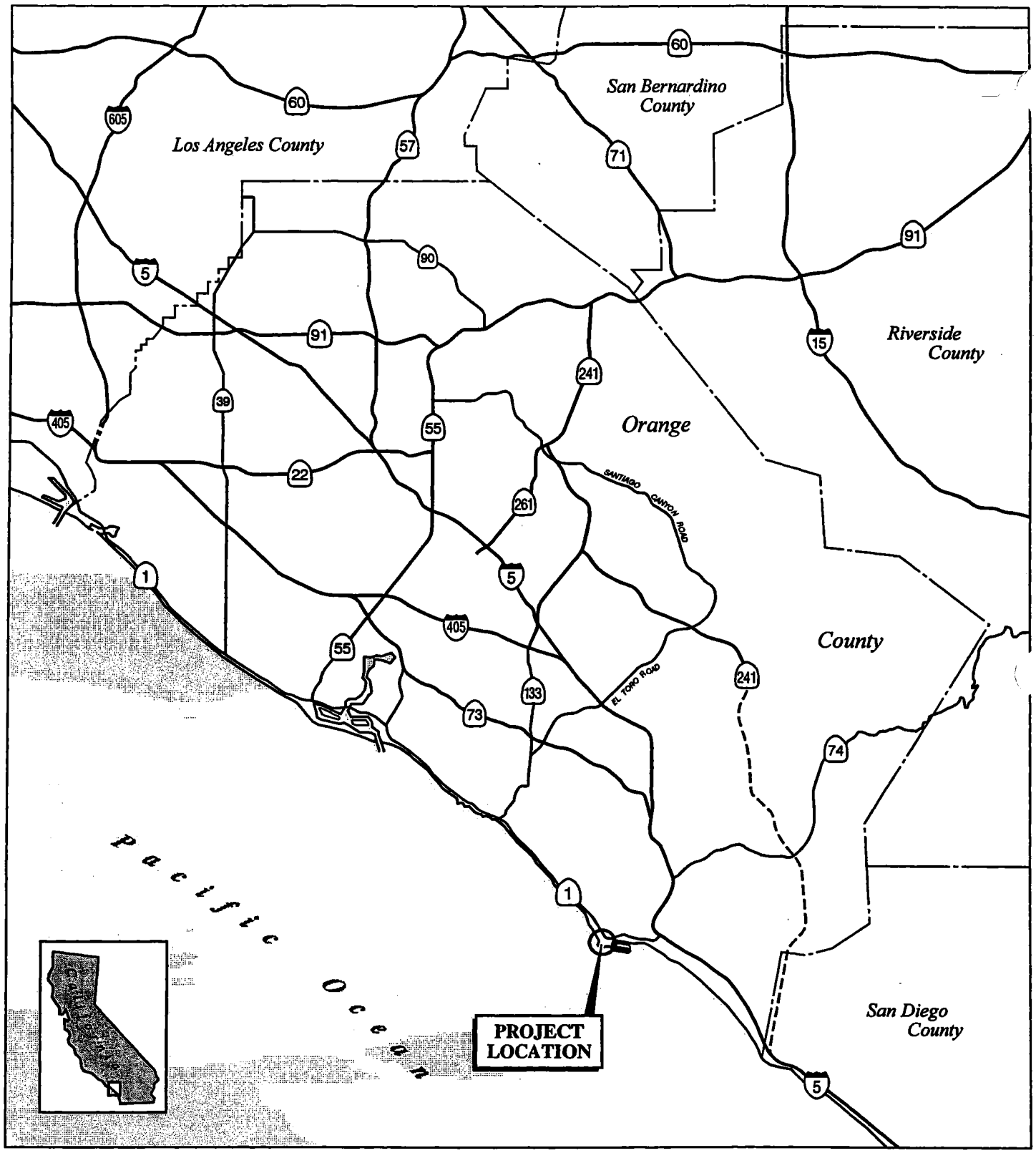
The Project Applicant, Headlands Reserve LLC, has submitted an application requesting City of Dana Point (the City) approval of the proposed Headlands Development and Conservation Plan (HDCP or proposed project), a mixed-use development project, including the following land uses: residential, visitor/recreation commercial, recreation open space, and conservation open space. Under the requirements of the California Environmental Quality Act (CEQA), the City, acting as the Lead Agency for environmental review, must evaluate the potentially significant environmental effects of a proposed development. Based on an initial review of the application for the proposed project, the City determined that an Environmental Impact Report (EIR) must be prepared to assess the proposed project's effects on the environment, to identify potentially significant impacts, to identify feasible mitigation measures to reduce or eliminate potentially significant environmental impacts, and to discuss feasible alternatives to the project that may accomplish basic project objectives while lessening or eliminating any potential significant project impacts.

This Notice of Preparation (NOP) is being circulated pursuant to California Public Resources Code Section 21153(a) and CEQA Guidelines Section 15082. Public agencies and the public are invited to comment on the proposed scope and content of the environmental information to be included in the EIR. A 30 day comment period is provided to return written comments to the City of Dana Point, attention: Mr. Edward Knight, Director of Community Development, City of Dana Point, Community Development Department, 33282 Golden Lantern, Dana Point, CA 92629.

Project Location, Surrounding Uses, And Site Conditions

Project Setting. The HDCP site is located in the west-central portion of the City, in the County of Orange (County). The project site is shown in its regional context in Figure 1.1. Regional access to the vicinity of the project site is provided by Interstate 5 (I-5) to the southeast, the San Joaquin Hills Transportation Corridor (State Route 73 or SR-73) to the northeast, and Pacific Coast Highway (PCH) adjacent to the eastern boundary of the project site. The project site is located at PCH and Street of the Green Lantern, see Local Vicinity Map, Figure 1.2.

The project site is located in an area of the City with urban development that ranges from residential development at densities of 5 to 22 dwelling units per acre to commercial and visitor/recreation commercial land uses typical of those associated with PCH and the Street of the Golden Lantern. The majority of the project site overlooks the Pacific Ocean, with areas in the eastern portion overlooking Dana Point Harbor. The project site surrounds two existing residential enclaves. Although these developments are encompassed by and take access through the project site, they are not included as part of the proposed project addressed herein. Beginning in the early 1920s, several Tract Maps were recorded that dedicated street easements and created lots of varying sizes. Over the years, several of these lots were sold and developed. These became the residential enclaves.



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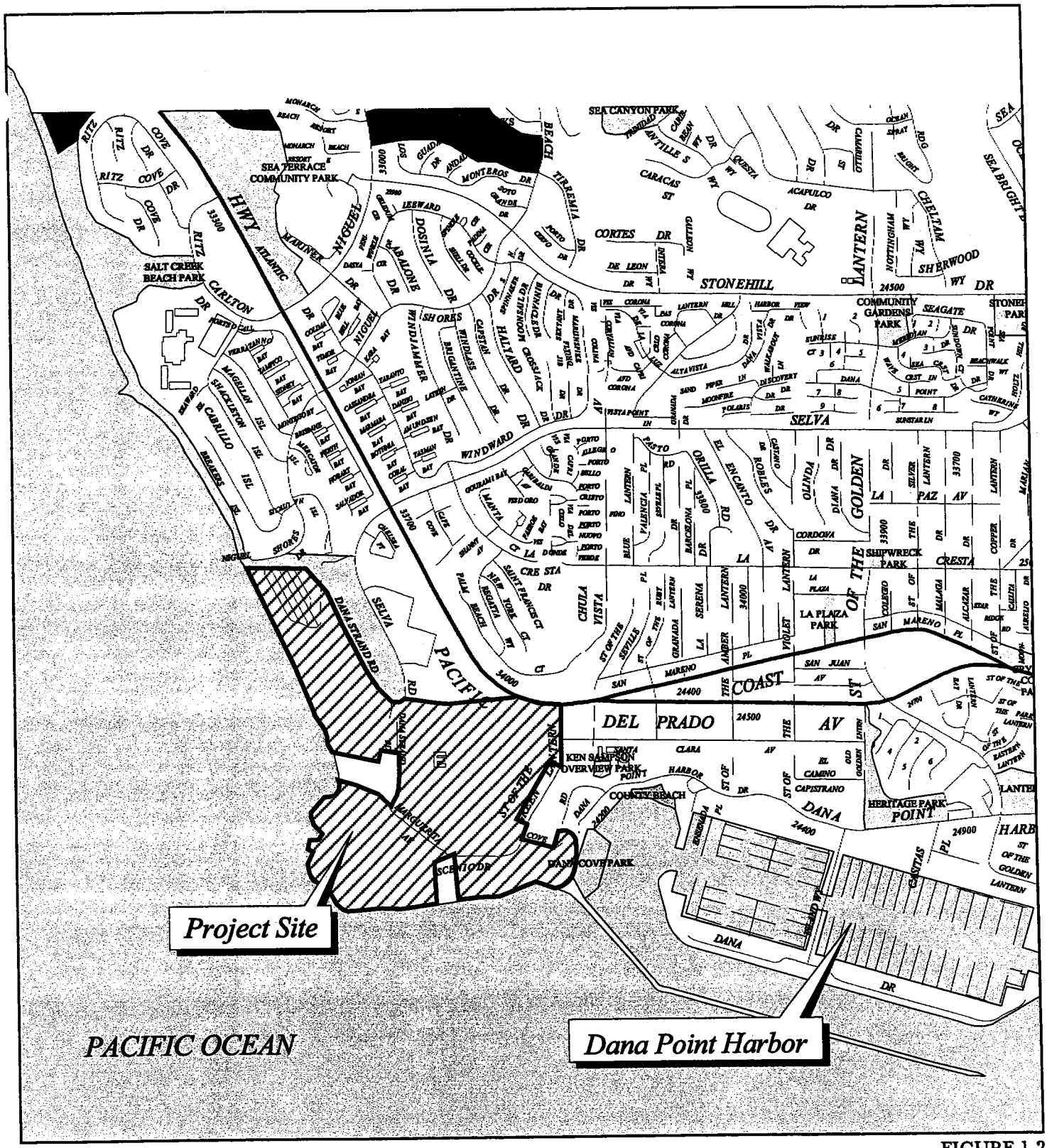
FIGURE 1.1

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The Headlan
Development and Conservation Plan
Regional Location

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FIGURE 1.2

The Headlands
Development and Conservation Plan
Local Vicinity

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The project site is bounded by: the Pacific Ocean, including the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge, to the west and south; Breaker Isle, Niguel Terrace, and Chelsea Point residential areas and County owned Strand Beach parking lot to the north and northeast; and PCH area and visitor serving commercial uses, such as Blue Lantern Plaza, and the Cannons and Chart House restaurants, to the east and southeast. Local access to the project site is provided via Selva Road to the northeast, Street of the Green Lantern to the southeast, Cove Road to the south, and PCH adjacent to the eastern boundary of the project site. The project site is shown in its local setting in Figure 1.2.

The 121.3 acre project site, located primarily on a coastal promontory that forms a series of bluffs and man-made terraces, comprises three distinct planning areas: the Headlands Area; the Strand Beach Area; and the Pacific Coast Highway/Hilltop Area. A portion of the project site contains Pacific pocket mouse habitat and is fenced with restricted access.

The Strand Beach Area of the project site consists of a wide, sandy beach surrounded by terraced slopes. The Strand Residential Area was formerly developed as a 90 lot mobile home park, which closed in 1988. This fenced area is in a degraded condition with abandoned buildings, parking lots, asphalt streets, pads, walls, and septic, water, and storm drainage facilities. Beginning in the 1950s, a riprap revetment was installed along the edge of the former mobile home park adjacent to the beach to protect slopes and improvements in this area from coastal erosion. The Strand Residential Area is fenced on all four (4) sides and, except for the actual sandy beach, it is not accessible to the public.

The Hilltop Park Area is located in the northeast portion of the site. This area is surrounded by urban development and directly fronts PCH. This portion of the project site is currently occupied by commercial storage facilities and contains structures that were formerly used for horticultural operations. This area contains a hilltop that, at 288 feet above mean sea level, is the highest elevation on the project site and provides a 360 degree view of the Pacific Ocean and the City.

The project site drainage can be divided into three basic flows: 1) approximately 60 percent drains to Strand Beach via five existing storm drain outlets constructed since the 1950s to serve the mobile home park; 2) on the beach, approximately 30 percent drains over the bluff edges from Harbor Point around Dana Point extending to the residential enclave to the north; and 3) approximately ten percent drains to the Dana Point Harbor.

The project site contains various wildlife and plant species. The wildlife found on the project site consist of: mammals such as squirrels, rabbits, mice, and the federally endangered Pacific pocket mouse; reptiles; and several species of birds, including the California gnatcatcher (a federally threatened species) and the coastal cactus wren. Many of the vegetation associations found on the project site are native to the Southern California area, while others are associated with the previous development on the project site. Some of the vegetation associations include coastal bluff scrub, coastal sage scrub, southern mixed chaparral, and nonnative grassland. The project site is adjacent to the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge, which provide habitat for marine species.

All of the project site is governed by the land use designations of the City's General Plan, and a large portion of the site is also governed by an adopted and certified Dana Point Local Coastal Program (LCP).

Project Description and Discretionary Actions

The proposed project provides for the orderly development and conservation of resources on the project site. The project responds to the physical characteristics of the project site and establishes public and private development opportunities. Additionally, the plan provides a framework that balances the social, historical, cultural, and economic issues associated with the development of the project site. The proposed project will be implemented by a series of plans, programs, and guidelines adopted by the City and applicable State and federal regulatory agencies. The overall development program involves permitting and approvals from the City of Dana Point, which are listed later in this section. The EIR being prepared for the proposed project will satisfy the CEQA requirements for all permits or approvals needed to implement the HDCP project. At this time the applicant is requesting the following approvals from the City:

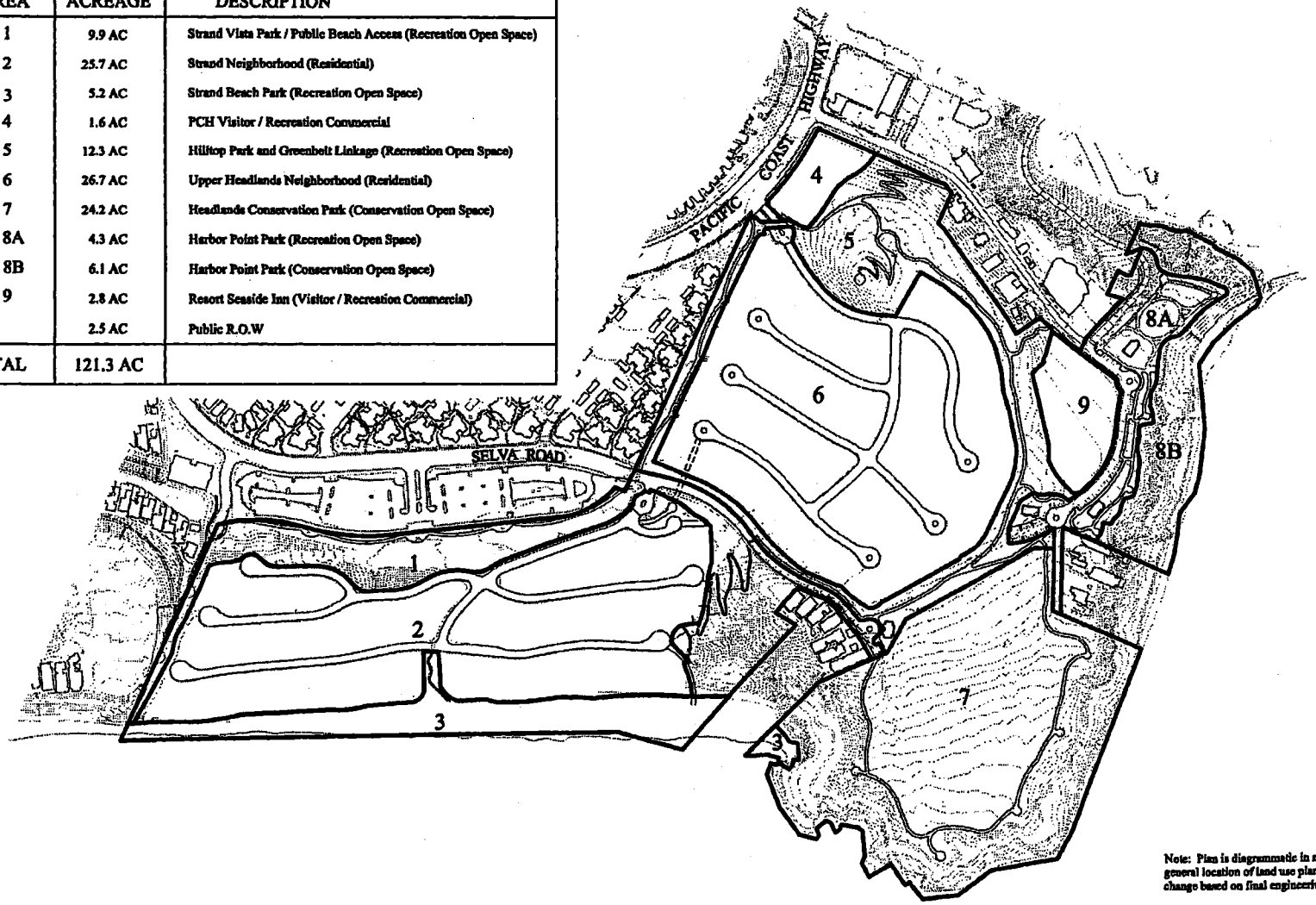
1. Certification of the Environmental Impact Report
2. Adoption of Mitigation Monitoring Program
3. Approval of an Amendment to the City of Dana Point General Plan
4. Approval of an Amendment to the Zoning Code
5. Approval of a Planned Development District
6. Approval of an Amendment to the City of Dana Point Local Coastal Program
7. Approval of a Development Agreement

The proposed Land Use Plan emphasizes: coastal access and public safety; the conservation of natural resources; the provision of public parks, open space, and recreational opportunities; and the development of high quality visitor recreational facilities, visitor commercial, and residential uses. As indicated in Table A, Land Use Plan Statistical Summary, and Figure 1.3, Land Use Plan, the development is separated into four basic land use types: recreation open space; conservation open space; visitor/recreation commercial; and residential. The Land Use Plan provides for the development of 125 single family residential lots; a maximum 4.4 acres of Visitor/Recreational Commercial (V/RC) land uses comprised of a 65 room inn and 40,000 square foot commercial structure; 30.3 acres of Conservation Open Space (CON/OS) that have public safety constraints,

Table A: Land Use Statistical Summary

Land Use	Acres	Planning Area	Residential Lots/ Square Feet
Recreation Open Space (REC/OS)			
Recreation Open Space (REC/OS)	9.9	1	
	5.2	3	
	12.3	5	
	4.3	8A	
Subtotal REC/OS	31.7		
Conservation Open Space (CONS/OS)			
Conservation Open Space (CONS/OS)	24.2	7	
	6.1	8B	
Subtotal CONS/OS	30.3		
Visitor/Recreation Commercial (V/RC)			
Visitor/Recreation Commercial (V/RC)	1.6	4	40,000 sq.ft.
	2.8	9	65 keys
Subtotal V/RC	4.4		65 keys 40,000 sq.ft.
Residential (RSF 0-3.5)			
Residential Single Family	25.7	2	75 Lots
	26.7	6	50 Lots
Subtotal (RSF 0-3.5)	52.4		125
Public Right-of-Way	2.5	1, 6, 8A	
Total Public Open Space	**62.0**		
Total	**121.3**		

PLANNING AREA	ACREAGE	DESCRIPTION
PA 1	9.9 AC	Strand Vista Park / Public Beach Access (Recreation Open Space)
PA 2	25.7 AC	Strand Neighborhood (Residential)
PA 3	5.2 AC	Strand Beach Park (Recreation Open Space)
PA 4	1.6 AC	PCH Visitor / Recreation Commercial
PA 5	12.3 AC	Hilltop Park and Greenbelt Linkage (Recreation Open Space)
PA 6	26.7 AC	Upper Headlands Neighborhood (Residential)
PA 7	24.2 AC	Headlands Conservation Park (Conservation Open Space)
PA 8A	4.3 AC	Harbor Point Park (Recreation Open Space)
PA 8B	6.1 AC	Harbor Point Park (Conservation Open Space)
PA 9	2.8 AC	Resort Seaside Inn (Visitor / Recreation Commercial)
	2.5 AC	Public R.O.W
TOTAL	121.3 AC	



Note: Plan is diagrammatic in nature and intended to show the general location of land use planning areas. It is subject to change based on final engineering, planning, and design.

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FIGURE 1.3

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SOURCE: SWA

The Headlands
Development and Conservation Plan
Land Use Plan

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environmental resources, and/or scenic value, and 31.7 acres of Recreation Open Space (REC/OS) that include a trail system, public parks, a public beach, and a series of public recreational visitor facilities.

Figure 1.4, Circulation Plan, illustrates the proposed on-site circulation improvements required to serve the proposed project. Vehicular access will occur through a new intersection at PCH and Selva Road extension, which provide for movement of vehicles and people within the project site.

Vehicular access to the project site is proposed from PCH and Selva Road. Primary access to the site will be at [signalized] entrances on "A" Street at PCH and at Selva Road at PCH.

The following actions are contemplated by the City of Dana Point to implement the proposed HDCP:

1. Certification of the Environmental Impact Report.

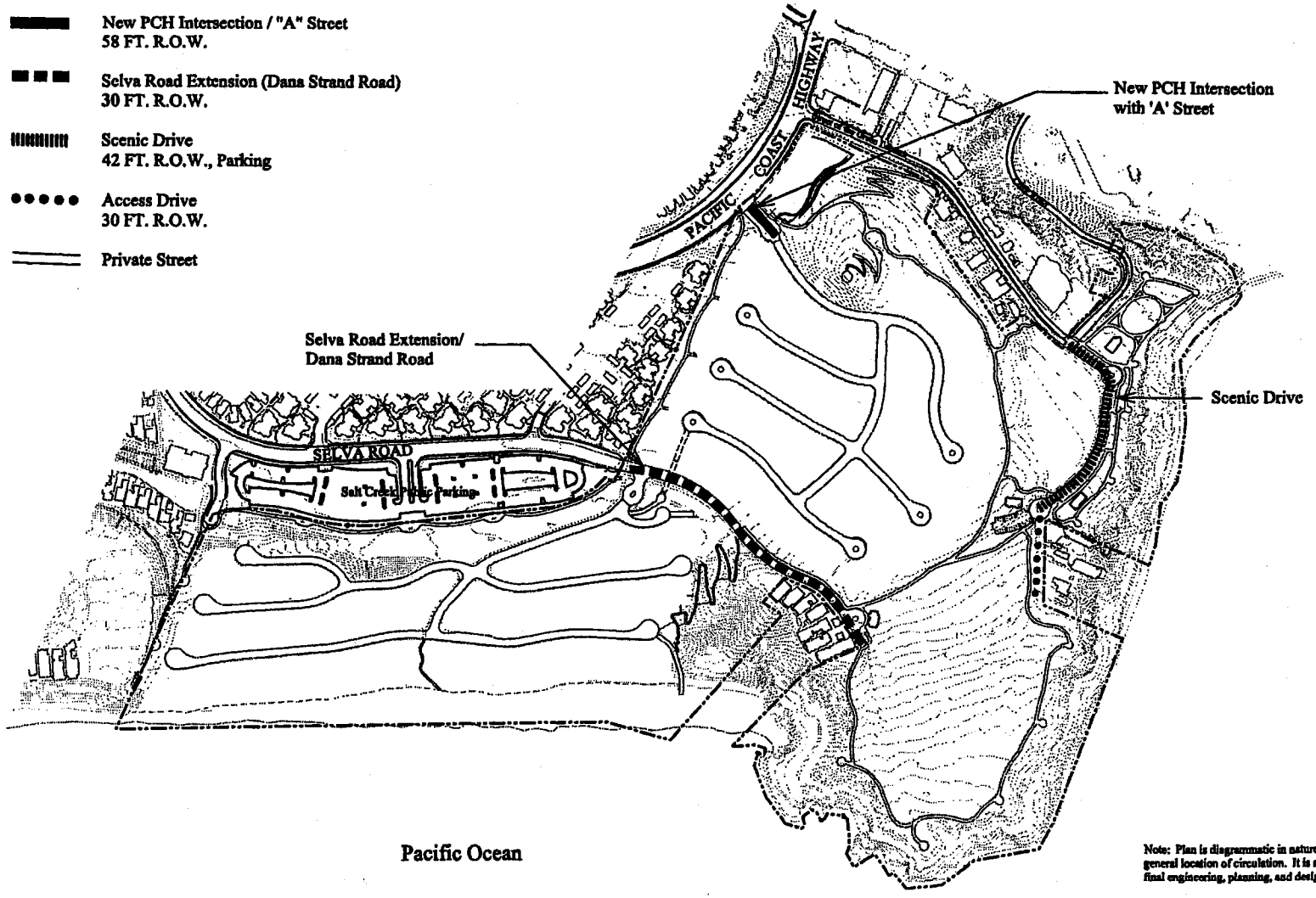
2. Adoption of a Mitigation Monitoring Program.

3. Consideration of an Amendment to the General Plan. Currently the project site is designated Residential 3.5-7.0, Residential 7.0-14.0, Visitor/Recreational Commercial, and Recreation/Open Space and is slated for preparation of a Specific Plan in the Land Use Element of the City's General Plan. The proposed project is inconsistent with this designation, and an amendment to the General Plan is required to accommodate the proposed zoning of Planned Development District and HDCP. A General Plan Amendment has been filed by the project applicant, requesting redesignation of the project site to the following land use categories: Residential 0-3.5, Visitor/Recreational Commercial, and Recreation/Open space.

4. Consideration of an Amendment to the Zoning Code. An amendment to the Zoning Code is proposed to add Planned Development District as a zoning classification and to zone the site as a Planned Development District.

5. Consideration of a Planned Development District. A Planned Development District approval is requested by the project proponent to provide the land use regulatory framework for the project, as well as to illustrate the overall development concept and distribution of land uses within the proposed HDCP. The Planned Development District application is the primary development plan document describing the project reviewed in the EIR. The Planned Development District is a comprehensive development guide and regulating document (commonly referred to as zoning), which contains policies and development standards for design and implementation of the HDCP.

6. Consideration of an Amendment to the Dana Point Local Coastal Program Amendment. The Coastal Act establishes policies and procedure regulating the development and conservation of California's coast. The Coastal Act requires local governments to prepare Local Coastal Programs for areas located within the Coastal Zone. Local Coastal Programs are composed of the relevant portions of a local government's General Plan, zoning ordinances, zoning district maps, and other implementing actions, which when taken together meet the requirements of and implement the provisions and policies of the California Coastal Act at the local level.



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FIGURE 1.4

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SOURCE: SWA

The Headlands
Development and Conservation Plan
Circulation Plan

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A portion of the HDCP site is included within the currently certified Dana Point Local Coastal Program and a portion of the site is currently whiteholed. The HDCP will be submitted by the City to the Coastal Commission for certification as an amendment to the Dana Point Local Coastal Program.

7. Consideration of a Development Agreement. This agreement addresses the following topics: 1) permitted and conditional uses; 2) density and intensity of uses; 3) location of uses; 4) phasing of development; 5) provision for public improvements; 6) property development and public improvement standards; 7) the site configuration; 8) property acquisition; 9) utility service; 10) funding participation for on-site and off-site infrastructure improvements, and 11) street vacations and property dedications or transfers to the City. The Development Agreement also includes provisions to provide the City with assurances of developer performance and to provide the developer with rights to develop the property as depicted in the HDCP.

8. Additional Permits and Approvals. In addition to 1 through 7, above, certain permits are required to implement the proposed project. They may include the following: tract maps and/or parcel maps, Master Coastal Development Permit (CDP), CDPs, Public Finance District, Master Site Development Permit (SDP), SDPs, Street Vacations, and other ministerial permits/approvals and compliance reviews or inspections, such as grading permits, building permits, NPDES Permit compliance review, and street work permits issued by the City.

Other permits and approvals that exist or may be required from County, State, and federal agencies or other governmental entity to implement the project.

Responsible and Trustee Agencies

According to sections 15050 and 15367 of the State CEQA Guidelines, the City has been designated as the Lead Agency. Responsible agencies are those agencies that have discretionary approval over one or more actions involved with the development of a proposed project. Trustee agencies are State agencies having discretionary approval or jurisdiction by law over natural resources affected by a proposed project that are held in trust of the people of the State of California. The potential responsible and trustee agencies that have been identified as of the preparation of this document and the required permits, approvals, or their associated responsibilities for the proposed project are identified in Table B, Potential Responsible and Trustee Agencies.

Environmental Procedures

This NOP for the proposed project will be submitted to the State Clearinghouse, Responsible Agencies, and other interested parties that have specifically requested a copy of the NOP.

Table B: Potential Responsible And Trustee Agencies

Agency	Permit/Approval/Responsibility/Trust
United States Department of Interior Fish and Wildlife Service	Federal threatened or endangered species, Section 10a Permit (issued) and NCCP Implementation Agreement.
United States Army Corps of Engineers	401 Permits for repair of outfall at Harbor, 404 Permit for impacts to jurisdictional drainages.
California Coastal Commission	Local Coastal Program Amendment.
State Department of Transportation (Caltrans)	Transportation Demand Management Program.
	Encroachment permit(s).
	Congestion Management Program.
State Department of Fish and Game	State threatened or endangered species and NCCP Implementation Agreement, Section 1603 Streambed Alteration Agreement.
South Coast Air Quality Management District	Asbestos removal permits.
State of California Water Quality Control Board and San Diego Regional Water Quality Control Board.	National Pollutant Discharge Elimination Systems Permit (NPDES) - construction storm water Notice of Intent review.
	Section 401 water quality certification
South Coast Water District	Water supply and distribution.
	Reclaimed water.
	Sewage collection and nuisance water discharge to sewer system.
County of Orange	Rights-of-Entry, encroachment permit(s). Ability to locate BMP filters on County land.
County of Orange - Local Agency Formation Commission	Annexation to South Coast Sewer Improvement District.

After the 30 day review period for the NOP is complete and all comments are received, a Draft Environmental Impact Report (DEIR) will be prepared in accordance with CEQA as amended (Public Resources Code, Section 21000 et seq.), and the State Guidelines for Implementation of CEQA (California Code of Regulations, Section 15000 et seq.). This DEIR will comply with the procedures for implementation of CEQA adopted by the City of Dana Point.

The DEIR will examine the proposed project in the context of the City's existing General Plan, Zoning Ordinance, Local Coastal Program, and other relevant planning programs/policies. Detailed analyses will be conducted in order to ascertain the proposed project's effects on the environment and the relative degree of impact prior to implementation of mitigation measures. Where impacts are determined to be significant, mitigation measures will be prescribed with the purpose of reducing the project's effects on those impacts either completely or to the maximum degree feasible. Where appropriate, City approved plans, policies and standard conditions of approval will be applied to the development requirements, and/or amendments to those plans/policies will be discussed as part of the project. An analysis of alternatives to the proposed project will also be included in the DEIR, including alternative site plans and the No Project Alternative.

II. INITIAL STUDY CHECKLIST AND RESPONSES

Introduction

Compliance with CEQA is required to implement the proposed Headlands Development and Conservation Plan (HDCP). An Initial Study is a preliminary environmental analysis of a proposed project prepared by the Lead Agency to determine whether a Negative Declaration or EIR must be prepared (State CEQA Guidelines section 15365).

The Initial Study Checklist addresses each question required by the State CEQA Guidelines. An indication is provided related to the potential impacts of the proposed project. The Threshold of Significance Section provides impact criteria from the federal or State Agencies, the State CEQA Guidelines, or adopted City policies. The Impacts Section indicates the potential impacts of the proposed project. The Analysis Section provides an analysis of the physical effects of the proposed project. The Analysis Section indicates if the proposed project will have an impact that is:

1. Potentially Significant;
2. Potential Significant Unless Mitigation Incorporated;
3. Less than Significant Impact; or
4. No Impact.

The Initial Study Checklist and Responses Section has been prepared according to sections 15063, 15064, and 15065 of the State CEQA Guidelines.

ENVIRONMENTAL CHECKLIST FORM

1. Project title: The Headlands Development and Conservation Plan (HDCP)

2. Lead agency name and address:
City of Dana Point - Community Development Department
33282 Golden Lantern
Dana Point, CA 92629

3. Contact person and phone number: Edward M. Knight, Director of Community Development (949) 248-3567

4. Project location: Pacific Coast Highway at Street of the Green Lantern (see Section I)

5. Project sponsor's name and address:
Headlands Reserve LLC — Contact Person: Mr. Kevin Darnall
24849 Del Prado — Telephone: (949) 488-8800
Dana Point, CA 92629

6. A. Current General Plan designation: Residential: 3.5 to 7 dwelling units per acre (du/a) and 7 to 14 du/a; Visitor/Recreational Commercial and Recreation/Open Space. The property is designated for adoption of a Specific Plan.
B. Proposed General Plan designation: Residential 0 to 3.5 du/ac, Visitor/Recreational Commercial, and Recreation/Open Space.

7. A. Current Zoning: Specific Plan
B. Proposed Zoning: Planned Development District

8. Description of project: (Describe the whole action involved, including but not limited to later phases of the project, and any secondary, support, or off-site features necessary for its implementation. Attach additional sheets if necessary.)
See Section I.

9. Surrounding land uses and setting: Briefly describe the project's surroundings:
Pacific Ocean, Strand Beach, Dana Point Harbor, public parking, single family and multi-family residential, and commercial uses.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement.)
Orange County Flood Control District, United States Department of Interior Fish and Wildlife Service, United States Army Corps of Engineers, California Coastal Commission, State Department of Transportation (Caltrans), State Department of Fish and Game, South Coast Air Quality Management District, San Diego Regional Water Quality Control Board, South Coast Water District, County of Orange, County of Orange - Local Agency Formation Commission

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

X	Aesthetics		Agriculture Resources	X	Air Quality
X	Biological Resources	X	Cultural Resources	X	Geology/Soils
X	Hazards & Hazardous Materials	X	Hydrology/Water Quality	X	Land Use/Planning
	Mineral Resources	X	Noise	X	Population/Housing
X	Public Services	X	Recreation	X	Transportation/Traffic
X	Utilities/Service Systems	X	Mandatory Findings of Significance		

DETERMINATION

On the basis of this initial evaluation:

[ ] I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.

[ ] I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE

[X] I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required..

[ ] I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has

[ ] I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been

Signature

6/29/01
Date

Edward Knight
Printed Name

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).

2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.

3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect is significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.

4) 'Negative Declaration: Less than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).

5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:

    a) Earlier Analysis Used. Identify and state where they are available for review.

    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.

    c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.

6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.

7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.

8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.

9) The explanation of each issue should identify:
   a) the significance criteria or threshold, if any, used to evaluate each question; and
   b) the mitigation measure identified, if any, to reduce the impact to less than significance

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
I. AESTHETICS – Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☒	☐	☐	☐
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☒	☐	☐	☐
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☒	☐	☐	☐
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☒	☐	☐	☐
II. AGRICULTURE RESOURCES – In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☒
III. AIR QUALITY – Where applicable, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☒	☐
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☒	☐	☐	☐
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☒	☐	☐	☐

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
d) Expose sensitive receptors to substantial pollutant concentrations?	☒	☐	☐	☐
e) Create objectionable odors affecting a substantial number of people?	☐	☒	☐	☐
IV. BIOLOGICAL RESOURCES – Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☒	☐	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☒	☐	☐	☐
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☒	☐
V. CULTURAL RESOURCES – Would the project:				
a) Cause a substantial adverse change in the significance of an historical resource as defined in §15064.5?	☐	☒	☐	☐
b) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?	☐	☒	☐	☐
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☒	☐	☐
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☒	☐	☐
VI. GEOLOGY AND SOILS – Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☒	☐	☐	☐

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☒
ii) Strong seismic ground shaking?	☒	☐	☐	☐
iii) Seismic-related ground failure, including liquefaction?	☒	☐	☐	☐
iv) Landslides?	☒	☐	☐	☐
b) Result in substantial soil erosion or the loss of topsoil?	☒	☐	☐	☐
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☒	☐	☐	☐
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☒	☐	☐	☐
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☒
VII. HAZARDS AND HAZARDOUS MATERIALS – Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☒	☐	☐
b) Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☒	☐	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☒	☐	☐
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☒	☐	☐
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☒	☐	☐
VIII. HYDROLOGY AND WATER QUALITY – Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☒	☐	☐	☐
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted?	☒	☐	☐	☐
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☒	☐	☐	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☒	☐	☐	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☒	☐	☐	☐
f) Otherwise substantially degrade water quality?	☒	☐	☐	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☒	☐	☐	☐
h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☒	☐	☐	☐
i) Expose people or structures to a significant risk of loss, injury or death, involving flooding, including flooding as a result of the failure of a levee or dam?	☒	☐	☐	☐
j) Inundation by seiche, tsunami, or mudflow?	☒	☐	☐	☐
IX. LAND USE AND PLANNING – Would the project:				
a) Physically divide an established community?	☐	☐	☒	☐

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
b) Conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☒	☐	☐	☐
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☒	☐	☐
X. MINERAL RESOURCES – Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☒
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒
XI. NOISE – Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☒	☐	☐	☐
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☒	☐
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☒	☐	☐
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☒	☐	☐	☐
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☒	☐
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒
XII. POPULATION AND HOUSING – Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☒	☐
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
XIII. PUBLIC SERVICES				
a) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services:	☐	☒	☐	☐
Fire protection?	☐	☒	☐	☐
Police protection?	☐	☒	☐	☐
Schools?	☒	☐	☐	☐
Parks?	☐	☒	☐	☐
Other public facilities?	☐	☒	☐	☐
XIV. RECREATION				
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☒	☐	☐	☐
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☒	☐	☐	☐
XV. TRANSPORTATION/TRAFFIC – Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☒	☐	☐	☐
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☒	☐	☐	☐
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☒
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☒	☐	☐	☐
e) Result in inadequate emergency access?	☒	☐	☐	☐

	Potentially Significant Impact	Less Than Significant With Mitigation Incorporated	Less Than Significant Impact	No Impact
f) Result in inadequate parking capacity?	☒	☐	☐	☐
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☒	☐
XVI. UTILITIES AND SERVICE SYSTEMS – Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☒	☐	☐	☐
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☒	☐	☐	☐
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☒	☐
e) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☒	☐	☐	☐
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☒	☐
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☒	☐
XVII. MANDATORY FINDINGS OF SIGNIFICANCE				
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☒	☐	☐	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?	☒	☐	☐	☐
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☒	☐	☐	☐

III. POTENTIAL ENVIRONMENTAL EFFECTS/ISSUES

This section provides detailed discussion supporting the conclusions identified in the Environmental Checklist Form, Section II. The conclusions were based upon preliminary assessment of the proposed HDCP using available sources and documents.

The environmental checklist form identifies four categories of project impact: "potentially significant impact," "less than significant with mitigation incorporated," "less than significant impact," and "no impact." A response of "potentially significant impact" applies if there is a substantial evidence that an effect is significant. A response of "less than significant with mitigation incorporated" applies where the mitigation measures are available to reduce an effect from "potentially significant impact" to a "less than significant impact." A response of "less than significant impact" applies if there is evidence that potential project impacts are not significant. A response of "no impact" indicates that the project will have no effect on the environment.

References Used in Completing the Environmental Checklist

The following documents were used in completing the Environmental Checklist/Initial Study and the discussion provided herein. These documents are available for review at the City of Dana Point, Community Development Department, 33282 Golden Lantern, Dana Point, California. Where appropriate, the documents have also been cited in the Environmental Checklist.

- City of Dana Point General Plan
- NCCP/HCP EIR/EIS
- City of Dana Point LCP

I. AESTHETICS

A) Have a substantial adverse effect on a scenic vista?

Potentially significant impact. Implementation of the proposed project will alter existing views from the surrounding public areas and roadways in the proximity of the project area. Views of coastal bluffs, currently vacant land on the property, and the Pacific Ocean may be affected. Pacific Coast Highway and Cove Road are designated scenic highways by the City of Dana Point (Reference: Open Space and Conservation Element of the General Plan). A visual impact assessment to evaluate the proposed project's potential effect on existing views from uses in the proximity of the project will be completed as part of the EIR.

B) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?

Potentially significant impact. There are several scenic resources in the project area that would be affected with implementation of the proposed project. Pacific Coast Highway and Cove Road are designated scenic highways by the City of Dana Point. In addition, current public vehicle and pedestrian access to the site will be altered, and public views from the bluff and strand beach area will be substantially changed. Public access will be substantially changed.

C) Substantially degrade the existing visual character or quality of the site and its surroundings?

Potentially significant impact. Implementation of the proposed project will substantially change and alter the existing visual character of the site and will potentially affect views from public view areas. A visual impact assessment to evaluate the proposed project's potential effect on existing views from public land in the proximity of the proposed HDCP area will be completed as part of the EIR. This assessment will describe the existing aesthetic quality and visual resources on and adjacent to the project site. Potential visual impacts on existing public viewsheds at selected locations will be assessed.

D) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

Potentially significant impact. Implementation of the proposed project may result in the generation of light, glare, shade and shadow that would potentially impact adjacent land uses, including the potential for the spillover of light from residences, public parking areas, commercial and hotel uses. Lighting from the proposed uses on the project site may be visible from distant view sites. Lighting and view impacts will be identified and the severity of these impacts determined.

Potential impacts related to light and glare issues, aesthetics, building height and potential shade and shadow impacts will be evaluated in the EIR. This analysis will include an evaluation of the proposed project in relation to surrounding public property and how they may be visually impacted.

II. AGRICULTURE RESOURCES

In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:

A) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No impact. The project site is privately owned by Headlands Reserve LLC and is not used for agricultural purposes. Portions of the site were formerly used for mobile home uses, a nursery, and storage. The only use currently in place is storage of building materials, RV and boat storage, and related uses. The proposed project would not affect agricultural resources or operations. Therefore, this issue will not be discussed in the EIR.

B) Conflict with existing zoning for agricultural use, or a Williamson Act contract?

No impact. The proposed project is currently designated in the General Plan as residential, visitor/recreation commercial, and open space. Since on-site agricultural uses are not present, the proposed project does not conflict with existing zoning for agricultural use or any use under a Williamson Act contract.

C) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?

No impact. The proposed project is located in an urbanized area not currently used for agricultural purposes. The project would not result in the conversion of on-site or off-site farmland to a non-agricultural use.

III. AIR QUALITY

Where applicable, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:

A) Conflict with or obstruct implementation of the applicable air quality plan?

Less than significant impact. The proposed project includes a General Plan Amendment, which will decrease residential density and visitor serving commercial uses. Because the regional air quality plan is based upon adopted General Plans within the region, the General Plan Amendment and project will be consistent with the Air Quality Management Plan. This will be further assessed in the EIR.

B) Violate any air quality standard or contribute substantially to an existing or projected air quality violation? and;

C) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?

Potentially significant impact. Traffic resulting from operation of the proposed uses may result in increased emissions of criteria air pollutants. Additional criteria emissions will result from the consumption of natural gas on site and generation of electricity used by the residences and businesses. Short-term air pollutant emissions (NO_X and PM_{10}) will result during construction of the project. The project site, City of Dana Point, and the County of Orange are in a non-attainment area for ozone, carbon monoxide (CO), and particulate matter (PM_{10}). Nitrogen dioxide (NO_2) has been designated as maintenance under federal and State standards. Additional contributions to these criteria pollutants may cause a significant impact.

An air quality analysis will be conducted for the EIR to estimate air pollutant emissions during implementation of the proposed HDCP and to compare these estimates to the significance threshold criteria developed by the South Coast Air Quality Management District (SCAQMD). A determination of the significance of the emissions associated with the proposed HDCP will be made.

D) Expose sensitive receptors to substantial pollutant concentrations?

Potentially significant impact. The air quality analysis will evaluate the effect of increased traffic on local and regional air quality. Increased traffic generated by the proposed HDCP has the potential to result in congestion on existing roadways in the vicinity of the project site. Congestion on local roadways may result in the generation of carbon monoxide "hot spots" or exacerbate an existing "hot spot." Carbon monoxide "hot spots" (locations where pollutant levels exceed accepted federal and State standards), if any, will be identified in the air quality analysis and in the EIR.

E) Create objectionable odors affecting a substantial number of people?

Potentially significant impact. During construction, diesel operated machinery will be used in grading and building operations. The use of diesel may produce odors that may affect adjacent residences. This issue will be addressed in the EIR.

IV. BIOLOGICAL RESOURCES - Would the project:

A) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? and;

B) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Game or U.S. Fish and Wildlife Service? and;

C) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means? and;

D) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites? and;

E) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

Potentially significant impact. The project site contains disturbed, non-native vegetation such as non-native grasslands and developed/ ornamental landscaping, as well as sensitive native habitat such as coastal sage scrub, maritime succulent scrub, and coastal bluff scrub. The coastal sage scrub habitat provides habitat for a number of sensitive plant and animal species, including Blochman's

dudleya and the California gnatcatcher. The site also contains one of four known populations of the pacific pocket mouse in Southern California. The site contains a minor ephemeral drainage that may be jurisdictional to the U.S. Army Corps of Engineers.

The site also contains coastal resources such as a sandy beach and rocky intertidal/bluff face habitats adjacent to the site at the shoreline of the Pacific Ocean. Offshore, the site is bounded by the Niguel Marine Life Refuge and the Dana Point Marine Life Refuge, which are home to sensitive marine life. The EIR will address direct and indirect impacts to these resources.

The project proposes substantial alterations to the existing setting, which have the potential to significantly impact the biological resources found on the site. The project is listed as a Planned Activity in the adopted Central/Coastal Orange County Natural Community Conservation Plan (NCCP). The EIR will discuss the project's impacts to on-site and off-site biological resources and assess project effects in relation to the NCCP, the City's General Plan, and other applicable regulations protecting biological resources.

F) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

Less than significant impact. The project proposes substantial alterations to the existing setting, which have the potential to significantly impact the biological resources found on the site. The project is listed as a Planned Activity in the adopted Central/Coastal Orange County Natural Community Conservation Plan (NCCP). The EIR will discuss the project's impacts to on-site and off-site biological resources and assess project effects in relation to the NCCP, the City's General Plan, and other applicable regulations protecting biological resources.

V. CULTURAL RESOURCES - Would the project:

A) Cause a substantial adverse change in the significance of an historical resource as defined in §15064.5? and;

B) Cause a substantial adverse change in the significance of an archaeological resource pursuant to §15064.5?

Less that significant with mitigation incorporated. A records search was performed in 1998 for the project site. No historical resource was identified within the site, and no resource was identified within one mile of the site. Two prehistoric archaeological sites have been identified on the site, along with an unrecorded scatter of historic archaeological debris (South Central Coastal Information Center correspondence, June 9, 1998). Large portions of the site have been disturbed due to grading for trailer pads, internal roadways, and the former Dana Strand Club. Subsequent site surveys have failed to locate significant surface evidence of the sites. However, subsurface resources could be unearthed during grading and excavation. The proposed project will substantially change the site through mass grading and excavation. There is the potential that unknown historic and prehistoric resources could be affected by grading and excavation. The EIR will incorporate a summary of

previous site surveys, records checks, and relevant information to address prehistoric and historical resources at the project site.

C) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

Less than significant with mitigation incorporated. The proposed project may directly or indirectly destroy unknown paleontological resources or unique geologic features. The EIR will incorporate a paleontological resources technical report, site survey, and records check to address potential impacts to unknown resources.

D) Disturb any human remains, including those interred outside of formal cemeteries?

Less than significant with mitigation incorporated. To ensure that the proposed project will not disturb any human remains, EIR analysis will incorporate relevant information on previous site visits and records checks to address potential for historic and prehistoric resources and unknown human remains at the project site.

VI. GEOLOGY AND SOILS - Would the project:

A) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:

i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42. and;

ii) Strong seismic ground shaking? and;

iii) Seismic-related ground failure, including liquefaction? and;

iv) Landslides?

Potentially significant impact. The project site is located in a seismically active region near major faults. A geotechnical analysis will be conducted for the EIR to evaluate potential geologic constraints. No active fault has been identified on the project site and the site is not designated a fault hazard zone on the Alquist-Priolo Fault Zoning Map. Therefore, under A(i), above, there is not anticipated to be any risk of on-site fault rupture. Portions of the site are overlain with potentially unstable geologic conditions associated with several inactive landslides. A geotechnical analysis will be included in the EIR to evaluate potential secondary seismic impacts to the site, such as ground shaking, liquefaction potential, settlement, landslide, and subsidence. Grading plans and removal/recompaction of unstable geologic conditions will be described and analyzed.

B) Result in substantial soil erosion or the loss of topsoil? And;

C) Be Located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse? And;

D) Be located on expansive soil, as defined in Table 18-1-b of the Uniform Building Code (1994), creating substantial risks to life or property?

Potentially significant impact. Previous development of the property for the mobile home park provided an extensive storm drain system. The storm drain lines are in a state of disrepair, resulting in undermining of storm drains in several locations. This has created some deep wash-outs in the strand area. Implementation of the project may increase erosion potential due to exposure of soil during and immediately after grading. During construction, short-term erosion will occur from grading and trenching activities. The short-term erosion potential will be evaluated in the EIR and mitigation measures identified to reduce potentially significant impacts if necessary.

As discussed above, the strand area includes areas of geologic instability resulting from the presence of several inactive landslides. Topographic changes, remedial grading, terraced grading, soil removal and compaction, grading operations, and proposed erosion control methods will be described and analyzed in the EIR.

Geotechnical and soil constraints, such as expansive, compressible and/or corrosive soils, unconsolidated soils, and landslides will be identified as part of the geotechnical analysis conducted for the HDCP.

E) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?

No impact. No septic systems are proposed. Septic systems in place for the mobile home park and the greenhouse area will be removed.

VII. HAZARDS AND HAZARDOUS MATERIALS - Would the project:

A) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

Less than significant with mitigation incorporated. Planned land uses within the proposed HDCP include residential; visitor/recreation commercial; recreation and conservation open space uses; and public roadways. These uses do not generally have the need to store substantial amounts of hazardous materials/substances such as oil, pesticides, chemicals, gas or radiation. There are several structures on site that will be demolished. These structures were constructed prior to 1972 when federal regulations banned asbestos in construction. Therefore, AQMD permits may be required for demolition. This issue will be addressed in the EIR.

B) Create a significant hazard to the public or the environment through reasonable foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

Less than significant with mitigation incorporated. Planned land uses within the proposed project include residential; visitor/recreation commercial; recreation and open space uses; and public roadways; these uses do not generally emit or require storage of hazardous materials that may result in health hazards to adjacent sensitive land uses. Previous development on site included electrical transformers and switches that may contain PCB, a hazardous material. The potential for the proposed project to pose a health hazard to adjacent land uses will be assessed in the EIR, and mitigation measures will be explored in the EIR to reduce potentially significant impacts.

C) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

Less than significant with mitigation incorporated. A school exists within one-quarter mile of the site. Planned land uses within the proposed project include residential, visitor/recreation commercial, recreation and conservation open space uses, which do not generally emit or require storage of hazardous materials that may result in health hazards to adjacent sensitive land uses. Potential impacts to the school from construction activities will be assessed in the EIR.

D) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No impact. The site is not included on any government agency list of hazardous materials spills, accidents, or underground storage tanks. No evidence exists to indicate that the site would create a significant health hazard.

E) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?

No impact. The site is not within an Airport Land Use Plan or in close proximity to any airport. Therefore, there is no potential effect.

F) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?

No impact. The proposed project is not located within the vicinity of a private airstrip; therefore, the project would not result in a safety hazard.

G) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

Less than significant with mitigation incorporated. Implementation of the proposed project will result in a new concentration of development and people that may not be anticipated in adopted City emergency plans. Affected agencies will be consulted regarding the compatibility of the proposed project with City emergency plans and evacuation routes.

H) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?

Less that significant with mitigation incorporated. The project site is located within a densely urbanized area and is not subject to wildland fires from surrounding areas; however, the project will be required to prepare a fuel modification plan, which will be finalized in the EIR. The 24.2 acre conservation park is a natural fuel source for a potential wildland fire. (Reference: Development Application Aerial Photograph and Environmental Information Worksheet.)

VIII. HYDROLOGY AND WATER QUALITY - Would the project:

A) Violate any water quality standards or waste discharge requirements? and;

B) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted? and;

C) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site? and;

D) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site? and;

E) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff? and;

F) Otherwise substantially degrade water quality?

Potentially Significant Impact. The watershed for the site, which forms the study area for the drainage report, includes approximately 26.2 acres of developed property adjacent to the site in addition to the 121.3 acre project site. Currently, stormwater runoff from the watershed flows to three general areas, all of which eventually reaches the Pacific Ocean: Strand Beach, Dana Point Harbor, and over the bluff edges in the vicinity of the Headlands Promontory (Dana Point) and Harbor Point.

In the existing condition, stormwater is conveyed by adjoining parking lot swales and gutters, improved storm drains in abutting and on-site streets, and man-made "V" ditches and natural drainages. Most of the existing stormwater runoff from the site is generated by impervious surfaces on the site and adjacent properties within the watershed area. This urban runoff contains pollutants associated with urban uses and causes erosion, sedimentation, and other water quality impacts. Runoff from existing uses in and around Dana Point Harbor currently contributes to water quality concerns in the vicinity of the Harbor. The project site is under the jurisdiction of the San Diego Regional Water Quality Control Board (RWQCB), a state agency which regulates discharges into the state's waters.

Implementation of the project would result in an increase in the rate and amount of stormwater runoff generated from the watershed that includes the site. The project would include the installation of catch basins in the streets, storm drain lines sized to serve the project site and the adjoining tributary areas, filtering devices, energy dissipating structures, and storm drain outlets near the Pacific Ocean or connecting to existing public outlets in Dana Point Harbor. The storm drain system would maintain generally the same drainage pattern of the site, though in a more developed condition. Drainage flowing to the coastal bluffs on the Headlands would continue.

As a result of the proposed development, most of the erosion caused by existing degraded storm drain conditions throughout the site would be eliminated because surface flow would be confined to improvements and flows controlled through energy dissipation devices. Due to the increase in urban uses on site as a result of the project, including streets and residential and commercial uses, the project has the potential to increase the amount of pollution flowing to Dana Point Harbor and the ocean. This increase in urban runoff from the project site has the potential to degrade water quality and could violate existing water quality standards that are designed to protect human health and the health of the marine ecosystem if not adequately mitigated. Technical reports will be prepared to describe potential water quality impacts from construction activities and from long-term operation of the project. Project facilities designed to mitigate these effects will be discussed.

G) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or Other flood hazard delineation map? and;

H) Place within a 100 year flood hazard area structures which would impede or redirect flood flows?

Potentially significant impact. The project site is not within a Flood Hazard zone nor is it within a designated floodway and, therefore, would not be affected by flood hazard or alter flood flows. The

project site is potentially within a wave runup area (City of Dana Point General Plan, Figure PS-3, Flood Hazard Area). Impacts will be addressed in the EIR.

I) Expose people or structures to a significant risk of loss, injury or death, involving flooding, including flooding as a result of the failure of a levee or dam?

Potentially significant impact. The project site is not within a dam inundation area and, therefore, would not be affected by dam inundation hazards.

J) Inundation by seiche, tsunami, or mudflow?

Potentially Significant Impact. Due to the proximity to the Pacific Ocean, the project may be affected by tsunami. This issue will be addressed in the EIR.

IX. LAND USE AND PLANNING - Would the project:

A) Physically divide an established community?

Less than significant impact. The proposed project will not physically divide an established residential community. The project site is located in an area of the city with urban development that ranges from residential development at densities of 5 to 22 dwelling units per acre to commercial and visitor/recreation commercial land uses typical of those associated with PCH and the Street of the Green Lantern. The site is surrounded by urbanized uses on three sides. Two additional sides face the Pacific Ocean. The majority of the project site overlooks the Pacific Ocean, with areas in the southern portion overlooking Dana Point Harbor. The project site surrounds two existing residential enclaves. Although these developments are encompassed by and take access through the project site, they are not included as a part of the proposed project. Implementation of the project will eliminate a private road easement, Marguarita Avenue, and provide a new point of access to serve the western residential enclave from Selva Road. This may result in temporary disruption.

The existing use of the proposed project site does not physically connect an established community. However, there are existing public paths or roads through the site. Proposed project improvements will provide increased public access between established communities and coastal access proposed on site.

Potential impacts of developing existing vacant/semi-vacant land to residential and visitor/recreation commercial uses may result in changes to the character and appearance of the site. This issue will be addressed in the EIR.

B) Conflict with applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?

Potentially significant impact. The proposed project may potentially conflict with plans, goals and objectives in the City of Dana Point General Plan, plans or policies adopted by regional and subregional planning agencies, such as the Southern California Association of Governments (SCAG) and South Coast Air Quality Management District (SCAQMD), and the Local Coastal Program. As part of the application, the project applicant is requesting approval of a General Plan Amendment and Local Coastal Program Amendment. These actions, if approved, would bring the project into compliance with the abovementioned plans and programs. An evaluation of the project's compatibility with the relevant environmental plans and policies in the City's General Plan and the Local Coastal Program will be included in the EIR, as well as analysis of the project's compatibility with the above regional plans.

C) Conflict with any applicable habitat conservation plan or natural community conservation plan?

Less than significant with mitigation incorporated. The proposed project conforms to an adopted and functioning habitat conservation plan and the NCCP implementation agreement. In addition, a conservation areas are proposed to be set aside for on-site plant and animal species. The EIR will address project conformity with the NCCP.

X. MINERAL RESOURCES - Would the project:

A) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?

No impact. According to the City's General Plan, there are no mineral resources of regional or Statewide importance within the City of Dana Point.

B) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No impact. According to the City's General Plan, there are no mineral resources of local, regional, or Statewide importance within the City of Dana Point.

XI. NOISE - Would the project result in:

A) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies? and;

B) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project? and;

C) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?

Potentially significant impact. Increased traffic and public use generated by the proposed HDCP may result in increased noise levels along roadways adjacent to and surrounding the project site. Short-term noise will result during construction of the proposed project. A noise analysis will be conducted for the EIR to document the existing noise environment along adjacent roadways and land uses in the vicinity of the proposed project and to estimate the proposed project's potential effect on existing and projected future noise levels.

D) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?

Less than significant impact. Proposed project land uses include residential, recreation, and open space. None of these uses generate excessive groundborne vibration or noise levels. The commercial component will provide limited activity; however, these activities typically do not generate excessive groundborne vibration or noise levels. The noise analysis will analyze the potential for vibration or groundborne noise from these uses. The proposed project will result in short-term construction noise during the construction phase.

E) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

Less than significant impact. There is no airport within two miles of the project site.

F) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?

No impact. The proposed project is not located within the vicinity of a private airstrip. Therefore, the proposed project would not expose people residing or working in the project area to excessive noise levels.

XII. POPULATION AND HOUSING - Would the project:

A) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

Less than significant impact. The project site is surrounded by urban development. The General Plan designates the site for 261-570 homes and 12.5 acres of visitor/recreation commercial (V/RC). The proposed project will not induce substantial growth in the area either directly or indirectly. The proposed project will include new homes. There were 14,910 households in the City in 1998 *(personal communication: City Community Development Department, August 21, 2000)*. The proposed 125 new residential lots are less than one percent of the existing households. This is not considered substantial direct growth nor will it create indirect growth in the City. This impact is not considered significant.

The proposed project will include new businesses. The businesses will be located in two V/RC areas. The Pacific Coast Highway V/RC area will allow the development of approximately 40,000 square feet of V/RC development. The V/RC area will allow the development of a 65 room inn. The businesses that will occupy this space do not represent substantial direct new growth nor will they be anticipated to create indirect growth in the City due to the small size of the new businesses and the limited number of new employees that would potentially be hired for these businesses. This impact is not considered significant.

The proposed project will include the extension of roads and the construction and reconstruction of infrastructure. Roads will be extended to serve the recreation and conservation open space, visitor/recreation commercial, and residential land use. Additionally, infrastructure will be reconstructed and constructed to serve the proposed land uses. The project is an "in-fill" parcel within an existing developed community. No additional significant extension of roads and infrastructure to development "fringe" areas is proposed. This impact is not considered significant. This issue will be discussed further in a growth inducement section.

B) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?

No impact. No existing housing units are located within the proposed HDCP site, and housing displacement impacts will not occur. Therefore, this issue will not be discussed in the EIR.

C) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?

No impact. No existing housing units are located within the proposed HDCP site, and housing displacement impacts will not occur. Therefore, this issue will not be discussed in the EIR.

XIII. PUBLIC SERVICES

A) Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times or other performance objectives for any of the public services: Fire protection? Police protection? Parks? Other public facilities?

Less than significant with mitigation incorporated. Implementation of the proposed project will result in additional demand on existing public services, including City fire and police protection, schools and water. Affected purveyors of public services will be contacted to determine the level of existing services, projected future capacity, and the ability to accommodate the increased demand associated with the proposed project. The EIR will include an assessment of the project's effect on public services.

Schools?

Potentially significant impact. Schools in the general area are experiencing growth in student population. This has led to the need to build additional classrooms and schools. The proposed project will add to this demand and to the overcrowding impacts in area schools. This impact will be addressed in the EIR.

XIV. RECREATION

A) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

Potentially significant impact. Implementation of the proposed HDCP may increase demand for local or regional parks or other recreational facilities in the area, since it is primarily a residential and open space project, which generates permanent residents and an ongoing demand for recreational resources. There may be a substantial increase in beach, shoreline and harbor parks and open space visitation resulting from project development. This issue will be assessed in the EIR.

B) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

Potentially significant impact. The project proposes recreational facilities and open space access and requires the construction or expansion of recreational and open space facilities. This issue will be addressed in the EIR.

XV. TRANSPORTATION/TRAFFIC - Would the project:

A) Cause an Increase in Traffic Which Is Substantial in Relation to the Existing Traffic Load and Capacity of the Street System (I.e., Result in a Substantial Increase in Either the Number of Vehicle Trips, the Volume to Capacity Ratio on Roads, or Congestion at Intersections)?

Potentially significant impact. Implementation of the proposed project will result in vehicle trips that were not previously forecast in the Transportation Element of the City's General Plan, and there is a potential that this increase in trips may result in congestion on roadways adjacent to the project site. A traffic analysis will be conducted for the EIR to evaluate the effect of the proposed project on existing and projected traffic volumes on roadways within the City.

B) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?

Potentially significant impact. Project impacts to county congestion management roads and highways may occur. A transportation impact analysis report shall be prepared to determine project and cumulative impacts.

C) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?

No impact. Air traffic movement will not be directly affected by the proposed project due to the absence of such facilities within the project site and the limited potential for the proposed project to affect the existing facilities. Therefore, this issue will not be discussed in the EIR.

D) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

Potentially significant impact. Design of the proposed HDCP does not include roadway improvements that incorporate hazardous design features, such as sharp curves or dangerous intersections that may affect public safety. All street access will be designed and constructed at grade, and will provide adequate sight distance and traffic control measures to allow smooth traffic flow on site and reduce potential pedestrian/vehicle conflicts. However, public access on the site and through the site from adjacent development may cause vehicle/pedestrian conflicts. This issue will be addressed in the EIR.

E) Result in inadequate emergency access?

Potentially significant impact. Project vehicle access and emergency access will be altered by the project. The effect of implementation of the proposed HDCP on emergency access and access to adjacent uses will be evaluated in the EIR.

F) Result in inadequate parking capacity?

Potentially significant impact. A parking analysis will be prepared to identify the adequacy of the proposed parking supply in relation to City parking requirements. The analysis will include parking generation for land uses proposed for the project, and will determine whether the proposed parking supply is sufficient to accommodate the overall parking demand of the mixed use project. This analysis will be incorporated into the EIR and will determine whether the proposed project affects parking demand at surrounding properties.

G) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?

Less than significant impact. Compatibility of the proposed HDCP with policies identified by the City, Orange County Transportation Authority, and SCAG regarding incorporation of facilities that accommodate alternative modes of transportation into new developments will be evaluated in the EIR.

XVI. UTILITIES AND SERVICE SYSTEMS - Would the project:

A) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?

Potentially significant impact. Wastewater generation from the project will be calculated and impacts described and, if necessary, mitigation will be reported in the EIR.

B) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Potentially significant impact. The proposed project will generate an increased amount of wastewater and may impact existing sewer lines in the project vicinity. The South Coast Water District will be contacted to determine capacity to accommodate the project.

C) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?

Potentially significant impact. The proposed project may generate increased stormwater runoff. The hydrology study will be prepared and analyze existing and potential stormwater runoff, and determine adequacy of existing facilities to accommodate project runoff.

D) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?

Less than significant impact. The proposed project is expected to have sufficient water supplies available to serve the project. The EIR will include analysis and documentation of the water supplies necessary to serve the proposed project.

E) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

Potentially significant impact. The proposed project is expected to have sufficient wastewater service capacity to serve the occupants. The water district will be contacted to determine wastewater impacts and capacity and water district ability to serve the project. As noted in XVI(B) above, this issue will be addressed in the EIR.

F) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?

Less than significant impact. The proposed project will be served by County of Orange landfills. Existing and programmed landfills owned by the County of Orange may be incrementally affected by increased solid waste generated by the project. This issue will be addressed in the EIR.

G) Comply with federal, state, and local statutes and regulations related to solid waste?

Less than significant impact. As with checklist response XVI(F) above, solid waste generation will be calculated for the project, and a discussion of impacts will be incorporated into the EIR.

XVII. MANDATORY FINDINGS OF SIGNIFICANCE

A) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

Potentially significant impact. There will be potentially significant effects on biological resources with the implementation of the proposed project. The proposed project's potentially significant effect on unknown prehistoric resources will be evaluated in the EIR.

B) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Potentially Significant Impact. In conjunction with other development within the City of Dana Point, the proposed HDCP has the potential to contribute significantly to cumulative impacts on traffic, noise, and air quality. An assessment of the cumulative impacts of the proposed project and reasonably foreseeable future projects will be conducted.

C) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

Potentially significant impact. Increases in traffic related noise and air pollutant emissions, alteration of views, the introduction of new lighting and glare sources, and cumulative regional air quality and traffic congestion may potentially have effects on persons in the vicinity of the project site. The EIR will assess the severity these effects generated by the proposed project.

IV. POSSIBLE RESPONSIBLE AND TRUSTEE AGENCIES

California Coastal Commission
South Coast District
245 West Broadway, Suite 38D
P.O. Box 1450
Long Beach, CA 90802-1450

California Department of Fish and Game - Region 5
330 Golden Shore, Suite 50
Long Beach, CA 90802

California Department of Water Resources
Attn: Ms. Nadell Gayou
1416 Ninth Street
Sacramento, CA 95814

Caltrans - District 12
Attn: Mr. Robert Joseph
3337 Michelson Drive, Ste. 380
Irvine, CA 92612-8894

County of Orange - Local Agency Formation Commission
Dana Smith, Executive Officer
10 Civic Center Plaza, Rm. 235
Santa Ana, CA 92701

County of Orange
George Britton, Manager EPPSD
P.O. Box 4048
Santa Ana, CA 92702-4048

San Diego Regional Water Quality Control Board
Bob Morris, Senior WRC Engineer
9117 Clairemont Mesa Blvd., Ste. A
San Diego, CA 92124-1331

South Coast Air Quality Management District
Attn: Ms. Cindy Greenwald
Planning Manager
21865 E. Copley Drive
Diamond Bar, CA 91765

South Coast Water District
Attn: Glen Kau, Principal Engineer
P.O. Box 30205
Laguna Niguel, CA 92607-0205

U.S. Army Corps of Engineers (COE)
L.A. District
300 N. Los Angeles Street
P.O. Box 7211
Los Angeles, CA 90053-2325

Department of the Interior
U.S. Department of Fish and Wildlife Services
Attn: Jim Bartel
Carlsbad Fish and Wildlife Office
2730 Loker Avenue West
Carlsbad, CA 92008

V. NOP RECIPIENT LIST, HEADLANDS DEVELOPMENT AND CONSERVATION PLAN PROJECT DEIR

Aliso Water Management Agency (AWMA)
California Coastal Commission
California Department of Fish and Game - Region 5
Caltrans - District 12
Capistrano Valley Unified School District
City of Laguna Beach
City of Laguna Niguel
City of San Clemente
City of San Juan Capistrano
Cox Communications Company
County Water District
Internal City Distribution (City Council, City Manager, and Planning Commission)
Orange County Environmental Management Agency
Orange County Harbors, Beaches and Parks
Orange County Transportation Authority
Pacific Bell
San Diego Regional Water Quality Control Board
Sempra Energy
South Coast Air Quality Management District
South Coast Water District
Southern California Association of Governments (SCAG)
Southern California Gas Company
State Agencies through Office of Planning and Research (OPR) (21 agencies)
State Lands Commission
U.S. Fish and Wildlife Service

SCOPING ACTIVITIES

Agency Scoping Meeting

This meeting was held on Wednesday, July 25, 2001, from 3:00 to 4:30 p.m. at the Dana Point City Council Chambers, at 33282 Golden Lantern, Dana Point, California. An agency scoping meeting is an optional function under the practice of the City of Dana Point in notifying interested parties of the preparation of an Environmental Impact Report (EIR) and soliciting comments regarding the content of such documents.

During an open forum for participants to identify environmental issues to be addressed in the Draft EIR, the following environmental resource issues were identified:

- Speaker: Maryam Molavi; Transportation Planner; Division of Planning; Caltrans District 12
  - Address the traffic management plan requirements for the construction period
  - Suggests submission of plans or mitigation measures affecting Pacific Coast Highway or nearby freeway ramps for informal review by responsible Caltrans parties prior to circulation of the Draft EIR
  - Caltrans would be concerned about project hydrology that allowed stormwater to be discharge onto PCH

- Speaker: Eric Jessen; Supervisor, Programs Management; Harbors, Beaches & Parks Division; Public Facilities and Resources Department; County of Orange
  - Requested consideration of resource preservation easements over bluff face portions of the project area
  - Requested consideration of extending County jurisdiction to Strand Beach
  - Discussed stormwater drainage plans and effect on County owned Dana Point Harbor
  - Requested information regarding project proposed public access trails, open space, and visitor amenities

Public Scoping Meeting

This meeting was held on Wednesday, July 25, 2001, from 6:30 to 7:20 p.m. at the Dana Point City Council Chambers, at 33282 Golden Lantern, Dana Point, California. A public scoping meeting is an optional function under the practice of the City of Dana Point in notifying interested parties of the preparation of an EIR and soliciting comments regarding the content of such documents.

During an open forum for participants to identify environmental issues to be addressed in the Draft EIR, the following environmental resource issues were identified:

- Speaker: Ed Gallagher
  - Beach access after the proposed project is implemented
  - Traffic generated by operation of the proposed inn

- Speaker: Toni Gallagher
  - Traffic on Pacific Coast Highway as a result of the proposed project and, specifically, the proposed inn
  - Impacts of the proposed project on the Regetta neighborhood (visual and traffic)

- Proposed park areas of the proposed project/access to parks and beach

No other attendees identified any environmental issues to be addressed in the Draft EIR.

No other written comments were received from scoping meeting attendees regarding potential issues to be addressed in the environmental documentation for the proposed project.

SUMMARY OF NOP COMMENTS RECEIVED AND DISPOSITION OF ISSUES

Letters Received

Responses to the Notice of Preparation (NOP) were received by the following agencies:

AGENCY	DATE
California Coastal Commission,	August 1, 2001.
California Department of Fish and Game,	August 17, 2001.
California Department of Fish and Game,	July 23, 2001.
California Department of Transportation,	August 1, 2001.
California Regional Water Quality Control Board,	June 29, 2001.
City of San Juan Capistrano, CA,	August 10, 2001.
County of Orange, Planning & Development Services Department,	July 31, 2001.
Native American Heritage Commission,	July 11, 2001.
Orange County Fire Authority,	July 13, 2001.
Orange County Transportation Authority,	July 17, 2001.
Pacific Bell, South Regional Business Unit,	July 30, 2001.
Southern California Association of Governments,	July 18, 2001.
South Coast Air Quality Management District,	July 11, 2001.
South Coast Water District,	August 28, 2001.
South Coast Water District,	July 22, 2001.

Disposition Of Issues Raised In The NOP Comment Letters

The following table identifies the EIR Sections that address the issues raised in the NOP comment letters listed above. A list of acronyms used to abbreviate the agency names is provided below for the reader's use.

Acronym Definitions

Caltrans	Department of Transportation
CCC	California Coastal Commission
CDFG	California Department of Fish and Game
CMP	Congestion Management Plan
County	County of Orange
CRWQCB	California Regional Water Quality Control Board
NAHC	Native American Heritage Commission
OCFA	Orange County Fire Authority
OCTA	Orange County Transportation Authority
PacBell	Pacific Bell
SCAG	Southern California Association of Governments
SCAQMD	South Coast Air Quality Management District
SCWD	South Coast Water District

NOP ISSUES SUMMARY TABLE

Source/Comment	Section in Which Issue is Addressed
CDFG - Requirements/conditions of Subarea Plan and Implementing Agreement are to be met	Aesthetics Terrestrial Biological Resources Marine Biological Resources Cumulative Effects Hydrology Land Use Noise Transportation/Traffic Water Quality
CDFG - Specific impacts/mitigation requirements for wetlands or sensitive species and habitats not covered in the Subarea Plan and Implementing Agreement must be met	Terrestrial Biological Resources
CRWQCB - Project effects on drainage patterns	Hydrology
CRWQCB - Project effects on quantity of surface water and runoff	Water Quality
CRWQCB - Project effects on groundwater flow	Hydrology
CRWQCB - Required permits	Water Quality
SCWD - Wastewater pipelines must be constructed from the development to the Pacific Coast Highway Lift Station	Water Quality
SCWD - Potable water pipeline connection points must be engineered for District review	Water Quality
SCWD - Recycled water pipeline connection points must be engineered for District review	Water Quality
SCWD - Dry weather diversions	Hydrology
OCTA - OCTA is responsible for oversight of Congestion Management Program	Transportation/Traffic
SCAQMD - Construction related emissions	Air Quality
SCAQMD - Mitigation to minimize adverse air quality impacts	Air Quality

Source/Comment	Section in Which Issue is Addressed
NAHC - Contact NAHC for consultation and assistance with mitigation measures	Cultural and Paleontological Resources
NAHC - Sacred Lands File check	Cultural and Paleontological Resources
NAHC - Provisions for accidentally discovered archaeological resources	Cultural and Paleontological Resources
NAHC - Follow Health and Safety and Public Resources code in the event of an accidental discovery of human remains	Cultural and Paleontological Resources
County - Existing conditions of receiving waters as identified in Water Quality Control Plan - San Diego Basin	Water Quality
County - Water quality impairments in downstream receiving waters, per Clean Water Act and 1996 California Water Quality Assessment report	Water Quality
County - Runoff impacts resulting from impervious surfaces, pesticides, accidental spills	Water Quality
County - Stormwater Pollution Prevention Plan, Best Management Practices	Water Quality
County - Urban edge treatment plan to screen development and viewshed analysis relative to Dana Point Harbor	Aesthetics
County - Drainage should be directed into the ocean, not Dana Point Harbor	Water Quality
County - Safeguard the ambiance of the harbor and the ecological reserve	Aesthetics
County - Dedication of a resource preservation easement over the headlands bluff to a public agency	Land Use
County - Dedication of bluff top open space and promenade to a public agency	Land Use
County - Dedication of Hill Top Park and greenbelt linkage to the City	Land Use
County - Dedication of large bluff top Vista Park to a public agency	Land Use

Source/Comment	Section in Which Issue is Addressed
County - Dedication of Dana Strand Beach together with any related access ways to the County as an addition to its existing Salt Creek Beach Park	Land Use
County - Impact on Selva parking lot should be addressed	Transportation/Traffic
County - Trail and bikeway systems should be included as a component of the project	Land Use Recreation
County - DEIR should address potential impacts on regional parks and beaches	Land Use Recreation
County - County and Orange County Historical Commission would like to receive a copy of the Cultural Resources report	Cultural and Paleontological Resources
County - California Integrated Waste Management Board recommends the developer contact the City's recycling coordinator to ensure the project is in compliance with the City's program	Public Services
OCFA - Project may present significant impacts to existing fire and rescue services and a secured protection agreement with OCFA may be a condition of development	Public Services
City of San Juan Capistrano - Consistent with CMP, EIR traffic analysis should include ICU and HCM analysis of arterial intersections within San Juan Capistrano at which the project would increase traffic volumes by at least 1%	Transportation/Traffic
PacBell – Possible facility growth levels may require reinforcement to Pacific Coast Highway, Stonehill Road, Santa Clara, and Street of the Ruby Lantern	Utilities
Caltrans – Traffic study should be submitted to Caltrans for review	Transportation/Traffic
Caltrans – Describe pedestrian, bicycle, and transit along PCH property line	Transportation/Traffic

Source/Comment	Section in Which Issue is Addressed
Caltrans – Conform to NPDES Permit and discharge requirements of San Diego Regional Water Quality Control Board controls on vehicle loads and avoid tracking materials that may fall or blow onto Caltrans' roadways or facilities	Water Quality
Caltrans – Hydrology report should be submitted to Caltrans for review	Hydrology
Caltrans – Encroachment permit for activities in Caltrans' right-of-way is required	Transportation/Traffic
Caltrans – Stormwater Pollution Prevention Plan (SWPPP) or Water Pollution Control Program (WPCP) is required, pursuant to Caltrans' Stormwater Quality Handbook	Hydrology Water Quality
CCC – Certified LCP and coastal development permits are needed	Hydrology Water Quality Land Use
CCC – Analysis of traffic, public access, and recreational policies needed	Aesthetics Transportation/Traffic Recreation Land Use
CCC – Biological assessment incorporating Coast Act is needed	Terrestrial Biological Resources Marine Biological Resources Land Use
CCC – Analysis of geological remediation and/or bluff or shoreline protective works in conformance with Coastal Act	Hazardous Materials Geology and Soils Land Use
CCC – Identify impacts to wetlands	Terrestrial Biological Resources Hydrology
CCC – Identify impacts and mitigation measures related to coastal erosion, and include alternatives that will not rely on shoreline protective works	Cumulative Impacts Coastal Process Hydrology Geology and Soils Water Quality

Source/Comment	Section in Which Issue is Addressed
CCC – Visual Impact Assessment needed to address potential impacts to scenic vistas	Aesthetics Land Use
CCC – Best Management Practices needed to address urban stormwater runoff	Hydrology Water Quality
CCC – Archaeology/paleontology mitigation measures needed	Cultural and Paleontological Resources

STATE OF CALIFORNIA - THE RESOURCE GENCY

GRAY DAVIS, Governor

CALIFORNIA COASTAL COMMISSION

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RECEIVED
CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT

AUG 2 2 43 PM '01

August 1, 2001

Mr. Edward Knight
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Subject: **COMMENTS - NOTICE OF PREPARATION (NOP)**
Dana Point Headlands Development and Conservation Plan (HDCP)
City of Dana Point, Orange County
SCH# 2001071015

Dear Mr. Knight:

Commission staff received the subject NOP on July 2, 2001. Your NOP requested that comments be mailed within 30 days of receipt of the NOP. Commission staff understand the project being evaluated is the development of 125 residential lots, a 65 room inn, up to 40,000 square feet of visitor/recreational commercial use, 62 acres of public open space including 30.3 acres of conservation area on a 121.3 acre site. The following comments address the issue of the proposed project's consistency with the Chapter 3 policies of the California Coastal Act of 1976 which should be evaluated in the Environmental Impact Report (EIR). The comments contained herein are those of Coastal Commission staff only and should not be construed as representing the opinion of the Coastal Commission itself. As described below, the proposed project raises issues related to the provision of public access and recreational opportunities; protection of biological resources and environmentally sensitive habitat areas; cultural resources; geologic, flood, erosion, and wave uprush hazards; water quality; and visual impacts.

The entire property is located within the coastal zone in the City of Dana Point. Some portions of the site occur within an area of the City of Dana Point which has a Coastal Commission certified Local Coastal Program (LCP). The proposed development within the existing certified areas will require an amendment to the certified LCP and will require coastal development permits. In addition, the proposed project incorporates the Dana Strands area of the City, which presently does not have a certified local coastal program. A local coastal program will need to be certified for this area for the City to issue coastal development permits in Dana Strands. Otherwise, coastal development permits must be obtained directly from the Coastal Commission for the development located in the Dana Strands. In addition, the Commission retains jurisdiction over the issuance of coastal development permits for any portion of the development which occurs upon tidelands, submerged lands, and other lands subject to the public trust.

Public Access and Recreation

The proposed project is located on land that is between the first public road and the sea. Development of the site needs to provide public access and recreational opportunities. The NOP indicates that the proposed project provides public access and recreational elements. The EIR needs to analyze the consistency of the proposed project with the public access and recreational policies of the Coastal Act. Relevant policies include the following:

Section 30210 of the Coastal Act states:

> *In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall*

be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.

Section 30211 of the Coastal Act states:

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

Section 30212.5 of the Coastal Act states:

Wherever appropriate and feasible, public facilities, including parking areas or facilities, shall be distributed throughout an area so as to mitigate against the impacts, social and otherwise, of overcrowding or overuse by the public of any single area.

Section 30213 of the Coastal Act states, in relevant part:

Lower cost visitor and recreational facilities shall be protected, encouraged, and, where feasible, provided. Developments providing public recreational opportunities are preferred.

Section 30214 of the Coastal Act states, in relevant part:

(a) The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:

(1) Topographic and geologic site characteristics.

(2) The capacity of the site to sustain use and at what level of intensity.

(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses.

(4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter.

(b) It is the intent of the Legislature that the public access policies of this article be carried out in a reasonable manner that considers the equities and that balances the rights of the individual property owner with the public's constitutional right of access pursuant to Section 4 of Article X of the California Constitution. Nothing in this section or any amendment thereto shall be construed as a limitation on the rights guaranteed to the public under Section 4 of Article X of the California Constitution.

(c) In carrying out the public access policies of this article, the commission and any other responsible public agency shall consider and encourage the utilization of innovative access management techniques, including, but not limited to, agreements with private organizations which would minimize management costs and encourage the use of volunteer programs.

Section 30220 of the Coastal Act states:

Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

Section 30221 of the Coastal Act states:

Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and forseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.

Section 30222 of the Coastal Act states:

The use of private lands suitable for visitor-serving commercial recreational facilities designed to enhance public opportunities for coastal recreation shall have priority over private residential, general industrial, or general commercial development, but not over agriculture or coastal-dependent industry.

Section 30223 of the Coastal Act states:

Upland areas necessary to support coastal recreational uses shall be reserved for such uses, where feasible.

Section 30224 of the Coastal Act states:

Increased recreational boating use of coastal waters shall be encouraged, in accordance with this division, by developing dry storage areas, increasing public launching facilities, providing additional berthing space in existing harbors, limiting non-water-dependent land uses that congest access corridors and preclude boating support facilities, providing harbors of refuge, and by providing for new boating facilities in natural harbors, new protected water areas, and in areas dredged from dry land.

Section 30250 of the Coastal Act states:

(a) New residential, commercial, or industrial development, except as otherwise provided in this division, shall be located within, contiguous with, or in close proximity to, existing developed areas able to accommodate it or, where such areas are not able to accommodate it, in other areas with adequate public services and where it will not have significant adverse effects, either individually or cumulatively, on coastal resources. In addition, land divisions, other than leases for agricultural uses, outside existing developed areas shall be permitted only where 50 percent of the usable parcels in the area have been developed and the created parcels would be no smaller than the average size of surrounding parcels.

Section 30252 of the Coastal Act states:

The location and amount of new development should maintain and enhance public access to the coast by (1) facilitating the provision or extension of transit service, (2) providing

commercial facilities within or adjoining residential development or in other areas that will minimize the use of coastal access roads, (3) providing nonautomobile circulation within the development, (4) providing adequate parking facilities or providing substitute means of serving the development with public transportation, (5) assuring the potential for public transit for high intensity uses such as high-rise office buildings, and by (6) assuring that the recreational needs of new residents will not overload nearby coastal recreation areas by correlating the amount of development with local park acquisition and development plans with the provision of onsite recreational facilities to serve the new development.

Section 30255 of the Coastal Act states:

Coastal-dependent developments shall have priority over other developments on or near the shoreline. Except as provided elsewhere in this division, coastal-dependent developments shall not be sited in a wetland. When appropriate, coastal-related developments should be accommodated within reasonable proximity to the coastal-dependent uses they support.

The proposed provision of visitor serving commercial and lower cost public access and recreational opportunities appears to be in keeping with Coastal Act policies regarding such facilities. However, the EIR will need to contain sufficient information and analysis regarding the consistency of the project with Chapter 3 Coastal Act policies. For instance, the EIR will need to provide information regarding whether any component of the project will interfere with public access. The project description and analysis should also distinguish between publicly accessible trails, open space, and commercial areas and any trails, open space, and commercial ventures to which access would be limited to select persons (e.g. private parks, private trails, member-only clubs, etc.). In addition, as noted in Section 30222 of the Coastal Act, residential development is a lower priority use within the coastal zone. The EIR should analyze whether the provision of the lower cost public access and recreational opportunities and visitor serving commercial opportunities included in the project sufficiently counterbalance the proposed residential and other limited access development. The EIR should analyze whether sufficient open space and recreation area is available to serve the new residential development and the general public. The EIR should also analyze traffic impacts and proposed parking in order to assess whether the proposed development would adversely impact the public's ability to access the coast and whether sufficient parking will be available for persons wishing to utilize the recreational and access facilities to be provided in the project. The EIR should develop feasible alternatives which maximize public access and recreation opportunities and minimize or avoid adverse impacts upon public access and recreation.

Biological Resources

The NOP states that the subject site contains areas of disturbed non-native and ornamental vegetation as well as native habitat such as coastal sage scrub, maritime succulent scrub, and coastal bluff scrub. Sensitive plant and animal species include Blochman's dudleya, California gnatcatcher, and Pacific pocket mouse. The site may also contain ephemeral drainages. Other habitat includes sandy beach, rocky intertidal and bluff face habitats. The site is also bounded by two Marine Protected Areas including the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge.

A recent biological assessment must be prepared for the EIR to document the presence of all sensitive habitat and wildlife present on the subject site. In addition to cataloging the presence of plant and animal species, the biological assessment must identify the ecological interactions of these species on the site and the impact that the proposed project would have upon certain species and the ecological function of the site as a whole. Also, any wet habitat area delineation of the site must include a delineation which uses Coastal Act criteria for identifying wet habitat areas as outlined in the Coastal Act and the California Code of Regulations.

The NOP indicates that sensitive resources are present on the property which would be impacted by the proposed development. The EIR should include drawings which show existing habitat areas, compared with the proposed development. The drawings should indicate impact areas and mitigation areas on the site.

The site may contain wetlands and is known to be occupied by Blochman's dudleya, California gnatcatcher, and Pacific pocket mouse. These species and their habitat may be considered Environmentally Sensitive Habitat Area (ESHA) as defined under Section 30107.5 of the Coastal Act. Section 30240 of the Coastal Act requires that uses in and adjacent to an ESHA be compatible with the maintenance of the ESHA. Section 30240 is as follows:

> *(a) Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values, and only uses dependent on those resources shall be allowed within those areas.*
>
> *(b) Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

The environmental analysis must address the presence of ESHA on or adjacent to the subject site, and whether the proposed development is consistent with Coastal Act policies regarding ESHA's. The EIR should also develop feasible alternatives which would avoid impacts upon ESHA.

In addition, if wet habitat areas are present on the subject site and the proposed project would dredge and/or fill such areas, Section 30233 of the Coastal Act would govern such activities. Section 30233(a) of the Coastal Act states:

> *(a) The diking, filling, or dredging of open coastal waters, wetlands, estuaries, and lakes shall be permitted in accordance with other applicable provisions of this division, where there is no feasible less environmentally damaging alternative, and where feasible mitigation measures have been provided to minimize adverse environmental effects, and shall be limited to the following:*
>
> *(1) New or expanded port, energy, and coastal-dependent industrial facilities, including commercial fishing facilities.*
>
> *(2) Maintaining existing, or restoring previously dredged, depths in existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps.*

(3) In wetland areas only, entrance channels for new or expanded boating facilities; and in a degraded wetland, identified by the Department of Fish and Game pursuant to subdivision (b) of Section 30411, for boating facilities if, in conjunction with such boating facilities, a substantial portion of the degraded wetland is restored and maintained as a biologically productive wetland. The size of the wetland area used for boating facilities, including berthing space, turning basins, necessary navigation channels, and any necessary support service facilities, shall not exceed 25 percent of the degraded wetland.

(4) In open coastal waters, other than wetlands, including streams, estuaries, and lakes, new or expanded boating facilities and the placement of structural pilings for public recreational piers that provide public access and recreational opportunities.

(5) Incidental public service purposes, including but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines.

(6) Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas.

(7) Restoration purposes.

(8) Nature study, aquaculture, or similar resource dependent activities.

The EIR should identify any impacts to wetlands, the use causing the impact and whether such use is allowable under Section 30233 of the Coastal Act. If dredging or fill of wetlands will occur, the EIR should also identify whether there are feasible alternatives and whether the proposed project is the least environmentally damaging feasible alternatives. If the fill is allowable and is the least environmentally damaging feasible alternative, mitigation for the impacts should be identified.

Hazards/Bluff Stabilization/Shoreline Protective Works

The NOP indicates that the proposed project may include development that is subject to high geologic, flood, and wave uprush hazards. If geologic remediation and/or bluff or shoreline protective works will be involved, the EIR should analyze the proposed projects conformance with Sections 30235 and 30253 of the Coastal Act. Sections 30235 and 30253 (in relevant part) state:

Section 30235.

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

Section 30253.

New development shall:

(1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.

(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs…

The NOP indicates that geologic hazards and constraints will be identified and mitigation measures will be developed to address geologic hazards. Remediation of geologic hazards may require significant grading of the site. Grading to remediate hazards may require the alteration of natural landforms. Section 30253 of the Coastal Act encourages minimizing exposure to hazards. In addition, Section 30251 encourages avoidance of the alteration of natural landforms. The EIR should identify alternatives which would result in avoidance of geologic hazards and landform alteration. For development located near high hazard areas, such as along bluffs or near a landslide, the EIR should identify development setbacks which would minimize or avoid these hazards.

The NOP indicates that there is an existing revetment located in the Dana Strands portion of the proposed project area which protected a mobile home park that was demolished in the late 1980's. Since the mobile home park in the Dana Strands area is no longer present, the revetment does not appear to be protecting existing development. An engineering analysis prepared by an engineer with expertise in coastal processes should be prepared which analyzes coastal erosion along this area as well as the remaining areas of the project site. The analysis should investigate whether the revetment is needed to protect existing development or public beaches from erosion and alternatives for removal of any unneeded portions. In addition, protective devices can cause erosion elsewhere and have adverse impacts upon public access and visual quality. Therefore, any new proposed development should be designed to avoid reliance upon any existing, repaired, expanded, or new shoreline protective works. The EIR should identify impacts and mitigation measures related to coastal erosion and include project alternatives which will not rely upon shoreline protective works.

Aesthetics/Visual Impacts

As noted in the NOP, the proposed project would grade portions of the site and place structures upon land that is currently vacant. Grading of the site may result in landform alteration. In addition, the construction of structures on the site may impacts public views to and along the ocean in this scenic coastal area. Section 30251 of the Coastal Act states:

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

Recreation Plan prepared by the Department of Parks and Recreation and by local government shall be subordinate to the character of its setting.

The NOP notes that the proposed project may have a potentially significant impact upon scenic vistas and resources and notes the need for a visual impact assessment. A visual impact assessment would address whether impacts will occur. Meanwhile, the EIR must also identify any project alternatives which would minimize or avoid landform alteration and minimize or avoid the obstruction of public views.

Water Quality

As noted in the NOP, the proposed project would create urban development that would generate urban stormwater runoff that would be discharged to the Pacific Ocean. Urban stormwater runoff can have adverse impacts upon water quality and marine resources. Section 30230 of the Coastal Act states:

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

Section 30231 of the Coastal Act states:

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

The NOP indicates that mitigation measures will be developed to manage water quality impacts caused by the proposed development. The proposed measures must be sized and designed to mitigate water quality impacts generated by the development. The Commission has recently required that post-development peak runoff rates and average volume from the developed site should not exceed pre-development levels for the 2-year 24-hour storm runoff event. In addition, post-construction treatment control BMPs should be designed to mitigate (treat, infiltrate or filter) stormwater runoff from each storm event, up to and including the 85th percentile, 24-hour storm event for volume-based BMPs, and/or the 85th percentile, 1-hour storm event, with an appropriate safety factor, for flow-based BMPs. If the proposed water quality mitigation measures do not meet the above criteria, water quality could be adversely impacted. The EIR should address whether the proposed development meets the above guidelines and any impacts upon water quality which may result if the development is not consistent with the guidelines.

The EIR should also address construction phase impacts upon water quality such as soil discharges from exposed graded areas and soil stockpiles. The EIR should identify the impacts

with reference to those specific mitigation measures that will be implemented to reduce impacts to less than significant levels.

Archeology/Paleontology

The NOP states that cultural resources may be encountered at the subject site. Impacts to these resources will be "less than significant with mitigation incorporated". Section 30244 of the Coastal Act states,

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

Accordingly, the EIR must indicate whether the proposed project will adversely affect any archaeological or paleontological resources identified by the State Historic Preservation Officer. If such resources will be impacted, mitigation measures must be identified.

Local Coastal Program Amendment

The NOP indicates that the proposed project will require an amendment to the City's Local Coastal Program. The NOP also indicates that the proposed EIR would be intended to satisfy the CEQA requirements for all of the permits and approvals needed to implement the proposed project, including the Local Coastal Program Amendment. In order for the proposed Local Coastal Program Amendment land use policies and implementing ordinances to be adequately analyzed in the EIR, the language for the policies and ordinances should be made available as part of the EIR process.

Thank you for the opportunity to comment on the NOP. Commission staff request notification of any future activity associated with this project or related projects. Please note, the comments provided herein are preliminary in nature. More specific comments may be appropriate as more information becomes available and the project develops into final form.

Sincerely,

Karl Schwing
Coastal Program Analyst

Cc: State Clearinghouse

STATE OF CALIFORNIA-THE RESOURCES AGENCY GRAY DAVIS, *Governor*

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RECEIVED
CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT
AUG 21 2 37 PM '01

August 17, 2001

Mr. Edward M. Knight
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Comments on the Notice of Preparation (NOP) of a Draft Environmental Impact Report for Headlands Development and Conservation Plan (SCH# 2001071015)

Dear Mr. Knight:

The California Department of Fish and Game (Department) submits this NOP comment letter to replace the NOP comment letter dated July 23, 2001. The Department has reviewed the above referenced document in the City of Dana Point, County of Orange. The project's potential effects on sensitive species have been evaluated via the approved Orange County Central Coastal Subarea Plan and Implementing Agreement under the Natural Community Conservation Planning (NCCP) program. In preparing the environmental documentation for the proposed project, the Draft Environmental Impact Report must ensure and verify that all requirements and conditions of the Subarea Plan and Implementing Agreement are met. Biological issues that are not addressed in the Subarea Plan and Implementing Agreement, such as specific impacts to and mitigation requirements for wetlands or sensitive species and habitats that are not covered by the Subarea Plan and Implementing Agreement, also will need to be addressed.

Issue areas in the environmental report that may be influenced by the Subarea Plan and Implementing Agreement include "Land Use," "Landform Alteration/Visual Quality," "Traffic/Circulation," "Biological Resources," "Drainage/Urban Runoff/Water Quality," "Noise," and "Cumulative Effects." In addition, the environmental document should describe why the proposed project, irrespective of other alternatives to the project, is consistent with and appropriate in the context of the Subarea Plan.

Thank you for the opportunity to comment. Please contact Brad Henderson at (310) 214-9950 if you need to discuss this response.

Sincerely,

William E. Tippets

William E. Tippets
Environmental Programs Manager

cc: Department of Fish and Game
File
San Diego

Anne E. Hoecker
U.S. Fish and Wildlife Service
Carlsbad

State Clearinghouse
Sacramento

STATE OF CALIFORNIA - THE RESOURCES AGENCY GRAY DAVIS, *Governor*

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CITY OF DANA POINT
COMMUNITY DEVELOPMENT
DEPARTMENT
JUL 27 2 10 PM '01

July 23, 2001

Mr. Edward M. Knight
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Comments on the Notice of Preparation of a Draft Environmental Impact Report for the Headlands Development and Conservation Plan

(SCH# 2001071015)

Dear Mr. Knight :

The Department of Fish and Game (Department) appreciates this opportunity to comment on the above-referenced project, relative to impacts to biological resources. The project site supports several Rare Natural Communities including southern coastal bluff scrub, maritime succulent scrub, and coastal sage scrub. In addition, the site supports the California gnatcatcher (*Polioptila californica californica*), coastal cactus wren (*Campylorhynchus brunneicapillus couesi*), Pacific pocket mouse (*Perognathus longimembris pacificus*), and Blochman's dudleya (*Dudleya blochmaniae*). Several other rare plants and animals may potentially occur on the site.

To enable Department staff to adequately review and comment on the proposed project, we recommend the following information be included in the Draft Environmental Impact Report (DEIR):

1. A complete assessment of the flora and fauna within and adjacent to the project area, with particular emphasis upon identifying endangered, threatened, and locally unique species and sensitive habitats.

   a. A thorough assessment of rare plants and rare natural communities, following the Department's May 1984 Guidelines (revised May 2000) for Assessing Impacts to Rare Plants and Rare Natural Communities (Attachment 1).

   b. A complete assessment of sensitive fish, wildlife, reptile, and amphibian species. Seasonal variations in use of the project area should also be addressed. Focused species-specific surveys, conducted at the appropriate time of year and time of day when the sensitive species are active or otherwise identifiable, are required. Acceptable species-specific survey procedures should be developed in consultation with the Department and the U.S. Fish and Wildlife Service.

c. Rare, threatened, and endangered species to be addressed should include all those which meet the California Environmental Quality Act (CEQA) definition (see CEQA Guidelines, § 15380).

d. The Department's California Natural Diversity Data Base in Sacramento should be contacted at (916) 327-5960 to obtain current information on any previously reported sensitive species and habitat, including Significant Natural Areas identified under Chapter 12 of the Fish and Game Code.

2. A thorough discussion of direct, indirect, and cumulative impacts expected to adversely affect biological resources, with specific measures to offset such impacts, should be included.

a. CEQA Guidelines, § 15125(a), direct that knowledge of the regional setting is critical to an assessment of environmental impacts and that special emphasis should be placed on resources that are rare or unique to the region.

b. Project impacts should be analyzed relative to their effects on off-site habitats. Specifically, this should include nearby public lands, open space, adjacent natural habitats, riparian ecosystems, and any designated and/or proposed Natural Communities Conservation Planning (NCCP) reserve lands. Impacts to and maintenance of wildlife corridor/movement areas, including access to undisturbed habitat in adjacent areas, should be fully evaluated and provided.

c. A discussion of impacts associated with increased lighting, noise, human activity, changes in drainage patterns, changes in water volume, velocity, and quality, soil erosion, and /or sedimentation in streams and water courses on or near the project site, with mitigation measures proposed to alleviate such impacts should be included.

d. The zoning of areas for development projects or other uses that are nearby or adjacent to natural areas may inadvertently contribute to wildlife-human interactions. A discussion of possible conflicts and mitigation measures to reduce these conflicts should be included in the environmental document.

e. A cumulative effects analysis should be developed as described under CEQA Guidelines, § 15130. General and specific plans, as well as past, present, and anticipated future projects, should be analyzed relative to their impacts on similar plant communities and wildlife habitats.

f. If applicable, the document should include an analysis of the effect that the project may

have on completion and implementation of regional and/or subregional conservation programs. Under § 2800-§ 2840 of the Fish and Game Code, the Department, through the Natural Communities Conservation Planning (NCCP) program, is coordinating with local jurisdictions, landowners, and the Federal Government to preserve local and regional biological diversity. Coastal sage scrub is the first natural community to be planned for under the NCCP program. The Department recommends that the lead agency ensure that the development of this and other proposed projects do not preclude long-term preserve planning options and that projects conform with other requirements of the NCCP program. Jurisdictions participating in the NCCP program should assess specific projects for consistency with the NCCP Conservation Guidelines. Additionally, the jurisdictions should quantify and qualify: 1) the amount of coastal sage scrub within their boundaries; 2) the acreage of coastal sage scrub habitat removed by individual projects; and 3) any acreage set aside for mitigation. This information should be kept in an updated ledger system.

3. A range of alternatives should be analyzed to ensure that alternatives to the proposed project are fully considered and evaluated. A range of alternatives which avoid or otherwise minimize impacts to sensitive biological resources should be included. Specific alternative locations should also be evaluated in areas with lower resource sensitivity where appropriate.

   a. The Department considers Rare Natural Communities as threatened habitats having both regional and local significance. Thus, these communities should be fully avoided and otherwise protected from project-related impacts (Attachment 2).

4. Mitigation measures for adverse project-related impacts to sensitive plants, animals, and habitats should be discussed. Mitigation measures should emphasize avoidance and reduction of project impacts. For unavoidable impacts, on-site habitat restoration or enhancement should be discussed in detail. If on-site mitigation is not feasible, off-site mitigation through habitat acquisition and preservation in perpetuity should be addressed.

   a. The Department generally does not support the use of relocation, salvage, and/or transplantation as mitigation for impacts to rare, threatened, or endangered species. Studies have shown that these efforts are experimental in nature and largely unsuccessful.

   b. Areas reserved as mitigation for project impacts should be protected from future direct and indirect impacts. Potential issues to be considered include limitation of access, conservation easements, monitoring and management programs, control of illegal dumping, water pollution, and fire.

   c. Plans for restoration and revegetation should be prepared by persons with expertise in

southern California ecosystems and native plant revegetation techniques. Each plan should include, at a minimum: (a) the location of the mitigation site; (b) the plant species to be used, container sizes, and seeding rates; (c) a schematic depicting the mitigation area; (d) planting schedule; (e) a description of the irrigation methodology; (f) measures to control exotic vegetation on site; (g) specific success criteria; (h) a detailed monitoring program; (i) contingency measures should the success criteria not be met; and (j) identification of the party responsible for meeting the success criteria and providing for conservation of the mitigation site in perpetuity.

5. A California Endangered Species Act (CESA) Permit must be obtained, if the project has the potential to result in "take" of species of plants or animals listed under CESA, either during construction or over the life of the project. CESA Permits are issued to conserve, protect, enhance, and restore State-listed threatened or endangered species and their habitats. Early consultation is encouraged, as significant modification to a project and mitigation measures may be required in order to obtain a CESA Permit. Revisions to the Fish and Game Code, effective January 1998, may require that the Department issue a separate CEQA document for the issuance of a 2081 permit unless the project CEQA document addresses all project impacts to listed species and specifies a mitigation monitoring and reporting program that will meet the requirements of a 2081 permit. For these reasons, the following information is requested:

   a. Biological mitigation monitoring and reporting proposals should be of sufficient detail and resolution to satisfy the requirements for a CESA Permit.

   b. A Department-approved Mitigation Agreement and Mitigation Plan are required for plants listed as rare under the Native Plant Protection Act.

6. The Department has responsibility for wetland and riparian habitats. It is the policy of the Department to strongly discourage development in wetlands or conversion of wetlands to uplands. We oppose any development or conversion which would result in a reduction of wetland acreage or wetland habitat values, unless, at a minimum, project mitigation assures there will be "no net loss" of either wetland habitat values or acreage. Development and conversion include but are not limited to conversion to subsurface drains, placement of fill or building of structures within the wetland, and channelization or removal of materials from the streambed. All wetlands and watercourses, whether intermittent or perennial, should be retained and provided with substantial setbacks which preserve the riparian and aquatic values and maintain their value to on-site and off-site wildlife populations.

   a. A jurisdictional delineation of lakes, streams, and associated riparian habitats should be included in the EIR, including a wetland delineation pursuant to the U. S. Fish and

Wildlife Service wetland definition adopted by the Department[1]. Please note that some wetland and riparian habitats subject to the Department's authority may extend beyond the jurisdictional limits of the U.S. Army Corps of Engineers.

b. The project may require a Lake or Streambed Alteration Agreement, pursuant to Section 1600 *et seq.* of the Fish and Game Code, with the applicant prior to the applicant's commencement of any activity that will substantially divert or obstruct the natural flow or substantially change the bed, channel, or bank (which may include associated riparian resources) of a river, stream or lake, or use material from a streambed. The Department's issuance of a Lake or Streambed Alteration Agreement for a project that is subject to CEQA will require CEQA compliance actions by the Department as a responsible agency. The Department as a responsible agency under CEQA, may consider the local jurisdiction's (lead agency) Negative Declaration or EIR for the project. To minimize additional requirements by the Department pursuant to Section 1600 *et seq.* and/or under CEQA, the document should fully identify the potential impacts to the lake, stream or riparian resources and provide adequate avoidance, mitigation, monitoring and reporting commitments for issuance of the agreement[2].

The Department holds regularly scheduled pre-project planning/early consultation meetings. To make an appointment, please call our office at (858) 636-3160.

Thank you for this opportunity to comment. Questions regarding this letter and further coordination on these issues should be directed to Brad Henderson at (310) 214-9950.

Sincerely,

Donald R. Chadwick
Environmental Specialist Supervisor

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[1] Cowardin, Lewis M., et al. 1979. Classification of Wetlands and Deepwater Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service.

[2] A Streambed Alteration Agreement form may be obtained by writing to: Department of Fish and Game, 4949 Viewridge Avenue, San Diego, CA 92123, by calling (858) 636-3160, or by accessing the Department's web site at www.dfg.ca.gov/1600.

Attachments

cc: Department of Fish and Game
File
San Diego

Anne E. Hoecker
U.S. Fish and Wildlife Service
Carlsbad

State Clearinghouse
Sacramento

Guidelines for Assessing the Effects of Proposed Projects on Rare, Threatened, and Endangered Plants and Natural Communities

State of California
THE RESOURCES AGENCY
Department of Fish and Game
December 9, 1983
Revised May 8, 2000

The following recommendations are intended to help those who prepare and review environmental documents determine when a botanical survey is needed, who should be considered qualified to conduct such surveys, how field surveys should be conducted, and what information should be contained in the survey report. The Department may recommend that lead agencies not accept the results of surveys that are not conducted according to these guidelines.

1. Botanical surveys are conducted in order to determine the environmental effects of proposed projects on all rare, threatened, and endangered plants and plant communities. Rare, threatened, and endangered plants are not necessarily limited to those species which have been "listed" by state and federal agencies but should include any species that, based on all available data, can be shown to be rare, threatened, and/or endangered under the following definitions:

   A species, subspecies, or variety of plant is "endangered" when the prospects of its survival and reproduction are in immediate jeopardy from one or more causes, including loss of habitat, change in habitat, over-exploitation, predation, competition, or disease. A plant is "threatened" when it is likely to become endangered in the foreseeable future in the absence of protection measures. A plant is "rare" when, although not presently threatened with extinction, the species, subspecies, or variety is found in such small numbers throughout its range that it may be endangered if its environment worsens.

   Rare natural communities are those communities that are of highly limited distribution. These communities may or may not contain rare, threatened, or endangered species. The most current version of the California Natural Diversity Database's List of California Terrestrial Natural Communities may be used as a guide to the names and status of communities.

2. It is appropriate to conduct a botanical field survey to determine if, or to the extent that, rare, threatened, or endangered plants will be affected by a proposed project when:

   a. Natural vegetation occurs on the site, it is unknown if rare, threatened, or endangered plants or habitats occur on the site, and the project has the potential for direct or indirect effects on vegetation; or
   b. Rare plants have historically been identified on the project site, but adequate information for impact assessment is lacking.

3. Botanical consultants should possess the following qualifications:

   a. Experience conducting floristic field surveys;
   b. Knowledge of plant taxonomy and plant community ecology;
   c. Familiarity with the plants of the area, including rare, threatened, and endangered species;
   d. Familiarity with the appropriate state and federal statutes related to plants and plant collecting; and,
   e. Experience with analyzing impacts of development on native plant species and communities.

4. Field surveys should be conducted in a manner that will locate any rare, threatened, or endangered species that may be present. Specifically, rare, threatened, or endangered plant surveys should be:

   a. Conducted in the field at the proper time of year when rare, threatened, or endangered species are both evident and identifiable. Usually, this is when the plants are flowering.

ATTACHMENT 2

Sensitivity of Top Priority Rare Natural Communities in Southern California

Sensitivity rankings are determined by the Department of Fish and Game, California Natural Diversity Data Base and based on either number of known occurrences (locations) and/or amount of habitat remaining (acreage). The three rankings used for these top priority rare natural communities are as follows:

S1.# Less than 6 known locations and/or on less than 2,000 acres of habitat remaining.

S2.# Occurs in 6-20 known locations and/or 2,000-10,000 acres of habitat remaining.

S3.# Occurs in 21-100-known locations and/or 10,000-50,000 acres of habitat remaining.

The number to the right of the decimal point after the ranking refers to the degree of threat posed to that natural community regardless of the ranking. For example:

S1.1 = very threatened
S2.2 = threatened
S3.3 = no current threats known

Sensitivity Rankings (February 1992)

Rank	Community Name
S1.1	Mojave Riparian Forest
	Sonoran Cottonwood Willow Riparian
	Mesquite Bosque
	Elephant Tree Woodland
	Crucifixion Thorn Woodland
	Allthorn Woodland
	Arizonan Woodland
	Southern California Walnut Forest
	Mainland Cherry Forest
	Southern Bishop Pine Forest
	Torrey Pine Forest
	Desert Mountain White Fir Forest
	Southern Dune Scrub
	Southern Coastal Bluff Scrub
	Maritime Succulent Scrub
	Riversidean Alluvial Fan Sage Scrub
	Southern Maritime Chaparral
	Valley Needlegrass Grassland
	Great Basin Grassland
	Mojave Desert Grassland
	Pebble Plains
	Southern Sedge Bog
	Cismontane Alkali Marsh

STATE OF CALIFORNIA—BUSINESS AND TRANSPORTATION AGENCY GRAY DAVIS, Govern

DEPARTMENT OF TRANSPORTATION

DISTRICT 12
3347 Michelson Drive Suite 100
Irvine, CA. 92612-0661

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AUG 6 3 10 PM '01

FAX & MAIL

August 1, 2001

Edward Knight
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

File: IGR/CEQA
SCH#: 2001071015
Log #: 939
SR: PCH

Subject: The Headlands Development and Conservation Plan (HDCP)

Dear Mr. Knight,

Thank you for the opportunity to review and comment on the **Notice of Preparation (NOP) for the Headlands Development and Conservation Plan (HDCP) Draft Environmental Impact Report (EIR).** The HDCP proposes development of 125 residential lots, a 65 room inn, and up to 40,000 square feet visitor/recreation commercial use, 62 acres of public open space including 30.3 acres of natural resources conservation and associated infrastructure on 121.3 gross acres of land in the west central portion of the City of Dana Point. The project site is located on Pacific Coast Highway and Golden Lantern Street.

Caltrans District 12 status is a responsible agency on this project and has the following comments:

- According to the Transportation/Traffic section XV of the DEIR there are potential significant traffic impacts on PCH. Therefore, a traffic study report and mitigation measures to reduce the level of these impacts are to be submitted to Caltrans for review and comments.

- If increased levels of traffic generated by the project require expansion/modification of Caltrans facilities within the project vicinity (i.e., PCH/Selva Road, PCH/ Street of the Green Lantern), impacts need to be addressed in the environmental document. Special attention should be given to any proposed new access (openings/driveways) to the site from PCH. Further, please describe pedestrian, bicycle and transit along the PCH property line.

- Any runoff draining into the Caltrans Right of Way from construction operations or from the resulting project must fully conform to the Caltrans Statewide NPDES Permit (Order No. 99-06-DWQ, NPDES No. CAS000003) and the current discharge requirements of the San Diego Regional Water Quality Control Board to avoid impacting water quality. Controls must be implemented to contain all vehicle loads and avoid any tracking of materials that may fall or blow onto Caltrans roadways or facilities.

- Planned areas 4,5 and 6 surface runoff must be drained away from PCH.

- Please submit final design plans, hydraulic/hydrology study reports to Caltrans for review and comment.

- If any construction activity is to occur within the Caltrans Right of Way, the applicant must apply for an Encroachment Permit. As a condition of the application process, the applicant will be required to submit either a Storm Water Pollution Prevention Plan (SWPPP) or a Water Pollution Control Program (WPCP) pursuant to the Caltrans Storm Water Quality Handbook. In addition, biological and cultural impacts will have to be assessed to meet Caltrans standards.

- All activities in Caltrans right of way will require an encroachment permit. Applicants need to plan for sufficient permit processing time, which may include engineering and environmental studies and documentation.

Please continue to keep us informed of this project and other future developments, which could potentially impact our Transportation facilities. If you have any questions or need to contact us please do not hesitate to call Maryam Molavi at (949) 724-2267.

Sincerely,

Robert F. Joseph, Chief
Advanced Planning Branch

cc: Terry Roberts, OPR
Ron Helgeson, HDQRTRS Planning
Philip Brierly, Right of Way
Praveen Gupta, Environmental Planning
Roger Kao, Hydraulics
Raouf Moussa, Traffic Operation

California Regional Water Quality Control Board

San Diego Region

Internet Address: http://www.swrcb.ca.gov/~rwqcb9/
9771 Clairemont Mesa Boulevard, Suite A, San Diego, California 92124-1324
Phone (858) 467-2952 • FAX (858) 571-6972

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June 29, 2001

City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

ATTN: Edward M. Knight

Subject: **The Headlands Development and Conservation Plan**

Dear Mr. Knight,

We have received the subject documents and offer the following comments. We are also providing some additional information regarding the possible regulatory requirements for the subject project since this information has not been selected to be project-specific. Some of the information might not apply to this project.

We would like to see the following questions/concerns addressed in your Environmental Impact Report regarding the subject project:

a) Would the proposed project create a potentially significant adverse environmental impact to drainage patterns or the rate, or quantity of surface water and runoff?

b) Would the proposed project result in discharges into surface waters during or following construction, or in any way lead to a significant alteration of surface water quality including, but not limited to temperature, dissolved oxygen, turbidity or other typical urban storm water pollutants (e.g., metals, pathogens, synthetics, organics, sediment, nutrients, oxygen demanding substances.)?

c) Would the proposed project have a potentially significant adverse impact to groundwater flow though the alteration of pressure head (water table level) within the aquifer or though the interception of groundwater flow via cuts or excavation?

d) Would the proposed project result in the loss or degradation of any beneficial uses that have been designated for the water bodies that will be directly or indirectly affected by the project?

e) What mitigation measures are being proposed to eliminate or compensate for the adverse effects identified in (a) through (d) above?

Permits

There are six potential permits or approvals that might be needed from the Regional Quality Control Board during the life of a project. Additional information on these permits is provided to assist you in determining the permits that may be required for the proposed project; as well as to encourage project design modifications that may assist in obtaining all needed permits from the RWQCB or SWRCB.

During the construction and development phases of a project, the project could be subject to any one or more of four types of RWQCB permits or approvals. These include; (1) the Statewide National Pollutant Discharge Elimination System (NPDES) General Construction Activity Storm Water Permit, (2) the Clean Water Act 401 water quality Certification, (3) General Dewatering Permit, and (4) Dredging Permit. Upon completion of construction, and throughout the project's operational life, the project may be also subject to one or both of the following two types of RWQCB permits: (1) NPDES permit for any point source discharge of wastes to surface waters; and (2) State Waste Discharge Requirements (WDRs) for any waste discharge to land. Examples of discharges to land requiring WDRs include landfills, reclaimed water discharges from sewage treatment plants for irrigation purposes, sand and gravel operations, and animal confinement facilities.

Water quality degradation is regulated by the Federal National Pollutant Discharge Elimination System (NPDES) Program, established by the Clean Water Act, which controls and reduces pollutants to water bodies from point and non-point discharges. In California, the program is administered by the California Regional Water Quality Control Boards. The Regional Board issues NPDES permits for discharges to water bodies in the San Diego area, including Municipal (area- or county-wide) Storm Water Discharge Permits.

Construction SWPPP

Projects disturbing more than five acres of land during construction must be covered under the State NPDES General Permit for Discharges of Storm Water Associated with Construction Activity. This can be accomplished by filing a Notice of Intent (NOI). The project sponsor must propose and implement control measures that are consistent with this State Construction Storm Water General Permit, and with recommendations and policies of the local agency and the RWQCB.

Industrial SWPPP

Projects that include facilities with discharges of Storm Water Associated with Industrial Activity must be covered under the State NPDES General Permit for Discharges of Storm Water Associated with Industrial Activity. This may be accomplished by filing a Notice of Intent. The project sponsor must propose control measures that are consistent with this, and with recommendations and policies of the local agency and the RWQCB. In a few cases, the project sponsor may apply for (or the RWQCB may require) issuance of an individual (industry- or facility-specific) permit.

Municipal SWPPP

The RWQCB's San Diego Urban Runoff Municipal Permit requires San Diego area municipalities to develop and implement Storm Water Management Plans (SWMPs) The SWMPs must include a program for implementing new development and construction site storm water quality controls. The objective of this component is to ensure that appropriate measures to control pollutants from new development are: considered during the planning phase, before construction begins; implemented during the construction phase; and maintained after construction, throughout the life of the project.

Water Quality Certification

The RWQCB must certify that any permit issued by the U.S. Army Corps of Engineers pursuant to Section 404 of the Clean Water Act (covering, dredging, or filling of wetlands) complies with state water quality standards. Section 401 Water Quality Certification, or waiver, is necessary for all 404 Nationwide Permits, reporting and non-reporting, as well as individual permits.

Wetlands enhance water quality through such natural functions as flood and erosion control, stream bank stabilization, and filtration and purification of contaminants. Wetlands also provide critical habitats for hundreds of species of fish, birds, and other wildlife; offer open space; and provide many recreational opportunities. Adverse Water quality impacts can occur in wetlands from construction of structures in waterways, dredging, filling, and, otherwise altering the drainage to wetlands.

All projects must be evaluated for the presence of jurisdictional wetlands. Destruction or impact to wetlands should be avoided. Water quality certification may be denied based on significant adverse impacts to "Waters of the State." The goals of the California Wetlands Conservation Policy, include ensuring "no overall net loss and achieving a long-term net gain in the quantity, quality, and permanence of wetlands acreage and values." In the event wetland loss is unavoidable, mitigation will be preferably in-kind and on-site, with no net destruction of habitat value. Mitigation will preferably be completed prior to, or at least simultaneous to, the filling or other loss of existing wetlands.

Successful mitigation projects are complex tasks and difficult to achieve. This issue will be strongly considered during agency review of any proposed wetland fill. Wetland features or ponds created as mitigation for the loss of existing "jurisdictional wetlands" or "waters of the United States" cannot be used as storm water treatment controls.

CEQA requires monitoring of all mitigation efforts as a condition of project approval. Although monitoring programs are not required to be included in environmental documents, it is helpful to know what sort of mitigation monitoring the applicant intends to implement, and who will be accountable for seeing that any proposed mitigation's are successfully executed.

Project/ Site Planning

Evidence of filing for a NOI and development of a SWPPP should be a condition of development plan approval by all municipalities. Implementation of the SWPPP should be enforced during

construction via appropriate options such as citations, stop work orders, or withholding occupancy permits. Impacts identified should be avoided and minimized by developing and implementing the following.

The project should minimize impacts from project development by incorporating appropriate site planning concepts. This should be accomplished by designing and proposing site planning options as early in the project planning phases as possible. Appropriate site planning concepts to include, but are not limited to the following:

- Phase construction to limit areas and periods of impact.
- Minimize directly connected impervious areas.
- Preserve natural topography, existing drainage courses and existing vegetation.
- Locate construction and structures as far as possible from streams, wetlands, drainage areas, etc.
- Reduce paved area through cluster development, narrower streets, use of porous pavement and/or retaining natural surfaces.
- Minimize the use of gutters and curbs that concentrate and direct runoff to impermeable surfaces.
- Use existing vegetation and create new vegetated areas to promote infiltration.
- Design and lay out communities to reduce reliance on cars.
- Include, green areas for people to, walk their pets, thereby reducing build-up of bacteria, worms, viruses, nutrients, etc. in impermeable areas, or institute ordinances requiring owners to collect pets' excrement.
- Incorporate low-maintenance landscaping.
- Design and lay out streets and storm drain systems to facilitate easy maintenance and cleaning.
- Consider the need for runoff collection and treatment systems.
- Label storm drains to discourage dumping of pollutants into them.

Construction- Phase Management

Erosion Prevention

The project should minimize erosion and control sediment during and after construction. This should be done by developing and implementing an erosion control plan, or equivalent plan. This plan should be included in the SWPPP. The plan should specify all control measures that will be used or which are anticipated to be used, including, but not limited to, the following:

- Limit access routes and stabilize access points.
- Stabilize denuded areas as soon as possible with seeding, mulching, or other effective methods.
- Protect adjacent properties with vegetative buffer strips, sediment barriers, or other effective methods.
- Delineate clearing limits, easements, setbacks, sensitive areas, vegetation and drainage courses by marking them in the field.
- Stabilize and prevent erosion from temporary conveyance channels and outlets.
- Use sediment controls and filtration to remove sediment from water generated by dewatering or collected on-site during construction. For large sites, stormwater settling basins will often be necessary.
- Schedule grading for the dry season (May-Sept.)

Chemical and Waste Management

The project should minimize impacts from chemicals and wastes used or generated during construction. This should be done by developing and implementing a plan or set of control measures. The plan or control measures should be included in the Storm Water Pollution Prevention Plan. The plan should specify all control measures that will be used or which are anticipated to be used, including, but not limited to, the following:

- Designate specific areas of the site, away from streams or storm drain inlets, for storage, preparation, and disposal of building materials, chemical products, and wastes.
- Store stockpiled materials and wastes under a roof or plastic sheeting.
- Store containers of paint, chemicals, solvents, and other hazardous materials stored in containers under cover during rainy periods.
- Berm around storage areas to prevent contact with runoff.
- Cover open Dumpsters securely with plastic sheeting, a tarp, or other cover during rainy periods.
- Designate specific areas of the site, away from streams or storm drain inlets, for auto and equipment parking and for routine vehicle and equipment maintenance.
- Routinely maintain all vehicles and heavy equipment to avoid leaks.

- Perform major maintenance, repair, and vehicle and equipment washing off-site, or in designated and controlled areas on-site.
- Collect used motor oil, radiator coolant or other fluids with drip pans or drop cloths. Store and label spent fluids carefully prior to recycling or proper disposal.
- Sweep up spilled dry materials (cement, mortar, fertilizers, etc.) immediately—do not use water to wash them away.
- Clean up liquid spills on paved or impermeable surfaces using "dry" cleanup methods (e.g., absorbent materials, cat litter, rags) and dispose of cleanup materials properly.
- Clean up spills on dirt areas by digging up and properly disposing of the soil.
- Keep paint removal wastes, fresh concrete, cement mortars, cleared vegetation, and demolition wastes out of gutters, streams, and storm drains by using proper containment and disposal.

We appreciate the opportunity to comment on the subject environmental document and look forward to your response. If you have any questions regarding our concerns or questions, please do not hesitate to contact me at (858) 467-2705 or at lemop@rb9.swrcb.ca.gov.

Sincerely,

Paul Lemons

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San Juan Capistrano, CA 92675
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(949) 493-1053 (FAX)
www.sanjuancapistrano.org

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MEMBERS OF THE CITY COUNCIL
DIANE L. BATHGATE
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WYATT HART
DAVID M. SWERDLIN

CITY MANAGER
GEORGE SCARBOROUGH

August 10, 2001

Edward M. Knight, Community Development Director
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Subject: The Headlands Development and Conservation Plan, City of Dana Point (our file: Inter-jurisdictional Project Review 2001-05, Headlands Reserve LLC)

Dear Mr. Knight:

We appreciate the opportunity to comment on the Notice of Preparation (NOP) for the proposed Environmental Impact Report (EIR) for this project. Consistent with the State-mandated Congestion Management Plan (CMP), we would expect that the EIR traffic analysis will include ICU and HCM analysis of those arterial intersections within our City at which the project would increase traffic volumes by at least 1%.

When completed and available, please provide a review copy of the Draft EIR. Also, please mail all public meeting notices and CEQA-related notices for this project to:

George Scarborough, City Manager
City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, CA 92675

William A. Ramsey, AICP, Principal Planner
City of San Juan Capistrano
32400 Paseo Adelanto
San Juan Capistrano, CA 92675

We look forward to working with you and your staff on this project.

Sincerely,

William A. Ramsey, AICP
Acting Planning Director

WR:hs
C:\My Documents\WordPerfect Documents\Inter-jurisdictional\ij0105Headlands\ij0100headlands-le1.wpd
cc: George Scarborough, City Manager
Tom Tomlinson, Planning Director
William Huber, Engineering & Building Director
Alan Oswald, Senior Engineer-Traffic

DRUG USE IS LIFE ABUSE

County of Orange
Planning & Development Services Department

THOMAS B. MATHEWS
DIRECTOR

300 N. FLOWER ST.
SANTA ANA, CALIFORNIA

MAILING ADDRESS:
P.O. BOX 4048
SANTA ANA, CA 92702-4048

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NCL 01-57

July 31, 2001

Edward Knight, Director of Community Development
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

SUBJECT: NOP for Headlands Development and Conservation Plan (HDCP)

Dear Mr.Knight:

Thank you for the opportunity to respond to the above referenced project. The county of Orange has reviewed the NOP and offers the following comments:

WATER QUALITY

1. We recommend the following issues be addressed in the EIR:

   a) Existing conditions of Receiving Waters as identified in the Water Quality Control Plan - San Diego Basin (Basin Plan), with its goals and objectives for surface water quality;

   b) Water quality impairments in the downstream receiving waters, as reflected in the Clean Water Act 303(d) list and the 1996 California Water Quality Assessment Report;

   c) The potential surface water quality impacts of the project including but not limited to: construction activities, long-term runoff impacts of new impervious surfaces, pesticides and fertilizers applied to landscaping, future spills from accidents and/or improper business management of chemicals, as they relate to a. and b.; and

   d) Mitigations for project water quality impacts, which should include:

      (1). Preparation of a construction Stormwater Pollution Prevention Plan under State NPDES requirements;

(2). Development of a long-term post-construction water quality management plan, describing commitments to installation and maintenance of structural facilities and conduct of non-structural Best Management Practices (BMPs) consistent with the DAMP New Development Appendix.

2. The need for the incorporation of "special" structural BMPs, as defined in the Countywide Drainage Area Management Plan (DAMP) should be evaluated with respect to the size and nature of the development and the proximity to a waterbody impaired by the constituents of concern. This consideration could include the following resource documents:

a) Incorporation of Federal EPA/NOAA guidance measures for coastal nonpoint source pollution;

b) Incorporation of measures from the State Municipal BMP Manual;

c) Incorporation of other measures from the State Urban Runoff Technical Advisory Committee Report and Recommendations;

OPEN SPAE/RECREATION

3. Dana Point Harbor:

We recommend that the following protective measures for Dana Point Harbor and project mitigation measures be incorporated into the DEIR:

a) Provision of an urban edge treatment plan relative to Dana Point Harbor to screen project development.

b) Viewshed analysis of off-site views from Dana Point Harbor to the project be incorporated within the DEIR.

c) Currently the Harbor suffers from siltation caused by runoff from development regardless of the presence of catch basins. Sloughing also occurs from the subject property. The owner disclaims any responsibility because the land is in a natural condition. In order to avoid future dredging expense due to development, all drainage must be directed to the ocean, not Dana Point Harbor. In addition, the owner must take responsibility for the sloughing and slides that occur from subject property by taking corrective action and repairing any damage caused to harbor parcels below.

d) Light spillage and glare analysis within the DEIR should include mitigation to safeguard the ambiance of the harbor as well as the ecological reserve below the headlands. Intrusive light poses the potential to adversely affect the ambiance of the harbor at night and the behavior of marine wildlife.

e) Impacts to water quality within Dana Point Harbor should be addressed and incorporate mitigation measures and design features to comply with Regional Water Quality Control Board standards.

4. Public Benefits:

We suggest the following public benefits be incorporated as mitigation measures within the DEIR:

a) Dedication of a resource preservation easement over the headlands bluff face to a public agency. The County may be willing to consider acceptance of same if the City so desires.

b) Dedication of bluff-top open space and promenade to a public agency. The County may also be willing to consider acceptance of same, pending financial capability to do so, if the City so desires.

c) Dedication of Hill Top Park and greenbelt linkage to the City.

d) Dedication of previously promised (and not labeled) large bluff top Vista Park (please identify in the DEIR) to a public agency. The County may be willing to consider acceptance of same, pending financial capability to do so, if the City so desires.

e) Dedication of Dana Strand Beach together with any related access ways to the County as an addition to its existing Salt Creek Beach Park.

All these dedications are consistent with previous approvals and the previous Local Coastal Plan for this project.

5. Circulation/Parking Concerns:

a) Impact on the Selva parking lot should be addressed. It is apparent that anyone wishing to access project amenities would use the County's parking lot designed for its adjacent beach access way and which also serves Dana Point Harbor overflow via shuttle on event occasions and for shuttle for the Catalina passenger service.

b) A trail and bikeway system should be included as a component of the project and include both Class I Off-Road bikeways, and riding and hiking trails. Both types of trails should follow the same general routes, particularly along the bluff top adjacent the ocean side of the project linking other various open space planning areas and separated by varying width of open space.

c) Linkages to Pacific Coast Highway are desirable for trail and bikeway users

6. Other Concerns:

DEIR should address potential impacts on increased user demand upon regional parks, Dana Point Harbor, and other shoreline recreational facilities (i.e., Salt Creek Beach, Capistrano Beach Park etc.) from new visitation due to project implementation.

CULTURAL RESOURCES

7. The County of Orange HBP/Cultural and Historical Programs section along with the Orange County Historical Commission would like to receive a copy of the Cultural Resources report that will be prepared for the proposed EIR along with the Draft EIR.

8. We encourage the City of Dana Point to follow the Board of Supervisors example in determining that cultural resource artifacts found during the development of the site should be donated to a suitable repository that will maintain the collection for future scientific study and exhibition within Orange County. The project proponent should prepare any finds to the point of identification and be required to pay potential curation fees.

WASTE MANAGEMENT

9. The California Integrated Waste Management Board requires that all counties have an approved Countywide Integrated Waste Management Plan (CIWMP). To be approved, the CIWMP must demonstrate sufficient solid waste disposal capacity for at least 15 years, or identify additional available capacity outside of the County's jurisdiction. Orange County's CIWMP, approved in 1996, contains future solid waste disposal demand based on the County population projections previously adopted by the Board of Supervisors. The County's Integrated Waste Management Department's (IWMD) database shows that the Orange County landfill system has capacity in excess of 30 years. This is well above the 15-year threshold established by the California Integrated Waste Management Board.

   The County of Orange owns and operates three active landfills. The Olinda Alpha Landfill is the closest facility to the project, and will likely be the solid waste facility receiving the waste. Notwithstanding, the City of Stanton is under contract to IWMD to commit all of its waste to the County landfill system (not to a particular facility) until the year 2007. At the same time, the landfill system is accepting additional waste from outside Orange County. Under these circumstances, it has been agreed that should the cumulative effect of development cause the daily tonnage ceiling of a particular facility to be exceeded, the waste being imported to that facility will be reduced by a corresponding amount. Consequently, it may be assumed that adequate capacity for the subject project is available for the foreseeable future.

   Notwithstanding the availability of landfill capacity in the County system, the State of California has required that by the start of this year, each city and county demonstrate a reduction of at least 50% in the amount of waste from that jurisdiction that had gone into landfills in the year of 1990. Also, the State requires that this level of reduction be sustained in perpetuity. Waste haulers are expected to contribute by recycling residential and commercial waste they have collected, and project developers are expected to

employ measures to reduce the amount of construction-generated waste. IWMD recommends that the project developer contact the city recycling coordinator to ensure that the proposed project is in compliance with the city's program.

At this time, IWMD does not have information on solid waste generation rates in Orange County. Any questions about solid waste generation rates should be forwarded to the California Integrated Waste Management Board in Sacramento.

Thank you for the opportunity to respond the NOP. Please send one complete set of the DEIR to me at the above address when it becomes available. If you have any questions, please contact me or feel free to call Grace Fong directly. Grace may be reached at (714) 834-2708.

Very truly yours,

for George Britton, Manager
Environmental and Project
Planning Services Division

STATE OF CALIFORNIA

NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

Gray Davis, *Governor*

RECEIVED
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JUL 13 12 44 PM '01

July 11, 2001

Mr. Edward M. Knight
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

RE: SCH# 2001071015 – The Headlands Development and Conservation Plan

Dear Mr. Knight:

The Native American Heritage Commission has reviewed the above mentioned NOP. To adequately assess the project-related impact on archaeological resources, the Commission recommends the following action be required:

- ✓ Contact the Native American Heritage Commission for:
  - A Sacred Lands File Check.
  - A list of appropriate Native American Contacts for consultation concerning the project site and assist in the mitigation measures.
- ✓ Provisions for accidental discovery of archeological resources:
  - Lack of surface evidence of archeological resources does not preclude the existence of archeological resources. Lead agencies should include provisions for accidentally discovered archeological resources during construction per California Environmental Quality Act (CEQA) §15064.5 (f).
- ✓ Provisions for discovery of Native American human remains
  - Health and Safety Code §7050.5, CEQA §15064.5 (e), and Public Resources Code §5097.98 mandates the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery and should be included in all environmental documents.

If you have any questions, please contact me at (916) 653-4040.

Sincerely,

Rob Wood
Associate Governmental Program Analyst

CC: State Clearinghouse

ORANGE COUNTY FIRE AUTHORITY

P. O. Box 86, Orange, CA 92856-9086 • 180 South Water St., Orange, CA 92866-2123

Chip Prather, Fire Chief (714) 289-3712 www.ocfa.org

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July 13, 2001

Mr. Edward M. Knight
City of Dana Point
33282 Golden Lantern,
Dana Point, CA 92629

Re: Dana Point Headlands

Dear Mr. Knight

Thank you for the opportunity to comment on the Dana Point Headlands Notice of Preparation for a draft EIR. The Orange County Fire Authority (OCFA) has considered the potential impacts associated with this proposal and would like to offer some preliminary comment.

The OCFA has identified that the proposed project may present significant impacts to existing fire and rescue services. Currently, the OCFA is responsible for provision of these services to the project area. To mitigate these impacts, the applicant may be required to enter into a secured fire protection agreement with the OCFA as a condition of development.

The project will be subject to standard conditions of development. flows for the proposed project will be determined at the time of plans submittal.

We look forward to continued participation in the environmental review process for this project. Should you have any additional questions at this time please contact me at (714)744-0484.

Sincerely,

Michael S. Rohde
Battalion Chief, Advance Planning

OCTA

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DEPARTMENT

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Ex-Officio Member

July 17, 2001

Mr. Edward M. Knight
Community Development Director
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Subject: The Headlands Development and Conservation Plan (HDCP) Notice of Preparation of an Environmental Impact Report

Dear Mr. Knight:

The Orange County Transportation Authority (OCTA) has reviewed the above referenced document and has the following comments:

- The OCTA is responsible for overseeing the Congestion Management Program for Orange County. This should be reflected in *Table B: Potential Responsible and Trustee Agencies* on page 11.

The OCTA appreciates the opportunity to review and comment on this project. Please contact me with questions or comments at 714-560-5751 or cdolan@octa.net.

Sincerely,

Christine Dolan

Christine Dolan
Assistant Transportation Analyst

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AUG 3 2 54 PM '01

Pacific Bell
South Regional
Business Unit

July 30, 2001

Sandy Walter, Outside Plant Engineer
27402 Camino Capistrano, Rm. 105,
Laguna Niguel, Ca., 92677

Mr. Edward M. Knight, Community Development Director
City of Dana Point
33282 Golden Lantern,
Dana Point, Ca., 92629

RE: Response to Notice of Preparation for a Draft Environmental Impact Report for The Headlands Development and Conservation Plan (HDCP)

TO: Mr. Edward M. Knight,

Thank-You for sending Notice of Preparation for a Draft Environmental Impact Report which was received 7/26/01. After reviewing proposed project Pacific Bell Telephone Company does have some information concerning project. The fundamental feed for this development was originally to be off of new access road from Pacific Coast Highway.

According to this plan, some of project does not have road access thru to new roadway coming off of Pacific Coast Highway. Planning Areas 1 thru 3 would have access from Selva Rd only. Depending on existing facility growth levels, reinforcement back to Pacific Coast Highway and Stonehill Rd may be required.

Also Planning Area 7 thru 9 would be fed off of Street of the Green Lantern. Depending on Pair requirements, reinforcement back to Santa Clara and Street of the Ruby Lantern might be required.

If you should have any questions please do not hesitate to contact me on (949)855-5091.

Sincerely

Sandy Walter

Sandy Walter

SOUTHERN CALIFORNIA

ASSOCIATION of GOVERNMENTS

Main Office

818 West Seventh Street

12th Floor

Los Angeles, California

90017-3435

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San Bernardino County: Jon Mikels, San Bernardino County • Bill Alexander, Rancho Cucamonga • David Eshleman, Fontana • Lee Ann Garcia, Grand Terrace • Bob Hunter, Victorville • Gwenn Norton-Perry, Chino Hills • Judith Valles, San Bernardino

Ventura County: Judy Mikels, Ventura County • Glen Becerra, Simi Valley • Donna De Paola, San Buenaventura • Toni Young, Port Hueneme

Riverside County Transportation Commission: Robin Lowe, Hemet

Ventura County Transportation Commission: Bill Davis, Simi Valley

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CITY OF DANA POINT
COMMUNITY DEVELOPMENT
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JUL 20 1 24 PM '01

July 18, 2001

Mr. Edward M. Knight
Community Development Director
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

RE: SCAG Clearinghouse I20010366 The Headlands Development and Conservation Plan (HDCP)

Dear Mr. Knight:

We have reviewed the above referenced document and determined that it is not regionally significant per Areawide Clearinghouse criteria. Therefore, the project does not warrant clearinghouse comments at this time. Should there be a change in the scope of the project, we would appreciate the opportunity to review and comment at that time.

A description of the project was published in the **July 15, 2001** Intergovernmental Review Report for public review and comment.

The project title and SCAG Clearinghouse number should be used in all correspondence with SCAG concerning this project. Correspondence should be sent to the attention of the Clearinghouse Coordinator. If you have any questions, please contact me at (213) 236-1867.

Sincerely,

Jeffrey M. Smith for

JEFFREY M. SMITH, AICP
Senior Planner
Intergovernmental Review

South Coast
Air Quality Management District
21865 E. Copley Drive, Diamond Bar, CA 91765-4182
(909) 396-2000 • http://www.aqmd.gov

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July 11, 2001

Mr. Edward M. Knight
Community Development Director
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

Dear Mr. Knight:

Notice of Preparation of an Environmental Impact Report for
The Headlands Development and Conservation Plan

The South Coast Air Quality Management District (AQMD) appreciates the opportunity to comment on the above-mentioned document. The AQMD's comments are recommendations regarding the analysis of potential air quality impacts from the proposed project that should be included in the Draft Environmental Impact Report (EIR).

Air Quality Analysis

The AQMD adopted its California Environmental Quality Act (CEQA) Air Quality Handbook in 1993 to assist other public agencies with the preparation of air quality analyses. The AQMD recommends that the Lead Agency use this Handbook as guidance when preparing its air quality analysis. Copies of the Handbook are available from the AQMD's Subscription Services Department by calling (909) 396-3720.

The Lead Agency should identify any potential adverse air quality impacts that could occur from all phases of the project and all air pollutant sources related to the project. Air quality impacts from both construction and operations should be considered. Construction-related air quality impacts typically include, but are not limited to, emissions from the use of heavy-duty equipment from grading, earth-loading/unloading, paving, architectural coatings, off-road mobile sources (e.g., heavy-duty construction equipment) and on-road mobile sources (e.g., construction worker vehicle trips, material transport trips). Operation-related air quality impacts may include, but are not limited to, emissions from stationary sources (e.g., boilers), area sources (e.g., solvents and coatings), and vehicular trips (e.g., on- and off-road tailpipe emissions and entrained dust). Air quality impacts from indirect sources, that is, sources that generate or attract vehicular trips should be included in the evaluation. An analysis of all toxic air contaminant impacts due to the decommissioning or use of equipment potentially generating such air pollutants should also be included.

Mitigation Measures

In the event that the project generates significant adverse air quality impacts, CEQA requires that all feasible mitigation measures be utilized during project construction and operation to minimize or eliminate significant adverse air quality impacts. To assist the Lead Agency with identifying possible mitigation measures for the project, please refer to Chapter 11 of the AQMD CEQA Air Quality Handbook for sample air quality mitigation measures. Additionally, AQMD's Rule 403 – Fugitive Dust, and the Implementation Handbook contain numerous measures for controlling construction-related emissions that should be considered for use as CEQA mitigation if not otherwise required. Pursuant to state CEQA Guidelines §15126.4 (a)(1)(D), any impacts resulting from mitigation measures must also be discussed.

Data Sources

AQMD rules and relevant air quality reports and data are available by calling the AQMD's Public Information Center at (909) 396-2039. Much of the information available through the Public Information Center is also available via the AQMD's World Wide Web Homepage (http://www.aqmd.gov).

The AQMD is willing to work with the Lead Agency to ensure that project-related emissions are accurately identified, categorized, and evaluated. Please call Dr. Charles Blankson, Transportation Specialist, CEQA Section, at (909) 396-3304 if you have any questions regarding this letter.

Sincerely,

Steve Smith

Steve Smith, Ph.D.
Program Supervisor, CEQA Section
Planning, Rule Development and Area Sources

SS:CB:li

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Control Number

SOUTH COAST WATER DISTRICT

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COMMUNITY DEVELOPMENT
DEPARTMENT
JUL 27 2 30 PM '01

Providing Quality Water and Wastewater Services to the Coastal Communities

July 22, 2000

Mr. Ed Knight
Director of Community Development
City of Dana Point
33282 Street of the Golden Lantern
Dana Point, CA 92629

Re: Headlands Development and Conservation Plan Notice of Preparation

Dear Mr. Knight:

Thank you for forwarding a copy of the Notice of Preparation for the Headlands Development and Conservation Plan (HDCP). The District reviewed the Notice of Preparation and offers the following comments:

Under Section XVI UTILITIES AND SERVICE SYSTEMS, the question of wastewater capacity for the proposed project was discussed. The District had master planned the development of the Headlands area during the 1980's. The Pacific Coast Highway Lift Station was sized and funded by the Chandler Sherman Company (sole owner of the property at that time). The capacity of the lift station was sized for development that was much greater than the current development plan. The sewer pipelines that would convey the wastewater from the lift station to the Coastal Treatment Plant are also adequately sized for the earlier and greater development. The developer, Headlands Reserve, LLC., would be required to construct sewer pipelines from the development to the Pacific Coast Highway Lift Station. Plans would need to be engineered for District review and acceptance.

There do exist potable water pipelines within Pacific Coast Highway that would supply potable water to the development. In-tract facilities and connection points would need to be engineered for District review and acceptance.

Recycled water facilities are available at the intersection of Niguel Road and Pacific Coast Highway. The District had master planned to construct a recycled transmission main along Pacific Coast Highway to service the common areas along the highway and to serve the Headlands area. The developer would need to engineer the connection points and in tract facilities for District review and acceptance.

Mailing Address: P.O. Box 30205, Laguna Niguel, CA 92607-0205
Street Address: 31592 West Street, Laguna Beach, CA 92651
Fax: (949) 499-4256 Phone: (949) 499-4555

Discussions have taken place between the developer and the District concerning the conveyance of dry weather diversions. The District's Board of Directors has adopted a policy for dry weather diversions. The developer would need to engineer the connection points subject to District review and acceptance.

Again, thank you for the opportunity to comment on the Notice of Preparation. We are prepared to discuss our comments at your convenience. If you have any questions or require further information, please feel free to call me at 499-4555.

Sincerely,
SOUTH COAST WATER DISTRICT

Michael P. Dunbar

Michael P. Dunbar
General Manager

MPD/dms

Enclosures

APPENDIX B

AIR QUALITY MODEL DATA

APPENDIX B

AIR QUALITY MODEL DATA

Appendix B, Air Quality Model Data, is contained in Volume IIA, Additional Appendices.

APPENDIX C

TERRESTRIAL BIOLOGICAL RESOURCES ASSESSMENT AND RELATED DOCUMENTS

BIOLOGICAL RESOURCES REPORT

THE HEADLANDS

Prepared for

The City of Dana Point

URS Project No. 5800161052.01 05050

February 2002

URS

1615 Murray Canyon Road, Suite 1000
San Diego, CA 92108-4314
619-294-9400 Fax: 619-293-7920

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The Headlands consists of approximately 121.3 acres of coastal-front, including a series of coastal bluffs and terraces overlooking the Pacific Ocean and Dana Point Harbor, in the city of Dana Point, California (Project Site). The regional location of the Project Site is shown on Figure 1. Local access to the Project Site is from Cove Road, Dana Strand Road, Street of the Green Lantern, Scenic Drive, and Selva Road. Pacific Coast Highway (SR-1) also provides local access (Figure 2). Urbanized development surrounds the Project Site, including residential, visitor-serving commercial, a public parking lot, and Dana Point Harbor. The level and extent of urbanized development surrounding the Project Site has precluded the establishment of wildlife corridors or other terrestrial biotic linkages between the Headlands and open-space communities established inland of the Project Site. There are two existing residential areas on the Headlands, on the south and west sides of the Project Site. These areas are not part of the proposed project. The residential enclave to the south along Scenic Drive has detached, single-family homes. The residential enclave to the west along Dana Strand Road has attached, multi-family homes. These existing uses adjoining the property, as well as visitors to the Project Site, have resulted in direct and indirect impacts to sensitive species. Such impacts are ongoing.

Offsite of the Project Site to the west and south is the Pacific Ocean. Potential impacts to marine biology resources resulting from the proposed project are analyzed in the Marine Biological Resources Technical Report.

The implementation of the proposed project will result in short-term construction and development activities and in long-term use of facilities and land uses. Short-term activities include the preparation and development of onsite and offsite facilities. Long-term activities include public parks, open space, trails, visitor facilities, and residential and visitor-serving commercial land uses. The proposed project involves a variety of land use and circulation improvements. Proposed onsite land uses include a two-story, 40,000-square-foot office/commercial building on approximately 1.6 acres, a 65-room inn with associated amenities on approximately 2.8 acres, and two residential planning areas totaling 125 dwelling units. Planning Area 2 consists of 75 units on 25.7 acres. Planning Area 6 consists of 50 units on 26.7 acres. Also included in this proposed project are new and improved beach accesses, over three miles of public trails and several parks, and five small visitor recreational facilities on 62.0 acres of public open space, of which approximately 42.07 acres will remain natural, open space.

This technical report documents the existing biological resources on the 121.3-acre Project Site and analyzes the potential impacts to terrestrial communities resulting from the proposed project.

The Project Site, including a development proposal more intense than the proposed project, was included in the analysis for the Orange County Central/Coastal Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) Environmental Impact Report /Environmental Impact Statement (EIR/EIS) in 1996. The NCCP/HCP EIR/EIS allows for tiering for those projects addressed in the NCCP/HCP and analyzed in the EIR/EIS, such as the proposed project. Implementation of the NCCP/HCP Program provides for regional protection and long-term perpetuation of natural wildlife diversity and provides proper mitigation measures for biological impacts associated with future development projects.

When the California Legislature enacted the NCCP Act in 1991, it declared, "There is a need for broad-based planning to provide for effective protection and conservation of the state's wildlife heritage while continuing to allow appropriate development and growth." Accordingly, the purpose of the proposed NCCP/HCP focus is on creating a multiple-species, multiple-habitat subregional Reserve System and implementing a long-term "adaptive management" program that will protect coastal sage scrub (CSS) and other habitats and species within the CSS habitat mosaic while providing for economic uses that will meet the social and economic needs of the people of the subregion (County of Orange, 1996).

These NCCP/HCPs provide an alternative to the single-species, project-by-project conservation effort approach by formulating regional and subregional, natural, community-based habitat protection programs. NCCP/HCP Programs are designed to protect the numerous species inhabiting the targeted natural communities and to provide for their long-term conservation by establishing a permanent Habitat Reserve System (NCCP/HCP EIR/EIS Implementation Agreement, 1996).

The primary goal of the NCCP/HCP is to protect and manage habitat supporting a broad range of plant and animal populations that are now found within the Central and Coastal Subregion. To accomplish this goal, the proposed HCCP/HCP creates a subregional Habitat Reserve System and implements a coordinated program to manage biological resources within the Habitat Reserve. Creating a defined Reserve System will provide certainty to the public and to affected landowners regarding the location of future development and open space within the subregion. Specific project purposes of the NCCP/HCP are as follows:

- Planning for the protection of multiple species and multiple habitats within the coastal sage scrub habitat mosaic by creating a Habitat Reserve System that contains substantial coastal sage scrub, chaparral, grasslands, riparian, oak woodlands, cliff and rock, forest, and other habitats.
- Developing a conservation program that shifts away from the current focus on project-by-project, single-species protection to conservation and management of many species and multiple habitats on a subregional level.
- Allowing social and economic uses within the subregion that are compatible with the protection of identified species and habitats.
- Protecting the federally listed coastal California gnatcatcher in a manner consistent with Section 10(a) of the FESA and the Special 4(d) Rule for the gnatcatcher while providing for future incidental take of the species.
- Protecting the other two "target species" – the coastal cactus wren and orange-throated whiptail lizard – by treating them "as if they were listed" under Section 10(a) of FESA and allowing incidental take of these species.
- Protecting non-CSS habitat within the CSS habitat mosaic at a level comparable to the protection provided for CSS, thereby contributing to the protection of a broader range of species than just the target species or CSS species.

- Addressing the habitat needs of the non-target species within the subregion and the non-CSS habitats, including protecting six other federally listed species consistent with FESA Section 10(a) and treating 33 other "identified" species "as if they were listed" under Section 10(a) of the FESA.
- Addressing the conservation of sensitive species on the Dana Point Headlands site, including the coastal California gnatcatcher, Pacific pocket mouse (PPM), other identified species, and five designated plant species.
- Building on prior regional open-space planning that has occurred in Orange County and integrating that open-space planning into the creation of the Habitat Reserve System and subregional conservation strategy.
- Addressing impacts to CSS and non-CSS habitats and related NCCP/HCP species addressed in the Joint EIR/EIS in a manner that will be used and relied on in conjunction with future environmental reviews and documents (County of Orange, 1996).

A Habitat Reserve System in excess of 37,000 acres has been created via implementation of the NCCP/HCP; it protects more than 18,800 acres of CSS habitat but is also designed to function as a multiple-habitat system. Additionally to CSS habitat, it contains about 7,300 acres of chaparral, 6,100 acres of grasslands, 1,800 acres of riparian, 950 acres of woodland, 200 acres of forest habitat, and significant portions of six other habitat types now existing within the subregion. In terms of target bird species, the Reserve contains 381 coastal California gnatcatcher sites and 674 coastal cactus wren sites. Moreover, the Reserve includes 10,960 acres in the coastal zone, of which approximately 5,670 acres are coastal sage scrub.

The NCCP/HCP has implemented a comprehensive habitat management program designed to protect the biological resources within the Reserve over the long term. Based on the principles set forth in the NCCP Planning Guidelines, this management regime is called "adaptive management." It literally means that management actions within the Reserve will be monitored closely and modified (adapted) over time to respond to new scientific information and changing conditions and habitat needs. A non-wasting adaptive management endowment of approximately $11 million, which ultimately may grow to as much as two to five times as large, has been established for the Reserve.

For the Headlands, the NCCP/HCP EIR/EIS analyzed the potential biological impacts associated with 370 dwelling units, a 400-room resort hotel on 10.8 acres, a 2.7-acre commercial center, and 55 acres of public open space. The findings in this biological resources report are consistent with the assessment, conclusions, and mitigation requirements put forth in the programmatic NCCP/HCP EIR/EIS, specific to the Project Site potential impacts. The impacts associated with the activities at the Project Site will be mitigated to a less-than-significant level through the Project's participation in the NCCP/HCP Program, and any potential impact reduction suggestions beyond the NCCP/HCP EIR/EIS mitigation requirements would exceed the requirements of the California Environmental Quality Act (CEQA) and are unnecessary for approval of the proposed Project.

Several biological studies and assessments have been completed for the Project Site. Relevant documents include 1) Biological Assessment of the Dana Point Headlands (PSBS, 1993); 2) PPM survey conducted by P. Brylski (1993); 3) Dana Point Headlands Biological Resource Analysis (BonTerra Consulting, 1999); 4) Orange County Central/Coastal Subregion NCCP/HCP EIR/EIS (County of Orange, 1997); 5) PPM population monitoring and research conducted by the United States Fish and Wildlife Service (USFWS, 1998) and Dodd et al. (1997, 1999, personal communication); 6) Jurisdictional Waters of the U.S. Delineation for the Headlands (Glen Lukos Associates, September 2000); and 7) Blochman's Dudleya Survey (LSA, April 2001). Table 1 summarizes the biological survey efforts to date for the Project Site. The following provides a summary of these survey efforts.

PSBS (1993) surveyed the Project Site in March and April 1991 to document the area's botanical and zoological resources, including focused surveys for California gnatcatcher and San Diego cactus wren, as well as sensitive plant surveys in May 1991. A focused butterfly survey was performed by Dr. Rudi Mattoni in March 1993.

A PPM population was detected on the Project Site during a trapping survey (Brylski, 1993), prompting the USFWS to place this population under emergency listing status, then on the endangered species list (USFWS, 1994). Since that time, a temporary PPM preserve on 22 acres has been established at the Project Site pursuant to the Orange County Central/Coastal Subregion NCCP/HCP EIR/EIS Implementation Agreement and a Section 10A permit. Five years (1996 through 2000) of trapping studies for the PPM population have been completed (USFWS, 1996; Dodd et al., 1997, 1998; S. Dodd, personal communication). Live trapping was performed in 1993, 1997, and 1998, and a decrease in the numbers of PPM was observed. During the winter 1999 PPM hibernation season, vegetation adjacent to occupied PPM habitat was hand cleared on behalf of the USFWS and California Department of Fish and Game (CDFG) to create more suitable habitat. This habitat manipulation, which is part of a long-term study of the PPM and consistent with the USFWS Recovery Plan and the NCCP/HCP Program, is being done to expand suitable PPM habitat and possibly increase the PPM population size – at least temporarily – on the Headlands.

BonTerra Consulting mapped the onsite vegetation and assessed habitat values for sensitive biological resources on the Project Site in January 1998 by using aerial photographs. However, field work or focused surveys were not conducted for sensitive plant or wildlife species.

In April and August 2000, S.C. Dodd Biological Consulting performed PPM surveys consistent with the methodology of the 1999 survey. These surveys investigated and compared PPM use in areas where vegetation has been thinned, areas without thinned vegetation, and control areas. Non-grid trapping was also performed, as necessary, to monitor PPM activity on the Project Site (Dodd, 1999-2000 summary).

Glenn Lukos Associates performed a jurisdictional wetland delineation on the Project Site on September 28, 2000. The U.S. Army Corps of Engineers (ACOE) 1987 Wetland Delineation Manual was used to evaluate areas of potential ACOE jurisdiction and CDFG streambed jurisdiction. Additionally, the site was evaluated for presence of wetlands subject to the

jurisdiction of the California Coastal Commission (CCC) as defined by the California Coastal Act. Jurisdictional areas were delineated in the field and reported in a letter report, the results of which are discussed in the impacts section of this report.

LSA biologists conducted Blochman's dudleya (Dudleya blochmaniae ssp blochmaniae) surveys on the Project Site in April 2001 and determined potential onsite transplant locations for this species.

URS Corporation (URS) biologists made site visits in January, February, April, and May 2000 and March 2001 to verify past vegetation mapping, determine the status of sensitive species locations, and perform a soils assessment.

Mr. Jim Rocks, a URS botanist, surveyed the Project Site on January 20, 2000, and again on February 9, 2000, to confirm the presence of the previously mapped vegetation communities and to delineate any changes in vegetation distribution. Based on several previous surveys, Mr. Rocks verified the existence of known populations of sensitive plant species on the Project Site in April 2000 (see Table 1). The previous vegetation maps were updated with the aid of a January 5, 1999, digitally rectified aerial photograph of the Project Site and surrounding vicinity.

Dr. Patrick Mock, URS Senior Wildlife Biologist, conducted a focused coastal California gnatcatcher survey on the site on February 9, 2000, to confirm the presence of this species.

Dr. Richard Friesen, URS Senior Biologist, a mammalogist with expertise in pocket mouse ecology, reviewed prior documentation associated with the PPM and performed a site reconnaissance on May 31, 2000, within the temporary PPM preserve area and the immediate adjoining property.

Phillip Richards, a URS biologist, conducted a soils assessment in March 2001.

Biological resources are defined here as plant or animal species of rare or endangered status, depleted or declining species, or plant communities of limited distribution. Animals were identified in surveys using scat, tracks, burrows, vocalizations, or direct observations with the aid of binoculars. Nomenclature used throughout this report conforms to Holland (1986) for plant communities, Hickman (1993) for plants, and Laudenslayer et al. 1991 for vertebrate species.

Table 1
SURVEY EFFORTS ON THE PROJECT SITE

Survey Team	Survey Date(s)	Survey Efforts
Pacific Southwest Biological Services	April 1991 May 1991 March 1993	Botanical and Zoological surveys. Focused gnatcatcher and cactus wren surveys. Quino checkerspot butterfly survey.
P. Brylski	1993	Live-trap PPM survey.
USFWS	1996	Limited PPM trapping efforts.

Table 1 (continued)
SURVEY EFFORTS ON THE PROJECT SITE

Survey Team	Survey Date(s)	Survey Efforts
S.C. Dodd et al.	1997, 1998, 1999, 2000	Live-trapping surveys to determine PPM population status and to compare with data from previous surveys. PPM predators assessed to determine potential threats to population.
BonTerra Consulting	January, 1998	Vegetation mapping from aerial photographs.
Glenn Lukos Associates	September 28, 2000	Wetland delineation
LSA	April, 2001	Blochman's Dudleya Survey
URS Corporation	January 20, 2000 February 9, 2000 April 15, 2000 May 31, 2000 March 9, 2001	Vegetation and sensitive species mapping, focused gnatcatcher survey, sensitive plant verification survey, PPM preserve site reconnaissance and soils assessment.

3.1 EXISTING LAND USE

Existing land uses on the Project Site consist of a former plant nursery and offices, a parking lot and storage area, greenhouses, and the remains of a mobile-home park and the privately owned Strand Beach, vacant land, and an onsite road network. Existing improvements associated with these past land-use activities include storm-drainage systems, water systems, septic systems, underground and aboveground utilities, catch basins, a gate guard house, tennis courts, garages, parking lots, shore revetment, street paving, curbs and gutters, greenhouse commercial structures, several terraced pads, retaining walls, street lighting, water hydrants, fencing, stormwater outfalls, irrigation, and past ornamental landscaping.

Surrounding land uses consist of fully urbanized development, including residential and commercial uses. Dana Point Harbor, owned and maintained by the County of Orange, lies east of the Project Site.

The topography of the Project Site is varied, with coastal bluffs, terraces, and knolls overlooking the Pacific Ocean. Elevations range from approximately sea level to 288 feet above mean sea level (MSL).

Many of the vegetation communities found on the Project Site are native to the southern California area (Holland, 1983), while others exist due to past human disturbance and landscaping (Figure 3). Coastal bluff scrub and California coastal sage scrub dominate the southwest portion of the Project Site. The southeast portion of the Project Site supports coastal sage scrub, disturbed coastal sage scrub, coastal bluff scrub, southern mixed chaparral, and rocky intertidal beach. The northeastern portion of the Project Site contains coastal sage scrub, maritime succulent scrub, southern mixed chaparral, and non-native grassland. The northern portion of the Project Site consists of heavily disturbed vegetation, ornamental plantings, disturbed coastal sage scrub, and nonnative grassland. One hundred eighty-two plant species have been recorded on the Project Site, including 72 (40 percent) non-native species. A complete list of the floral species detected on the Project Site is provided in Appendix A.

Given the level of urban development that surrounds the Project Site and the project vicinity, there are no wildlife corridors or other biotic linkages between the property and core terrestrial, natural, open-space communities located several miles from the Project Site. The resource agencies and empirical studies recommend linkages to established core preserves with wildlife corridor widths of 400 to 1,000 feet for effective wildlife corridor function (Mock et al., 1992). To be effective, wildlife corridors typically need to have greater than 250 feet of undisturbed native shrubland habitats (Beier, 1992; Fahrig and Merriam, 1985). Such wildlife corridors do not link to the Project Site.

3.1.1 Vegetation Communities

- ***Southern Coastal Bluff Scrub*** (3.34 acres) is composed of prostrate woody and/or succulent plants that are found on the cliffs, ridgelines, and bluffs adjacent to the ocean on the western and southern edges of the Project Site. The coastal bluff scrub found on the Project Site consists of common plants such as lemonadeberry (*Rhus integrifolia*), coastal cholla (*Opuntia prolifera*), dudleya (*Dudleya* spp.), ice plant (*Carpobrotus* spp.), bladderpod (*Isomeris arborea*), California encelia (*Encelia californica*), coyote bush (*Baccharis pilularis*), and

California sagebrush (*Artemisia californica*), as well as less common species such as cliff spurge (*Euphorbia misera*) and California box thorn (*Lycium californicum*).

- ***Coastal sage scrub*** (48.07 acres) is composed of low, soft-woody subshrubs to about one meter (three feet) high, many of which are facultatively drought-deciduous. This association is found typically on dry sites such as steep, south-facing slopes. Dominant shrub species in this vegetation type may vary depending on local site factors and levels of disturbance.

  The coastal sage scrub within the Project Site is dominated by California sagebrush and flat-topped buckwheat (*Eriogonum fasciculatum*). Other less dominant shrubs include orangebush monkeyflower (*Mimulus aurantiacus*), California encelia, coastal goldenbush (*Isocoma menziesii*), coastal prickly pear (*Opuntia littoralis*), lemonadeberry, and coyote bush. In some locations, the herbaceous cover within the openings between the shrubs is dominated by southern needlegrass. The main elements of this herbaceous layer include purple needlegrass (*Nassella pulchra*), needlegrass (*N. lepida*), fascicled tarplant (*Deinandra fasciculata*), *Vulpia myuros*, purple false brome (*Brachypodium distachyon*), and golden-rayed pentachaeta (*Pentachaeta aurea*). Purple needlegrass and non-native grasses are also present in the area that supports Blochman's dudleya (*Dudleya blochmaniae*) and are scattered throughout the coastal sage scrub onsite.

- ***Disturbed coastal sage scrub*** (2.33 acres) is also present within the Project Site. A disturbed qualifier is placed on coastal sage scrub (or any other native habitat) based on mechanical disturbance (e.g., brushing or clearing, heavy use by hikers and bicycles, and off-road vehicle activity). Disturbed coastal sage scrub typically has a high percent cover of non-native species and is fragmented to some degree. The species present in the disturbed coastal sage scrub on the Project Site include California sagebrush, flat-topped buckwheat, deerweed (*Lotus scoparius*), and non-native species such as mustard (*Brassica* spp.) and tarweed (*Hemizonia* spp.).

- ***Maritime Succulent Scrub*** (0.61 acres) is found on south-facing slopes in the northeastern portion of the project site. This community is a low, open vegetation type with a poorly developed understory (Holland, 1986). The dominant shrub species in this community include some of the coastal sage scrub dominants and a high percentage of coastal cholla (*Opuntia prolifera*) and prickly pear (*O. littoralis*).

- ***Southern Mixed Chaparral*** (2.69 acres) is found along the eastern boundary of the site on east-facing slopes. This association consists of a mix of chaparral species and occurs below 5,000 feet in elevation. The dominant species found in this plant community are toyon (*Heteromeles arbutifolia*), laurel sumac (*Malosma laurina*), and lemonadeberry with a large patch of the non-native, ornamental *Hypericum canariense* in the chaparral in the northwest corner of the site.

- ***Disturbed Southern Needlegrass Grassland*** (1.65 acres) is found along the northeastern boundary of the site. Southern needlegrass grassland is characterized by a relatively low (<30 percent) to dense herbaceous cover of the perennial, tussock-forming species, purple needlegrass (*Nassella* (*Stipa*) *pulchra*). Native and introduced annuals are found between the needlegrass, often actually exceeding the bunchgrass in cover (Holland, 1986). This association is found generally on fine-textured clay soils that are moist or wet in winter but very dry in summer. Shrubs are infrequent, probably due to the unstable clay soils. The degree of habitat quality in native grasslands varies greatly depending on the history of grazing, cultivation, or other

disturbance factors. The disturbed southern needlegrass grassland onsite is composed of purple needlegrass, foothill needlegrass (*N. lepida*), melic grass (*Melica imperfecta*) common goldenstar (*Bloomeria crocea*), and blue dicks (*Dichelostemma capitatum*) with a significant cover of non-native annual grasses such as *Vulpia myuros*, brome grasses (*Bromus* spp.) and purple false brome (*Brachypodium distachyon*).

- ***Non-native Grassland*** (2.93 acres) is characterized by dense to sparse cover of annual grasses, often with native and nonnative annual forbs (Holland, 1986). This habitat is a disturbance-related community most often found in old fields or openings in native scrub habitats. This association may have replaced native grassland and coastal sage scrub at many locales throughout the Project Site. Typical grasses include wild oat, soft chess (*Bromus mollis*), red brome, ripgutgrass (*Bromus diandrus*), and foxtail fescue (*Vulpia megalura*). Characteristic forbs include red-stem filaree (*Erodium cicutarium*), mustard (*Brassica* spp.), tarweed (*Hemizonia* spp.), California goldfields (*Lasthenia chrysostoma*), and owl's clover (*Orthocarpus purpurascens*).
- ***Developed/Ornamental*** (46.79 acres). Developed areas support no native vegetation due to past disturbances associated with the presence of buildings, roads, and other infrastructure. The level of soil disturbance is such that only the most ruderal plant species would be expected. Ornamental areas include historically maintained landscaped areas that support species from previous developments (e.g., ice plant, myoporum, etc.). Species found in these areas include pepper tree (*Schinus molle*), ice plant (*Gasoul crystallinum*), and Eucalyptus (*Eucalyptus* sp.). Some of these areas are mixed with developed areas. These areas onsite include an abandoned mobile-home park, portions of a plant nursery, and roads.
- ***Disturbed/Ruderal Habitat*** (3.21 acres) is any land on which the native vegetation has been significantly altered by land-clearing activities, and the species composition and site conditions are not characteristic of any disturbed phase of native plant association. Such habitat is typically found in recently cleared areas, vacant lots, roadsides, and construction staging areas and is dominated by a lack of vegetation or an inclusion of non-native broadleaf species, including castor bean (*Ricinus communis*) and tree tobacco (*Nicotiana glauca*).
- ***Sandy Beach*** (5.2 acres) is the flat, sandy area along the immediate coastline that is found between mean tide and the revetment, or the furthest inland reach of storm waves on the northwestern portion of the Project Site. This habitat is characterized by high exposure to salt spray and sandy substrate with a low organic content and water-holding capacity. Plant species found on the upper portion of beaches include sea-rocket (*Cakile* spp.) and beach saltbush (*Atriplex leucophylla*).
- ***Rocky Intertidal/Bluff Face*** (6.11 acres) is the tidally influenced hardscape habitat along the southern and southeastern end of the Project Site. This habitat association includes the talus cliff edge and rocky intertidal areas at the base of the cliffs.

3.1.2 Wildlife

Wildlife species that have been recorded on the Project Site include Pacific tree frog (*Hyla regilla)*, western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), mourning dove (*Zenaida macroura*), California gnatcatcher (*Polioptila californica californica*),

white-throated swift (*Aeronautes saxatalis*), western kingbird (*Tyrannus verticalis*), American crow (*Corvus brachyrhynchos*), northern mockingbird (*Mimus polyglottos*), orange-crowned warbler (*Vermivora celata*), deer mouse (*Peromyscus maniculatus*), Pacific pocket mouse (*Perognathus longimembris pacificus*), western harvest mouse (*Reithrodontomys megalotis*), San Diego desert woodrat (*Neotoma lepida intermedia*), cactus mouse (*Peromyscus eremicus*), California vole (*Microtus californicus*), house mouse (*Mus musculus*), California ground squirrel (*Spermophilus beecheyi*), desert cottontail (*Sylvilagus audubonii*), and coyote (*Canis latrans*). There are also domestic cats and dogs on the Project Site. No raptor nests were observed onsite during surveys, but nesting activity likely occurs near the project. Ninety-two wildlife species have been recorded on the Project Site since 1993. A complete list of the vertebrate species detected on the Project Site is provided in Appendix B.

3.2 SENSITIVE RESOURCES

3.2.1 Sensitive Habitats

Sensitive habitats are plant communities or species that are considered rare or seriously declining within the region, are listed by the California Natural Diversity Database (CNDDB), or are habitats that support sensitive plants or wildlife. Sensitive upland habitats on the Project Site encompass 56.6 acres and include coastal sage scrub (50.4 acres) and disturbed coastal sage scrub (2.33 acres), maritime succulent scrub (0.61 acre), and coastal bluff scrub (3.34 acres). The results of the CNDDB query are provided in Appendix C. Figure 4 depicts the sensitive species that were detected on the Project Site by biologists in this and previous surveys. These sensitive species are discussed below.

Coastal Sage Scrub

Coastal sage scrub is considered sensitive by the California Native Plant Society (CNPS), CDFG, and USFWS and is present on the Project Site. Impacts on coastal sage scrub habitat are considered significant because this habitat is ranked as "very threatened" on the CNDDB. Coastal sage scrub is of particular importance in southern California because it provides habitat for the federally threatened coastal California gnatcatcher, as well as approximately 100 other sensitive species. The USFWS estimated that coastal sage scrub habitat has been reduced by over 70 percent of its historical extent (USFWS, 1991) primarily due to agriculture and urban development.

Additional evidence of the decline of this once common habitat is the growing number of declining plant and animal species dependent on it, including the California gnatcatcher, cactus wren (*Campylorhynchus brunneicapillus cousei*), California rufous-crowned sparrow (*Aimophila ruficeps canescens*), orange-throated whiptail (*Cnemidophorus hyperythrus beldingi*), and several sensitive plant species such as Blochman's dudleya (*Dudleya blochmaniae ssp blochmaniae*) and western dichondra (*Dichondra occidentalis*). Dominant plants in this community include California sagebrush (*Artemisia californica*), flat-top buckwheat (*Eriogonum fasciculatum* ssp. *fasciculatum*), laurel sumac (*Malosma laurina*), white sage (*Salvia apiana*), and black sage (*Salvia mellifera*).

Maritime Succulent Scrub

Maritime succulent scrub is the least prevalent habitat found on the Project Site. This coastal-restricted habitat supports many plant species considered sensitive by the CDFG and CNPS (CDFG, 1985; Skinner and Pavlik, 1994).

Southern Coastal Bluff Scrub

Southern coastal bluff scrub is a low, sometimes prostrate scrub found at localized sites along the California coast south of Point Conception. Dominant plants are mostly woody or succulent and include such species as saltbush (*Atriplex* spp.), coastal prickly-pear (*Opuntia littoralis*), lemonadeberry (*Rhus integrifolia*), dudleya (*Dudleya* spp.), cliff spurge, woolly sea blite, and California box-thorn. Development along the southern California coastline has reduced this geographically restricted plant community throughout its limited range.

3.2.2 Sensitive Plants

Focused surveys were conducted for plant species considered sensitive according to the CNDDB for the regional area of the Project Site. Plants are considered sensitive if they are rare, listed by the CNPS, or listed as federally threatened or endangered. Blochman's dudleya (*Dudleya blochmaniae* ssp. *blochmaniae*), Coulter's saltbush (*Atriplex coulteri*), Nuttall's scrub oak (*Quercus dumosa*), western Dichondra (Dichondra occidentalis), Palmer's grappling hook (Harpagonella palmeri), cliff spurge (*Euphorbia misera*), California box-thorn (*Lycium californicum*), golden rayed pentachaeta (*Pentachaeta aurea*), vernal barley, woolly sea blite (*Suaeda taxifolia*), and small-flowered microseris (*Microseris douglasii* var. *platycarpha*) were detected in 1991, 1998, 2000, and/or 2001 (Figure 4).

Blochman's Dudleya (CNPS List 1B, 3-3-3) is a late spring-blooming (May through June) herbaceous perennial found in dry, stony places below 450 meters (1,500 feet) elevation. It is associated with coastal sage scrub and found near the coast from San Luis Obispo County south to northern Baja California. In southern California, this species is rare (fewer than 20 known locations). A population of 250 plants was reported by PSBS (1991) near the hilltop in the eastern portion of the project site. The Blochman's Dudleya are in unprotected areas of the property either in or adjacent to areas of disturbed coastal sage scrub. This area currently has heavy foot traffic and occasional bicycle traffic from site visitors. URS biologists confirmed this species' presence in January 2000, and LSA biologists reconfirmed the locations in April 2001.

Coulter's saltbush (CNPS List 1B, 2-2-2) is a perennial herb that flowers from March through October. It inhabits coastal bluff scrub, coastal dunes, and alkaline grasslands from Santa Barbara County south to Baja California and is on many of the Channel Islands. Coulter's saltbush is rare and declining in its range. In Orange County, it is known from fewer than 12 occurrences, and perhaps only 6 are extant. Two known populations are within the Central/Coastal Subregion of the Nature Reserve of Orange County established by the NCCP/HCP. This species was reported onsite by Mr. Fred Roberts and verified by URS in November 2001. The Coulter's saltbush (fewer than ten individuals onsite) is in an unprotected

area co-existing with Blochman's dudleya. This area currently has heavy foot traffic and occasional bicycle traffic from site visitors.

Cliff Spurge (CNPS List 2, 2-2-1) is an irregularly branched shrub restricted to sea bluffs in coastal bluff scrub. Its coastal range extends from Corona Del Mar to Baja California and the Channel Islands. PSBS (1991) reported several thousand individuals on the coastal bluffs of the Project Site. The presence of this species was confirmed in January 2000 by URS biologists.

Nuttall's scrub oak (CNPS List 1B. 2-3-2) is a species of scrub oak that has declined in proportion to the level of coastal development. Populations are restricted to coastal sage scrub and chaparral habitats typically within ten miles of the coast. A single individual Nuttall's scrub oak is found near the former plant nursery on the Project Site.

Palmer's Grapplinghook (CNPS List 4, 1-2-1) is a widely distributed, diminutive annual found in Los Angeles, Orange, Riverside, and San Diego counties; on San Clemente Island; and in Arizona Baja California, and Sonora, Mexico. This species is found generally on clay slopes and recent burns below 1,000 meters (3,280 feet) elevation and flowers from February to April. Fewer than ten plants were found on the Project Site in 1983. URS biologists surveyed for this species in 2000, but no individuals were observed.

California box-thorn (CNPS List 4, 1-2-1) is a rigidly branched shrub that flowers from March through April. It inhabits coastal bluff scrub and coastal sage scrub from Santa Barbara County to Baja California and is on many of the Channel Islands. This species was observed onsite in 1991, 1998, and 2000 in the coastal bluff scrub along the sea cliffs, and one large individual was found in the coastal sage scrub co-existing with Blochman's dudleya.

Golden-rayed pentachaeta (CNPS List 4, 1-2-2) is a small annual that flowers from March through July. It inhabits grassy areas, openings in coastal scrub, and cismontane woodland and forests from San Bernardino County to Baja California. This species was observed onsite in 1991 and 2000 in the coastal sage scrub north of the access road.

Vernal barley (CNPS List 3, ?-2-2) is an annual grass that flowers from March through June. It inhabits grasslands and vernal pool areas from Mono County west to San Mateo County and south into Baja California. This species was not detected during surveys in 1991, 1998, and 2000 but was observed onsite by a biologist in 1996 (T. Bomkamp, personal communication). The biologist reported that there are fewer than 100 total plants onsite in two small patches.

Woolly seablite (CNPS List 4, 1-2-1) is an evergreen shrub that inhabits coastal bluff scrub, coastal dunes, and marshes from Santa Barbara County to San Diego County and on many of the Channel Islands. Depending on local site conditions, woolly seablite can flower at any time during the year. Woolly seablite was observed along the sea bluffs in 1991.

Small-flowered microseris (CNPS List 4, 1-2-2) is a small, annual that inhabits grassland and coastal sage scrub and flowers from March through May. This species was not observed on the Headlands during the past surveys, and its presence has not been confirmed. Therefore, it was not addressed in the Biological Resources Report. However, Harmsworth Associates (1999) reported that a population of small-flowered microseris was observed on the Headlands in 1998.

Additional plant species that were not observed but have the potential to be found onsite due to the presence of suitable habitat are Aphanisma (*Aphanisma blitoides*, CNPS 1B, 2-2-2), Pacific saltbush (*Atriplex pacifica*, List 1B, 3-2-2), and Robinson's peppergrass (*Lepidium virginicum* var. *robinsonii*, List 1B, 3-2-2).

Prostrate Spineflower (Chorizanthe procumbens, formerly CNPS List 4) is found within openings of scrub and chaparral associations. The prostrate spineflower's range includes southern California and Baja California. The CNPS has removed this species from its sensitive plant rankings, which indicates that this species is sufficiently widespread and abundant or insulated from significant impacts to be relatively secure in the near future. This plant species was identified on bluffs at the Project Site before 1998 but not in the 1999 and 2000 surveys performed by URS.

Western dichondra (*Dichondra occidentalis*) (CNPS: List 4, 1-2-1) is a perennial herb found in chaparral, scrub associations, and rock outcrops in grasslands and often found in recent burn areas. Two populations of this species were found in 1991 beneath coastal sage scrub and west of the hilltop in open habitat. URS biologists surveyed for this species in 2000, but it was not detected on the Project Site.

Sensitive Wildlife

Focused surveys were conducted for all wildlife species considered sensitive by the CNDDB near the Project Site. Listed animal species detected onsite were coastal California gnatcatcher (*Polioptila californica californica*) and Pacific pocket mouse (*Perognathus longimembris pacificus).* Cactus wren and orange-throated whiptail, both California Species of Concern, are also historically recorded on the Project Site.

The USFWS lists the coastal California gnatcatcher as a threatened species, and the CDFG considers the bird a species of special concern. The coastal California gnatcatcher population is estimated at nearly 5,000 pairs within the United States (USFWS, 2000). The primary cause of this species' decline is the cumulative loss of coastal sage scrub vegetation to urban and agricultural development. This species is declining proportionately with the continued loss of coastal sage scrub habitat in the four remaining southern California counties located within the coastal plain. Gnatcatcher territory size requirements vary with habitat quality. Documented home ranges have varied from 2 to 45 acres in San Diego County (Preston et al., 1998). Studies of the species' habitat preferences in San Diego County indicate that California sagebrush, (*Artemisia californica*) and flat-topped buckwheat (*Eriogonium fasciculatum*) are the primary plants used by gnatcatchers when foraging for insects (Mock and Bolger, 1992; Weaver, 1998; Campbell et al., 1998). The gnatcatcher survey conducted by URS biologists on February 9, 2000, resulted in confirmation of seven of the eight previously documented gnatcatcher territories.

Cactus wren, an NCCP focal species, was detected in 1991 efforts but not in the 1998 or 2000 surveys, although suitable habitat is present onsite. This species' characteristic nests were lacking in the 2000 site survey.

Historically, PPM was endemic to the coast of southern California from Marina del Rey and El Segundo in Los Angeles County, south to the Mexican border in San Diego County. Currently, only four populations of the PPM are known to exist in southern California. One population was

originally detected on the Project Site in 1993, and 10 to 25 individuals were present at the Project Site in 1999 (S. Montgomery, personal communication, 1999). The remaining populations exist on U.S. Marine Corps Base Camp Pendleton in three geographically distinct populations. This subspecies is restricted to sandy substrates within open coastal sage scrub habitats, less than 4 kilometers from the coast (USFWS, 1998). The USFWS listed this subspecies as an endangered species in 1994 and has developed a recovery plan since its detection on the Project Site. The CDFG lists the PPM as a Species of Concern.

Orange-throated whiptail is a Species of Special Concern in California. This species uses open areas of coastal sage scrub with gravelly soils in San Bernardino, Orange, Riverside, and San Diego counties. One whiptail was observed onsite in 1991 surveys, but this species may be present in the coastal sage scrub habitats throughout the site. No observations of the orange-throated whiptail were made during the 2000 surveys by URS biologists.

Coronado island skink (*Eumeces skiltonianus interparietalis)* is a species of special concern known from San Diego County and Baja California. It is most commonly found in open areas, sparse brush, and in oak woodlands – usually under rocks, leaf litter, logs, debris, or in the shallow burrows it digs (Zeiner et al., 1988). Prey consists of insect eggs and larval insects. *This species was not detected or previously recorded at the Project Site; however, impacts to these species were included for analysis in the* Orange County Central/Coastal Subregion NCCP/HCP Program.

The northern red diamond rattlesnake (*Eumeces skiltonianus interparietalis)* is a species of special concern restricted to southern California and Baja California from Morongo Pass to the tip of the Baja Peninsula, with most of its California range in San Diego County. Habitat preferences include dense vegetation in rocky areas with a supply of burrowing rodents for prey. It is often found in chaparral, coastal sage scrub, along creek banks, and in rock outcrops or piles of debris. This species was not detected or previously recorded at the Project Site; however, impacts to these species were included for analysis in the Orange County Central/Coastal Subregion NCCP/HCP Program.

Figure 4 shows the distribution of sensitive species found onsite, including current and historical locations of California gnatcatcher and historical locations of cactus wren. Information from surveys of the PPM on the Headlands in 1997 and 1998 by S.C. Dodd Biological Consulting was used to map the PPM-occupied habitat in this figure.

Predatory birds, such as northern harrier (*Circus cyaneus*), sharp-shinned hawk (*Accipiter striatus*), white-tailed kite (*Elanus leucurus*), and Cooper's hawk (*Accipiter cooperii*), potentially use the habitat within the Project Site. An American kestrel (*Falco sparverius*) and a pair of red-tail hawks (*Buteo jamaicensis*) were detected onsite in 2000. As mentioned above, no raptor nesting sites have been detected onsite.

4.1 SIGNIFICANCE CRITERIA

Direct impacts may occur when natural resources are altered or destroyed during the course of, or because of, project implementation. General examples of such impacts include removal of sensitive vegetation, filling of wetland habitats, or severing or physically restricting the width of wildlife corridors. Other direct impacts may include loss of foraging or nesting habitat and loss of individual species because of habitat clearing. Indirect impacts may occur due to elevated levels of noise or lighting, change in surface water hydrology within a floodplain, and increased erosion or sedimentation. These types of indirect impacts can affect vegetation communities or their potential use by sensitive wildlife species.

The California Environmental Quality Act (CEQA) Guidelines define "significant effect on the environment" as a "substantial or potentially substantial adverse change in the environment." CEQA Guidelines further indicate that there may be a significant effect on biological resources if the project will:

- Substantially affect an endangered, rare, or threatened species of animal or plant or the habitat of the species;
- Interfere substantially with the movement of resident or migratory fish or wildlife species to the extent that it adversely affects the population dynamics of the species;
- Substantially diminish habitat for fish, wildlife, or plants; or
- Affect a substantial portion of the distribution of plant communities defined as threatened or very threatened by the Nature Conservancy Heritage Program or as designated in the CNDDB.

4.2 PROJECT APPROVALS

California's Natural Community Conservation Planning effort was established by law under the state Act of 1991 (NCCP Act). The purpose of the statewide natural community conservation effort is to provide for regional protection and long-term perpetuation of natural wildlife diversity while allowing compatible and appropriate development and growth. The NCCP Act intends that these goals be achieved through the implementation of Natural Community Conservation Plans. These plans are designed to provide an alternative to the current single species, project-by-project conservation efforts by formulating regional and subregional natural community-based habitat protection programs to protect the numerous species inhabiting the targeted natural communities, and to provide for their long-term conservation by establishing a permanent Habitat Reserve System (NCCP/HCP EIR/EIS Implementation Agreement, 1996). The USFWS, California Resources Agency, CDFG, California Department of Forestry (CDF), California Department of Parks and Recreation, and other public agencies were active participants in the formulation of the Orange County Central/Coastal NCCP/HCP Program. An NCCP/HCP plan was adopted by the County of Orange and approved by the CDFG and USFWS for a subregion, including the Project Site in 1996.

The USFWS, CDFG, and County of Orange determined that the overall Central/Coastal NCCP/HCP Program provides a comprehensive, habitat-based approach to the protection of the habitat of coastal sage scrub species, as well as other habitats found within the Project Site and consistent with the Federal Endangered Species Act (FESA) and California Endangered Species Act (CESA) and that it qualifies as a habitat conservation plan for a variety of sensitive species under the FESA and CESA. The NCCP/HCP Program established a Habitat Reserve System in excess of 37,000 acres and an Adaptive Management Program that includes 17,200 acres within the coastal subarea and maintains net habitat value for coastal sage scrub species within the Central/Coastal Subregion on a long-term basis. Approximately 10,960 acres of the Habitat Reserve System are within the Coastal Zone (personal communication, County of Orange PDSD). The Conservation Guidelines indicate that NCCP regional planning is to be conducted, approved, and implemented based on subregional planning areas that may proceed independently of one another. Therefore, habitat essential to the conservation of the coastal sage scrub species is to be addressed at the subregional and regional levels (NCCP/HCP EIR/EIS Implementation Agreement, 1996). Criteria specified by the USFWS in designating critical habitat are included in Section 424.12 of the FESA regulations and include "those physical and biological features that are essential to the conservation of a given species and that may require special management considerations or protection" (50 C.F.R. 424.12(b)). The USFWS has found that critical habitats for coastal sage scrub species within Central/Coastal Orange County Subregion are within the 37,000-plus-acre Reserve System established by the NCCP/HCP Program.

The Project Site was included in the analysis for the NCCP/HCP EIR/EIS as a planning mechanism to determine mitigation requirements for future development on the Project Site. The subregional plan determined that the Project Site was not an appropriate component of the NCCP Habitat Reserve due to the small, fragmented patches of natural vegetation extant on the Project Site and the isolation of the Project Site from other NCCP Reserve areas. Except for the PPM population, no regionally significant core populations of sensitive species are found on the Project Site, although the Headlands' small size and proximity to existing urbanization renders the Headlands ill-suited for the long-term conservation of a PPM population. The nearest available, large, open space is several miles away and is separated by extensive suburban/urban development. However, the sensitivity of, and impacts to, the species found on the Project Site were addressed in the NCCP/HCP EIR/EIS.

The Project Site is included in the Orange County Central/Coastal NCCP/HCP EIR/EIS as a Covered Project, and the proposed project is included as a "Planned Activity" of a "Participating Landowner." An Endangered Species Act incidental take (10a) permit (TE810581-1) that authorizes incidental take of 44 covered species was issued to Headlands Reserve, LLC on January 21, 2000 (USFWS 2000). Therefore, development impacts on federal- and state-listed species, Identified Species designated in the NCCP/HCP EIR/EIS, Covered Habitats designated in the NCCP/HCP EIR/EIS, removal of roughly 30 acres of coastal sage scrub, and impacts on species dependent on or associated with the Covered Habitats are authorized and considered mitigated to a level of insignificance, consistent with the NCCP guidelines under the NCCP Act, state and federal ESAs, and CEQA. Satisfactory implementation of the NCCP/HCP EIR/EIS and the terms of the Implementation Agreement will result in no additional mitigation being deemed necessary or required under state and federal endangered species Acts, the NCCP Act, and CEQA for impacts to the identified sensitive species and habitats on the Project Site.

4.3 DIRECT IMPACTS

4.3.1 Vegetation

Figure 5 depicts the area of direct impact that will occur on the Project Site due to vegetation clearing or grading activities and fuel modification for the proposed project. Post-development plans for native habitat restoration, which include the revegetation of areas disturbed by the proposed project into coastal sage scrub habitat, are also shown. The total disturbed area resulting from the proposed project as designed is 79.23 acres (65 percent) of the Project Site. Table 2 compares the amount of existing vegetation to the amount of vegetation that will be affected by the proposed project.

Twenty-eight acres (52 percent) of coastal sage scrub will be affected by the proposed project, fuel modification, and public-access and bluff-top trails. Of the 28.0 acres of coastal sage scrub that will be affected, 1.84 acres are currently classified as disturbed coastal sage scrub. Impacts to this habitat are considered significant and adverse; however, as discussed above, impacts to approximately 30 acres of this habitat are considered to be mitigated to a less than significant level and consistent with the NCCP Guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement. The mitigation requirements included in the NCCP/HCP Program and Implementation Agreement are discussed in further detail in the mitigation section of this document (Section 3).

About 0.61 acres of maritime succulent scrub and 0.06 acres of coastal bluff scrub habitat will be affected by site-clearing/grading activities on the Project Site. These two plant communities support sensitive plant species. Impacts to this habitat are considered significant and adverse; however, as discussed above, impacts to this habitat are considered to be mitigated to less than significant levels and consistent with the NCCP Guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement. The mitigation requirements included in the NCCP/HCP Program and Implementation Agreement are discussed in further detail in the mitigation section of this document (Section 3).

The impact on 1.65 acres of disturbed southern needlegrass grassland is insignificant due to the small size of the impact and the isolated condition of the Headlands site. Moreover, the NCCP/HCP EIR/EIS anticipated the loss of this grassland as part of the proposed project. Additionally, within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone), there are approximately 8,055 acres of grassland in the Reserve (including over 1,300 acres in the coastal zone), Special Linkage, and Non-reserve Open Space, of which approximately 3,067 acres are designated as "High" or "Moderate" quality (Harmsworth Associates, 1999). The Adaptive Management endowment allows for further enhancement and restoration of needlegrass grassland in the Central/Coastal Nature Reserve of Orange County. Moreover, there are approximately 720 acres of southern needlegrass grassland in the 8,000-acre Foothill Transportation Corridor (South) Study Area in southern Orange County and hundreds of acres of native perennial grassland in the Southern Subregion of the Orange County NCCP/HCP (Tony Bomkamp, personal communication). Finally, the impact on 1.65 acres of disturbed southern needlegrass grassland does not meet or exceed a "significant effect on the environment" pursuant to the standard CEQA Significance Criteria provided in the Biological Resources Report Section 4.1. The mitigation requirements included in the

NCCP/HCP Program and Implementation Agreement are discussed in further detail in the mitigation section of this document (Section 3).

The remainder of the direct impacts will affect 48.91 acres of common native (mixed chaparral) and non-native habitats considered biologically insignificant. Rocky intertidal areas will not be directly affected by the proposed development associated with the proposed project (see Marine Resources technical report for further discussion). The chaparral habitat affected in the northeastern portion of the Project Site will be revegetated as coastal sage scrub, adding approximately 0.74 acres to the overall amount of coastal sage scrub that will be conserved on the Project Site. The project will also convert Marguerita Avenue and adjoining areas to coastal sage scrub, as shown on Figure 5. Approximately 9.9 acres of revegetation are available within the proposed project design. Impacts to these common and non-native habitats are considered insignificant.

4.3.2 Sensitive Species

Five of the eight current or historical gnatcatcher territories would be directly affected by the proposed development of the Project Site, leaving three territories associated with the 24.2-acre area of the proposed Headlands Conservation Park (HDCP) to be preserved in perpetuity as natural, open space and managed to conserve the sensitive native species. Historical cactus wren locations would be directly affected by the proposed development plan. These impacts are considered significant and adverse; however, as discussed above, impacts to these species are considered mitigated to less than significant levels and consistent with NCCP Guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement. Any indirect impacts, such as noise, lighting, and edge effects to California gnatcatcher and cactus wren species and any other sensitive species have been included in the NCCP/HCP EIR/EIS analysis and are considered mitigated to less than significant levels and consistent with the NCCP Guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement and Adaptive Management Program. Furthermore, noise impacts on California gnatcatchers have been studied extensively throughout southern California since 1993 and indicate that noise is not a biologically relevant issue in determining productivity. Construction monitoring programs have documented successfully breeding gnatcatchers directly adjacent to construction sites (Ogden Environmental, 1989-1995; Dudek & Associates; Levine, 1994-1997), and a large number of gnatcatcher territories is found adjacent to major arterial roadways and airport runways. Productivity of these birds is similar to birds in quieter locations (Awbrey and Hunsaker, 1997; Awbrey, 1991; Awbrey et al., 1995; Hunsaker et al., 1993).

The PPM population and the single historical orange-throated whiptail location will not be directly affected by the proposed project because they are designated for protection within the area proposed as conservation open space. Any take of these two species outside the proposed conservation open space has been mitigated to a level below significance through the NCCP/HCP. Additionally, the 22-acre, temporary PPM preserve designated in the NCCP/HCP EIR/EIS has been expanded by 2.2 acres as the 24.2-acre HDCP. Furthermore, the Project proposes the removal of existing Marguerita Avenue, which is currently immediately adjacent to the temporary pocket mouse preserve. This area will be regraded and revegetated with native species, including coastal sage scrub, to form a minimum 100-foot buffer outside and contiguous to the HDCP (Figure 5). Under the NCCP/HCP EIR/EIS, all necessary buffers for the temporary PPM preserve were incorporated within the original 22-acre preserve boundaries.

Potential future adverse direct and indirect impacts to the PPM population within the proposed preserve area were included in the NCCP/HCP EIR/EIS analysis and are considered mitigated to less than significant levels and consistent with the NCCP Guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement and Adaptive Management Program. These potential impacts include potential indirect impacts from development outside the temporary preserve and construction of the trails and fencing around the preserve. Mitigation requirements for these impacts are described in the Mitigation section of this report. A population viability analysis was performed for the PPM at the Dana Point site by URS biologists Patrick Mock, Ph.D. and Richard Friesen, Ph.D. (Appendix D). These analyses support previous qualitative assessments (Erickson, 1996; Spencer, 2000) suggesting that the PPM population on the 22-acre temporary preserve may be below the Minimum Viable Population threshold for long-term survival. Although the temporary 22-acre preserve area includes an internal habitat buffer of approximately 18.3 acres, as originally established and approved by the wildlife agencies in conjunction with the 1996 NCCP/HCP EIR/EIS, several factors continue to limit the long-term viability of the PPM.

The original PPM-occupied Headlands habitat was restricted to 3.75 acres and consisted of one patch of open coastal sage scrub with fine, sandy soil (Brylski, 1993). The temporary preserve incorporated an additional 18.3 acres to minimize impacts associated with adjacent existing development, as well as the future proposed development. Specifically, the buffer zone provides physical distance from direct impacts to PPM-occupied habitat from human activities occurring on the site by forming a barrier to public access to the core of the occupied habitat. Concomitantly, it reserved approximately 10.1 acres supporting PPM-suitable soils to allow for future expansion of occupied habitat. The buffer also served to ensure that future adjacent uses, such as those contemplated in the 1996 EIR/EIS for the Project Site, were compatible with the conservation of the PPM-occupied habitat.

In addition to lands previously set aside as habitat buffer as part of the temporary preserve, the current development proposal – the HDCP – incorporates an additional 2.2 acres of land into the proposed HDCP, bringing the total preserve area to 24.2 acres. Directly adjacent to the proposed HDCP, a 100-foot-wide buffer zone designated as a greenbelt encompassing approximately 2.7 acres is included in the current proposal. Therefore, the HDCP proposes an additional total of 4.9 acres of habitat buffer, which, when combined with the current 18.3-acre buffer area within the temporary preserve, serve to ensure that significant adverse effects associated with future development are minimized. However, the edge effects from the existing residential units privately held and not subject to the approved NCCP/HCP still pose a threat to the long-term viability of the species. In summary, Drs. Mock and Friesen conclude that the small initial population size and the extensive existing development edge appear to be major constraints to improving the viability of the population at this site. Translocation of individuals of PPM from Dana Point Headlands to a more biologically practicable site or to a captive breeding program would contribute to the goals of the PPM recovery plan. See Appendix D for further details.

The following sensitive plant species on the Project Site could be adversely affected by the proposed project: Blochman's dudleya, Coulter's saltbush, western dichondra, a single Nuttall's scrub oak, cliff spurge, historic Palmer's grappling hook, and prostrate spineflower locations. Impacts to Blochman's dudleya, cliff spurge, prostrate spineflower, western dichondra, Nuttall's scrub oak, and Palmer's grappling hook were specifically analyzed and impacts deemed adequately mitigated under the NCCP plan to less than significant levels and consistent with the NCCP Guidelines under the Orange County

Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement and Adaptive Management Program. As part of the NCCP/HCP EIR/EIS mitigation, onsite or offsite translocation of the Blochman's dudleya will occur in accordance with approval from CDFG. Potential onsite translocation sites for this species have been proposed (Figure 5).

Coulter's saltbush is known from approximately 45 occurrences on the Channel Islands and mainland California combined. There are at least 34 documented occurrences on Santa Cruz Island (29 documented occurrences), Santa Rosa Island (2 occurrences), and San Miguel Island (3 occurrences) combined (CalFlora Database 2001). These occurrences are presumed extant and conserved due to the designation of these islands as part of Channel Islands National Park. On the mainland, there are approximately 12 known occurrences, of which at least 6 are in Orange County. Within the Central/Coastal Subregion of the Nature Reserve of Orange County, there is a population in Upper Bommer Canyon and two occurrences in Newport Backbay (Harmsworth Associates, 1999). The current status of the populations within Newport Backbay is unclear due to potential disturbance from flood-control activities. Two other occurrences of Coulter's saltbush are within the proposed reserve area of the Southern Subregion NCCP/HCP of Orange County. These two southern populations are found in Chiquita Canyon and Cristinos Canyon. Other known populations include Newport Beach behind the Main Public Library (Harmsworth Associates, 1999).

Impacts to Coulter's saltbush will be mitigated to less than significant by implementing Mitigation Measure 3-1, which is as follows:

> Prior to any site preparation or other project-related activities that would impact the species, the project site shall be surveyed for the presence of extant individuals of Coulter's saltbush. The location of the individuals shall be identified and fenced as a temporary protection measure. Care shall be taken to avoid impacts on the individuals of Blochman's dudleya, (that are located in close proximity), that shall also be identified and protected. Cuttings and seed collection of Coulter's saltbush shall be undertaken prior to translocation to ensure the genetic resource is conserved. The individuals shall be transplanted to suitable, protected areas onsite in the Hilltop area and also in the Conservation Park, if appropriate soils are present in this area. It is recommended that the extant individuals be translocated by removing the soil and associated microbiota in blocks by digging down to a depth of approximately 12 inches. This will increase the potential for success by keeping the microhabitat conditions intact when moving Coulter's saltbush to the translocation area. Where appropriate, a combination of signage, fencing, and/or planting of Prickly Pear, Coast Prickly Pear, or Coast Cholla (consistent with the Headlands Revegetation Plant Palette) shall be installed to preclude trampling of the translocation sites. The same protection measures shall be provided for the remaining dudleya and translocated dudleya remaining on the project site. The Project Applicant will assure adequate funding for a qualified botanist to monitor the translocation sites for up to five years after translocation and to be able to take appropriate corrective management actions (additional seeding, cuttings, etc.) to support to the success of the translocation effort. The establishment of a translocated population of Coulter's saltbush would reduce impacts on this species to below a level of significance. This mitigation requirement and other mitigation requirements that pertain to species included in the NCCP/HCP Program and Implementation Agreement are discussed in further detail in the mitigation section of the DEIR.

Other sensitive plant species found onsite are California box-thorn, golden rayed pentachaeta, vernal barley, California groundsel, and woolly seablite. These species are not explicitly addressed in the NCCP/HCP program because they were not designated sensitive species at that time. They are now CNPS List 3 (vernal barley) and List 4 species, and direct, indirect, and cumulative impacts on these species would be less than significant, as described below.

Most of the individuals of California box-thorn (List 4) are found along the coastal bluffs and will be conserved onsite with cliff spurge and woolly seablite. List 4 species are still relatively common but considered by CNPS to be in potential need of future monitoring. Bomkamp (personal communication) reports that California box-thorn is still common on coastal bluffs in Orange County and occurs in Crystal Cove State Park, Newport Back Bay, Bolsa Chica Reserve, and Fairview-Talbert Park in Costa Mesa. The NCCP/HCP program, through the creation of the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and adaptive management, benefits this species. For these reasons, potential direct, indirect, and cumulative impacts to California box-thorn are less than significant.

Golden-rayed pentachaeta is more widespread and common in San Diego County and has been documented in Los Angeles, San Bernardino, Orange, and Riverside counties. This List 4 species is still relatively common but is considered by CNPS to be in potential need of future monitoring. Although not explicitly covered, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, direct, indirect, and cumulative impacts to golden-rayed pentachaeta are less than significant, and its change in CNPS status does not affect our assessment under CEQA.

There are two small patches of vernal barley with fewer than 100 total individuals onsite. Harmsworth Associates (1999) reports that there are 21 known locations of vernal barley in the Central/Coastal Subregion, of which 13 are within the Central/Coastal Nature Reserve, Special Linkage, or Non-reserve Open Space. Specifically, vernal barley is known within the Reserve at Aliso Canyon (several occurrences), Bommer Canyon (several occurrences), and the Ecological Reserve at UC-Irvine. Harmsworth Associates (1999) also notes that vernal barley is "much more common than previously thought" and is often misidentified, thereby resulting in a further underreporting of its abundance. Vernal barley is a CNPS List 3 species (a review list where more information is required to determine conservation status) and will benefit from the NCCP/HCP program, which provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program. For these reasons, potential direct, indirect, and cumulative impacts to vernal barley are less than significant.

California groundsel was not detected onsite during past surveys, and its presence has not been confirmed. This species was reported to be onsite by Roberts (personal communication). Regardless, this is a CNPS List 4 ("watch list") species. This species was formerly a List 2 but is now known to be more widespread and abundant. Consequently, its status has been adjusted. List 4 species are still relatively common but considered by CNPS to be in potential need of future monitoring. Although not explicitly covered, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, if the species is

onsite, direct, indirect, and cumulative impacts on California groundsel are less than significant, and its current CNPS status does not affect our assessment under CEQA.

Most or all of the individuals of woolly seablite onsite are found along the coastal bluffs and will be conserved with cliff spurge and California box-thorn. This List 4 species is still relatively common (it is found at Bolsa Chica, Newport Back Bay, etc.) but is considered by CNPS to be in potential need of future monitoring. Additionally, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and an adaptive management program. For these reasons, direct, indirect, and cumulative impacts (if any) to woolly seablite are less than significant.

Table 2
DIRECT IMPACTS ON VEGETATIVE COMMUNITIES

Vegetation Association	Existing Area (acres)	Affected Area (acres)*	Designated Natural Open Space (acres)
Coastal sage scrub	48.07	26.17	21.9
Disturbed coastal sage scrub	2.33	1.83	0.5
Coastal bluff scrub	3.34	0.06	3.3
Maritime succulent scrub	0.61	0.61	0
Disturbed So. Needlegrass Grassland	1.65	1.65	0
Southern mixed chaparral	2.69	0.74	1.95
Non-native grassland	1.28	0.58	0.704
Developed/Ornamental	46.79	45.11	1.68
Disturbed/Ruderal habitat	3.21	2.42	0.794
Sandy Beach	5.2	0.06**	5.14
Rocky Beach/Bluff Face	6.11	0	6.11
Total	121.3	79.23	42.07

* Includes graded areas and fuel modification zones.
** See Marine Biology Technical Report regarding impact assessment associated with Sandy Beach.

4.3.3 Waters of the United States

4.3.3.1 U.S. Army Corps of Engineers Jurisdiction

Impacts to ACOE and CDFG Jurisdictional Waters of the U.S. are limited to 0.056 acres of 0.073 total acres of ephemeral drainage channels. None of the drainage channels supports riparian vegetation. Two drainage channels (Drainages A and C, Figure 3) will be filled because of project implementation. The remaining ephemeral drainage (Drainage B, Figure 3) will be preserved onsite as part of the HDCP. Due to the small size, lack of riparian vegetation, and ephemeral nature of the drainages, these impacts are not considered significant under CEQA. Additionally, their habitat value

is primarily associated with the upland vegetation that those drainages support (see Section 3.1.1). Significance of impacts to the upland vegetation is discussed in Section 4.3.1. Mitigation for these impacts is addressed through the NCCP/HCP process. For impacts of fewer than 0.10 acres to Waters of the U.S., the ACOE requires only pre-construction notification of impacts onsite. Potential impacts to jurisdictional drainage channels resulting from the proposed project are analyzed in the Jurisdictional Delineation for the Dana Point Headlands by Glenn Lukos Associates (2001). The ephemeral drainages are shown on Figure 3.

4.3.3.2 California Department of Fish and Game Jurisdiction

CDFG requires mitigation for all impacts to drainages (i.e., well-defined channels), regardless of the area of impact. Mitigation for impacts to CDFG jurisdictional drainages is recommended at a 1:1 ratio for onsite mitigation, or 2:1 if mitigation occurs offsite. Preservation of a higher-quality resource (e.g., vegetated wetland) would allow a lower mitigation ratio subject to the CDFG 1603 Streambed Alteration Agreement process. Potential impacts to jurisdictional drainage channels resulting from the proposed project are analyzed in the Jurisdictional Delineation for the Dana Point Headlands by Glenn Lukos Associates (2001). The ephemeral drainages are shown on Figure 3.

4.3.3.3 California Coastal Commission Jurisdiction

The CCC regulates the diking, filling, or dredging of wetlands within the coastal zone. The Coastal Act Section 30121 defines wetlands as land "that may be covered periodically or permanently with shallow water." The site was evaluated for the presence of wetland hydrology, hydric soils, or areas that support a predominance of hydrophytic vegetation. Under the California Coastal Act, the presence of only one of these criteria is sufficient for CCC to take jurisdiction over the area as a jurisdictional wetland. No areas on the Dana Point Headlands Project Site were identified by Glenn Lukos Associates as wetlands as defined by the California Coastal Act.

4.4 INDIRECT IMPACTS

There is potential for indirect impacts to occur because of implementation of the proposed project. Indirect impacts could potentially occur 150 feet from the development edge into conserved habitat due to such activities as excessive landscape irrigation, fuel modification, vegetation trampling outside marked trails, and introduction of non-native species (e.g., argentine ants, cats) (Noss, 1993; Paton, 1993; Vissman, 1993). Approximately 80 percent of the proposed naturalized open space has the potential to be affected by indirect impacts, most of which is already affected by existing residential enclaves and the numerous visitors to portions of the Project Site. The existing edge effects are demonstrated by the presence of non-native ornamental vegetation on the Project Site near the two residential enclaves and the homes along Green Lantern. Additionally, numerous visitors to the site, including bicycles and occasional off-road vehicles, have resulted in denuded vegetation along numerous trails and pathways near the hilltop and nearby crest. Due to the small patch size and extensive amount of existing and future development edge, the proposed naturalized open space has greater potential to be dominated by edge-affected habitats; however, as discussed in Section 4.3.2, these indirect edge-effect impacts have been included in the NCCP/HCP EIR/EIS analysis and are considered mitigated to less than significant levels and consistent with the NCCP Guidelines under the

Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement and Adaptive Management Program.

Additional indirect impacts include impacts to wildlife from residential noise and lighting and temporary impacts to wildlife because of construction activities. These impacts are considered insignificant; however, recommendations to minimize impacts to wildlife are included in the Mitigation section of this report.

4.5 SPECIES INTERACTION AND ECOSYSTEM FUNCTION

Existing Ecological Interactions between Species on the Site

Ecological interactions between species on the Headlands site are limited and constrained due to the relatively small size of the project area, the fragmented configuration of the native habitat patches, the amount of urban-habitat interface that can cause adverse edge effects (Paton 1993), and the site's isolated condition within the surrounding urbanized landscape (Dickman, 1987; Sanders et al., 1990; Bolger et al., 1991, 1997a, 1997b). The current site conditions and isolation by the surrounding developed lands that extend more than two miles beyond the site adversely affect predator-prey interactions and opportunities for typical population migration processes. The food web matrix currently existing onsite is expected to be simplified and truncated, with the higher trophic levels (top native predators) likely to be absent or well below the local habitat carrying capacity (Kareiva, 1987; Estes et al., 2001). Energy and nutrient cycles can be adversely affected by this food web simplification. Human subsidized non-native predators (domestic cats) have been observed onsite and may exceed local habitat carrying capacity and adversely affect prey (songbird and rodent) populations onsite (Vissman, 1993; Crooks, 1998, Crooks and Soulé, 1999).

The small size and isolated condition of the site will adversely affect plant-pollinator interactions due to the local extirpation of pollinator populations, resulting in the disruption of species' reproductive processes. This may be the case for such species as prostrate spineflower, Palmer's grapplinghook, and cactus wren, species detected in the early 1990s but not detected in recent site surveys. Small, isolated populations have higher likelihood of becoming extirpated from an area than populations located in large open space preserves. Competition between native species and invasive non-native species is a current condition on the site. Argentine ants currently may be adversely affecting native ant populations onsite and potentially reducing local food availability for native lizards (Suarez et al., 1998; Bolger et al., 2000). Ice plant is an invasive exotic plant that dominates relatively large portions of the Headlands site. Past disruption of site soil conditions may have limited the distribution of soil endemic species, such as Blochman's Dudleya.

The site's small size and isolated condition within the surrounding urbanized landscape compared to other subregional areas of biological open space suggest that it is incapable of any sustained ecological functioning even if left in an "as is" condition. In analyzing the NCCP program for the Orange County Central/Coastal subregion, the USFWS, CDFG and County of Orange determined that the PPM population on the Headlands site was likely to become extirpated from the site unless very active management of the site was immediately undertaken, and even then, the species' ability to maintain a viable population was very much in doubt.

One example of adverse ecological trends onsite is the increasing density of both native and non-native plant species. Studies on the site to date suggest that unless habitat manipulation methods are employed periodically, increasing vegetation density may result in – in and of itself – eventual extirpation of the PPM from the site. Other sensitive species, such as the cactus wren, grappling hook, and prostrate spineflower, have either become extirpated from the site over the last ten years or are able to maintain only a very tenuous hold on the site, further evidencing the site's compromised ecological functioning.

The constant exposure to and damage from chronic human trespass also adversely affects the ecological functioning of the site related to the successful preservation of various sensitive species on the site. For example, the Blochman's dudleya could soon be extirpated from the site given its current location in areas often used by trespassers from the adjacent developed residential areas. The dichondra, spineflower, and grappling hook, if still present, may also be experiencing this kind of current exposure to uncontrolled trespassers trampling the vegetation.

Existing Ecological Function of Project Site as a Whole

The small size and isolated condition of the site within an urbanized landscape severely compromises the existing ecological functioning of the project site as a whole (i.e., without the project). Properly functioning natural ecosystems, not subjected to the severe limitations shown on the Headlands site, can provide certain "services," such as serving as potential source of biodiversity, mediating the hydrologic cycle, ameliorating local climates, building soil, controlling erosion, detoxifying wastes, and providing recreational opportunities. The 37,000-plus-acre Orange County Nature Reserve provides all of these ecological services by developing a conservation program that shifts away from the current focus on project-by-project, single-species protection to conservation and management of many species and multiple habitats on a subregional level. Some of these functions are more predominant than others for certain ecosystems. The coastal scrub communities existing on the Headlands site are important in moderating water runoff, soil erosion, a nominal contribution to biodiversity, and some degree of passive recreation (Brussard et al., 1993). Four rare species that occur onsite (PPM, Blochman's Dudleya, Coulter's saltbush, and Cliff Spurge) are restricted to coastal areas of southern California. Retention of these narrow, endemic species onsite is a goal of the proposed project open-space design and long-term habitat-management program. The isolated condition of the site and its location within the urbanized landscape preclude the site from functioning as habitat linkage between larger, natural habitat areas that support source populations of sensitive species. The potential for the site to act as an "ecological sink" is likely due to the small size of the site and the extensive habitat edge conditions that typically prevail in small isolated habitat patches (Alberts et al., 1993; Bolger et al., 1991, 1997a, 1997b; Lovio, 1996; Crooks and Soulé, 1999, Crooks et al., 2001). The surrounding urban development has also modified the natural fire ecology of the site with subsequent ecological effects (Zedler et al., 1983; O'Leary 1990).

Ecological Functioning of the Site with the Proposed Project

Given the site's constrained ecological functioning baseline, the after-project functioning is expected to be equal to or better than current conditions. The project will establish and maintain in perpetuity a 24.2-acre Conservation Park on the Headlands that will be actively managed for the benefit of sensitive coastal species, including PPM, California gnatcatcher, and certain rare

native plants. A substantial monetary endowment will be established to ensure that adaptive management techniques can be applied to the Conservation Park for the benefit of the native species onsite. Non-native invasive species will be reduced, and conditions for native species will be enhanced. A minimum 100-foot buffer between the proposed residential development and Conservation Park is included in the proposed design. Public access will be managed so as to benefit biological resources conserved onsite by establishing and limiting coastal access to a clearly delineated public trail system that includes conservation and safety fencing.

The PPM population currently has, at best, a tenuous hold on the project site, and the ecological functioning of the site is limited by the above factors. In contrast, implementation of the proposed project will provide the greatest possibility to maintain the viability of the PPM population, either by establishing the permanent 24.2-acre Conservation Park on the Headlands site or, if later determined by the Wildlife Agencies, by translocating PPM elsewhere within the Orange County Nature Reserve. Without the proposed project, the Headlands property owners may withdraw from the NCCP/HCP, and the PPM population would not have active protection or management resources assigned to the Headlands site. Without the proposed project: (1) current proactive conservation and management actions on the site would be jeopardized, (2) significant funding for habitat acquisition for the Nature Reserve of Orange County and adaptive management activities would be lost, (3) the opportunity to protect Blochman's dudleya population from extirpation due to unrestricted human trespass would be lost, and (4) the opportunity to preserve a PPM population within the property or coastal subregion of Orange County would be lost or, at a minimum, severely compromised.

With the project, the site would continue to provide opportunities for occupation by California gnatcatcher. The proposed biological open space and habitat buffer areas will provide sufficient habitat for three to five gnatcatcher territories. Blochman's dudleya, Coulter's saltbush cliff spurge, and woolly seablite can continue to exist, as the dudleya and saltbush can be successfully translocated into protected open space onsite. The cliff spurge and woolly seablite will persist due to its location on the steep cliffs of the site within project-designated, conserved, open space.

Ecosystem Function within the Subregion's Coastal Zone with and without Project

A primary function of the Orange County NCCP program is to protect habitat types found within the Orange County coastal subregion in sufficient amounts and distributions to ensure their long-term conservation and proper ecological functioning, and thereby also ensure long-term conservation of the particular species that use those habitat types. Specifically, as noted in the NCCP/HCP Final Environmental Impact Report/Environmental Impact Statement (County of Orange 1996), the specific project purposes of the NCCP/HCP are as follows:

(1) Planning for the protection of multi-species and multiple-habitats within the coastal sage scrub habitat mosaic by creating a Habitat Reserve System that contains substantial coastal sage scrub, chaparral, grasslands, riparian, oak woodlands, cliff and rock, forest, and other habitats.

(2) Developing a conservation program that shifts away from the current focus on project-by-project, single-species protection to conservation and management of many species and multiple habitats on a subregional level.

(3) Allowing social and economic uses within the subregion that are compatible with the protection of identified species and habitats.

(4) Protecting the federally listed coastal California gnatcatcher in a manner consistent with Section 10(a) of the FESA and the Special 4(d) Rule for the gnatcatcher while providing for future incidental take of the species.

(5) Protecting the other two "target species," the coastal cactus wren and orange-throated whiptail lizard, by treating them "as if they were listed" under Section 10(a) of FESA and allowing incidental take of these species.

(6) Protecting non-CSS habitat within the CSS habitat mosaic at a level comparable to the protection provided for CSS, thereby contributing to the protection of a broader range of species than just the target species or CSS species.

(7) Addressing the habitat needs of the non-target species within the subregion and the non-CSS habitats, including protecting six other federally listed species consistent with FESA Section 10(a) and treating 33 other "identified" species "as if they were listed" under Section 10(a) of the FESA.

(8) Addressing the conservation of sensitive species located on the Dana Point Headlands site, including the coastal California gnatcatcher, PPM, other identified species, and five designated plant species.

(9) Building on prior regional open-space planning that has occurred in Orange County and integrating that open-space planning into the creation of the Habitat Reserve System and subregional conservation strategy.

(10) Addressing impacts to CSS and non-CSS habitats and related NCCP/HCP species addressed in the Joint EIR/EIS in a manner that will be used and relied on in conjunction with future environmental reviews and documents.

By meeting these goals, the Headlands development and conservation project, as a primary participant in the County's Central/Coastal NCCP/HCP Subarea Plan, was instrumental in ensuring the long-term conservation of functioning ecosystems in the coastal subarea, including the Coastal Zone. The Central/Coastal Subarea Plan assures the conservation of nearly 11,000 acres of interconnected sensitive habitats in the Coastal Zone and over 18,800 acres of coastal sage scrub, 7,300 acres of chaparral, 6,100 acres of grasslands, 1,800 acres of riparian, 950 acres of woodland, 200 acres of forest habitat, and significant portions of six other habitat types now existing within the subregion. The Central/Coastal Subarea Plan also provides a non-wasting adaptive management endowment of approximately $11 million, which ultimately may grow to as much as two to five times as large. The NCCP Subregional Habitat Reserve protects and manages viable, connected habitats in the coastal zone and the coastal subarea that have been configured to provide for the mobility, foraging, breeding, genetic exchange, and refugia needs of sensitive and listed species both within the Coastal Zone and within the larger subregion.

In contrast, without the proposed Headlands conservation and development plan, the ecosystem functioning of the subregion may be significantly diminished. In its current condition, the site does not contribute significantly to the healthy ecosystem functioning of other open-space areas of the subregion. The site's isolation from these other areas by significant urbanization precludes such contributions. The relative value of the site as gnatcatcher breeding habitat is suspect due to its isolation and the extensive edge effects currently present onsite.

The site is one of four known populations of PPM. However, it is unlikely to support this population in the medium to long term (10 to 20 years), and the population is likely to become extirpated from the site even sooner without the proposed active program for PPM protection and habitat management. With the proposed project, the wildlife agencies have the opportunity to provide ongoing protection and management, and should they deem it necessary for the long-term survival of this PPM population, to translocate the members of the population to more suitable and secure habitat within the Orange County Nature Reserve or San Diego County.

4.6 CUMULATIVE IMPACTS

Other approved or proposed projects affecting biological resources within the City of Dana Point include the Monarch Beach Resort, the Capo-by-the-Sea Project; and the former Bade Property, which is the westernmost three lots in the southern residential enclave. Three new homes have been approved where one home and ancillary uses currently exist. The development of the Project Site in a manner consistent with the proposed project was included in the analysis for the Orange County Central/Coastal Subregion NCCP/HCP EIR/EIS. The NCCP/HCP Program is intended to mitigate cumulative impacts on biological resources at the subregional level. Therefore, the proposed project's incremental contribution to a cumulative impact to sensitive habitats and associated sensitive species will be reduced to a less than significant level by participation in the NCCP/HCP Program.

4.7 SIGNIFICANCE OF IMPACTS

Direct, indirect, and the proposed project's incremental contribution to the cumulative impacts on coastal sage scrub, maritime succulent scrub, and coastal bluff scrub and associated sensitive plant and wildlife species are considered to be mitigated to a level of insignificance and consistent with the NCCP guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement (USFWS 1995).

The coastal California gnatcatcher and the PPM are both sensitive species and are species covered by the approved NCCP/HCP Program (i.e., "take" of these species and their habitats is authorized on the Project Site and has been analyzed under CEQA). Therefore, impacts to these species are considered to be mitigated to a level of insignificance. Other species considered sensitive by the resource agencies documented on the Project Site, treated as Identified Species under the NCCP plan and analyzed under CEQA include orange-throated whiptail, and cactus wren. Plant species found on the Project Site that are explicitly covered under the NCCP plan include Nuttall's scrub oak, Blochman's dudleya, cliff spurge, Palmer's grappling hook, prostrate spineflower, and western dichondra. Direct, indirect, and cumulative effects on these species were considered to be adverse and significant due to loss of sensitive coastal sage scrub habitat. However, mitigation in the NCCP/HCP Program reduces the impacts to these species associated with development of the Project Site to a less than significant level.

Coulter's saltbush is a List 1B species that is not explicitly covered under the NCCP/HCP Program. However, direct, indirect, and cumulative impacts on this species are considered to be reduced to a less than significant level through the application of specific Project Design Features, Project Conditions and mitigation measures (translocation) and through the project's consistency with the NCCP/HCP and IA. Coulter's saltbush is known from approximately 45 occurrences on the Channel

Islands and mainland California combined. There are at least 34 documented occurrences on Santa Cruz Island (29 documented occurrences), Santa Rosa Island (2 occurrences), and San Miguel Island (3 occurrences) combined (CalFlora Database 2001). These occurrences are presumed extant and conserved due to the designation of these islands as part of Channel Islands National Park. On the mainland, there are approximately 12 known occurrences, of which, at least 6 are in Orange County. Within the Central/Coastal Subregion of the Nature Reserve of Orange County, there is a population in Upper Bommer Canyon and two occurrences in Newport Backbay (Harmsworth Associates 1999). The current status of the populations within Newport Backbay is unclear due to potential disturbance from flood control activities. Two other occurrences of Coulter's saltbush are within the proposed reserve area of the Southern Subregion NCCP/HCP of Orange County. These two southern populations are found in Chiquita Canyon and Cristinos Canyon. Other known populations include Newport Beach behind the Main Public Library (Harmsworth Associates 1999).

Other sensitive plant species that occur onsite are California box-thorn, golden rayed pentachaeta, California groundsel, small-flowered microseris, vernal barley, and woolly seablite. They are not explicitly addressed in the NCCP/HCP program because they were not designated sensitive species at that time. They are now CNPS List 4 species except for vernal barley (List 3). The construction of the site will not significantly directly, indirectly, or cumulatively impact these species for the reasons described below.

Most of the individuals of California box-thorn (List 4) occur along the coastal bluffs and will be conserved onsite with cliff spurge and woolly seablite. List 4 species are still relatively common, but are considered by CNPS to be in potential need of monitoring in the future. Bomkamp (personal communication) reports that California box-thorn is still common on coastal bluffs in Orange County and occurs in Crystal Cove State Park, Newport Back Bay, Bolsa Chica Reserve, and Fairview-Talbert Park in Costa Mesa. The NCCP/HCP program, through the creation of the 37,000 acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and an adaptive management program benefits this species. For these reasons potential direct, indirect, and cumulative impacts to California box-thorn are less than significant.

Golden-rayed pentachaeta is more widespread and common in San Diego County and has also been documented in Los Angeles, San Bernardino, Orange, and Riverside Counties. This List 4 species is still relatively common, but is considered by CNPS to be in potential need of monitoring in the future. Although not explicitly covered, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, direct, indirect, and cumulative impacts to golden-rayed pentachaeta are less than significant.

California groundsel was not detected onsite during past surveys and its presence has not been confirmed. This species was reported to be onsite by Roberts (personal communication). Regardless, this is a CNPS List 4 ("watch list") species. This species was formerly a List 2, but is now known to be more widespread and abundant and its status has been adjusted. List 4 species are still relatively common, but are considered by CNPS to be in potential need of monitoring in the future. Although not explicitly covered, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program

that can be used to benefit this species, if appropriate. For these reasons, if the species is onsite, direct, indirect, and cumulative impacts on California groundsel are less than significant.

Small-flowered microseris was not observed on the Headlands during the past surveys and its presence has not been confirmed. Therefore, it was not addressed in the Biological Resources Report. However, Harmsworth Associates (1999) reports that a population of small-flowered microseris was observed on the Headlands in 1998. Small-flowered microseris is known from 22 localities within the Central/Coastal Subregion and 14 of these occurrences are within the Reserve, Special Linkage, or Non-reserve Open Space. Small-flowered microseris is a CNPS List 4 ("watch list") species that is still relatively common, but is considered by CNPS to be in potential need of monitoring in the future. This species is benefited by the NCCP/HCP program, which provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, potential direct, indirect, and cumulative impacts to small-flowered microseris are less than significant.

Two small patches of vernal barley with less than 100 individuals total are onsite. One patch occurs within the Blochman's dudleya population and the other patch is adjacent to Scenic Drive in Planning Area 8A (Harbor Point Park). Harmsworth Associates (1999) reports that there are 21 known locations of vernal barley in the Central/Coastal Subregion of which 13 are within the Reserve, Special Linkage, or Non-reserve Open Space. Specifically, vernal barley is known within the Reserve at Aliso Canyon (several occurrences), Bommer Canyon (several occurrences), and the Ecological Reserve at UC-Irvine. Harmsworth Associates (1999) also notes that vernal barley is "much more common than previously thought" and is often misidentified thereby resulting in a further under reporting of its abundance. Vernal barley is a CNPS List 3 species (a review list where more information is required to determine conservation status) and will be benefited by the NCCP/HCP program, which provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, potential direct, indirect, and cumulative impacts to vernal barley are less than significant.

Most or all of the individuals of woolly seablite onsite occur along the coastal bluffs and will be conserved with cliff spurge and California box-thorn. This List 4 species is still relatively common (occurs at Bolsa Chica, Newport Back Bay, etc.), but is considered by CNPS to be in potential need of monitoring in the future. Additionally, the NCCP/HCP program provides suitable habitat for this species within the 37,000-acre Central/Coastal Nature Reserve of Orange County (11,000 acres are in the Coastal Zone) and provides an adaptive management program that can be used to benefit this species, if appropriate. For these reasons, direct, indirect, and cumulative impacts (if any) to woolly seablite are less than significant.

4.8 ALTERNATIVES TO THE PROJECT

No Project/No Development: The No Project/No Development alternative results in maintaining the status quo of the Project Site. No new development would occur, including any project-related environmental effects from such development. The temporary pocket mouse preserve would not be expanded by an additional 2.2 acres and set aside as permanent conservation open space, and Marguerita Avenue would not be removed and the creation of a minimum 100-foot wide buffer

adjacent to the pocket mouse preserve would not occur. This allows the current uses of the Project Site to continue, which include continued unregulated human uses, bicycle and dog traffic through the Hilltop and ridgeline coastal sage scrub and maritime succulent scrub habitats, causing further unchecked disturbance to the area, and erosion from runoff from Marguerita Avenue and Dana Strand Road. Long-term habitat management activities to assist in the conservation of the PPM within the 22-acre PPM preserve would cease and the landowners could withdraw from participation in the NCCP/HCP. Blochman's dudleya, Coulter's saltbush, and other sensitive species will still be subject to disturbance from trampling by human and bicycle traffic. Edge effects will continue to accrue in the area now used as a temporary pocket mouse preserve from the adjoining residential enclaves, from Marguerita Avenue and from unauthorized human activities.

Additional impacts on the area that may occur if the No Project/No Development alternative is chosen include ongoing edge effects; erosion; off-road activity; degradation through human trespassing, the lost opportunity to actively manage the 22-acre area now serving as a temporary PPM preserve; and possible fires, resulting in significant adverse impacts on biological resources over time.

Because all biological impacts from this project have been reduced to a level of insignificance through the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement, analysis of alternatives to the proposed project is unnecessary.

5.1 MITIGATION

To mitigate for planned development, the Project Site was included in the analysis for the Orange County Central/Coastal Natural Community Conservation Plan/Habitat Conservation Plan (NCCP/HCP) Environmental Impact Statement/Environmental Impact Report (EIR/EIS) in 1996. The Project Site owner is a "Participating Landowner" in the NCCP/HCP Program, and is a signatory to the Implementation Agreement (IA) for the NCCP/HCP Program. The proposed project is a "Planned Activity" under the IA. The NCCP/HCP Program allows for the loss of sensitive species and their habitats because of the development of the Project Site for a combination of residential, visitor serving commercial, recreational, and open space uses. The NCCP/HCP Program allows for the 'take' of approximately 30 acres of coastal sage scrub habitat on the Project Site, which is outside of the Reserve System established by the NCCP/HCP Program. This take authorization specifically allows for flexibility in the location and configuration of the onsite coastal sage scrub loss and for flexibility in the location, intensity, and type of land use on the Project Site. The authorization covers the biological impacts from the Proposed Project on the Project Site. The subregional permit also allows for "take" of 44 Identified species and their habitats, which may or may not occur on the Project Site, and which are listed or may be listed in the future under the Endangered Species Act. The subregional permit also authorizes "take" of the sensitive plant species on the Project Site. Requirements for mitigation under the NCCP/HCP Program were identified in the Implementation Agreement, and will reduce project impacts (direct and indirect) and cumulative impacts to a level of less than significant while meeting project objectives. The following mitigation measures are intended to reiterate, but not alter, the detail provided in the NCCP/HCP EIR/EIS Implementation Agreement.

The potential adverse impacts to PPM have been avoided, mitigated, and minimized by: the establishment of a 22-acre temporary preserve on the Headlands site; initiation and funding of a programmatic research and recovery effort; the commitment from the USFWS to see that the temporary preserve is acquired, if it is determined through scientific study that this 22-acre area is necessary for the survival and recovery of the PPM; and the establishment of the NCCP/HCP EIR/EIS Reserve System and implementation of the Adaptive Management Program, which may provide suitable habitat for PPM translocation and long-term conservation and population expansion, should this be determined reasonable and feasible. These mitigation steps are described in greater detail below.

- The Participating Landowner shall continue to allow access to the PPM preserve area for 8 to 12 years according to the specific terms of the Implementation Agreement beginning on July 10, 1996, to the CDFG, USFWS, County of Orange, or their authorized biological consultants conducting PPM propagation and relocation efforts.
- Under certain circumstances more particularly described in the Implementation Agreement, the CDFG and USFWS have the right to exercise up to four, one-year extensions with the Property Owner to extend the life of the temporary preserve to an outside date of 2008 as they attempt to acquire this area, provided that they are making all diligent efforts by and after 2004 to see that this property is acquired. If the USFWS determines that translocation or captive breeding of the Headlands population of the PPM is not feasible and continuance of the preserve is necessary to ensure the survival and recovery of the species, USFWS shall

take all steps within its legal authority to see that the preserve area is acquired for wildlife conservation at or before expiration of the 8-year temporary preserve period.

- If the temporary preserve area is not acquired for conservation (or conserved as a project feature through approval of the Project as proposed) at the expiration of the temporary preserve period, and Pacific pocket mice remain in designated open space on the Project Site, the project applicant shall post information signs regarding the status of the PPM and its conservation needs in areas near the location of the former temporary preserve, and shall post signs at entry points into the remaining natural open space prohibiting pets into these areas. Under these circumstances, portions of the 22-acre area are authorized for incidental take of sensitive species consistent with residential/commercial development in a portion of this 22-acre area. Additionally, public use of any remaining open space areas within the former 22-acre temporary preserve area, which remain after the implementation of the Proposed Project and are occupied by the PPM shall be limited to designated walkways.
- If upon expiration of the temporary preserve period, unless the temporary reserve has been acquired (or conserved as open space as a project feature through approval of the Project as proposed), the take of all Identified Species shall be permitted anywhere within the former preserve area in accordance with the Proposed Project with the following conditions: 1) trapping of Pacific pocket mice in areas to be directly affected by grading within the former temporary preserve area will be conducted by an authorized biologist for three days before any earthmoving activities (if a longer period of trapping is necessary, USFWS will assume the additional trapping costs); 2) any captured Pacific pocket mice will be relocated to suitable areas designated by USFWS at the time of capture with funding from the NCCP PPM research and recovery budget or other USFWS sources.
- During the temporary preserve period, the following construction management practices shall be required, as indicated in the Implementation Agreement: 1) Monitoring of Pacific pocket mice during construction activities within 300 feet of occupied habitat within the preserve area and if significant adverse impacts on mice are determined, practicable operational modifications will be explored; 2) all areas of occupied habitat within the temporary preserve area will be marked, equipment operators will be informed of these marked areas, and, to the extent practicable, operational techniques will be explored to prevent unintended impacts on Pacific pocket mice; 3) if it is deemed necessary to restrict grading during a specific time of the year for the biological benefit of the PPM, grading will be avoided immediately adjacent to occupied habitat during that time period (not to exceed four months). This restriction supersedes any other grading restriction for any other species should there be an overlap.
- Following issuance of the Section 10(a) Permit (now issued) and CDFG Management Authorization for the Headlands Project Site (now authorized), the Participating Landowner shall provide to either CDFG, USFWS, the County EMA, or an appropriate conservation organization, a total of $350,000 to fund PPM propagation, enhancement, recovery, and relocation efforts on the Project Site, to be paid in yearly payments of $50,000 for six years after the initial payment.
- The Project Site Participating Landowner shall pay a total of $500,000 to the Nature Reserve of Orange County (NCCP/HCP Endowment Fund). The payments will be made as annual installments of $100,000 for 5 years, with the first payment due within seven days of the

issuance of a grading permit for the project site. The NCCP/HCP funding will assist in the establishment of the permanent open space in the Reserve System, which exceeds 37,000 acres, including 17,200 acres within the coastal sub-area, and nearly 11,000 acres within the coastal zone, and allow for the continued implementation of the Adaptive Management Program for the Nature Reserve of Orange County, which includes provisions for restoration and enhancement of the areas within the Reserve system.

The Project Site Participating Landowner shall offer to relocate any population of Blochman's dudleya that would be directly affected by project grading, in accordance with the terms set forth in the Implementation Agreement. The project applicant may opt to undertake a seed collection and planting program in lieu of translocation, if such a plan meets the approval of the CDFG and USFWS as outlined in greater detail in the Implementation Agreement. Translocation sites for the Blochman's dudleya have been proposed and are shown on Figure 5. This area would also be a suitable translocation site for Coulter's saltbush. In addition to translocation, cuttings of Coulter's saltbush would be taken if appropriate given the condition of extant individuals and seed would be collected for planting in the mitigation area. Although not addressed in the Orange County Central/Coastal Subregion NCCP/HCP, impacts to Coulter's saltbush are covered under CEQA and will be mitigated to insignificant levels as described above. Coulter's saltbush is known from approximately 45 occurrences on the Channel Islands and mainland California combined. There are at least 34 documented occurrences on Santa Cruz Island (29 documented occurrences), Santa Rosa Island (2 occurrences), and San Miguel Island (3 occurrences) combined (CalFlora Database 2001). These occurrences are presumed extant and conserved due to the designation of these islands as part of Channel Islands National Park. On the mainland, there are approximately 12 known occurrences, of which at least 6 are in Orange County. Within the Central/Coastal Subregion of the Nature Reserve of Orange County, there is a population in Upper Bommer Canyon and two occurrences in Newport Backbay (Harmsworth Associates 1999). The current status of the populations within Newport Backbay is unclear due to potential disturbance from flood control activities. Two other occurrences of Coulter's saltbush are within the proposed reserve area of the Southern Subregion NCCP/HCP of Orange County. These two southern populations are found in Chiquita Canyon and Cristinos Canyon. Other known populations include Newport Beach behind the Main Public Library (Harmsworth Associates 1999).

Direct, indirect, and the proposed project's incremental contribution to the cumulative impacts on coastal sage scrub, maritime succulent scrub, and coastal bluff scrub and associated sensitive plant (except Coulter's saltbush) and wildlife species are considered to be mitigated to insignificant levels and consistent with the NCCP guidelines under the Orange County Central/Coastal Subregion NCCP/HCP Program and Implementation Agreement (USFWS 1996).

Minimization and Mitigation Measures for Construction Related Impacts

- To the maximum extent practicable, and provided that the biological needs of the PPM do not require a restriction on grading any time between July 15 and February 15 of the following year, no grading of CSS habitat that is occupied by nesting gnatcatchers will occur during the breeding season (February 15 through July 15). It is expressly understood that this provision and the remaining provisions of these 'construction-related minimization measures' are subject to public

health and safety considerations. These considerations include unexpected slope stabilization, erosion control measure and emergency facility repairs. In the event of such public health and safety circumstances, the landowner will provide USFWS/CDFG with the maximum practicable notice to allow for capture of gnatcatchers, cactus wrens and any other CSS Identified Species that are not otherwise flushed and will carry out the following measures only to the extent as practicable in the context of the public health and safety considerations.

- Before the beginning of grading operations or other activities involving significant soil disturbance, all areas of CSS habitat to be avoided under the provisions of the NCCP/HCP EIR/EIS shall be identified with temporary fencing or other markers clearly visible to construction personnel. Additionally, pre-construction surveys will be conducted to locate gnatcatchers and cactus wrens within 100 feet of the outer extent of projected soil disturbance activities and the locations of any such species shall be clearly marked and identified on the construction/grading plans.
- A monitoring biologist, acceptable to USFWS/CDFG will be onsite during any clearing of CSS. The landowner will advise USFWS/CDFG at least seven (7) calendar days (and preferably fourteen (14) days) before the clearing of any habitat occupied by Identified Species to allow USFWS/CDFG to work with the monitoring biologist in connection with the bird flushing/capture activities. The monitoring biologist will flush Identified Species (avian or other mobile Identified Species) from occupied habitat areas immediately before brush-clearing and earth-moving activities. If birds cannot be flushed, they will be captured in mist nets, if feasible, and relocated to areas of the site to be protected or to the NCCP/HCP Reserve System. It will be the responsibility of the monitoring biologist to assure that Identified bird species will not be directly affected by brush-clearing and earth-moving equipment in a manner that also allows for construction activities on a timely basis.
- Following the completion of initial grading/earth movement activities, all areas of CSS habitat to be avoided by construction equipment and personnel will be marked with temporary fencing or other appropriate markers clearly visible to construction personnel. No construction access, parking or storage of equipment of materials will be permitted within such marked areas.

Additional Resource Protection Recommendations For Project Design

The following design recommendations are suggested:

- To the extent possible, and subject to any fuel modification requirements, open space areas directly adjacent to conserved native vegetation shall be revegetated with the Headlands revegetation plant palette (attached as Appendix E) to increase the area of continuous natural open space, especially adjacent to habitats occupied by PPM or California gnatcatcher. Approximately 9.9 acres of potential revegetation is available within the proposed project design.
- Further steps to minimize indirect impacts on the PPM during construction include building the perimeter fence and trails during the fall and winter, while this species is less active, and siltation fence shall be used to block the pocket mice from construction activity.

- The fuel modification plan developed for the Development Plan, in consultation with the Orange County Fire Authority, shall minimize impacts on the native vegetation, while adequately protecting future development areas.
- As determined in conjunction with the USFWS and CDFG, the designated habitat manager shall preclude depredation on the PPM population by feral cats and house cats and other predators by ensuring that they are kept out of the preserve area. If any cats are found in this area, the habitat manager shall permanently remove them.
- Within the designated conservation open space, disturbance areas for trails and lookout points shall be minimized to lessen impacts on native vegetation and sensitive species.
- The approved Headlands Revegetation Plant Palette will be used for all revegetation onsite, and is attached as Appendix E. Revegetation is proposed in areas where fuel modification is required or in open space areas that are currently disturbed or may be disturbed during construction activities, totaling approximately 9.2 acres (Figure 5). Additionally, on the slopes in the northeastern section, the woody chaparral species will be thinned and replaced by coastal sage scrub species; this totals approximately 0.7 acre. In proposed revegetation areas, the palette consists of coastal sage scrub species and will vary slightly in the number of species planted and the amount of, if any, irrigation that will be required.
- Implement best management practices during construction to minimize potential for silting/erosion of conservation areas. These shall include the use of silt fencing, sand bags, hydro- seeding, and other erosion prevention methods. Limits of construction shall be flagged to prevent inadvertent disturbance to the native vegetation and sensitive species.
- Streetlights should be shielded and directed downward to minimize excess lighting. Lighting in parking areas adjacent to conservation open space shall be minimized.
- Require that no dogs, cats, or other pets be allowed to enter the conservation open space including the PPM-occupied open space. The only exception shall be "in-service" dogs, which must be leashed at all times.
- Through the Nature Reserve of Orange County or other similar conservation group, make available to visitors to the site and to residents, information regarding the local biotic environment and conservation programs such as the NCCP/HCP. If approved by the city of Dana Point, a visitor recreation facility such as an interpretive center near the conservation open space would promote public awareness and education concerning the biotic environment and conservation.
- Minimize the opportunity for erosion or water quality impacts by directing potential runoff from new parking lots or streets away from conservation open space.
- Establish a "Conservation Program" to actively manage the conservation open space including: (1) times of access; (2) fencing; (3) native plant revegetation; (4) non-native plant removal; (5) trash pick-up; (6) trapping of cats and other inappropriate species in the PPM preserve; (7) management of resources; (8) monitoring of storm water runoff, erosion and fuel modification.

5.2 CEQA ISSUE ANALYSIS

- **Question 1**: Would the proposal result in substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

  The Natural Community Conservation Planning effort was established by California law under the Natural Communities Conservation Planning Act. The purpose of this regional conservation planning effort is to provide for regional protection and perpetuation of natural wildlife diversity while allowing compatible and appropriate development and growth. The NCCP Act intends that these goals be achieved through the implementation of Natural Community Conservation Plans. These plans are designed to provide an alternative to current single species and individual project-by-project conservation efforts by formulating regional, natural community-based habitat protection programs to protect the numerous species inhabiting the targeted natural communities.

  The County of Orange, along with the state and federal wildlife resource agencies, other local jurisdictions, utility companies, the University of California, the Transportation Corridor Agency, and major private landowners including the Headlands property owners, prepared a multi-habitat based subregional NCCP/HCP Program for the Central/Coastal Orange County Subregion to ensure the long-term survival of the coastal California gnatcatcher and other sensitive coastal sage scrub-dependent plant and animal species in accordance with state-sanctioned NCCP/HCP Program guidelines. This plan, which includes the Headlands Project Site, was approved July 10, 1996. The NCCP/HCP Program anticipated the development of the Project Site with a total of 370 residential dwelling units, a 400-room resort hotel, 2.7 acres of additional commercial uses and 55 acres of public open space, which is a project of larger size and intensity than the current project.

  The coastal California gnatcatcher and the PPM are both sensitive species and are species covered by the approved NCCP/HCP Program (i.e., "take" of these species and their habitats is authorized on the Project Site and has been analyzed under CEQA). Therefore, impacts to these species are considered to be mitigated to insignificant levels. The project proposes the establishment of a 24.2-acre conservation park that includes three pairs of California gnatcatchers and the PPM preserve area. Other species considered sensitive by the resource agencies documented on the Project Site and treated as Identified Species under the NCCP plan include orange-throated whiptail, Coronado island skink, northern harrier, sharp-shinned hawk, cactus wren, and red diamond rattlesnake. Sensitive plant species that are authorized for incidental take on the Headlands Site under the NCCP plan include Nutall's scrub oak, Blochman's dudleya, cliff spurge, Palmer's grappling hook, prostrate spineflower, and western dichondra. Direct and indirect effects on these species were considered to be adverse and significant due to loss of sensitive coastal sage scrub habitat. However, mitigation in the NCCP/HCP Program reduces the impacts associated with development of the Project Site to a less than significant level. Indirect effects on the gnatcatcher and PPM include potential depredation by feral and house cats, which would be minimized by the habitat management activities of the Habitat Manager of the designated HDCP.

- **Question 2**: Would the proposal result in substantial adverse effects on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?

  Riparian habitat would not be affected by this proposal because this type of habitat is not present onsite. Coastal sage scrub and other sensitive scrub habitats will be directly and indirectly affected by the proposed project. This impact is mitigated through the provisions of the NCCP/HCP EIR/EIS Implementation Agreement, which includes payment of $850,000 to the NCCP/HCP Program, commitment to set aside the 22-acre PPM preserve area for 8 years, and onsite conservation of open space. Participation in the NCCP/HCP Program leads to preservation of approximately 18,500 acres of coastal sage scrub, approximately 381 gnatcatcher sites and 674 cactus wren sites, and approximately 7,000 acres of chaparral habitat in the plan area. Moreover, some 5,670 acres of coastal sage scrub has been preserved in the coastal zone.

- **Question 3**: Would the proposal have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) or wetlands as defined by CDFG and the CCC through direct removal, filling, hydrological interruption, or other means?

  Wetlands would not be affected by the proposed project because no wetlands as defined by the Army Corps of Engineers, California Department of Fish and Game or California Coastal Act are present onsite. However, two ephemeral drainage channels that exist onsite will be filled. Due to the small size and ephemeral nature of the drainages, these impacts are not considered significant under CEQA. However, CDFG requires mitigation for all impacts to streambeds and their associated riparian habitats, regardless of the amount of impact. This mitigation will be determined as part of the CDFG 1603 Streambed Alteration Agreement process. The ACOE does not take jurisdiction on less than 0.10 acre of impacts to Waters of the U.S., but requires pre-construction notification of impacts onsite.

- **Question 4**: Would the proposal interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?

  There are currently no extant wildlife corridors between the Project Site and other biological open space. The Headlands is surrounded by suburban/urban development, and bounded by the Pacific Ocean on the west and south sides of the property. The nearest large available biological open space is approximately 4 miles north of the Project Site, separated by extensive suburban/urban development. No impacts on wildlife corridors would occur. Potential impacts on the offsite marine reserves adjacent to the property are subject to the analysis of the Marine Resources Technical Report.

- **Question 5**: Would the proposal conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

  The City of Dana Point does not have a tree preservation ordinance. The trees present on the Project Site are not naturally occurring and consist of ornamental species including some species that are native to California but not native to the region. The lone exception is the Nuttall's scrub oak near the nursery. Other plant and animals species present are conserved

through the NCCP/HCP Program, and the NCCP/HCP Program specifically anticipated that development of the Project Site would occur in a manner of higher development intensity than the proposed project. Thus, the proposed project does not conflict with any local policy or ordinance protecting natural resources.

- **Question 6**: Would the proposal conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?

  The proposed development activities and uses are consistent with, and anticipated by, the Orange County Central/Coastal NCCP/HCP Program and have been permitted under the state and federal ESAs and state NCCP Act. Mitigation requirements already imposed by the NCCP/HCP Program for the proposed project address impacts on individuals of sensitive species and habitat occupied by listed and other species covered by the NCCP/HCP EIR/EIS Implementation Agreement. Therefore, the proposal would not conflict with the provisions of the NCCP/HCP Program or other Habitat Conservation Plan. In reliance on the IA, the property owner has fulfilled its obligations for monetary contributions and for establishment of the temporary PPM preserve and study of the PPM.

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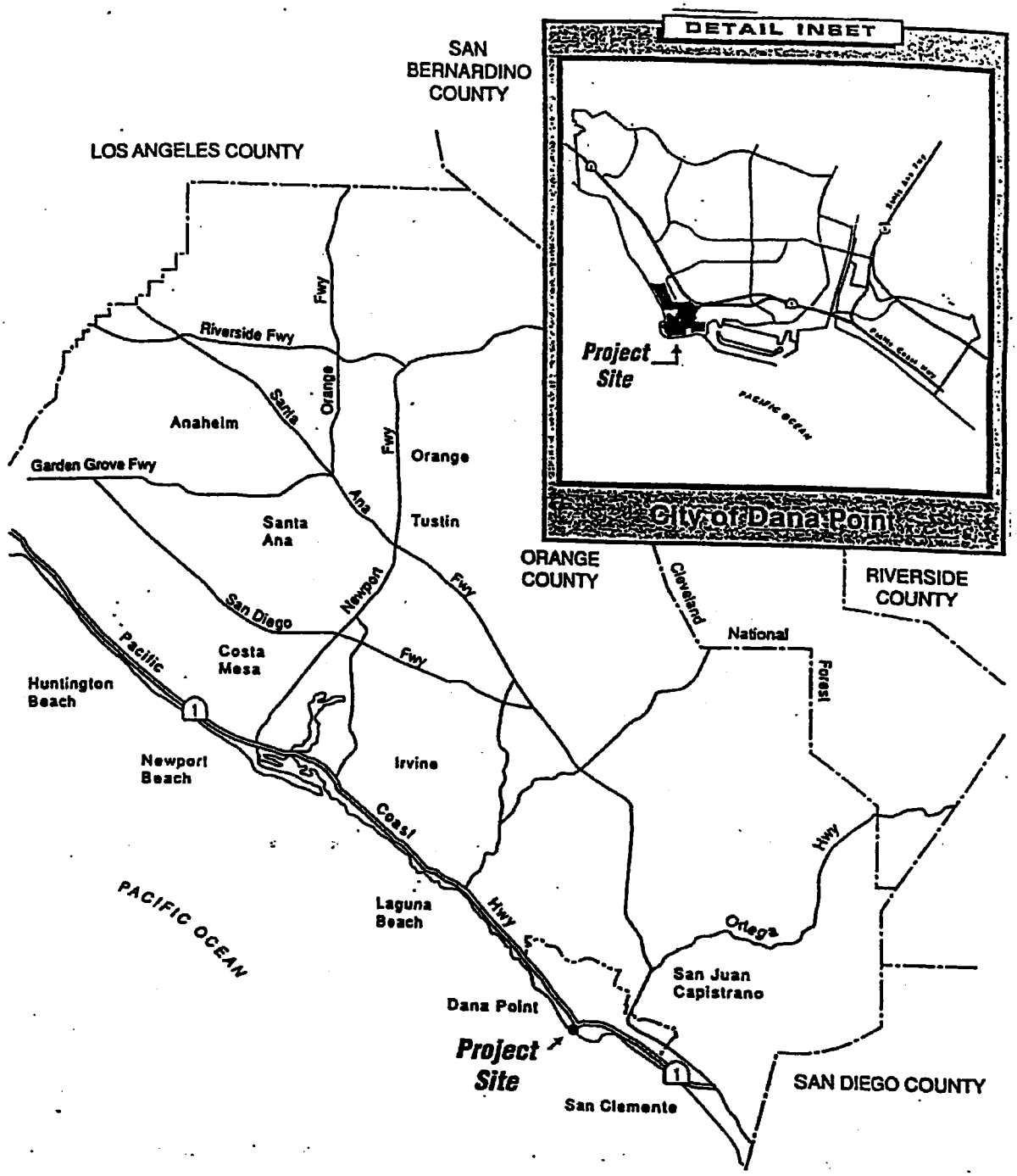
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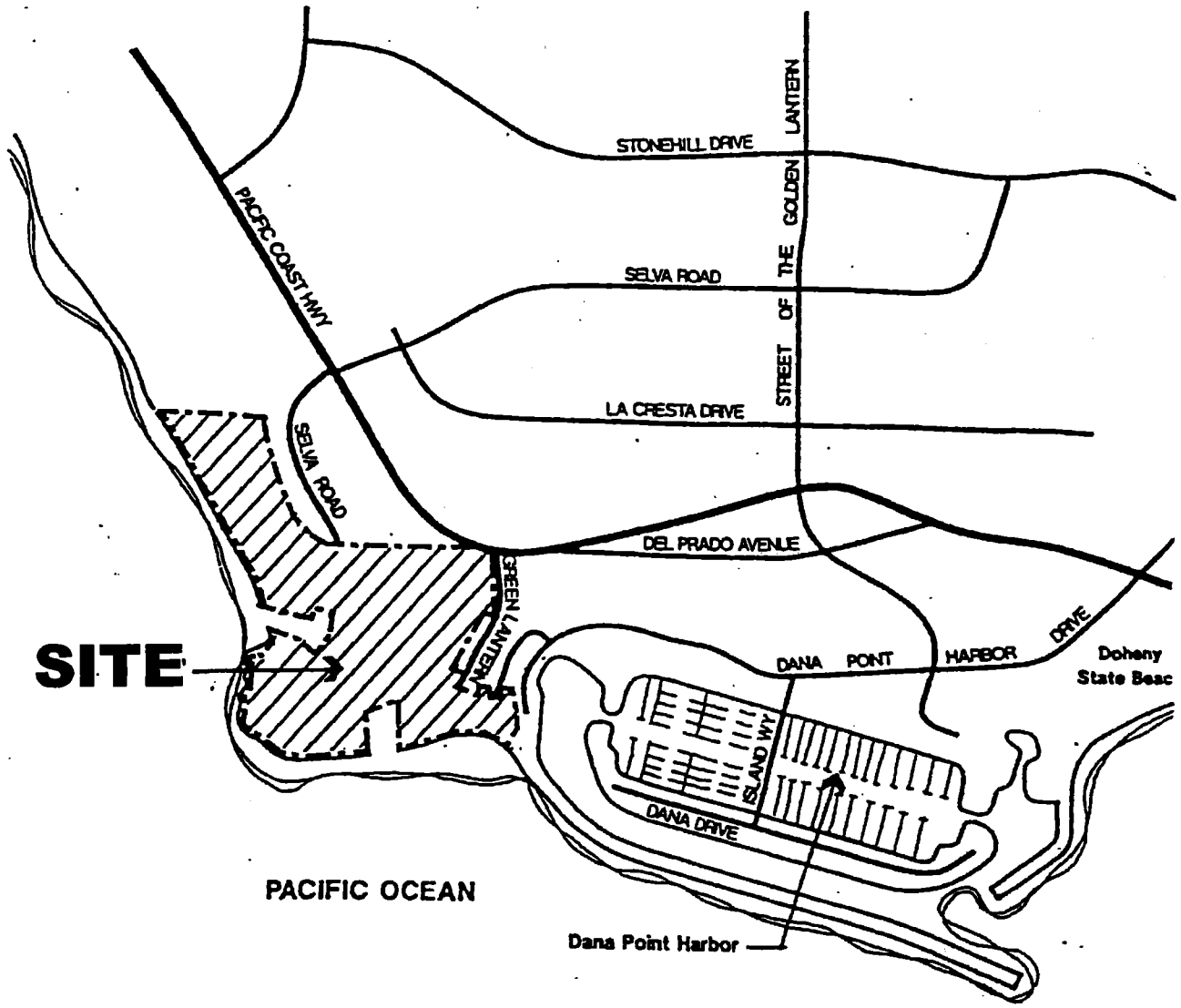


SOURCE: EDAW, Inc.

REGIONAL LOCATION MAP
HEADLANDS

URS	CHECKED BY:	DATE: 6-20-01	FIG. NO:
	PM: PM	PROJ. NO: 58-00161052.01	1

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SOURCE: PBR

LOCAL VICINITY MAP
HEADLANDS

URS	CHECKED BY:	DATE: 6-20-01	FIG. NO:
	PM: PM	PROJ. NO: 58-00161052.01	2

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LEGEND:

DEVELOPED/ORNAMENTAL
46.79 ACRES

DISTURBED/RUDERAL HABITA
3.21 ACRES

NON-NATIVE GRASSLAND
1.28 ACRES

COASTAL SAGE SCRUB
48.07 ACRES

DISTURBED COASTAL SAGE S
2.33 ACRES

SOUTHERN MIXED CHAPARRA
2.69 ACRES

MARITIME SUCCULENT SCRU
0.61 ACRES

SOUTHERN COASTAL BLUFF
3.34 ACRES

SANDY BEACH
5.22 ACRES

ROCKY INTERTIDAL/BLUFF F
6.11 ACRES

DISTURBED SOUTHERN
NEEDLEGRASS GRASSLAND
1.65 ACRES

JURISDICTIONAL CHANNELS



VEGETATION AND JURISDICTIONAL
WATERS OF THE U.S.
HEADLANDS

JRS	CHECKED BY:	DATE: 11-27-01	FIG. NO:
	PM: PM	PROJ. NO: 58-00161052.01	3

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LEGEND:

SENSITIVE SPECIES

CACTUS WREN (HISTORICAL)

OCCUPIED PACIFIC POCKET MOU

CALIFORNIA GNATCATCHER (PAIR)

▲ CALIFORNIA GNATCATCHER (HIST

ORANGE–THROATED WHIPTAIL (H

✱ WESTERN DICHONDRA (HISTORIC

◈ BLOCHMAN'S DUDLEYA

● NUTTALL'S SCRUB OAK

■ CLIFF SPURGE

◆ PALMER'S GRAPPLING HOOK (HI

● COULTER'S SALTBUSH (Atriplex

PROJECT BOUNDARY

N

0 400 800

APPROXIMATE GRAPHIC SCALE
(FEET)

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SENSITIVE SPECIES HEADLANDS

URS	CHECKED BY:	DATE: 12–3–01	FIG. NO:
	PM: PM	PROJ. NO: 58–00161052.01	4

LEGEND:

PROJECT SITE

AREA TO BE DISTURBED
79.2 ACRES

FUEL MODIFICATION ZONES REPLANTED WITH HEADLANDS REVEGETATION NATIVE PLANT PALETTE AND IRRIGATED.

* POTENTIAL BLOCHMAN'S DUDLEYA TRANSLOCATION SITES

OPEN SPACE PLANTED WITH HEADLANDS REVEGETATION NATIVE PLANT PALETTE, IRRIGATED AS NECESSARY.

REVEGETATION AS NECESSARY IF DISTURBED; THINNING AND/OR REMOVAL OF CHAPARRAL AND NON-NATIVE TREES, REPLACED WITH HEADLANDS REVEGETATION NATIVE PLANT PALETTE. EXCEPT FOR TRAILS, COASTAL SAGE SPECIES TO REMAIN.

REVEGETATION AS NECESSARY IF DISTURBED; LOW-GROWING GRASS AND SCRUB MIXTURE FROM HEADLANDS REVEGETATION NATIVE PLANT PALETTE. IRRIGATED AS NECESSARY.

UNIMPACTED VEGETATION

DEVELOPED/ORNAMENTAL
1.68 ACRES

DISTURBED/RUDERAL HABITAT
0.794 ACRES

NON-NATIVE GRASSLAND
0.704 ACRES

COASTAL SAGE SCRUB
21.9 ACRES

DISTURBED COASTAL SAGE SCRUB
0.5 ACRES

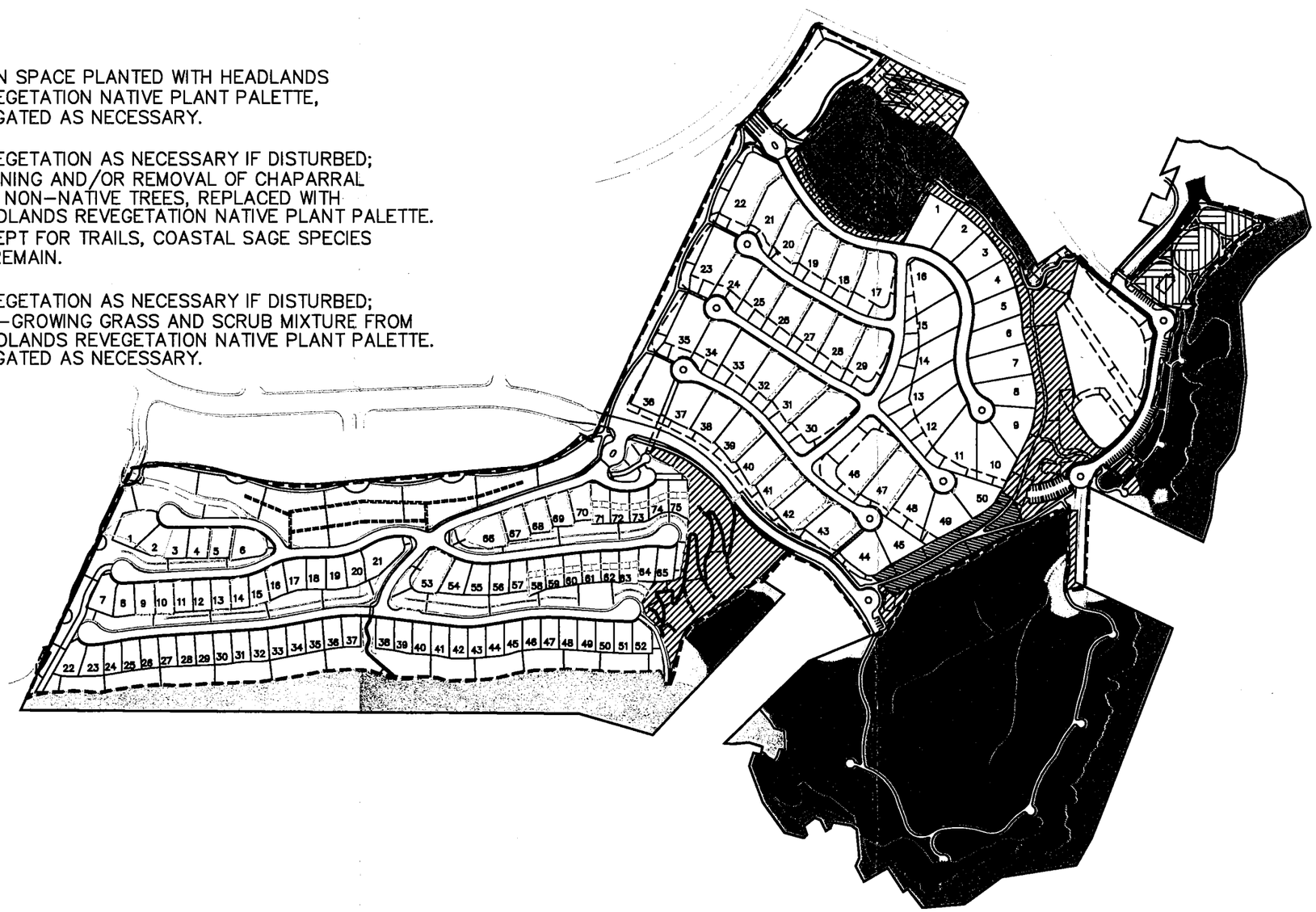
SOUTHERN COASTAL BLUFF SCRUB
3.28 ACRES

SOUTHERN MIXED CHAPPARAL
1.95 ACRES

SANDY BEACH
5.1 ACRES

ROCKY INTERTIDAL/BLUFF FACE
6.11 ACRES

TRAIL CONSTRUCTION WILL RESULT IN DISTURBANCE THAT IS INCLUDED IN THE CALCULATION FOR THE TOTAL AREA DISTURBED.



0 400 800

APPROXIMATE GRAPHIC SCALE
(FEET)

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BIOLOGICAL RESOURCES IMPACTS
HEADLANDS

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	PM: PM	PROJ. NO: 58-00161052.01	5

LEGEND:

DEVELOPED/ORNAMENTAL
46.79 ACRES

DISTURBED/RUDERAL HABITAT
3.21 ACRES

NON–NATIVE GRASSLAND
1.28 ACRES

COASTAL SAGE SCRUB
48.07 ACRES

DISTURBED COASTAL SAGE SCRUB
2.33 ACRES

SOUTHERN MIXED CHAPARRAL
2.69 ACRES

MARITIME SUCCULENT SCRUB
0.61 ACRES

SOUTHERN COASTAL BLUFF SCRUB
3.34 ACRES

SANDY BEACH
5.22 ACRES

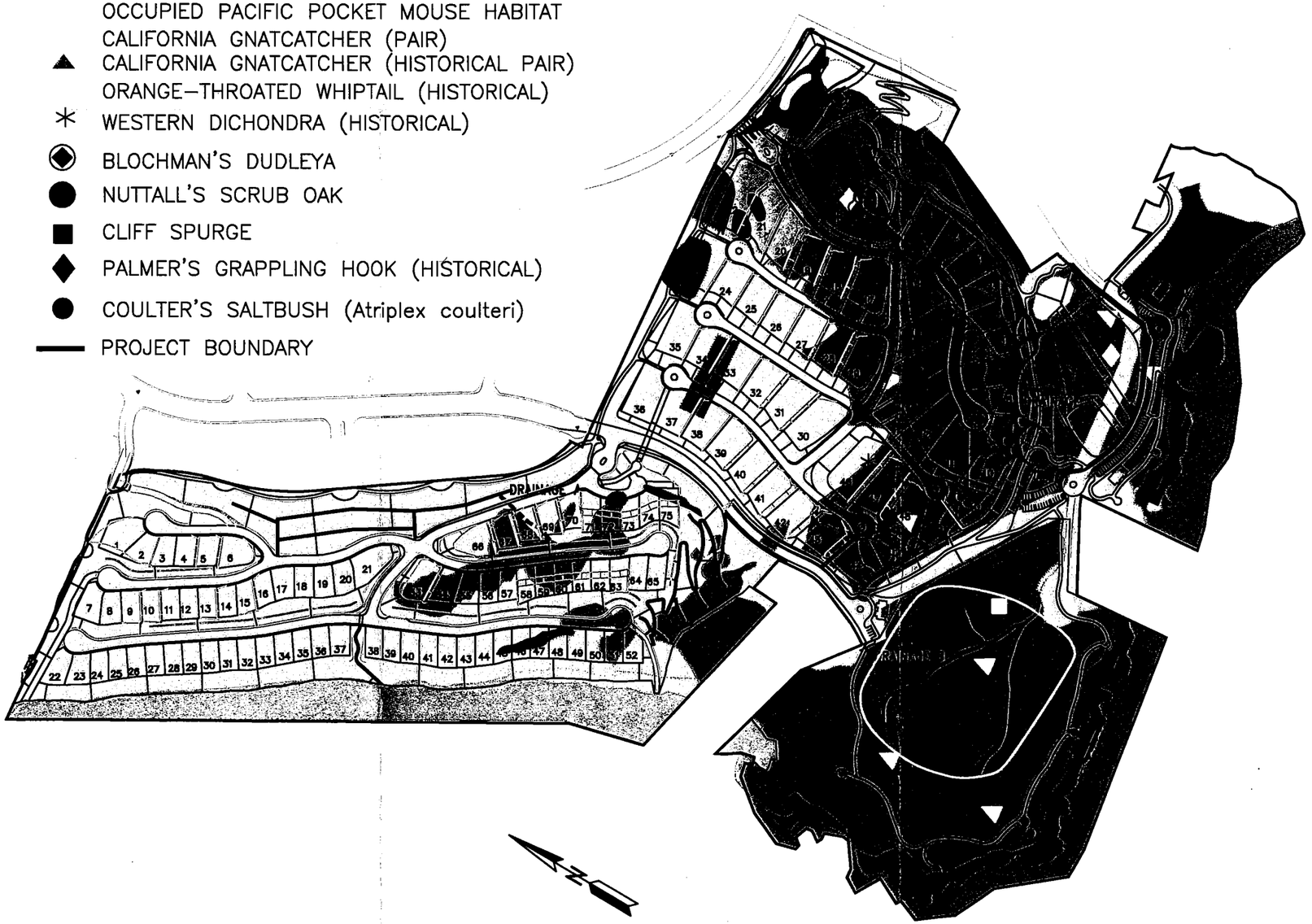
ROCKY INTERTIDAL/BLUFF FACE
6.11 ACRES

DISTURBED SOUTHERN
NEEDLEGRASS GRASSLAND
1.65 ACRES

JURISDICTIONAL CHANNELS

SENSITIVE SPECIES

CACTUS WREN (HISTORICAL)
OCCUPIED PACIFIC POCKET MOUSE HABITAT
CALIFORNIA GNATCATCHER (PAIR)
CALIFORNIA GNATCATCHER (HISTORICAL PAIR)
ORANGE–THROATED WHIPTAIL (HISTORICAL)
WESTERN DICHONDRA (HISTORICAL)
BLOCHMAN'S DUDLEYA
NUTTALL'S SCRUB OAK
CLIFF SPURGE
PALMER'S GRAPPLING HOOK (HISTORICAL)
COULTER'S SALTBUSH (Atriplex coulteri)
PROJECT BOUNDARY



0 400 800
APPROXIMATE GRAPHIC SCALE
(FEET)

VEGETATION, SPECIES AND JURISDICTIONAL WATERS OF THE U.S.
HEADLANDS

URS	CHECKED BY:	DATE: 12–2–01	FIG. NO:
	PM: PM	PROJ. NO: 58–00161052.01	6

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DANA POINT HEADLANDS FLORAL SPECIES LIST

Species[1]

Scientific name	Common Name
ARECACEAE	**Palm Family**
Washingtonia sp.	exotic planting
CUPRESSACEAE -	
**Juniperus* sp.	exotic planting
IRIDACEAE	**Iris Family**
Sisyrinchium bellum	Blue-eyed grass
JUNCACEAE	**Rush Family**
Juncus bufonius L.	Toad-Rush
LILIACEAE	**Lily Family**
**Agave americana* L.	American agave
**Agave attenuata* Salm.	Dyck
Bloomeria crocea (Torr.) Cov. ssp. *crocea*	Common goldenstars
Calochortus splendens Dougl. ex Benth.	Splendid mariposa-lily
Chlorogalum parviflorum Wats.	Small-flower soap plant
Dichelostemma capitatum Wood ssp. *capitatum*	Wild hyacinth
PINACEAE	**Pine Family**
**Pinus* sp.	exotic planting
POACEAE	**Grass Family**
**Arundo donax*	giant reed grass
**Avena barbata*	slender wild oat
**Bromus diandrus*	ripgut brome
**Bromus hordaceous* L	soft chess
**B. madritensis* ssp. *rubens*	foxtail chess
**Cynodon dactylon*	bermuda grass
**Gastridium ventricosum*	nitgrass
**Hordeum murinum* ssp. *leporinum*	hare barley
**Lolium perrene*	english ryegrass
Melica imperfecta	coast range melic
Muhlenbergia microsperma	little-seed muhly
Nassella (Stipa) lepida	foothill needlegrass
Nassella (Stipa) pulchra	purple needlegrass
**Pennisetum setaceum*	fountain grass
**Phalaris canariensis*	Mediterranean canary grass

**Piptatherum milliaceum*	smilo grass
**Poa annua*	annual bluegrass
**Polypogon monspeliensis*	annual beardgrass
**Schismus barbatus*	Mediterranean schismus
**Vulpia myuros* var. *myuros*	foxtail fescue
TYPHACEAE	**Cat Tail Family**
Typha latifolia	soft flag
AIZOACEAE	**Carpet-weed Family**
**Carpobrotus edulis* (Molina)N.E. Brit	
**Carpobrotus edulis*	hottentot fig
**Mesembryanthemum crystallinum*	crystal ice plant
** Mesembryanthemum nodiflorum*	little ice plant
**Mesembryanthemum* sp.	exotic planting
**Tetragonia tetragonioides* (Pallas)Kuntz	
ANACARDIACEAE	**Sumac Family**
Rhus integrifolia	lemonadeberry
**Schinus terebinthifolius*	Brazilian pepper
APIACEAE	**Carrot Family**
Apiastrum angustifolium	wild celery
**Daucus carota*	wild carrot
**Foeniculum vulgare*	fennel
Sanicula arguta	sharp-tooth sanicle
Sanicula crassicaulis Poepp. ex DC.	
APOCYNACEAE	**Dogbane Family**
**Nerium oleander*	oleander
**Vinca major* L.	
ASTERACEAE	**Sunflower Family**
Ambrosia psilostachya	western ragweed
Artemisia californica	California sagebrush
Baccharis pilularis	coyote brush
B. salicifolia (*glutinosa*)	mulefat
**Centaurea melitensis*	tocalote
Chaenactis glabriuscula	San Diego pincushion
**Chamomilla suaveolens*	pineapple weed
**Chrysanthemum coronarium*	garland chrysanthemum
**Cirsium vulgare*	bull thistle
**Conyza canadensis*	horseweed
**Coreopsis gigantea*	giant sea dahlia

**Cynara cardunculus*	artichoke thistle/cardoon
Encelia californica	common encelia
Erigeron foliosus var. *foliosus* (*stenophyllus*)	leaf daisy
Filago californica	California filago
Gnaphalium bicolor	bicolor cudweed
Gnaphalium californicum	California everlasting
Gnaphalium chilense	
Gnaphalium canescens	white everlasting
Grindelia camporum Green var.*bracteosum*	gum plant
**Hedypnois cretica*	crete hedypnois
Hemizonia fasciculata	tarweed
Heterotheca grandiflora	telegraph weed
**Hypochaeris glabra*	cat's ear
Isocoma menziesii	
Lasthenia californica	goldfields
Lessingia filaginifolia var. *filaginifolia*	
Malacothrix saxatilis ssp. *tenuifolia*	cliff malacothrix
Osmadenia tenella	rosinweed
Pentachaeta aurea	golden daisy
Senecio californicus	California butterweed
**Sonchus asper*	spiny-leaf sow-thistle
**Sonchus oleraceus*	common sow-thistle
Stephanomeria diegensis	San Diego wreath plant
Stylocline gnaphalioides	everlasting nest straw
Uropappus lindleyi	silver puffs
BORAGINACEAE	**Borage Family**
Amsinckia menziesii var. *intermedia*	rancher's fiddleneck
Cryptantha intermedia	nievitas
**Echium plantagineum*	
Harpagonella palmeri	
Plagiobothrys collinus var. *californicus*	California popcorn flower
Plagiobothrys collinus var.*gracilis*	small California popcorn flower
BRASSICACEAE	**Mustard Family**
**Brassica nigra*	black mustard
**Cakile maritima* ssp. *maritima*	sea-rocket
**Hirshfeldia incana*	short-pod mustard
Lepidium lasiocarpum var. *lasiocarpum*	sand peppergrass
Lepidium nitidum	peppergrass
**Lobularia maritima*	sweet alyssum
**Sisymbrium irio*	London rocket

CACTACEAE	**Cactus Family**
Opuntia littoralis	coastal prickly pear
Opuntia oricola	
Opuntia prolifera	coast cholla
CAPPARACEAE	**Caper Family**
Isomeris arborea	bladderpod
CARYOPHYLLACEAE	**Pink Family**
Cardionema ramosissima	tread lightly
Polycarpon depressum	California polycarp
**Polycarpon tetraphyllum*	four-leaf polycarp
**Silene gallica*	common catchfly
**Spergularia villosa*	
CHENOPODIACEAE	**Goosefoot Family**
Atriplex breweri	brewer's saltbush
Atriplex californica	California saltbush
Atriplex watsonii	Watson saltbush
Atriplex leucophylla	seaside saltbush
Chenopodium murale	nettle-leaf goosefoot
**Salsola tragus* (*iberica*)	Russian thistle
Suaeda taxifolia	sea blite
CONVOLVULACEAE	**Morning-Glory Family**
Calystegia macrostegia	morning glory
Dichondra occidentalis	western ponyfoot
CRASSULACEAE	**Stonecrop Family**
**Crassula argentea*	exotic planting
Crassula connata var. *connata*	dwarf stonecrop
Dudleya blochmeniae ssp. *blochmaniae*	Blochman's dudleya
Dudleya caespitosa	
Dudleya lanceolata	coastal dudleya
Dudleya pulverulenta	chalk dudleya
CUCURBITACEAE	**Gourd Family**
Marah macrocarpus	manroot, wild cucumber
EUPHORBIACEAE	**Spurge Family**
Croton californicus	
Euphorbia misera	cliff spurge
**Euphorbia peplus*	petty spurge
**Ricinus communis*	castor bean

FABACEAE	**Pea Family**
* *Acacia* sp.	exotic planting
**Bauhinia* sp.	exotic planting
Lotus scoparius	coastal deerweed
Lotus strigosus	bishop's lotus
Lupinus truncatus	collar lupine
**Medicago polymorpha*	California bur clover
**Melilotus indicus*	Indian sweet clover
FAGACEAE	**Oak Family**
Quercus dumosa	scrub oak
GERANIACEAE	**Geranium Family**
**Erodium botrys*	long-beak filaree
**Erodium cicutarium*	red-stem filaree
Erodium macrophyllum	large-leaf filaree
**Pelargonium zonale*	zonal geranium
HYDROPHYLLACEAE	**Waterleaf Family**
Phacelia distans	wild heliotrope
HYPERICACEAE	
Hypericum canariense	St. john's wort
LAMIACEAE	**Mint Family**
**Marrubium vulgare*	horehound
Stachys ajugoides var. *rigida*	hedge nettle
MALVACEAE	**Mallow Family**
**Hibiscus* sp.	exotic planting
**Lavatera assurgentiflora*	malva rose
**Malva parviflora*	cheeseweed
MUSACEAE	
Musa sp.	exotic planting
MYOPORACEAE	**Myoporum Family**
**Myoporum laetum*	ngaio
MYRTACEAE	**Myrtle Family**
Eucalyptus sp.	exotic planting
NYTAGINACEAE	**Four O'Clock Family**
Mirabilis californica	wishbone bush

ONAGRACEAE	**Evening Primrose Family**
Camissonia bistorta	southern sun cup
Camissonia cheiranthifolia ssp. *suffruticosa*	beach evening primrose
OXALIDACEAE	**Oxalis Family**
Oxalis albicans	wood sorrel
PLANTAGINACEAE	**Plantain Family**
Plantago erecta	dot-seed plantain
PLANTANACEAE	**Sycamore Family**
Plantanus racemosa	western sycamore
PLUMBAGINACEAE	**Leadwort Family**
Limonium californicum	sea lavender
POLEMONIACEAE	**Phlox Family**
Linanthus dianthiflorus	ground pink
POLYGONACEAE	**Buckwheat Family**
Chorizanthe procumbens	prostrate spine flower
Chorizanthe staticoides	
Eriogonum elongatum	tall buckwheat
Eriogonum fasciculatum	flat-topped buckwheat
Eriogonum gracile	slender buckwheat
Eriogonum parvifolium	coastal buckwheat
Pterostegia drymarioides	granny's hairnet
**Rumex crispus*	curly dock
PORTULACACEAE	**Purslane Family**
Calandrinia ciliata	red maids
PRIMULACEAE	**Primrose Family**
**Anagallis arvensis*	scarlet pimpernel
ROSACEAE	**Rose Family**
**Raphiolepis indica*	Indian hawthorn
RUBIACEAE	**Madder Family**
Galium angustifolium ssp. *angustifolium*	narrow-leaf bedstraw
**Galium aparine*	common bedstraw
SAPINDACEAE	
**Dodonea* sp.	exotic planting

SCROPHULARIACEAE	**Figwort Family**
Antirrhinum nuttallinum	Nuttall's snapdragon
Castilleja exserta ssp. *exserta*	purple owl's clover
Linaria canadensis	large blue toadflax
Mimulus aurantiacus	monkeyflower
Mimulus aurantiacus (*puniceus*)	red bush monkey flower
Scrophularia californica ssp. *floribunda*	California bee plant
SOLANACEAE	**Nightshade Family**
Datura wrightii	western jimsonweed
Lycium andersonii	waterjacket
Lycium californicum	California desert thorn
**Nicotiana glauca*	tree-tobacco
Solanum douglasii	Douglas' nightshade
**Solanum nigrum*	black nightshade
Solanum parishii	Parish's nightshade

[1] Nomenclature from Hickman (1993).

* Non-native species

HEADLANDS WILDLIFE SPECIES LIST

Scientific Name	Common Name
REPTILES AND AMPHIBIANS	
Order Salientia	**Frogs and Toads**
Family Hylidae	
Hyla regilla	Pacific treefrog
Family Iguanidae	
Sceloporus occidentalis	Western fence lizard
Uta stansburiana	Side-blotched lizard
Family Scincidae	
Eumeces skiltonianus	Western skink
Family Teiidae	
Cnemidophorus hyperythrus	Orange-throat whiptail
BIRDS	
Order Pelecaniformes	**Tropicbirds, Pelicans and Relatives**
Family Pelecanidae	
Pelecanus occidentalis	Brown pelican
Family Phalacrocoracidae	
Phalacrocorax auritus	Double-crested cormorant
Phalacrocorax pelagicus	Pelagic cormorant
Family Ardeidae	
Ardea herodias	Great blue heron
Butorides striatus	Green-backed heron
Order Falconiformes	**Vultures, Hawks, and Falcons**
Family Cathartidae	
Cathartes aura	Turkey vulture
Family Accipitridae	
Buteo jamaicensis	Red-tailed hawk
Family Falconidae	
Falco sparverius	American kestrel
Order Galliformes	**Megapodes, Curassows, Pheasants, and Relatives**
Family Phasianidae	
Callipepla californica	California quail

Order Columbiformes	**Pigeons and Doves**
Family Columbidae	
Zenaida macroura	Mourning dove
Columba livia	Rock dove
Order Apodiformes	**Swifts and Hummingbird**
Family Apodidae	
Aeronautes saxatalis	White-throated swift
Family Trochilidae	
Calypte anna	Anna's hummingbird
Calypte costae	Costa's hummingbird
Order Piciformes	**Woodpeckers and Relatives**
Family Picidae	
Picoides nuttallii	Nuttall's woodpecker
Colaptes auratus	Northern flicker
Order Charadriiformes	**Shorebirds, Gulls, and Relatives**
Family Charadriidae	
Pluvialis squatarola	Black-bellied plover
Family Scolopacidae	
Catoptrophorus semipalmatus	Willet
Numenius phaeopus	Whimbrel
Limosa fedoa	Marbled godwit
Arenaria melanocephala	Black turnstone
Aphriza virgata	Surfbird
Calidris alba	Sanderling
Family Laridae	
Larus heermanni	Heermann's gull
Larus delawarensis	Ring-billed gull
Larus californicus	California gull
Larus occidentalis	Western gull
Larus glaucescens	Glaucous-winged gull
Sterna caspia	Caspian tern
Order Passeriformes	**Perching Birds**
Family Corvidae	
Corvus brachyrhynchos	American crow
Corvus corax Common raven	

Family Aegithalidae	
Psaltriparus minimus	Bushtit
Family Muscicapidae	
Regulus calendula	Ruby-crowned kinglet
Polioptila californica californica	Coastal California gnatcatcher
Catharus guttatus	Hermit thrush
Family Tyrannidae	
Contopus sordidulus	Western wood peewee
Empidonax hammondii	Hammond's flycatcher
Empidonax difficilis	Pacific-slope flycatcher
Sayornis nigricans	Black pheobe
Sayornis saya	Say's phoebe
Myiarchus cinerascens	Ash-throated flycatcher
Tyrannus vociferans	Cassin's kingbird
Tyrannus verticalis	Western kingbird
Family Hirundidae	
Stelgidopteryx serripennis	Northern rough-winged swallow
Hirundo rustica	Barn swallow
Family Mimidae	
Mimus polyglottos	Northern mockingbird
Toxostoma redivivum	California thrasher
Family Troglodytidae	
Campylorhynchusbrunneicapillus cousei	Coastal cactus wren
Thryomanes bewickii	Bewick's wren
Troglodytes aedon	House wren
Family Sturnidae	
Sturnus vulgaris	European starling
Family Emberizidae	
Geothlypis trichas	Common yellowthroat
Pipilo erythrophthalmus	Spotted towhee
Pipilo crissalis	California towhee
Melospiza melodia	Song sparrow
Agelaius phoeniceus	Red-winged blackbird
Molothrus ater	Brown-headed cowbird
Pheucticus melanocephalus	Black-headed grosbeak
Wilsonia pusilla	Wilson's warbler

Carduelis psaltria	Lesser goldfinch
Carpodacus mexicanus	House finch
Vermivora celata	Orange-crowned warbler
Vermivora ruficapilla	Nashville warbler
Dendroica coronata	Yellow-rumped warbler
Dendroica nigrescens	Black-throated warbler
Dendroica townsendii	Townsend's warbler
Dendroica occidentalis	Hermit warbler
Oporornis tolmiei	MacGillivray's warbler
Spizella passerina	Chipping sparrow
Melospiza lincolnii	Lincoln's sparrow
Zonotrichia atricapilla	Golden-crowned sparrow
Zonotrichia leucophrys	White-crowned sparrow
Sturnella neglecta	Western meadowlark
Euphagus cyanocephalus	Brewer's blackbird
Icterus galbula	Northern oriole

MAMMALS

Order Lagomorpha	**Rabbits, Hares, and Pikas**
Family Leporidae	
Sylvilagus audubonii	desert cottontail
Order Rodentia	**Squirrels, Rats, Mice, and Relatives**
Family Sciuridae	
Spermophilus beecheyi	California ground squirrel
Family Cricetidae	
Peromyscus maniculatus	deer mouse
Reithrodontomys megalotis	western harvest mouse
Neotoma lepida intermedia	San Diego desert woodrat
Family Heteromyidae	
Perognathus longimembris pacificus	Pacific pocket mouse
Family Muridae	
Peromyscus eremicus	cactus mouse
Mus musculus	house mouse
Microtus californicus	California vole
Order Carnivora	**Carnivores**
Family Phocidae	

Phoca vitulina harbor seal (offshore)	
Family Otariidae	
Zalophus californianus	California sea lion (offshore)
Family Canidae	
Canis latrans	coyote (scat)

**Amphibian, reptile, bird, and mammal nomenclature follows Laudenslayer et al., 1991.

List of Elements and Status by Scientific Name
Dana Point Quadrangle

Scientific/Common Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
ATRIPLEX COULTERI *COULTER'S SALTBUSH*	None/ None	G2/ S2.2	1B/ 2-2-2	
CAMPYLORHYNCHUS BRUNNEICAPILLUS COUESI *COASTAL CACTUS WREN*	None/ None	G5T2?/ S2?		SC
CLEMMYS MARMORATA PALLIDA *SOUTHWESTERN POND TURTLE*	None/ None	G4T2T3 / S2		SC
COMAROSTAPHYLIS DIVERSIFOLIA SSP DIVERSIFOLIA *SUMMER HOLLY*	None/ None	G3?/ S2.2	1B/ 2-2-2	
DANAUS PLEXIPPUS *MONARCH BUTTERFLY*	None/ None	G5/ S3		
DUDLEYA BLOCHMANIAE SSP BLOCHMANIAE *BLOCHMAN'S DUDLEYA*	None/ None	G2T2/ S2.1	1B/ 2-3-2	
EUCYCLOGOBIUS NEWBERRYI *TIDEWATER GOBY*	Endangered/ None	G2G3/ S2S3		SC
EUPHORBIA MISERA *CLIFF SPURGE*	None/ None	G5/ S3.2	2/ 2-2-1	
GILA ORCUTTI *ARROYO CHUB*	None/ None	G2/ S2		SC
PEROGNATHUS LONGIMEMBRIS PACIFICUS *PACIFIC POCKET MOUSE*	Endangered/ None	G5T1/ S1		SC
POLIOPTILA CALIFORNICA CALIFORNICA *COASTAL CALIFORNIA GNATCATCHER*	Threatened/ None	G2T2/ S2		SC
QUERCUS DUMOSA *NUTTALL'S SCRUB OAK*	None/ None	G2/ S1.1	1B/ 2-3-2	
SCAPHIOPUS HAMMONDII *WESTERN SPADEFOOT*	None/ None	G3?/ S3?		SC

List of Elements and Status by Scientific Name
Dana Point Quadrangle

Scientific/Common Name	Federal/ State Status	Global/ State Rank	CNPS/ R-E-D	CDFG Status
SENECIO APHANACTIS *RAYLESS RAGWORT*	None/ None	G3?/ S1.2	2/ 3-2-1	
SOUTHERN COTTONWOOD WILLOW RIPARIAN FOREST	None/ None	G3/ S3.2		

Current Status and Viability Assessment of Pacific Pocket Mouse Population on Dana Point Headlands

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1 Introduction

The viability of the Pacific Pocket Mouse (PPM, *Perognathus longimembris pacificus*) on the Dana Point Headlands (DPH) is discussed in this paper. The biological baseline and population parameters relevant to the DPH PPM population are addressed below. The ability of DPH to support PPM (e.g., carrying capacity of the Temporary Preserve) is addressed from a qualitative, practical perspective. The DPH population is completely surrounded by large-scale urban development. As a result, it is isolated from the three other known populations on Camp Pendleton (Oscar One/Edison Range, San Mateo North and San Mateo South) and seven unoccupied historic locations elsewhere in Southern California. Due to this isolation, the DPH population cannot naturally disperse to or from other PPM populations and, therefore, cannot participate in PPM metapopulation dynamics without substantial human interventions to enhance the population's numbers, location, genetics, or habitat (Spencer 2000).

In the mid-1990's, the DPH property owners and the wildlife agencies recognized that the small PPM population on the DPH site would be unlikely to survive even in the short-term in the absence of intensive proactive conservation measures. The DPH landowners' conservation efforts for the PPM and concomitant agreements with the U.S. Fish and Wildlife Service (USFWS) and State of California regarding the regulatory effect of these conservation efforts are set forth in the NCCP/HCP for the Central/Coastal Subregion of Orange County.

Agreements executed by and between the USFWS, the California Department of Fish and Game (CDFG), the County of Orange (County), the DPH landowner's, and other appropriate parties established an 8.9 ha (22.0 acres) PPM Temporary Preserve on the DPH. Until July 2004, the wildlife agencies will study the role that the DPH PPM population plays in the conservation of the PPM population as a whole. If the PPM survive on the DPH site in the short-term, the wildlife agencies will determine whether to translocate the DPH PPM population to an area better suited for the population's long-term survival and conservation, or to establish a permanent DPH preserve through a land purchase. Until and if such translocation or purchase occurs, the wildlife agencies will actively manage the PPM population at the DPH site within the boundaries of the Temporary Preserve. However, on or before July 2004, the wildlife agencies must execute an agreement to purchase the Temporary Preserve if the agencies intend to maintain the PPM on the DPH site for any additional time thereafter, including any time required for additional management studies or activities associated with translocation.

1.1 Questions and Topics Addressed in this Paper

This paper briefly reviews the current status and adequacy of the available biological data that are considered necessary for making the management decisions recommended in the USFWS PPM Recovery Plan and NCCP/HCP Agreements for DPH. The basic questions are:

- Is the isolated DPH PPM population above a minimum viable size?
- Will increasing the allocations of land onsite substantially increase the viability of the PPM population?
- Are planned protection measures and management activities, such as fencing, habitat buffer areas, and active habitat management, adequate and appropriate to protect temporary preserve habitat in the short term, as concluded in the NCCP/HCP EIR/EIS and wildlife agency assessment?
- Will establishing a DPH non-profit trust with an endowment for habitat management meet conservation criteria for PPM?

1.2 Agreements Incorporated in the NCCP/HCP Affecting the DPH Population of the Pacific Pocket Mouse

Pursuant to the findings made in the final EIR/EIS through the NCCP/HCP Implementation Agreement (IA), the Headlands property owners have mitigated the potential adverse impacts on PPM from the development of DPH to below a level of significance. The mitigation conditions relevant to PPM are summarized here as stated in the IA. These conditions are (1) consistent with the PPM Recovery Plan, (2) based on short- and long-term strategies to avert extinction of the species, and (3) designed to improve the subspecies' likelihood of survival in the Orange County Central Coastal Subregion in the long term, and on DPH in the short term, while a course of action for the DPH PPM population is devised. The IA specifies a time limit of July 2004 when the USFWS, CDFG, and County of Orange must determine whether to take actions to attempt to maintain PPM on DPH on a permanent basis. The wildlife agencies concluded in 1996 that DPH was not an ideal location for the PPM population in the long term. The specific role that the DPH PPM population plays in achieving these overall goals is encompassed by the agreement:

- A Temporary Preserve for PPM, which includes habitat buffers, is established on an approximately 8.9 ha area depicted in the NCCP/HCP. This temporary reserve allows the wildlife agencies to conduct conservation/management actions that may benefit the PPM population in the short-term.

- The Participating Landowner allows access to the PPM Temporary Preserve for eight years, with four one-year extensions, according to the specific terms of the IA. Since July 10, 1996, CDFG, USFWS, County of Orange, or their authorized biological consultants, have been allowed access to the Temporary Preserve to conduct PPM monitoring, habitat manipulation, and relocation efforts.

- As described in the IA, the CDFG and USFWS have the right to exercise up to four one-year extensions if the USFWS determine that translocation or captive breeding of DPH population of PPM is not feasible, and the Reserve is necessary to ensure the survival and recovery of the species. Accordingly, the USFWS must take all steps within its legal authority, and enter into a purchase agreement to acquire the Temporary Preserve, on or before July 2004 to effectuate the four one-year extensions.

- If the Temporary Preserve is not acquired by USFWS and CDFG at the expiration of the temporary preserve period, the temporary preserve status shall be removed. If PPM remain in any designated open space on the Project Site after the expiration of the Temporary Preserve, during the project implementation, the project applicant will post information signs regarding the status of PPM. Such signs shall include information regarding PPM conservation needs in areas near the location of the former Temporary Preserve, and include signs at entry points in the remaining open space areas prohibiting pets in these areas. In addition, public use of designated open space areas within the former 8.9 ha temporary preserve area will be limited to designated walkways if any PPM continue to inhabit these specific open space areas.

- Issuance of the Section 10(a) Incidental Take Permit and the CDFG Management Authorization for DPH Project Site was subject to the DPH property owner providing to either CDFG, USFWS, the County Environmental Management Agency (EMA), or an appropriate conservation organization, a total of $350,000 to fund PPM propagation, enhancement, recovery, and relocation efforts on the Project Site, to be paid in yearly payments of $50,000 for seven years. To date, the property owners have paid $250,000 for the ongoing PPM studies on the DPH site.

- The DPH property owner shall also pay a total of $500,000 to the Nature Reserve of Orange County (NCCP/HCP Endowment Fund). The payments will be made as annual installments of $100,000 for 5 years, with the first payment due within seven days of the issuance of a grading permit for the project site. The remaining four payments will be made annually on the anniversary of the first payment. The NCCP/HCP funding will assist in the establishment of the approximately 15,378 ha of permanent open space in a reserve system (which does not include the DPH site[1]), and will allow for the continued implementation of the Adaptive Management Program for the Nature Reserve of Orange County, including provisions for restoration and enhancement of the areas within the Nature Reserve of Orange County.

[1] In the final assessment by the wildlife agencies and the EIR/EIS for the Central/Coastal NCCP/HCP, the DPH site was considered too small, isolated and edge affected to include in the Nature Reserve of Orange County.

- Upon expiration of the temporary preserve period, unless USFWS and CDFG have acquired the Temporary Preserve, the incidental take of all Identified Species shall be permitted within the former temporary preserve area in accordance with the needs of the Proposed Project, with the following conditions: 1) trapping of PPM will be conducted by an authorized biologist for three days prior to any earthmoving activities in areas to be directly affected by grading within the former temporary preserve area (if a longer period of trapping is necessary, USFWS will assume the additional trapping costs); 2) any captured PPM will be relocated to a suitable location designated by USFWS at the time of their capture with funding from the NCCP PPM research and recovery budget or other USFWS funding sources.

- During the temporary preserve period, the following construction management practices shall be implemented on the DPH site in connection with any development, as indicated in the Implementation Agreement: 1) monitoring of PPM during construction activities that occur within 300 feet of occupied habitat within the preserve area; if significant adverse impacts on mice are determined, practicable operational modifications will be implemented; 2) all areas of occupied habitat within the temporary preserve area will be marked, equipment operators will be informed of these marked areas, and operational techniques will be employed to prevent unintended impacts on PPM; 3) if it is deemed necessary to restrict grading during a specific time of the year, grading will be avoided immediately adjacent to occupied habitat during that time period (not to exceed four months).

1.3 Methodology of PPM Studies

A brief review of methodology used in studies of PPM is relevant to understanding the reliability, usefulness, and limitations of the data that have been collected for PPM to date. Most of the distribution, ecological, and population information about PPM have been derived from trapping studies. By definition, trapping of rodents is primarily a sampling procedure, and is not generally conducive to an actual census of the target species being studied. Trapping programs designed to determine presence or absence of most small mammals can be adequately conducted using Sherman live traps. Additional care is warranted when Sherman live traps are used for collecting data for population viability purposes. The research design, placement of the traps, and adjustments to trap trigger sensitivity influence the reliability of the data.

For determining population demographic parameters, it is difficult, to separate variation in sampling from actual variation in the population itself (White 2000). In situations where numerous traps are set over many nights in one location, appropriate statistics may be feasibly estimated from trapping data. However, in situations such as at the DPH, only a small population is present, and the impact of the trapping itself, if not conducted with pronounced care, could potentially harm a significant number of individuals that may affect population vitality before reliable estimates of population demographics are attained. Understanding how these sampling (trapping) variables influence the trapability

and population statistics of very small mammals is critical since the models by which we explore population dynamics are particularly sensitive to the initial conditions utilized(especially in estimates of carrying capacity, fecundity and survival).

Table 1 summarizes the trapping effort at the DPH site. The amount of trapping effort has increased since the first detection of the DPH PPM population in 1993. The methods for distributing the traps onsite have varied between years, however, making inter-year comparisons of these data difficult. The potential for significant sampling error of the estimate, rather than a real change in the population parameter, is substantial due to a lack a standardized sampling protocol consistently implemented each year.

1.4 Trapping Results and Status of DPH PPM Population in 1999/2000

Several years of data have been collected from the population of DPH PPM (Table 1). Dodd et al (pers. comm.) report that two trapping sessions (Spring and Summer) during 1999 were conducted, resulting in 22 captures of 13 unique individuals. The distribution of occupied habitat (3.0 ha or 7.4 acres) was not substantially different from the 1998 effort (Figure 1), although vegetation thinning plots were trapped for the first time in 1999. PPM appears to is utilizing the open spaces created by the vegetation thinning treatment. The locations of the vegetation thinning plots and control grids were trapped in the 1998 session for comparison of the results. These data suggest that the DPH PPM population may be decreasing in numbers from at least 25 individuals in 1993 to 10 individuals in 1999, while the size of the occupied area has increased from 1.4 ha in 1993 to 3.0 ha in 1998 (Figure 1). Thus, from 1993 to 1998, the density has dropped from an initial estimate of 26 PPM per ha to an estimate of less than 5 PPM per hectare Bryliski 1993, S. Dodd pers. comm.). The trapping program in 2000 resulted in 10 unique individuals being captured and an apparent density of less than 4 PPM per hectare (Table 1).

Population variability cannot be estimated or partitioned into variability categories, associated sampling techniques, or to actual differences in PPM population levels. Additionally, many heteromyids exhibit great variability in numbers between years and seasons, sometimes with changes on the order of a magnitude of 100 (Brown and Harney 1993). These changes, however, are usually highly correlated with changes in temperature and food supply in dry desert habitats. PPM, in contrast, is found only in coastal areas where the maritime climate is considerably more ameliorated. Changes in temperatures and food supplies are much less variable, in magnitude and frequency, in coastal areas of Southern California compared to inland areas (Mock 1998).

Although it would not be surprising if populations of PPM exhibited long term cycles of low and high population densities, additional years of trapping will be required before the current decreasing trend in perceived population size can be defined as a short-term or long-term population trend, or if it is a result of sampling error. If it is a long-term population trend, the decreasing population is clearly at a critically low density on DPH , with the population being vulnerable to the effects of inbreeding and adverse

demographic effects associated with small populations (e.g., some females fail to locate a mate each season).

The existing data cannot provide a robust characterization of PPM population dynamics on DPH, primarily because the techniques used to sample the population have not been identical between years, and the population numbers are very small, causing the potential sampling error to be disproportionately large. If the data are accurate, several trends are apparent in the data; such trends are not unexpected in heteromyid populations, which tend to be highly variable in population numbers from year to year (Table 1; Brown and Harney 1993):

- The number of PPM individuals captured on the DPH has declined, in spite of an increasing number of trap-nights expended to capture them. Several more years of trapping will need to occur before we can be sufficiently certain that changes in the population estimates are either a short- or long-term trend.
- The ratio of juveniles to adults has decreased.
- The mean ratio of males to females has increased to 1.28 to 1.

The small size and isolation of the occupied and potential habitat on DPH creates an area with an extensive interface (edge) with existing development. The negative effects of extensive development edge in isolated habitat fragments have been identified as an important proximate cause of local extirpation in small mammal populations (Mills 1995). The deleterious effects of edge on density may be partially counteracted by a population density buildup due to reduced emigration. The overall negative edge effect reduces the functional size of the habitat remnant. The extent to which these factors may influence the density of PPM on DPH is not known, but small mammal studies have shown that restricted dispersal may lead to higher densities in experimentally isolated populations (Lidicker 1975). The current data for the DPH PPM population is counter to this effect since apparent PPM density at DPH has declined over time.

1.5 Biology of the Heteromyidae and Perognathinae

In spite of the fact that the family Heteromyidae is one of the most studied rodent taxa in North America, the biology of PPM is not well known due to:

(1) the subspecies being restricted to small populations in sand dunes, water courses, and beaches along coastal southern California;
(2) the animal is one of the smallest of North American mammals, and accordingly, difficult to capture and observe in its microhabitat;
(3) PPM is nocturnal and secretive;
(4) Prior to 1993, PPM was last detected in Orange County in 1971 and was not found in historic localities or available for study during focused searches for it by mammalogists; and
(5) PPM remains underground, generally in a torpid (hibernation) condition through the winter months and emerges at more or less unpredictable intervals.

Several trapping programs were conducted in previously occupied habitats between 1981 and 1993 without detection of PPM (Friesen 1981, El Segundo Dunes, Matoni 1997, Erickson 1993, USFWS 1995, and perhaps others). Other than general trapping programs conducted by museums and independent naturalists early in the 1900s, no sustained, systematic searches were conducted for PPMs during most of the last century. During research for his dissertation, Meserve (1972, 1976) reported many details of the biology of PPM that co-occurred with other rodents in a coastal sage scrub community in the San Joaquin Hills in Irvine. Although Meserve's study area was subsequently eliminated by a commercial development, much of the population biology of PPM has been inferred from information derived incidentally from the other 15 *P. longimembris* subspecies (surrogates), other pocket mice species (*Perognathus* and *Chaetodipus*), and other heteromyids, such as kangaroo rats and kangaroo mice. In the absence of species-specific information, other closely related taxa may provide the "best available scientific knowledge" to guide management and recovery for the subspecies on DPH.

1.6 Life History, Demography, and Population Dynamics of PPM

The following sections briefly discuss the biological baseline data that enter into a population viability assessment of PPM on DPH. The species to which PPM belongs, *Perognathus longimembris*, is apparently adaptable since it is widely distributed in six U.S. states, and northern Baja, Mexico, where it occupies arid and semi-arid regions of the Intermountain Sagebrush and the American Desert provinces, as well as California Grassland, and Sierran Forest provinces of the Humid Temperate Domain (Schmidly, Wilkins, and Derr, 1993; Hall 1981). The subspecies *P. l. brevinasus*, which is geographically adjacent to PPM, is found in arid coastal basins of southern California grassland and coastal sage scrub vegetation (Williams, Genoways, and Braun, 1993). PPM is apparently restricted to maritime-influenced dunes, washes, and plains of southern California, and possibly northern Baja California, where sandy loam soils and open sage scrub is found within 4 km of the sea.

The biology of *Perognathus longimembris* is summarized in the USFWS Recovery Plan (USFWS 1998); Spencer et al. (2000a; 2000b); and California Statewide Habitat Relations System (1990), among others. Various aspects of the species' biology are discussed in some detail in Genoways and Brown (1993), a monograph on the heteromyid family. The natural history of the subspecies, *P. l. pacificus*, is emerging from studies sponsored by the USFWS, CDFG, the DPH property owners, Foothill/Eastern Transportation Corridor Agency, and other agencies on known populations at DPH and Camp Pendleton. Surveys of nearly all potentially suitable habitat and extant historically occupied habitat have been conducted for PPM (Spencer et al, 2000a). The results of the surveys indicate that a sufficient number of populations currently do not exist to meet the recovery criteria specified in the PPM Recovery Plan (USFWS 1998).

In addition to the trapping conducted by Brylski in 1993, the PPM population on DPH has been studied by limited live trapping by the USFWS in 1996 (Pavelka 1998-99); and more extensive trapping by Dodd et al. in 1997 and 1998 (Dodd et al. 1998a, 1998b); and

by Dodd et al. in 1999 and 2000 (S. Dodd 2000 pers. comm., see Table 1). Trapping effort on the Camp Pendleton populations is summarized in Table 2. The USFWS's summary of biological data in the 1998 Recovery Plan are partially extrapolated from PPM sister subspecies and several closely related species. The discussions below incorporate data from the Recovery Plan.

1.6.1 PPM Reproduction

PPM breeds from April through July. The species *P. longimembris* as a whole breeds from January to August, with a peak from March to May. Reproduction is keyed to the availability of green vegetation. Nests are constructed in a burrow with roots, leaves, and other organic materials. Gestation is approximately 22 to 23 days, although extremes of 21 to 31 days were recorded by Hayden et al (1966). Eisenberg (1993) summarized the following data from various studies of *P. longimembris*: Young of the year are capable of breeding in the same season they are born; litter size averages 3.3 pups, with weaning occurring between 14 to 18 days of age; juveniles begin foraging outside their burrows at about 4 or 5 weeks after birth and become sexually mature at 42 days; at birth, the litter may weigh about 50 percent of the weight of the mother. Hayden et al. (1966) reported that females can breed at 50 days of age and males start breeding at 150 days of age.

Brown and Harney show that fluctuation in population density can be very large and extremely variable among populations of some heteromyids. Density of one species of kangaroo rat (*Dipodomys deserti*) varied 100-fold in a four year period, although the population almost became extirpated by the end of a 3-year drought. Most of the data supporting these conclusions are based on fragmentary data; there have been few long-term studies (Brown and Harney, 1993). Brown and Harney (1993) note that populations in coastal areas where precipitation is more predictable are probably more stable than those inhabiting the most arid regions. Yet, the handful of intensive, long-term studies that have been conducted for heteromyids have not been of sufficient duration to provide an accurate characterization of the relationships between precipitation, primary production, food supply, and population density (Brown and Harney, 1993).

1.6.2 Longevity

In comparison to other rodents, heteromyids are relatively long-lived. Perognathus have been recorded to live for 5 years in the field (French, Maza, and Aschwanden, 1974; Brown and Harney, 1993), which allows energy to be allocated toward improving survival of individuals into adulthood rather than on producing increased numbers of young each season, as is typical for microtine rodents. Two *P. l pacificus* lived about 4 and 6 years in captivity (Bailey 1939). A *P. I. bangsi* trapped as an adult lived 3.5 years in captivity; when it died it was probably more than 4 years old (Behrends 1997). Within a population of *P. longimembris* studied at Joshua Tree (apparently *P. l. bangsi*), about 30 percent of the marked individuals survived from one spring to the next (Chew and Butterworth 1964). A maximum life span of 4 years would translate into an annual adult survival rate of about 45 percent.

The seasonality of reproductive activities within heteromyid species is variable, depending on specific environmental conditions. Reproduction may not occur in years when sufficient food resources are limited (Brown and Harney, 1993). Thus, populations of PPM may be comprised primarily of adults, with low population mortality rates during resource limiting years. Consequently, adult energies are allocated to foraging behaviors, food storage, facultative torpor, facultative dispersal, and predator-avoidance tactics to survive through harsh environmental periods, rather than toward producing young.

1.6.3 Behavior

Observations by Bailey (1939) and Meserve (1972) on captive *P. longimembris pacificus* indicate this subspecies, like other heteromyids, is aggressively solitary. They appear to have a peak activity period early in the night (Kenagy 1973).

1.6.4 Age Structure and Sex Ratio

Data from DPH and San Mateo Creek populations documented 55 percent and 75 percent of the *P. longimembris pacificus* captures, respectively, were young of the year (juveniles). Both studies were conducted during July and August. Despite a potential trap bias (juveniles may be more trappable than adults), the age structure of these populations after the breeding season is dominated by juveniles (Table 1). At DPH, the mean sex ratio was 1.23:1 (males:females). At the San Mateo Creek population, the sex ratio was 0.8:1. No data for other *P. longimembris subspecies* are reported.

1.7 Spatial Use of Habitat and PPM Population Density

Thirty-six *P. longimembris pacificus* were captured in approximately 1.4 ha (3.5 acres) of occupied habitat on DPH in 1993 (Brylski 1993). Ogden (1997) reported a maximum movement (by recapture) of about 22 meters by an individual at the San Mateo South site. Most other recaptures at the San Mateo South site were at the first capture location, suggesting PPM are somewhat sedentary in their seasonal movements (Ogden 1997). Twenty individual Pacific pocket mice were captured in 1996 at the San Mateo South site on approximately 13 hectares (32 acres) of occupied habitat. A total of 37 individuals were captured in 1995 at the San Mateo North site on approximately 6.5 ha (16 acres) of occupied habitat (Ogden 1997). These three PPM studies produce population densities ranging from 1.5 to 25 individuals per ha (mean 10.5 PPM/ha).

Where they occur, species of little pocket mice are often the most abundant rodent in arid habitats. Hall (1946) estimated a population density in Nevada to be as high as 990 individuals/ha (400 individuals/acre). Home ranges varied in size from 0.12 to 0.56 ha (0.30 to 1.4 acres) and populations ranged in density from 1 to 5.5 individuals per ha (0.4 to 2.2 individuals per acre) in Joshua Tree National Monument, California (Chew and Butterworth 1964). In Nevada, home ranges of males averaged 0.3 to 1.9 ha (0.7 to 4.7 acres) and home ranges of females averaged 0.5 to 3.1 ha (1.2 to 7.6 acres). The density of one Nevada population fluctuated from 1 to 5.4 individuals per hectare (0.4 to 2.2 individuals per acre). In the Owens Valley, California, Kenagy (1973) observed movements of less than 50 meters (165 feet). Population densities of *P. flavus* fluctuate

widely: in one Arizona study area, animals were absent for years and later were the most abundant species. Average range of movement was 62.5 meters (205 feet) (Chew and Chew 1970) and the average dispersal distance during a lifetime was 202 meters (660 feet) (Brown and Zeng 1989). Home ranges have been reported at 0. 11 ha (0.27 acres) in Arizona and 0.24 to 0.63 ha (0.6 to 1.6 acres) in New Mexico; males home ranges are larger than those of females.

1.8 Limiting Environmental Variables

Physical and biotic environmental variables that limit abundance and distribution of PPM specifically, and heteromyids in general, have not all been systematically identified and evaluated (Brown and Harney, 1993). Such factors do not act independently, but rather limit survival and reproduction by acting and interacting in complex ways, making it difficult to identify the effects of specific limiting factors and to assess their relative importance. Variation in the physical environment, either directly or mediated through other organisms, may frequently be the cause of nonrandom patterns of abundance and distribution. In cases where different rodent species coexist and interact within a particular habitat, the various species may differ substantially in the kinds and combinations of environmental variables that affect them and limit their local abundance (Brown and Harney, 1993).

Wherever and whenever a species' unique requirements are met, its abundance and distribution are limited by some combination of biogeographic barrier to dispersal, local physical conditions, and interactions with other coexisting plants and animals (Brown and Harney, 1993). Laboratory and field evidence (Brown and Harney, 1993) indicate increasingly that a number of deterministic processes of interaction between species within a biological community and environmental factors establish where a particular species may occur.

Habitat structure, which is largely determined by local geology, climate, soil, and vegetation on a site, determines what species assemblages may occur there, probably by facilitating locomotion, foraging, or by affecting risk of predation. Heterogenous habitats would be expected to support more diverse assemblages of species because they support more discrete microhabitats which allow for more species to coexist. Numerous studies have shown that species that coexist in local habitats are highly nonrandom assemblages with respect to body size (Brown and Harney, 1993), presumably because differences in body size reduce competition between species and promote local coexistence (Brown and Harney, 1993). In terms of microhabitat preference, *P. longimembris* on sand dunes in the Great Basin and Mojave Deserts were captured most frequently within the canopy of shrubs, whereas other rodents, with larger body sizes, such as kangaroo rats, were captured in open areas of the dunes. (Brown and Harney 1993).

PPM is the most westerly subspecies of *P. longimembris*, living within a climatic zone that differs considerably from that of most of the other subspecies that live in highly variable arid inland portions of North America. In arid situations, heteromyid populations generally exhibit large, irregular fluctuations in response to variation in their

environments, especially temperature changes and seed availability. The magnitude of these population fluctuations is moderated by life history traits that promote survival of adults through unfavorable periods (Brown and Harney 1993). Brown and Harney point out that seeds, green vegetation, and insects that comprise the diets of heteromyids are produced in high abundance following periods of sufficient rainfall, but the relationships that regulate seed production and rodent population dynamics are complex and depend upon the timing of precipitation, primary production, food availability, and reproductive success. PPM subspecies occur where many of these extrinsic factors or conditions appear to be tempered by the moderating effects of the ocean. For this reason alone, PPM may not be typical of the *longimembris* species as a whole. Fluctuations in the availability of seeds and vegetation may be less severe in maritime climate, which may lead to stable population levels between years and reduced inter-annual variation in demographic parameters.

Reproduction for many heteromyids is timed to coincide with high food availability. The small litter size and the long intervals between litters are likely to dampen and limit the potential rate of population increase. Some rodent species attain their highest population levels only after a succession of two or more exceptionally productive seasons (Brown and Harney, 1993). The maritime location of PPM populations likely have a moderating influence on population size and inter-annual variation. The ability of PPM to store food, utilize torpor, and effectively avoid predators likely moderate temporal changes in population levels of PPM.

1.9 Competitors and Other Rodents in Community

Other gramnivorous animals occurring on DPH may compete and interact with PPM for limited seed and herbaceous resources. Harvester ants (*Veromessor pergandei*) in California can collect about 6 million seeds per year from a hectare of ground surface, and it appears that the kind of seed collected often depends upon what is available (Sudd 1967). Ants may be a significant competitor of PPM on DPH, although Sudd notes that the number of seeds produced per hectare under good conditions may be in the order of 600 million seeds per hectare in desert habitats, where the ants do not make a significant inroad into depleting seed banks. Ants appear to remove seeds only from the soil surface, whereas PPM may rapidly sift sand for seeds, which it then transports in its cheek pouches back to the burrow for storage (Reichman and Price 1993).

Seed-eating birds, such as California Quail (*Callipepla californica*), Mourning Dove (*Zenaida macroura*), and numerous species of finches and sparrows (Emberizidae) would likely be foraging during the day for seeds also used by PPM. Other gramnivorous mammals that would be foraging and competing for resources and are reported to be on the site include California Ground Squirrel (*Spermophilus beecheyi*), Deer Mouse (*Peromyscus maniculatus*), Western Harvest Mouse (*Reithrodontomys megalotis*), Desert Woodrat (*Neotoma leipida*), House Mouse (*Mus musculus*), Cactus Mouse (*Peromyscus eremicus*), and California Vole (*Microtus californicus*). Norway Rat (*Rattus norvegicus*) and Black Rat (*Rattus rattus*) may also be expected, due to the proximity of existing houses near the Project Site. Although interaction and competition would likely be

related to food requirements, competition for burrowing space, nesting materials, water, or certain sizes of seeds could also occur (Reichman and Price 1998).

1.10 Extrinsic Environmental Factors

Extrinsic environmental factors that affect the distribution and abundance of heteromyid rodent populations, and accordingly PPM, are discussed by Brown and Harney (1993). The most general of these factors are climate and geology, which have a substantial influence on the soils and vegetation present within any particular habitat. These influences in turn, affect competitors, predators, parasites, and diseases that might be present within the habitat.

1.10.1 Soil Texture

Soil texture is a physical factor that appears to be an important direct limiting factor for PPM due to its influence on burrowing, locomotion, and foraging activities. This pattern is repeated in many species of heteromyids, and is probably a direct effect, not moderated by competitive exclusion by other organisms (Brown and Harney, 1993). Soil texture and substrate may be indirectly important in determining the distribution and dispersion of seed species and directly important by affecting the mechanisms used by PPM to harvest seeds (Brown and Harney, 1993; Reichman and Price, 1993). PPM is a very small mammal that largely survives by sorting sand for seeds. The tiny size of the species' limbs, feet, and toes directly limit or restrict the ability of the species in manipulating sand grains that might be too large for efficiently sorting out seeds. Any attempts at producing or expanding PPM habitat within DPH or elsewhere must pay particular attention to the texture, depth, dispersion, and location of fine sands in the habitat. Clay and rocky soils limit the PPM ability to create burrows.

1.10.2 Vegetation Structure

Vegetation structure (physiognomy) is documented as being important in physically limiting abundance and distribution of heteromyid species (Brown and Harney, 1993). Numerous studies have shown that the effect of physiognomy is both biotically mediated by community plant species composition, which is influenced by climate and soil, and abiotically mediated by the physical structure (size, shape, structure of woody parts) of the plants. The clearing of vegetation has been shown to increase the number of captures of Merriam's Kangaroo Rat (*Dipodomys merriami*) at trapping stations, indicating that this species may be limited locally by the abundance of its preferred open microhabitat (Price, 1978). However, vegetation clearing may also have other effects, such as increasing the susceptibility to predation that would also affect trapping results (Brown and Harney, 1993). Changes in the physiognomy of an area – such as opening the habitat by removing plants for PPM – may have an effect on both PPM and other coexisting competitors, which could change community dynamics and resource partitioning. Due to these highly interactive ecological relationships, it is difficult to predict with the existing data whether DPH PPM population can be effectively increased at the DPH site over the long-term. The initial vegetation manipulation treatments suggest that PPM do respond

to the treatment, but whether this management action will result in increased population size that is sustainable over the long term is unknown.

1.10.3 Predators, Parasites, and Disease

Information on predators of heteromyids, *Perognathus*, and specifically PPM, is very scant (Lay 1996). Long term studies on these taxa have not been conducted to document the extent of predation relative to rodent population densities. Reports of owl predation on *Perognathus*, including some *P. longimembris*, include Long-eared Owl (*Asio otus*) and Great-horned Owl (*Bubo virginianus*) in Nevada. Long-eared Owl, Burrowing Owl (*Speotyto cunicularia*), and Barn Owl (*Tyto alba*) in Colorado (Lay 1996). MBA (1997) examined 2,000 Barn Owl (*Tyto alba*) pellets from 27 sites inland along the Foothill Transportation Corridor study area and found no skeletal parts associated with PPM or *Perognathus longimembris brevina*sus. Either PPM are not sufficiently available at the sampled sites to be found in the samples, or Barn Owl are not preying upon them. In either case, PPM does not appear to be a common prey item of Barn Owl in the vicinity of the North San Mateo PPM population.

Natural nocturnal predators reported on DPH include Barn Owl (*Tyto alba*), Great-horned Owl (*Bubo virginianus*), Striped Skunk (*Mephitis mephitis*), Bobcat (*Lynx rufus*), Domestic Cat (*Felis catus*), and Domestic Dog (*Canis familiaris*). A single specimen of the Coachwhip (*Masticophis flagellum*) was reported by Dodd (1998). Raccoon (*Procyon lotor*), Virginia Opossum (*Didephis virginiana*), and Long-tailed Weasel (*Mustela frenata*) have been reported to be present (Dodd 1998). Additional native nocturnal predators not documented on DPH, but that may be present or could be expected to move on to the site along the coastal bluffs, include Gopher Snake (*Pituophis melanoleucus*), Racer (*Coluber constrictor*), Western Patch-nosed Snake (*Salvadora hexalepis*), Mountain King Snake (*Lampropeltis zonata*), California Whipsnake (*Masticophis lateralis),* and Spotted Skunk (*Spilogale putorius*).

The general consensus among conservation biologists is that habitat reserve systems are generally healthiest and conserve their naturally occurring fauna best if they maintain the natural complement of predators within their ecosystems. Removal or control of natural predators as a management practice should be considered if the predator population is considered a threat to the existence of PPM. Exclusion, control, or removal of any exotic predator species, such as Domestic Cat, should be conducted as a matter of policy. House cats living in the existing neighboring enclave of houses to the east and northwest of the site have been observed hunting within the currently fenced area of DPH. The ability of domestic cats to hunt is quite variable among individual cats, but some cats are prolific hunters, and quite successful at capturing prey (Fitzgerald 1988; Coleman and Temple 1995). Feral cats may also be present in the area, although no verified occurrence of a feral cat has been reported on the DPH site.

1.11 Intrinsic, Proximate Factors.

Intrinsic, proximate effects on individuals that result from variations in the factors discussed above can include immediate death, physiological stress, and reduced food

availability. Also, where habitats are adjacent to developed sites, human encroachments can be an important factor.

1.11.1 Immediate Death

The death of individual PPM on the DPH site can result from several natural causes, including predation, or death from "old age," which in *P. longimembris* may extend up to four years (Bailey 1939, Behrends 1997) Death may also occur if adequate food, or other resources are in short supply relative to the number of individuals requiring them. The rate that such density-dependent mortality occurs may vary between age classes and between males and females. In Joshua Tree National Monument, 30 percent of marked individuals were relocated from one spring to the next (Chew and Butterworth 1964).

Additionally, an intensely hot fire in Coastal Sage Scrub vegetation could also cause the direct death of individual PPM that might be nesting in shallow burrows or foraging on the surface during a fire. However, Kenagy (1973) reported that the nest chambers of burrow systems he excavated were 52 and 65 cm below the ground surface, which would likely protect most rodents from fire.

1.11.2 Physiological Stress and the Onset of Dormancy and Activity in PPM

P. longimembris pacificus hibernates in winter and generally remains in underground burrows from November to February (Meserve 1972). Kenagy (1973) observed that little pocket mice in the Owens Valley may stay in their burrows continuously for up to 5 months in winter, alternating between periods of dormancy and feeding on stored seeds. Periods of dormancy may be induced by, or correlated with, food shortage (Kenagy 1973). The activity of *P. l. longimembris* differed in three consecutive winters, ranging from 0 to 5 months of inactivity (Kenagy 1976). In 1969-1970, the year with greatest survival (82 percent) and the largest population size (27) for this group, the population was active throughout the winter. Precipitation in the season prior to the 1969-1970 winter was three times normal and plants produced a prolific crop of seeds. This population was also actively foraging above ground during a different winter that followed poor seed production, although it is not clear if all individuals were active. Less fit individuals and young of the year may be forced into winter activity due to low food stores. In the same study, males were detected earlier in the spring than females. Winters are less severe within the range of PPM than of other subspecies, which may explain (and predict) some differences in activity patterns (Ogden 1997).

The physiological characteristics of daily torpor have been studied in *Perognathus longimembris* by French (1993). As with normal sleep, daily torpor follows a strong circadian periodicity in *Perognathus longimembris*, accompanied by profound changes in body temperature, mediated through hypothalamic regulators. The timing of seasonal dormancy is strongly influenced by endogenous components. In laboratory conditions of constant temperatures over several years, *Perognathus longimembris* and sibling species alternated between periods of foraging activity on the ground surface at night and periods of dormancy during which they continuously remained underground. The duration of activity and dormancy were quite variable, even under constant environmental regimens.

The evidence suggests that the timing of active and dormant phases are greatly influenced by changes in environmental conditions in natural situations.

Environmental influences are complex in natural populations; the disappearance of individuals of *Perognathus* is asynchronous in adjacent populations falling under the same regimes of temperature and food availability (French 1993). Apparently, the quality and quantity of food available indirectly determine the timing of breeding, foraging success, and dormancy periods. The duration and timing of dormancy are likely different between sex and age-class,. Male pocket mice emerge earlier than females by a few weeks. A strong correlation exists between the amount of stored seeds in burrows prior to dormancy, and the length of time that an individual spends in dormancy. Some *Perognathus longimembris* in experimental conditions have continuously remained underground for more than three years when their stored food supplies are kept plentiful. Many individuals emerge even when their stored food supplies have not been depleted: Males and females differ considerably in the length of their stay underground, with females tending to remain underground for longer periods of time. The amount of time spent in torpor during winter appears to be a function of the animal's initial food supply and its sex and age.

In spite of the variability in the timing that dormancy may begin in *P. longimembris,* emergence from winter torpor appears to be constant from year to year, and appears to be triggered by warming of the soil (French, 1993). By removing vegetation and exposing soils at DPH to sunlight, additional solar radiation on the ground's surface may change the timing of PPM emergence from torpor/hibernation.

1.11.3 Reduced Food Availability and Food Habits in PPM

Seeds of different plant species used by PPM may differ in their physical, chemical, and nutritional properties. Rodents, in general, are selective in their foraging preferences, differentially harvesting seeds of certain sizes, chemical composition, moisture content, and coverings (Brown and Harney, 1993). PPM is such a small rodent with small front feet that seed-gathering abilities must be somewhat restricted by physical size limitations of seeds and foraging energetics of the individual animals.

PPM prefer seeds and stems of grasses and some forbs (Meserve 1976); arthropods are also eaten (von Bloeker 1931; Meserve 1972; Meserve 1976). Bailey (1939) recorded seeds of the following species from the pouches of collected PPM specimens: birds foot trefoil (*Lotus prostratus)*, two species of salt bush (*Atriplex* spp.), heliotrope, mustard, shoregrass (*Monanthochloe* sp.*), Franseria (=Ambrosia sp)*, and rush.(*Juncus* sp.). From the pouches of collected specimens, von Bloeker (in Bailey 1939) recorded seeds of telegraph weed (*Heterotheca grandiflora),* rabbitbrush *(Chrysothamnus sp.),* tecolote *(Centaurea melitensis),* Croton *(Croton californicus),* arrow weed *(Pluchea sericea),* and barley *(Hordeum murinum)*. PPM was observed to drink water regularly in captivity (Bailey 1939). *P. l. longimembris* typically forage in and adjacent to clumps of vegetation (Brown and Lieberman 1973).

2 Carrying Capacity Estimation of DPH and Potential Viability of PPM Population

Some biologists are reluctant to rely on the results of mathematical models in making population viability estimates for small and little-understood populations, as is the case for PPM. Several more heuristically-based lines of analysis are explored in the following sections of this paper. The information reviewed in this report are the requisite baseline data and the context in which any population models used to estimate the potential for survival of PPM on DPH must be developed.

2.1 Potential Effective Size of the DPH Site Relative to PPM Requirements

Pursuant to the IA, the DPH landowners are temporarily preserving 8.9 ha of the project site until July 2004, which includes about 3 ha currently supporting the PPM population. During this time, the USFWS and CDFG will determine a course of action for PPM on the DPH, based upon studies on DPH and at the Camp Pendleton populations, as well as research on non-endangered subspecies of *Perognathus longimembris*. Within the Temporary Preserve additional buffer land was set aside, as well as occupied habitat. Due to existing site constraints, however, portions of the occupied habitat suffer from direct edge conditions and is bounded by a chain-link fence on the northeast side that separates it from a number of existing single family units that lie adjacent to the preserve. These units are separately owned and were not parties to the IA. The nearest single-family residence is about 15 m (50 ft) northeast of a research plot within the Temporary Preserve. In addition, the northernmost point of occupied habitat lies adjacent to an existing road, about 7.6 m (25 ft) from Marguerita Avenue (see Figure 1). To the northwest lie a series of multi-family units that are also separately owned and not subject to the IA. The closest existing multi-family housing unit is about 3 m (15 ft) from the boundary of occupied PPM habitat.

Can increasing the allocation of land on the project site substantially increase the viability of the PPM population on the DPH site? The three scenarios outlined later in this section may all have the same potential outcomes for PPM conservation given the presence of the existing residential units on the perimeter of Marguerita Avenue, Dana Strand Road, and Scenic Road.

Spencer (2000) summarized the current status of the PPM subspecies as follows:

- No attempt has been made to quantify Genetic Effective Population Size[2] (N_e) or a minimum viable population (MVP) size for this subspecies;
- Conservative size estimates of the three smaller populations (Dana Point Headlands, San Mateo North, San Mateo South) may not be large enough to be considered viable populations for the long term;

[2] Genetic Effective Population Size (N_e)of a population is the size of an idealized population that would undergo the same amount of random genetic change as the actual population under consideration. N_e is a fraction of the actual census population size (N). For vertebrates, N is typically 2 to 5 times larger than the population N_e (Lande 1988, Nunney 2000).

- The small populations at these three sites are subject to (1) inbreeding depression, (2) gradual loss of genetic diversity and adaptability to changing conditions, (3) increased likelihood of stochastic or demographic extinction, (4) potential extirpation due to environmental catastrophic events, such as fire, weather-related mortality, disease, or ecological competitors, (5) existing development edge conditions associated with adjacent development and current human use of the Headlands bluff area;
- Recommended "rules" for minimum population size are simplifications that highlight the fact that PPM population viability is in dire straits, and that active management to increase population sizes and maintain genetic diversity may be necessary to keep this subspecies from becoming extinct.

The conservation biology "rule" noted by Spencer (2000) is known as the "Franklin-Soule 50/500 rule" -- a population's N_e needs to exceed 50 to resist genetic losses for short time periods, and a N_e greater than 500 may be necessary for long term adaptation to changing conditions (Franklin 1980, Soule 1980). Soule (1980) contended that both theory and empirical observations supported this rule, at least to an order of magnitude of the number of individuals required to maintain MVPs of completely isolated populations in the absence of unidirectional environmental change. White (2000) generally supported Soule's use of PVAs to provide initial target population sizes for conservation of species with unknown, or poorly known, population dynamics, but not as "a recipe for success or failure" of a conservation program.

Erickson (1996) reviewed some of the controversies associated with the use of the 50/500 rule, and noted that some conservation biologists assert that the 50/500 guideline should be more conservative, on the order of 500/5000. "Realistic models are...very data hungry and are only as good as the natural history insights and field studies that support them." (Meffe and Carroll 1997). Translated into the census population size, an N_e of 50 represents 100 to 250 individuals, depending on a variety of ecological and behavioral characteristics for the species. A census population of 30 individuals of a vertebrate species would have an N_e of between 6 to 15 (Lande 1988, Nunney 2000).

In some cases, populations that occupy small habitat fragments may not support "ideal" numbers, but may still posses some conservation potential, especially if they are not isolated. Thomas (1990) presents several examples (e.g., Jones and Diamond 1976, Soule et al. 1988, Bonnell and Selander 1974) of populations of birds and mammals that can persist at low levels for many years. Such examples indicate that small populations under certain conditions should not be abandoned as hopeless. However, Thomas (1990) notes that it is often easier and less expensive to make sure that a large population does not become too small than it is to ensure that a small population does not become extinct.

The discussion in Section 1 examined the biology of PPM with an eye toward understanding if the body of data is sufficient to make defensible assertions about the viability of the PPM population on DPH through general consensus of authorities or the use of mathematically derived models. White (2000) discusses the data requirements and

essential analyses required to perform a realistic PVA for any species and notes that the 50/500 rule and other rules like it, lack the biological realism needed to be useful. White cites modeling studies and common mistakes that do not provide defensible results due to a lack of attention to the biology of the species and the stochastic environments within which the species exists. Thomas (1990) suggests that a geometric mean value of 500 individuals may be "undesirably" low from a genetic perspective. He emphasizes the importance of using empirical data from animal populations that provide at least rough, interim estimates of population sizes that would likely allow for medium- to long-term persistence.

Since the dynamics of small mammal populations are rarely documented in adequate detail for more than a few generations (as is the case for PPM), a conservative approach would assume that a population would exhibit maximum variability, which could be three orders of magnitude in size (Thomas 1990). With this level of variability, a population geometric mean of 5,500 individuals would be required to minimize the likelihood that the population would not drop below 100 individuals more than once during a 100-year interval. The empirical evidence for mammals and birds suggests that a population size of 10 is considered too small, 100 is typically inadequate, 1,000 is adequate if the population exhibits normal variability, and 10,000 individuals should permit persistence over the medium- to long-term (Thomas 1990). However, if the population dynamics, genetics, and environmental aspects of the species warrants it, these MVP estimates may be reduced with the understanding that these numbers are optimistic when the estimate is based on marginally adequate evidence of genetics and population dynamics of the species being modeled (Thomas 1990). Based on this scale, the PPM population at DPH (< 30 individuals) would have low viability.

White (2000) and others support the use of PVA models if they do not ignore the fundamentals of the species' biology they are modeling and they are not simply based on generalized genetic or stochastic demography. A realistic model incorporating inputs of referenced estimates is more useful and reasonable than a simplistic model that ignores the importance of processes affecting persistence and does not partition the variation due to sampling design and population dynamics. PVA models can be very sensitive to initial conditions, and they often depend heavily upon sources of variation that are interactive or autocorrelated. White (2000) summarizes the data requirements and essential analyses for PVAs and includes a list of common omissions from PVAs reported in the literature as follows:

- Few or no data are available to estimate the basic parameters in the population model, with almost all the parameter estimates being just educated guesses.
- The model ignores spatial variation which tends to increase population viability. Occasionally, immigration can rescue a population from extinction (source-sink dynamics).
- The model uses estimates of temporal variation that are at best poor guesses because the modeler did not differentiate between estimates of temporal variation

and sampling variation. These guesses generally result in persistence values that are underestimated.

- The model uses demographic variation as a substitute for temporal variation in the process and ignores true temporal variation.
- The model ignores life-long individual heterogeneity that may increase population viability and assumes that all individuals experience identical survival and reproduction rates. This may result in population viability being underestimated.
- The model assumes that conditions are not changing because the model holds the stochastic processes at a constant level, and does not account for changes in the amount of available habitat over time.

The U.S. Fish and Wildlife Service (USFWS) issued a Recovery Plan for PPM in 1998 that is to be implemented over a 25 year period. This plan states that "statistically determining significant factors that affect population viability will be difficult" for the species, and that carefully designed studies will be required because of the small population sizes and limited number of populations (USFWS 1998, response to comments by P. Behrends 1997). Such data must be analyzed in context with genetic variability, population dynamics, life histories, ecological requirements, and other population parameters to be useful in estimating the likelihood of the persistence of the subspecies or any one of its populations over time.

Even if the entire portion of PPM habitable area within the DPH Project Site acreage were conserved as open space, the fate of PPM would not necessarily be different from the current wildlife agency permitted program, since the population may still be extirpated from the site due to unavoidable genetic, stochastic, demographic, or catastrophic processes. In each scenario, environmental conditions (such as precipitation) would not remain constant, and the population would be expected to fluctuate from year to year, as is typical for heteromyid rodents. The most important question is "Can the population continue to recover and thrive through each cycle?"

The current DPH development project, the Headlands Development and Conservation Plan (HDCP), proposes a lower density development than was previously analyzed and incorporated into the IA. The HDCP also proposes to add 0.9 ha (2.2 acres) to the Preserve and designate the resulting 9.8 ha (24.2 acres) as the Headlands Conservation Park, which will be dedicated in perpetuity to conservation and administered by a non-profit trust. The USFWS and CDFG shall be named as beneficiaries of the trust. Outside of the Conservation Park, the HDCP eliminates the existing Marguerita Avenue north of the occupied habitat (Figure 1). The road area will be removed and the underlying slope will be recontoured to blend with the natural grade. This area becomes part of a greenbelt buffer, vegetated with native coastal sage scrub species to create a 100-foot zone of native vegetation that includes a pedestrian trail. This extended habitat buffer will not improve the existing edge conditions caused by the existing residences directly adjacent to the Temporary Preserve. The HDCP proposes that environmental fencing will be maintained around the border of the occupied habitat within the Conservation

Park to prevent human incursions, except for authorized research and maintenance personnel. A footpath trail outside of occupied habitat at the edge of the bluff and within the new buffer area will be maintained for public use. The Headlands Conservation Park as proposed in the HDCP provides the basis for the Scenario Two analyses.

- *Scenario One – Status Quo Condition.* The 8.9 ha temporary preserve continues to provide PPM occupied and potential habitat (5.6 ha or 13.9 acres) with PPM-suitable soils and habitat buffers at the current level until July 2004. During this period, PPM shall be subject to research and management activities by wildlife agencies, and the occupied habitat may be augmented by modifications to existing vegetation to create more areas utilized by PPM. The population could possibly increase or remain relatively stable, or else become extirpated, due to natural (stochastic) processes, unsuccessful management actions, or a decision to relocate the population to a different site. After July 2004, the USFWS may purchase the Temporary Preserve if the population is determined to be necessary for survival of PPM, subject to the fair market value which has been estimated by the agencies to run as high as $1.0 million per acre. If the wildlife agencies do not enter into a purchase agreement, the Preserve status expires and the PPM habitat may be developed pursuant to the provisions of the 10(a) Incidental Take Permit and the CDFG Management Authorization for DPH Project Site. Any remaining PPM will be made available (under permits by the resources agencies) in propagation, enhancement, recovery, and relocation efforts in the remaining designated open space (portions of the previous Temporary Preserve) on the project site. This scenario is consistent with the NCCP/HCP.

- *Scenario Two – HDCP Proposed Permanent Preserve and Buffer Expansions.* The HDCP proposed enlargement of the temporary preserve area by 0.9 ha (2.2 acres) to create the permanent Headlands Conservation Park, and the addition of a 100-foot wide, 1.1 ha (2.7 acres) vegetated greenbelt buffer adjacent to the conservation park boundary. PPM will be subject to long-term research and management activities by the resource agencies. A non-profit trust shall administrate the park and be provided with an endowment to ensure the long-term costs associated with the on-site biological management of the PPM. The population could possibly increase or remain relatively stable, or else become extirpated due to natural (stochastic) or unsuccessful management processes. The population could also be eventually removed to a different site. This scenario is consistent with the NCCP/HCP.

- *Scenario Three – Occupation of Potentially Suitable Habitat in the Coastal Orange County Subarea.* The DPH PPM population is translocated to a receiver site considered more suitable for the long-term recovery of the PPM. The Central/Coastal NCCP/HCP identified 740 acres of potentially suitable habitat based on soils, vegetation, elevation, and distance from the coast (Figure 2). If the larger areas of potential habitat were managed for PPM conservation, including translocation of individuals, the potential benefit to PPM would be the

creation of relatively large areas of occupied habitat surrounded by conserved open space. This scenario is consistent with the NCCP/HCP.

The difference between the scenarios is the amount of space, duration of management activities, and effort dedicated toward managing potential habitat for occupation by PPM. Scenario One works within the existing IA, modifying habitat that is currently within the temporary preserve. Scenario Two works within and expands the existing IA, by eliminating the time constraints associated with the existing management activities, and by enlarging the temporary preserve area.. Scenario Three requires a major effort to create new and additional occupied PPM habitat within the approved Nature Reserve of Orange County.

2.2 Potential Carrying Capacity of DPH PPM Population

This section addresses the potential for PPM to develop varying sizes of populations on the DPH, based on spatial limitations and the population densities and territory sizes derived from studies of PPM on DPH and from other *P. longimembris* populations. The scenarios are explored using average values from the 1993 and 1997-2000 DPH trapping results presented in Table 1, as well as using values from other subspecies discussed in Section 1.7. The values from the five years of trapping are averaged for the discussion below, and use the lowest number for the minimum population density value given by Brylski in 1993. The numbers for females are reported separately in Table 1 since their reproductive potential is the primary parameter modeled for estimating the viability of populations on DPH. Since the sex ratio of males to females reported in the population averaged 1.23:1 (range 1.1:1 to 1.4:1), females are assumed to have adequate opportunity to acquire a mate and the number of males is not a demographically limiting factor.

2.2.1 DPH Carrying Capacity Based on Reported Densities in Occupied Habitat on DPH

Scenario One: If the entire 5.6 ha of temporary preserve area that supports PPM-suitable soils were to be converted into occupied habitat for PPM and assuming a density of 11 individuals per ha, then:

- The population of PPM in the temporary preserve could average 62 individuals.
- The female population of PPM in the temporary preserve could average 28 individuals (45% of total population, assuming a 1.28 : 1 male to female sex ratio).

Scenario Two: Adding 0.9 ha of potential habitat to the preserve would increase the DPH preserve carrying capacity to 72 total individuals with 32 females.

Scenario Three: If the entire 300 ha of potentially suitable PPM habitat in the Nature Reserve of Orange County were converted into occupied habitat, then:

- The total carrying capacity within 300 ha of habitat could be 3,300 individuals.
- The female population of PPM in the Nature Reserve could be 1,485 individuals.

Scenario Three is the most optimistic outcome. More detailed information on PPM habitat preferences and limitations will likely reduce the estimated area of potentially suitable habitat in the Nature Reserve.

2.2.2 DPH Carrying Capacity Based Estimated Territory Size

Heteromyid rodents, and specifically the species *Perognathus longimembris*, are thought to be solitary animals, except during breeding activities and the raising of young by females. Individuals of PPM at DPH likely defend territories and maintain even larger home ranges, the sizes of which are not known and may differ between males, females, subadults, and newly established young. A frequent pattern in heteromyid species is that females have smaller, non-overlapping territories, while males have larger territories that overlap several territories of females and are all served by a territorial male for breeding. The territories of *Perognathus longimembris* have been reported to be 0.12 to 0.56 ha in the Mojave Desert (Chew and Butterworth 1964). In Nevada, males ranged over 0.29 to 1.88 ha and females averaged 0.48 to 3.09 ha (Maza et al. 1973). These ranges average out to be 0.3 to 1.8 ha per individual for both sexes.

Scenario One: Assuming the range of these averaged densities (0.3 to 1.8 ha/individual) for PPM on DPH in the entire 5.6 ha of PPM-suitable soils in the Temporary Preserve and assuming that no overlap occurred within this area, the maximum number of territories occupied by females would be 3 to 19 territories.

Scenario Two: Assuming the range of these averaged densities (0.3 to 1.8 ha/individual) for PPM and expanding the preserve by 0.9 ha, the maximum number of female territories would be 4 to 22 territories.

Scenario Three: If the 300 ha of potentially suitable PPM habitat in the Nature Reserve of Orange County were occupied at the range of these averaged densities (0.3 to 1.8 ha/individual), then the maximum number of female territories would be 167 to 1,000 territories.

2.3 Population Viability Assessment for the DPH PPM Population

Section 4.8 of the PPM Recovery Plan (USFWS 1998) specifies that the USFWS will "Conduct research to understand viable population sizes and metapopulation dynamics, and construct appropriate mathematical models to guide management efforts." The Recovery Plan points out that "reliable estimates are only possible after conducting appropriate studies." This section of this paper addresses the question: "Have the appropriate studies been conducted to estimate the viability of PPM on DPH?"

The standards for estimating appropriate survival and extinction potential for PPM population on DPH include the use of adequate baseline population demographic data, ideally collected from DPH itself. Unfortunately, the data from DPH are scanty due to the small population size. An additional adverse factor is that estimates of population size are plagued with large variances. On theoretical grounds, the use of short time series of population estimates tend to yield misleading results concerning the relationship

between population variability and extinction risk (Vucetich et al. 2000). PVAs require that population parameters be accurately known, or that a reasonable range of estimates for them can be made. The collection of relatively robust population parameter data has just begun for the known PPM populations. Under these circumstances, a robust analysis of the population viability of the PPM species as a whole, let alone the DPH population, cannot be performed with information currently available.

As a framework for comparison and evaluation, Table 3 lists the extent of differences in information on hand or obtainable that would be needed to conduct a PVA for PPM, in contrast to the available information for the California Gnatcatcher. There is a considerable disparity between the two situations, and any PVA for the California Gnatcatcher would likely be orders of magnitude more robust than one for PPM.

This does not preclude, however, using such a model to explore the population dynamics at DPH, even if the data used are rough estimates derived from other ecologically similar species or other subspecies of little pocket mouse. Using the data now collected on DPH for PPM, such an analysis would be instructive, but not conclusive. A systematic series of PVA model scenarios, based on both empirical and simulated data, can provide insights into the next steps in collecting data for the PPM. Such an exercise would search for realistic assumptions of the unknown parameters, starting with data from surrogate species, from PPM populations on Camp Pendleton, from observations of general heteromyid population dynamics, and from other rodent population studies. The model would explore our knowledge of these parameters and help identify missing or unrealistic data, and provide a method of roughly estimating PPM population status. Such an analysis could be useful and instructive if the ranges of the estimated parameters are modeled at their average and most optimistic levels. The most pessimistic values would not be useful, other than to point out that the population does have a high risk of being extirpated.

Population models assume there is adequate information regarding the demography of the species, including survival rates (proportion of each stage that survives into the next stage to breed) and fecundity (number of females per female per cycle, considering mortality of mothers and newborns). While some data are easily estimated from knowledge of the natural history of the species or from life history data, it is usually very difficult to accurately estimate demographic rates and their temporal variances (Akcakaya 1998).

The remainder of the discussion below briefly outlines optimistic estimates of population parameters for PPM on DPH that can be inferred from the natural history, population dynamics, and demographic data noted in the previous sections above, including Table 1. Several qualitative assessments of the viability of the DPH PPM population have been offered by Erickson (1993, 1996) and Spencer (2000). The question remains, "Do the data now available for the DPH PPM population support a quantitative or theoretical analysis using a mathematical model?"

The population parameters for any realistic model of the DPH PPM population include the following:

- **Sex Ratio Of The Population**. The analysis of population viability depends squarely upon the number of females in the population and the number of daughters that each female can be expected to contribute to the population over time. The ratio of males to females in all recent trapping studies of PPM, including DPH, are biased toward males at a mean ratio of 1.28 to 1.

- **Knowledge of Stage Structure.** Stage structured models assume that organisms of different ages may have different characteristics, which are reflected in their vital rates, such as fecundity and survival rates. These stage structures are incorporated as Leslie Matrices in the PVA model. The trapping data on DPH indicate that PPM includes three stages: Juveniles are non-reproductive, subadults are just coming into reproductive condition, and experienced adults in breeding condition. Since the young of the year are able to reproduce within their first year, the division of reproductively capable PPM individuals into three stages may be reasonable; to include a stage of first year breeders (females that may produce one litter during the first year) and adult breeders that are capable of producing two litters per year. If the average litter size of 3.3 pups (Chew and Butterworth 1964) for *P. longimembris* in the Mojave Desert should hold for the DPH population, then first year breeders can produce on average 0.83 daughters in the first year (assuming 50 percent of each litter is female), and 1.65 females per litter during subsequent years.

- **Density Of The Population Per Hectare Of Habitat**. This parameter is difficult to estimate from the DPH data because the trapping techniques reported to date have not been standardized. The placement of traps and number of traps have been different for each of the studies reported, although more recent studies and research status reports (1999/2000 season) now being written (S. Dodd, W. Spencer, pers. comm.) promise to provide some replicate trapping surveys shortly. The mean minimum population density (10.5 PPM/ha) reported in Table 1 has a large standard deviation (9.2) mostly due to the large number of individuals captured in 1993. These numbers may be used as rough estimates of the minimum numbers of individuals under carrying capacity limitations imposed by the size of DPH.

- **Reproductive Rate (Fecundities)**. The actual number of births per female in PPM is not known, although the liter size of *Perognathus longimembris* is reported to be 3.3 pups per birth (Chew and Butterworth 1964). There is some evidence that more than one litter per season may be produced. Females are able to breed within 50 days of birth, so that at least females born in early spring may be capable of breeding in their birth year. A reasonable optimistic assumption is that there is one litter per female during the first season, and two litters per female during the remaining years the female survives. The calculation of fecundities

depend upon estimates of several sequential years of "maternity" data being available. The data that have been collected from PPM on DPH may estimate the maternities, albeit crudely at this point.

- **Survival Rate**. The survival rate of individuals in the DPH PPM population are not known because individual animals on DPH have not been permanently marked. Recently, the resource agencies have agreed to allow toe-clipping as the only practical method to mark individuals (S. Montgomery pers. comm.). The mean proportion of adults present in the DPH population as reported in Table 1 is 45 percent. Chew and Butterworth (1964) report a 30 percent survival rate of individuals of *P. longimembris* from the Mojave Desert. If the maximum adult life span is 4 years, then the typical annual adult survival would need to be about 45 percent, resulting in less than one percent of a given age class surviving beyond four years. Survival in the first year is typically low in rodents due to new born individuals dying before acquiring their own territory. A 20 percent survival rate for first year individuals would be on the optimistic side of the range.

- **Variability**. Estimates of variability for any population parameter for PPM on DPH are particularly difficult because very few data have been collected and the potential for substantial sampling error. Establishing and separating out a measure of sampling error (for the trapping data) versus variation due to actual variations of parameters within the DPH population, would be problematical due to differences in trapping techniques between years. For these reasons, a quantitative analysis would be limited to the use of standard deviations for population variance matrices derived from other species studied for many years. Variances on the order of 20 percent are considered optimistically small in most long term population studies.

To explore the use of a PVA model for the DPH PPM population, the RAMAS METAPOP simulation model (Akcakaya 1998) was run to simulate persistence of a single closed population (no movement of individuals in or out of the model population) using the following optimistic assumptions:

- Only females are included in the model.
- The average litter size is 3.3 (based on Chew and Butterworth 1964).
- Equal sex ratio at birth = 1.65 females per litter.
- Juvenile females produce one litter in their first year.
- Subadult and adult females produce two litters each year.
- Carrying Capacity (K) was varied between 15 and 1500 females (see Section 2.2).
- A population ceiling set at current carrying capacity was assumed. Exceeding K resulted in density dependent reduction of demographic rates.
- For simulations set with K equal to 100 or less, the initial abundance was set at 15 females with an initial stage distribution set at 55 percent Juveniles and 45 percent Subadults/Adults (8 Juveniles, 4 Subadults, 3 Adults). For simulations with K set at

1,000 or 1,500, the initial abundance was set equal to K and a stable age distribution was assumed.

- Annual survival was assumed to be 45 percent for Subadults and Adults and 20 percent for Juveniles.
- The percent Coefficent of Variation (%CV) of carrying capacity, reproduction, and survival rates is 20 percent of input values.
- The population census data are collected after the breeding season (Summer data are collected on DPH).
- No migration occurs (no potential for rescue effect from an external source population).

The degree to which any of these assumptions eventually are shown to be correct will determine if these model runs serve to realistically estimate the viability of PPM on DPH or only serve to highlight what is currently missing from the baseline data and research program on DPH.

These maternity (M) and survival (S) values were used in the model:

$M_1 = 1.65$ $S_0 = 0.20$
$M_2 = 3.3$ $S_1 = 0.45$
$M_3 = 3.3$ $S_2 = 0.45$

to generate the following Leslie Stage Matrix, assuming a post-breeding season census of Juvenile, Subadult and Adult stages:

0.33	1.49	1.49	0.00
0.20			
	0.45		
		0.45	
			0.00

Ten thousand replications for over a duration of 100 years were run for each simulation. Model simulation results for the median time to extinction for populations with K varying from 15 to 1500 females were as follows:

Carrying Capacity (females)	Median Time to Extinction (Years)
15	11.5
30	12.6
50	12.6
100	12.7
1000	37.5
1500	39.7

These simplistic simulations using relatively optimistic input parameters tend to support the previous qualitative assessments by Erickson (1993) and Spencer (2000). There is a low expectation that the DPH PPM population will continue to persist in that location without substantial management activities that have unknown effectiveness. For simulations with K=100 or less, setting the initial abundance equal to K increases the median time to extinction by about 10 years. This suggests that the DPH population may be below the Minimum Viable Population threshold.

The small initial population size appears to be a major constraint to improving the viability of the DPH site. The translocation of individuals from other populations would need to be a component of the management program for the DPH population if keeping the PPM extant on DPH is a long term management goal. Given the rarity of this subspecies, this may not be practicable. If the quality of DPH is not sufficient to sustain a long term population, then translocating individuals to the DPH site would be a waste of individuals that could be used to promote conservation of other more viable populations. Although the model simulations cannot be used to robustly estimate an extinction time for PPM on DPH, the parameters used in the model were chosen on the optimistic side of the realistic range of potential values documented in the heteromyid literature. These optimistic simulations are likely overestimates of the true viability of the DPH PPM population, given the limited amount of suitable habitat present on the DPH site.

2.4 Discussion

Two hallmarks of science are testability and repeatability. Study designs used to perform hypothesis tests are usually based on experimental manipulations of the test subject under controlled conditions, in comparison to the results of trials from differing experimental conditions or initial conditions. The details of the experimental design or model are highly dependent upon the assumptions incorporated into the model. In the absence of the ability to conduct such experiments, scientists often fall back to using mathematical models that allow for theoretical testing of assumptions, initial conditions, and alternative treatments of the subject. The sensitivity of various model input parameters may vary

dramatically based upon the actual biology of the species being modeled, the accuracy and reliability of the data being utilized, and the assumptions that are being tested.

Considering that there is only one DPH PPM population using only 3 ha of the site from which to derive information and that there are only three other known populations -- all more than fourteen miles to the south on Camp Pendleton -- the ability to experiment or manipulate the DPH PPM population is very limited. There is only 10.3 ha of PPM-suitable soils on the DPH site with only a portion of which supporting sage scrub vegetation. The very act of trapping the population may alter the natural history of the species in undetermined ways and adversely influence the viability of the population. The data required to test or model the population dynamics of PPM and estimating the risk of extinction at DPH will depend on acquiring appropriate data from the population – in spite of the unknown level of additional risk from the study process itself. Otherwise, dependence upon data from surrogate populations of sister subspecies and other PPM populations on Camp Pendleton will be the only available substitutes for lacking population parameter estimates.

2.4.1 Adequacy of DPH Habitat to Support PPM

The amount of available habitat for PPM on DPH has been generally prescribed and limited by the surrounding existing urban development. The maximum amount of open space that could feasibly support PPM, without major modification of existing areas on the site, is primarily contained within the area now managed as a Temporary Preserve, as specified in the NCCP/HCP IA . PPM-occupied habitat within the Temporary Preserve could potentially be enlarged (by selective thinning and replanting), as is currently being tested by Dodd and coworkers on DPH. The 1999 trapping data (trapping maps supplied by Dodd) indicate that PPM does move into previously thinned CSS habitat adjacent to PPM-occupied habitat.

Beyond the temporary preserve area, the soils have been exposed in many places to weathering, water erosion, and compaction associated with a lack of vegetative cover and vehicle or foot traffic. These areas would require selective or wholesale rehabilitation efforts to be made suitable for PPM use. The depth of the loose, fine-grained surface sands, the depth and texture of the substratum below the surface layer, the micro-topography of drainage, and other such factors are probably important influences affecting soil suitability for PPM. Since these factors are not currently known, it would likely require several years of research to determine the potential effectiveness of such an intensive habitat restoration and management program. This is one reason that receptor sites outside the DPH site are being sought by the USFWS in case the DPH population will require relocation to conserve the genetic resource of the population. In consideration of the biology of PPM—its genetics, population dynamics, and ecology—the population on DPH does not appear to have a high probability of surviving beyond a few decades without intensive habitat and population management, which we are not certain will be effective or practicable.

The PPM population on DPH is an important genetic resource for the long-term conservation of the PPM subspecies. The number of individuals reported to date on DPH has been decreasing and only additional years of trapping will determine the significance of this trend. The role that the wildlife agencies want for the DPH PPM population to play in conservation of the subspecies has not been decided, but must be determined by July 2004 (or as late as July 2008 if the wildlife agencies enter into a purchase agreement and four 1-year extensions are exercised) per the NCCP/HCP IA. Until that time (or earlier if the negative population trend is real), the population will be protected by the measures specified in the NCCP/HCP IA.

2.4.2 Adequacy of the Existing Buffer Zone to Protect PPM Habitat

The temporary 8.9 ha (22 acres) preserve area, as originally established, includes an internal habitat buffer of approximately 7.4 ha (18.3 acres) as approved by the wildlife agencies in conjunction with the 1996 NCCP EIR/EIS that serves several functions related to PPM. The original occupied DPH PPM habitat was restricted to 1.5 ha (3.75 acres), consisting of a single patch of open coastal sage scrub with fine, sandy soil (Brylski 1993). The Temporary Preserve incorporated the additional 7.4 ha (18.3 acres) to limit and prevent impacts associated with adjacent existing development, as well as the future proposed development. Specifically, the buffer zone provides physical distance from direct impacts on PPM-occupied habitat from human activities occurring on the DPH, by forming a barrier to public access to the core of the occupied habitat. Concomitantly, it reserved approximately 4.1 ha (10.1 acres) of potential habitat to allow for future expansion of the PPM occupied habitat. The buffer also serves to ensure that the future adjacent uses, such as those contemplated in the 1996 EIR/EIS Project Site, were compatible, to the greatest extent feasible, with the preservation of the core habitat (See NCCP EIR/EIS, Exhibit "C"). The habitat buffer ensures that a significant disruption of habitat values does not occur due to future development, however, the edge effects from the existing residential units, which are privately held and not subject to the NCCP/HCP, still pose a threat to the long-term viability of the DPH PPM, as discussed in previous sections.

2.4.3 Adequacy of the Proposed Additional Buffer Zone to Protect PPM Habitat

The DPH landowners have proposed a new development project, the Headlands Development and Conservation Plan ("HDCP") that exceeds the criteria established under the IA for the PPM habitat. The HDCP has significantly lower levels of development that those approved pursuant to the 1996 Section 10(a) Incidental Take Permit. The 1996 Project, which was analyzed in conjunction with the NCCP/HCP EIR/EIS, included 370 residential units, a 400-room hotel, with 12.7 acres of commercial development, and 55 acres of open space (including public roads). The proposed HDCP has 125 residential units, a 65-room hotel, with 4.4 acres of commercial development, and 64.5 acres of open space (including public roads).

The HDCP also proposes to establish the 9.8 ha (24.2 acre) Headlands Conservation Park which encompasses the entire 8.9 ha (22 acre) Temporary Preserve, and an additional 0.9 ha (2.2 acres) that are designed as habitat buffer lands suitable for potential occupied

habitat. This park will be set up as a non-profit trust, to be managed for perpetuity as Conservation Open Space, by the USFWS and the CDFG (who will be beneficiaries of the trust) and a site specific manager, such as the Center for Natural Land Management. The proposed HCP shall be deed restricted to preserve the existing native habitat and species. The Habitat Manager shall be the Trust for Public Lands. The establishment of the Conservation Park shall occur only if subsequent approvals for the HDCP are received from the City of Dana Point and the California Coastal Commission.

The HDCP also provides for an additional 1.1 ha (2.7 acres) greenbelt buffer to border the proposed HCP. The greenbelt buffer is a minimum 100 feet in width and serves to further ensure that the protected habitat within the park would not be significantly degraded by impacts from future development (Figure 1). A portion of the greenbelt involves removing the existing Marguerita Road, which currently sits directly adjacent to the Temporary Preserve. The existing asphalt paving will be removed, the area will be re-graded to natural contours and revegetated with CSS species, and motorized vehicular traffic would be prohibited in this area. The easterly end of the buffer zone includes a nature interpretative center of approximately 2,000 sq. feet and small parking lot. The westerly area of the habitat buffer will provide a small, open air interpretative conservation center access via Selva Road, with four parking spaces within the existing easement for Dana Scenic Drive. A walking trail would pass through the buffer parallel to the preserve boundary. The closest existing residence to the preserve area is about 5 m to the northwest.

The HDCP also proposes to remove the chain-link fence currently parallel to Marguarita Avenue and replace it with a six-foot vinyl-coated mesh fence that was environmentally designed to minimize potential impacts to the PPM habitat. The environmental fence will be expanded to surround the PPM occupied portion of the preserve to physically prevent unauthorized people from entering and disturbing the occupied habitat. If properly designed, this fencing also forms a partial barrier to certain predator species, including skunks, dogs, and cats, that prey upon PPM. As previously noted, the adjacent greenbelt buffer will be revegetated with native CSS species, which will further moderate the potential adverse effects of new development. These proposed HDCP changes have been designed to minimize the development edge condition associated with the existing Temporary Preserve, which could cause PPM to withdraw from the edge of its currently occupied habitat on DPH, resulting in the core habitat to become more densely occupied (Mills 1995) and inducing adverse demographic effects that are density dependent. The expanded buffer proposed by the DPH property owners will not modify the existing edge condition caused by the two residential enclaves directly adjacent to the PPM temporary preserve. Any individual PPM searching for new territory or foraging for resources, would find the buffer zone progressively less suitable, and would likely return to the occupied portion of the temporary preserve area. Individuals in the buffer zone could be at greater risk from predation by cats and dogs, and natural predators, than those inside the fenced occupied habitat due to the existing adjacent residences.

The analyses in preceding sections suggest that increasing the preserve area to encompass the entire area of PPM-suitable soils on the site would not alter the long-term status of PPM on DPH. Increasing the size of the preserve by an additional 0.9 ha (2.2 acres) of habitat, and adding a 1.1 ha (2.7 acre), 30 m (100-foot) wide greenbelt habitat buffer is an improvement over the existing Temporary Preserve configuration and is adequate for the proposed HDCP project. However, this additional habitat and buffer is not likely to substantially change development edge conditions directly adjacent to the existing residences. The existing homes cause a development edge that includes areas well beyond the temporary preserve area. The activities in the buffer area that are important to PPM would occur mostly at night, including potential movement of PPM into and out of the buffer zone, activities of predators hunting at night, and movement of fog banks in and out of the habitat. The buffer zone would likely be occupied by other gramnivorous rodents, including Western Harvest Mouse, Deer Mouse, California Vole, House Mouse, and California Ground Squirrel, which could compete with PPM for resources. A revegetated buffer zone may favor some of these species, but the amount of competitive exclusion, if any, that might occur in the DPH rodent community is unknown.

2.4.3 Adequacy of Current Research Program to Meet Goals of the Recovery Efforts by July 2004

The ability to understand and predict the viability of any small biological population is always associated with substantial uncertainty. However it is apparent that the DPH PPM population is particularly vulnerable since the population is very small and the biology of the species is difficult to study without potentially causing adverse effects on the population's viability itself. PPM responds to cold and wet weather by going into torpor, making individuals largely unavailable for study during winter months. The primary emphasis for research on the DPH PPM population is to answer questions about reproductive and survival rates. These data are must be reliably estimated before July 2004. These estimates need to be known to determine whether the apparently declining population numbers are due to differences in trapping techniques between years or are an actual annual decline in abundance of PPM.

The trapping studies will need to be replicated for several years without any changes to the trapping protocol. Having these statistics in hand will allow for better understanding of the mean and associated variances of key demographic parameters associated with the DPH PPM population, which are required for a more robust viability analysis. Conventional wisdom suggests that the DPH population is probably too small to survive for a long-term interval. The population may best serve as an experimental group in management actions that may increase the carrying capacity of the preserve area until a receptor site is identified for translocation, or with the intention of using it as a source of individuals for a captive breeding program. If the population appears to respond well to the vegetation thinning experiments currently underway, the option of the USFWS to purchase the land may be appropriate to leave the population in place until stochastic events cause its demise.

2.5 Recommendations

The following design recommendations are suggested:

- An 6-foot vinyl-coated chain link fence should be secured and maintained around the PPM occupied area to prevent the entry of stray cats and dogs into PPM habitat, and limit public access to occupied habitat. The chain-link mesh should be large enough to allow small mammals to move through it, but not large enough to allow small cats or other such sized animals to cross through it. The fencing should be designed to inhibit or prevent raptors from perching on the wire fabric or on posts supporting the chain-link fabric. This could be accomplished, for example, by tightly stretching three wires two inches apart just above the chain-link fabric (in the same plane as the fabric) between every fence post such that a heavy-bodied raptor could not easily grasp the wires or chain-link fabric (the wire would be too small in diameter and would not readily support the bird, interfering with perching). The posts should be supplied with a "tall pointed hat" that also could not easily be perched upon by a raptor. A heavy gauge aluminum flashing, such as the kind used in garden borders to exclude incursions of plant roots into cultivated areas, should be partially buried below ground and partially exposed above ground at the base of the fencing to prevent mammals, such as dogs, cats, skunks, and other predators, from digging under the fencing.

- To minimize predation by species that are not part of the natural ecosystem found on DPH, and as concurred with by USFWS and CDFG, the designated habitat manager should preclude feral cats and house cats and other exotic predators by monitoring the preserve and ensuring that they are kept out of the preserve area. If any cats are found in this area, the habitat manager should remove them. Residences in the vicinity of the preserve should be informed of the potential consequences regarding pets being found in the preserve.

- Open space areas directly adjacent to conserved native vegetation should be revegetated with a native vegetation palette to increase the area of continuous natural open space. About 0.8 ha of potential CSS revegetation is available adjacent to the PPM preserve area.

- Dogs, cats, or other pets should be prohibited within the conservation open space, including the trail areas adjacent to the PPM occupied habitat. The only exception should be "in-service" dogs in the trail area, which should be leashed at all times.

- Designated areas for trails and lookout points should be maintained without creating impacts on native vegetation and sensitive species within the preserve area.

- Through the Nature Reserve of Orange County or other similar conservation education group, make information available to visitors and residents regarding the importance of conserving PPM and local natural resources through conservation programs such as the NCCP/HCP. If approved by the City of Dana Point, construct

a visitor recreation facility, such as an interpretive area near the conservation open space, to promote public awareness and education concerning the environment and conservation.

- Best Management Practices (BMP) during construction and maintenance to minimize potential for silting/erosion of habitat conservation areas. These BMPs should include the use of silt fencing, sand bags, hydro- seeding, and other erosion prevention methods. Limits of construction should be flagged to prevent inadvertent disturbance to the native vegetation and sensitive species.

- The opportunity for erosion or water quality impacts should be minimized by directing potential runoff from new parking lots or streets away from preserve area open space. Moisture sensors within slope areas would be utilized to monitor soil moisture content and interrupt scheduled watering when sufficient moisture is present in the soil.

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Table 1. Summary of PPM Live-trapping Data Collected on Dana Point Headlands

Factor/Capture Date	1993 Survey	1997 Survey	1998 Survey	1999 Surveys		2000 Surveys		*Summary Statistics*
Survey Dates	19 Jul –05 Aug	19 - 28 Aug	24 Jul – 04 Aug	28 Apr – 05 May	07-14 Aug	05-11 May	02-08 Aug	Mean (SD) N = 5 †
Number of Unique PPM	36	21	19	11	4*	9**	6***	19.4 (19.4)
Trap Effort (No. Trap-nights)	817	2782	3325	3395	3395	3080	3080	3975 (2475)
Age Structure	61% juvenile 39% adult	57% juvenile 43% adult	47% juvenile 53% adult	100% adults	-- 100% adults	-- 100% adults	17% juvenile 83% adults	65% (28)
Males:Females	1.1:1.0	1.2:1.0	1.4:1.0	1.2:1.0	3.0:1.0	1.25:1.0	1.0:1.0 (3M:3F)	1.28 (0.16)
No. Females	13	11	10	5	1	4	3	9.4 (2.9)
Area of Occupied Habitat (ha)	1.4	2.8	3.0	3.0	--	3.0	--	8.6 (3.9)
Minimum Density (PPM/ha)	25.7	7.4	6.3	4.3	--	3.3	--	9.4 (9.2)

Table based on data in Spencer (2000) and S. Dodd, pers. comm.
The 1997 and 1998 surveys were conducted generally within the same trapping plots and areas.
* Two (2) known recaptures from spring trap session (animals were not permanently marked in 1999)
** One (1) known recapture from 1999
*** Five (5) definite recaptures from spring, only 1 new capture
† Values for 1999 and 2000 surveys were combined to produce singe estimate for each year.

Table 2b. Summary of PPM live-trapping Data Collected at San Mateo Creek North, Camp Pendleton, San Diego County	
Factor/Capture Date	**1995 Survey**
Survey Dates	
Number of Unique PPM	**37**
Trap Effort	
Age Structure	
Males:Females	
Area of Occupied Habitat	**6.5 ha**
Minimum Population Density	

Table 2c. Summary of PPM live-trapping Data Collected at Santa Margarita River North, Camp Pendleton, San Diego County	
Factor/Capture Date	***1995 Survey***
Survey Dates	
Number of Unique PPM	54
Trap Effort	
Age Structure	
Males:Females	
Area of Occupied Habitat	350 ha
Minimum Population Density	

Table 3. Differences in data-gathering capabilities and robustness for CAGN *versus* PPM on DPH

	California Gnatcatcher	**Pacific Pocket Mouse**
Population Sampling Method	Census of entire populations feasible because all individuals are observable above ground in daylight without "taking" the animals, and they occur in well-spaced territories	Sampling of population feasible by trapping at night-time only, which depends upon sensitivity of traps, bait suitability, trapability of individuals. Sampling method puts individual animals at risk from hypothermia due to wetting, cold temperatures, and mechanical injury by traps.
Seasonality of Species	Individuals are present and observable year round	Individuals spend winter months (November to February) underground in hibernation. Timing and length of above ground activities is variable and may be facultative if food stores are adequate. Individuals may come to the surface at varying intervals.
Physiology of Species	Individuals are active year-round	Individuals may enter into torpor (presumably only while underground) whenever food supply is inadequate for several days, or adverse weather patterns prevail. Individuals may come in and out of torpor independent of each other. Age classes and sexes appear to vary in this regard.
Identification of Individuals	Individuals can be banded, then identified by binoculars	Individuals are tiny and permanently marked by toe-clipping (mutilation). Other methods, such as PITT tags, appear to adversely affect behavior of individuals and ear tags easily fall away. Recaptures are necessary to acquire vitality data.
Ability for Dispersal	Individuals potentially may disperse over large distances (kilometers) by flying, forming natural metapopulations. Banded individuals can be tracked or relocated.	Individuals on DPH cannot disperse to new habitat patches because suitable habitat patches are separated by urban development for 17 miles, and cannot, therefore, perform in a metapopulation, unless there were to be human transport of individuals between populations. Dispersals on DPH presumably could occur anywhere within scrub habitat.
Number of Studies Conducted	Hundreds of surveys have been conducted and sightings reported since 1988, partially due to the large number of available professional and amateur birders and ornithologists, and to their general interest in birds. Several detailed ecological studies were in response to the listing of the species.	Only four known populations have been sampled since 1993. No populations were known between 1971 and 1993. Studies require considerable expertise, coordination, and effort to acquire sample data during night hours. Few experienced mammalogists are available or trained for trapping work. Permits are required to trap (take) the animals. There is a general lack of charisma associated with rodents, hence amateur mammalogists are scarce.

Trapping/sampling variables in population studies on the DPH PPM that may affect estimates of population vitality statistics include:

- Personnel doing the research
- Use of different kinds and sizes of traps
- Varying numbers of traps used from night to night, and season to season
- Varying placement of the traps in meandering lines, grids, clearing plots in different years

APPENDIX E Headlands Revegetation Plant Palette

Botanical Name	Common Name
Antirrhinum nuttalinum	Nuttall snapdragon
Baccharis pilularis	Coyote brush
Baccharis salicifolia (glutinosa)	Mulefat
Bromus carinatus	California Brome
Camissonia cheiranthifolia	Beach Evening Primrose
Ceanothus spp.	Ceanothus spp.
Comarostaphylis diversifolia	Summer Holly
Croton californicus	California Croton
Dichelostemma capitatum	Wild Hyacinth
Dudleya lanceolata	Coastal Dudleya
Dudleya pulverulenta	Chalk Dudleya
Encelia californica	California Sunflower
Epilobium californica	California Cottonweed
Eriophyllum confertiforum	Golden Yarrow
Eschscholzia californica	California Poppy
Garraya elliptica	Silktassel
Gnaphalium californicum	California Everlasting
Heteromeles arbutifolia	Toyon
Isomeris arborea	Bladderpod
Iva hayesiana	Marsh Elder
Lasthenia California	Goldfields
Lotus scoparius	Coastal Deerweed
Lupinus spp.	Lupine
Mirabilis californica	Wishbone Bush
Mimulus aurantiacus	Monkey Flower
Nassella (Stipa) lepida	Foothill Needle Grass
Nassella (Stipa) pulchra	Purple Needle Grass
Nemophila mensiesii	Baby Blue Eyes
Opuntia littoralis	Coast Prickly Pear
Opuntia oricola	Prickly Pear
Opuntia prolifera	Coast Cholla
Penstemmon sp.	Penstemmon
Plantago erecta	Dot-seed Plantain
Prunus ilicifolia	Holly Leaf Cherry
Rhamnus californica	California Coffeeberry
Rhamnus crocea	Spiny Redberry

Botanical Name	Common Name
Rhus integrifolia	Lemonadeberry
Ribes speciosum	Fuchsia-flowered Gooseberry
Romneya coulteri	Matilija Poppy
Sambucus mexicana	Elderberry
Sisyrinchium bellum	Blue-eyed Grass
Solanum douglasii	Douglas Nightshade
Trichostema lanatum	Wooly Blue Curls
Umbellularia californica	California Laurel
Atriplex lentiformis breweri	Coastal quail bush

URS

1615 Murray Canyon Road, Suite 1000
San Diego, California 92108
Phone 619 294-9400
Fax 619 293-7920

E-Mail: patrick_mock@urscorp.com

DATE: August 31, 2001

TO: Rob Balen, LSA

FROM: Patrick Mock, Sr. Biologist

SUBJECT: California gnatcatcher territory size in relation to distance for the coast

This memo is to clarify your question regarding gnatcatcher variation in territory size. Territory size has been documented in many California gnatcatcher studies throughout Southern California. Early on (about 1990), it became apparent that gnatcatcher densities were much higher in the coastal areas compared to occupied habitat farther inland. Coastal territories are as small as 2 acres, while populations 15 miles inland use 25+ acres per pair. This relationship is documented in a recent paper in Western Birds. Coastal populations of gnatcatcher appear to tolerate much higher densities than inland populations. Even though habitat availability is much more limiting in the coastal zone, number of territories is much higher than in inland areas where habitat patch size is much larger. The coastal zone appears to accommodate many more birds than inland areas, most likely due to mild weather conditions in the coastal zone.

References:

Mock, P.J. 1998. Energetic constraints to the distribution and abundance of the California gnatcatcher. Western Birds 29:413-420.

Mock, P.J. and D. Bolger. 1994. Ecology of the California Gnatcatcher at Rancho San Diego. Ogden Environmental report prepared for Home Capital Corporation. 58 pp.

Preston, K.L., P.J. Mock, M.A. Grishaver, E.A. Bailey, and D.F. King. 1998. California gnatcatcher territorial behavior. Western Birds 29:242-257.

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GLENN LUKOS ASSOCIATES
Regulatory Services

September 7, 2001

Kevin Darnall
Headlands Reserve, LLC
24849 Del Prado
Dana Point, California 92629

SUBJECT: Jurisdictional Delineation for the Dana Point Headlands, Dana Point, Orange County, California.

Dear Mr. Darnall:

This letter report summarizes our preliminary findings of U.S. Army Corps of Engineers (Corps), California Department of Fish and Game (CDFG), and the California Coastal Commission (CCC) jurisdiction for the above-referenced property.[1] The Dana Point Headlands site in Orange County [Exhibit 1], comprises approximately 121.3 acres and contains no blue-line drainages (as depicted on the U.S. Geological Survey (USGS) topographic map Dana Point, California [dated 1968 and photorevised in 1975]) [Exhibit 2]. On September 28, 2000, a regulatory specialist of Glenn Lukos Associates, Inc. (GLA) examined the project site to determine the limits of (1) Corps jurisdiction pursuant to Section 404 of the Clean Water Act, (2) CDFG jurisdiction pursuant to Division 2, Chapter 6, Section 1600 of the Fish and Game Code, and CCC jurisdiction pursuant to the California Coastal Act. Enclosed is a 100-scale map [Exhibit 3] which depicts the areas of Corps and CDFG jurisdiction. Photographs to document the topography, vegetative communities, and general widths of each of the waters are provided as Exhibit 4.

Corps jurisdiction at the site totals approximately 0.073 acre of ephemeral drainage channel. The site contains no jurisdictional wetlands. The project, as currently proposed, would impact approximately 0.056 acre of ephemeral drainage subject to Corps jurisdiction.

[1] This report presents our best effort at estimating the subject jurisdictional boundaries using the most up-to-date regulations and written policy and guidance from the regulatory agencies. Only the regulatory agencies can make a final determination of jurisdictional boundaries. If a final jurisdictional determination is required, GLA can assist in getting written confirmation of jurisdictional boundaries from the agencies.

23712 Birtcher Drive ▪ Lake Forest ▪ California 92630-1782
Telephone: (949) 837-0404 Facsimile: (949) 837-5834

CDFG jurisdiction at the site totals approximately 0.073 acre of ephemeral channel, none of which consist of vegetated riparian habitat. The project, as currently proposed would impact approximately 0.056 acre of CDFG jurisdiction consisting of ephemeral drainage channel.

There are no wetlands on the site as defined by the California Coastal Act, therefore, there would be no impacts to wetlands subject to the jurisdiction of the CCC.

I. METHODOLOGY

Prior to beginning the field delineation a 200-scale color aerial photograph, a 100-scale topographic base map of the property, and the previously cited USGS topographic map were examined to determine the locations of potential areas of Corps/CDFG/CCC jurisdiction. Suspected jurisdictional areas were field checked for the presence of definable channels and/or wetland vegetation, soils and hydrology. Suspected wetland habitats on the site were evaluated using the methodology set forth in the U.S. Army Corps of Engineers 1987 Wetland Delineation Manual[2] (Wetland Manual). While in the field the jurisdictional area was recorded onto a 200-scale color aerial photograph using visible landmarks. Other data were recorded onto wetland data sheets.

The Soil Conservation Service (SCS)[3] has mapped the following soil types as occurring in the general vicinity of the project site:

Cieneba Sandy Loam, 30 to 75 Percent Slopes

The Cieneba series consists of somewhat excessively drained sandy loam soils. These soils formed in material weathered from granitic rock of the Santa Ana Mountains and sandstone of the coastal foothills..

Marina Loamy Sand, 2 to 9 Percent Slopes

The Marina series consists of somewhat excessively drained loamy sands on terraces near the coast. These soils formed in old eolian sands

---

[2] Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterways Experimental Station, Vicksburg, Mississippi.

[3] SCS is now known as the National Resource Conservation Service or NRCS.

San Andreas Sandy loam, 15 to 30 Precent Slopes

The San Andreas soils consist of well drained soils on foothills formed from material weathered from soft sandstone.

None of these soil units are identified as hydric in the SCS's publication, Hydric Soils of the United States[4].

II. JURISDICTION

A. Army Corps of Engineers

Pursuant to Section 404 of the Clean Water Act, the Corps regulates the discharge of dredged and/or fill material into waters of the United States. The term "waters of the United States" is defined at 33 CFR Part 328 and includes (1) all navigable waters (including all waters subject to the ebb and flow of the tide), (2) all interstate waters and wetlands, (3) all other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce, (4) all impoundments of waters mentioned above, (5) all tributaries to waters mentioned above, (6) the territorial seas, and (7) all wetlands adjacent to waters mentioned above.

In the absence of wetlands, the limits of Corps jurisdiction in non-tidal waters, such as intermittent streams, extend to the ordinary high water mark (OHWM) which is defined at 33 CFR 328.3(e) as:

> *...that line on the shore established by the fluctuation of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas.*

---

[4] United States Department of Agriculture, Soil Conservation Service. 1991. Hydric Soils of the United States, 3rd Edition, Miscellaneous Publication Number 1491. (In cooperation with the National Technical Committee for Hydric Soils.)

Wetlands are defined at 33 CFR 328.3(b) as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support...a prevalence of vegetation typically adapted for life in saturated soil conditions." In 1987 the Corps published a manual to guide its field personnel in determining jurisdictional wetland boundaries. In 1989 the Federal Interagency Committee for Wetland Delineation developed an updated methodology which was adopted by the Corps, U.S. Fish and Wildlife Service (USFWS), U.S. Environmental Protection Agency (EPA), and SCS which replaced the 1987 Wetland Delineation Manual.[5] The use of this 1989 manual was perceived by many to excessively increase the jurisdictional limits of wetlands. After several congressional hearings, EPA, Corps, SCS, and USFWS published proposed 1991 revisions to the 1989 manual.[6] A few days afterwards, the President signed the Energy and Water Development Appropriations Act of 1992 which, in effect, prohibits the use of the 1989 manual. Because the 1991 proposed revisions to the 1989 manual have not yet been adopted, the only remaining valid methodology is the 1987 Wetland Delineation Manual.[7]

The methodology set forth in the 1987 Wetland Delineation Manual generally requires that, in order to be considered a wetland, the vegetation, soils, and hydrology of an area exhibit at least minimal hydric characteristics. While the manual provides great detail in methodology and allows for varying special conditions, a wetland should normally meet each of the following three criteria:

- more than 50 percent of the dominant plant species at the site must be typical of wetlands (i.e., rated as facultative or wetter in the National List of Plant Species that Occur in Wetlands[8]);

- soils must exhibit physical and/or chemical characteristics indicative of permanent or periodic saturation (e.g., a gleyed color, or mottles with a matrix of low chroma indicating a relatively consistent fluctuation between aerobic and anaerobic conditions); and

---

[5] Federal Interagency Committee for Wetland Delineation. 1989. Federal Manual for Identifying and Delineating Jurisdictional Wetlands. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, and USDA Soil Conservation Service, Washington, DC Cooperative technical publication.

[6] Government Printing Office. 1991. Federal Register, "1989 Federal Manual for Identifying Jurisdictional Wetlands; Proposed Revisions." August 14, 1991, Vol. 56, No. 157, pp 40446-40480.

[7] This delineation was performed using, where appropriate, the 1987 Wetland Manual. It is unlikely that any actions will be taken on a revised wetland manual in the near future. If a new manual is adopted, it may be necessary to review our delineation to determine its compliance with any changes set forth.

[8] Reed, P.B., Jr. 1988. National List of Plant Species that Occur in Wetlands. U.S. Fish and Wildlife Service Biological Report 88(26.10).

- hydrologic characteristics must indicate that the ground is saturated to within 12 inches of the surface for at least five percent of the growing season during a normal rainfall year[9].

B. California Department of Fish and Game

Pursuant to Division 2. Chapter 6, Sections 1600-1603 of the California Fish and Game Code, the CDFG regulates all diversions, obstructions, or changes to the natural flow or bed, channel, or bank of any river, stream, or lake which supports fish or wildlife.

CDFG defines a "stream" (including creeks and rivers) as "a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having surface or subsurface flow that supports or has supported riparian vegetation." CDFG's definition of "lake" includes "natural lakes or man-made reservoirs."

CDFG jurisdiction within altered or artificial waterways is based upon the value of those waterways to fish and wildlife. CDFG Legal Advisor has prepared the following opinion:

- Natural waterways that have been subsequently modified and which have the potential to contain fish, aquatic insects and riparian vegetation will be treated like natural waterways...

- Artificial waterways that have acquired the physical attributes of natural stream courses and which have been viewed by the community as natural stream courses, should be treated by [CDFG] as natural waterways...

- Artificial waterways without the attributes of natural waterways should generally not be subject to Fish and Game Code provisions...

Thus, CDFG jurisdictional limits closely mirror those of the Corps. Exceptions are CDFG's exclusion of isolated wetlands (those not associated with a river, stream, or lake), the addition of artificial stock ponds and irrigation ditches constructed on uplands, and the addition of riparian habitat supported by a river, stream, or lake regardless of the riparian area's federal wetland status.

---

[9] For most of low-lying southern California, five percent of the growing season is equivalent to 18 days.

C. California Coastal Commission

Pursuant to the California Coastal Act (California Public Resources Code Section 30233), the CCC regulates the diking, filling, or dredging of wetlands within the coastal zone. The Coastal Act Section 30121 defines "wetlands" as land "*which may be covered periodically or permanently with shallow water.*" The 1981 CCC Statewide Interpretive Guidelines state that hydric soils and hydrophytic vegetation "*are useful indicators of wetland conditions, but the presence or absence of hydric soils and/or hydrophytes alone are not necessarily determinative when the Commission identifies wetlands under the Coastal Act. In the past, the Commission has considered all relevant information in making such determinations and relied upon the advice and judgment of experts before reaching its own independent conclusion as to whether a particular area will be considered wetland under the Coastal Act. The Commission intends to continue to follow this policy.*"

Therefore, in determining whether wetlands were present on the Dana Point Headlands site, as defined by the Coastal Act and/or the Statewide Interpretive Guidelines, the site was carefully evaluated for the presence of wetland hydrology, hydric soils, or areas that support a predominance of hydrophytic vegetation. Whereas for Corps jurisdiction, indicators for all three criteria must be present for an area to be considered a wetland, under the Coastal Act, the presence of any one of these criteria would be sufficient to bring an area under CCC jurisdiction as as a jurisdictional wetland.

III. RESULTS

A. Corps Jurisdiction

Corps jurisdiction associated with the Dana Point Headlands totals approximately 0.073 acres of water of the United States consisting entirely of ephemeral drainages. No wetlands were identified on the site. The boundaries of the waters of the United States are depicted on the enclosed map [Exhibit 3].

1. Drainage A

Drainage A originates near the eastern boundary of the "panhandle" portion of the property where a culvert discharges storm runoff onto the site. The runoff has eroded a deep ravine, exhibiting a sandy bottom., and extending for approximately 230 feet to where an OHMW is no longer discerible [Exhibit 4, Photographs B and C depict areas within the lower portions of the ravine where an OHWM is no longer present]. In the

upper portions of the ravine, the presence of an OHWM was indicated by shelving, destruction of terrestrial vegetation and the presence of litter and debris. In these areas, the drainage varies in width from six to eight feet, and Corps jurisdiction associated with the drainage totals approximately 1,840 square feet (0.042 acre). The banks of the drainage/ravine are vegetated with hottentot fig (*Carpobrotus edulis*) and scattered individuals of coastal sagebrush (*Artemisia californica*).

2. Drainage B

Drainage B originates within the southwest portion of the site and extends in a southwesterly direction along an old fenceline. From its point of origin, the drainage extends for approximately 330 feet to where an OHWM is no longer discernible at a point where the drainage sheet flows across a broad flat area [see Exhibit 3]. Where present, the OHWM was indicated by shelving, destruction of terrestrial vegetation and the presence of litter and debris. The drainage varies in width from one to three feet, and Corps jurisdiction associated with the drainage totals approximately 750 square feet (0.017 acre). The banks of the drainage are vegetated with coastal sage scrub species including coastal sagebrush (*Artemisia californica*) and California buckwheat (*Eriogonum fasciculatum*).

3. Drainage C

Drainage C originates within the southeast portion of the site and extends in a southeasterly direction. From its point of origin, the drainage extends for approximately 260 feet to where an OHWM is no longer discernible, as the shallow channel disappears. The presence of an OHWM was indicated by shelving, destruction of terrestrial vegetation and the presence of litter and debris. The drainage varies in width from one to three feet, and Corps jurisdiction associated with the drainage totals approximately 600 square feet (0.014 acre). The banks of the drainage are vegetated with coastal sage scrub species including coastal sagebrush (*Artemisia californica*) and California buckwheat (*Eriogonum fasciculatum*).

B. <u>CDFG Jurisdiction</u>

CDFG jurisdiction associated with the Dana Point Headlands site totals approximately 0.073 acre and is coincident with Corps jurisdiction. None of the drainages support riparian vegetation.

C. CCC Jurisdictional Wetlands

No areas were identified that exhibited wetland hydrology or hydric soils. No areas were identified that support a predominance of hydrophytic vegetation. No wetlands, as defined by the California Coastal Act or California Code of Regulations were found to occur on the site.

IV. DISCUSSION

A. Impact Analysis

Development of the project would result in the removal of Drainages A and C totaling approximately 0.056 acre of ephemeral drainage course subject to Corps and CDFG jurisdiction. There would be no impacts to the wetlands subject to the jurisdiction of the CCC. A summary of Corps and CDFG jurisdiction on the site along with impacts to Corps and CDFG jurisdiction is provided in Table 1.

Table 1
Summary of Corps and CDFG Jurisdiction
and Impacts to Corps and CDFG Jurisdiction

Ephemeral	Corps Jurisdiction Onsite		Impacts to Corps Jurisdiction		CDFG Jurisdiction	
Drainage	Acres	Linear Feet	Acres	Linear Feet	Acres	Impacts
A	0.042	230	0.042	230	0.042	0.042
B	0.017	330	0.0	0	0.017	0.0
C	0.014	260	0.014	260	0.014	0.014
Total	0.073	820	0.056	490	0.073	0.056

D. Potential Mitigation

If the division engineer takes discretionary authority and requires an individual permit, or if authorization is sought under a NWP requiring case-by-case approval by the Corps through the pre-construction notification process, or if the proposed work does not qualify for authorization by NWP, then the Corps (and the state and federal resource agencies) will likely require mitigation for the impacted wetland/riparian habitat.

Unlike the Corps, the CDFG will likely require mitigation for all impacts to streambeds and their associated riparian habitats resulting from any aspect of the proposed project, regardless of Corps requirements or extent of impacts.

Mitigation can take several forms. It can consist of (1) avoidance of impacts, (2) reduction of impacts, or (3) compensation for impacts.[10] The first two types of mitigation (avoidance or reduction of impacts) are much preferred by the agencies and should be investigated to the maximum extent possible. In cases where impacts cannot be avoided or significantly reduced, compensation must be considered.

Compensation is the creation of habitat to replace similar habitat unavoidably eliminated at a different location. In order to be accepted, the concerned agencies must be convinced that the proposed compensation will totally mitigate for the lost habitat. Because the creation of habitat requires time (usually several years) there is a temporal loss of habitat unless the mitigation is performed several years in advance of the removal of the existing habitat. As a result, the agencies often require compensation at a ratio of greater than one-to-one. Our experience with NWP number 26 is that habitat replacement is usually required at a ratio of between 1.5:1 and 2:1; however, a ratio of 3:1 or more is not unheard of for the loss of high quality wetlands.

If performed on the project site or immediately adjacent to the project site, the mitigation is said to be "on site." If no mitigation opportunities are available at or adjacent to the project site, "off site" mitigation may be considered. Generally, as the distance between the project and mitigation sites increases, the value of the mitigation (as determined by the agencies) decreases. In addition, if the mitigation is too far off site, disputes may arise between local governing bodies in which one local government refuses to allow mitigation within its boundaries for a project outside its boundaries. Compensation does not have to take place on property owned by the developer (although it is imperative that the developer obtain written permission prior to formal application).

The Corps has recently taken the position that mitigation banking and other forms of consolidated mitigation are the preferred method of providing compensatory mitigation because

---

[10] The November 15, 1989 Memorandum of Agreement (MOA) between the Corps and EPA directed the Corps to require that impacts to waters of the United States be avoided to the maximum extent practicable. Although the MOA was intended to apply to individual permits only, recent experience with Corps permit managers has indicated that they are requiring prospective nationwide permittees to document that discharges into waters of the United States cannot be avoided and that there are no available upland alternatives.

this method involves larger blocks of protected aquatic environment, are more likely to meet the mitigation goals, and are more easily checked for compliance.

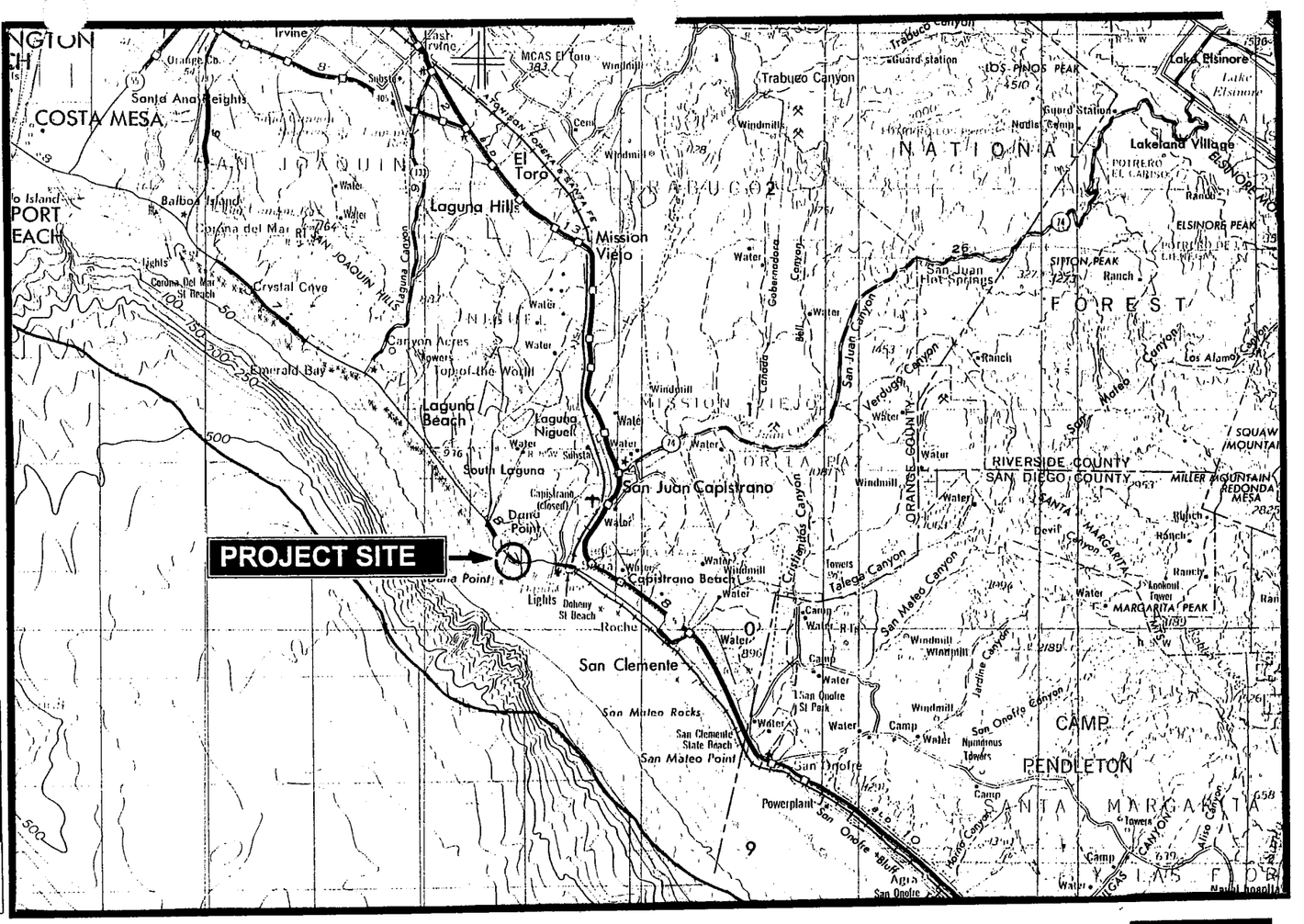
If you have any questions about this letter report, please contact either Glenn Lukos or Tony Bomkamp at (949) 837-0404.

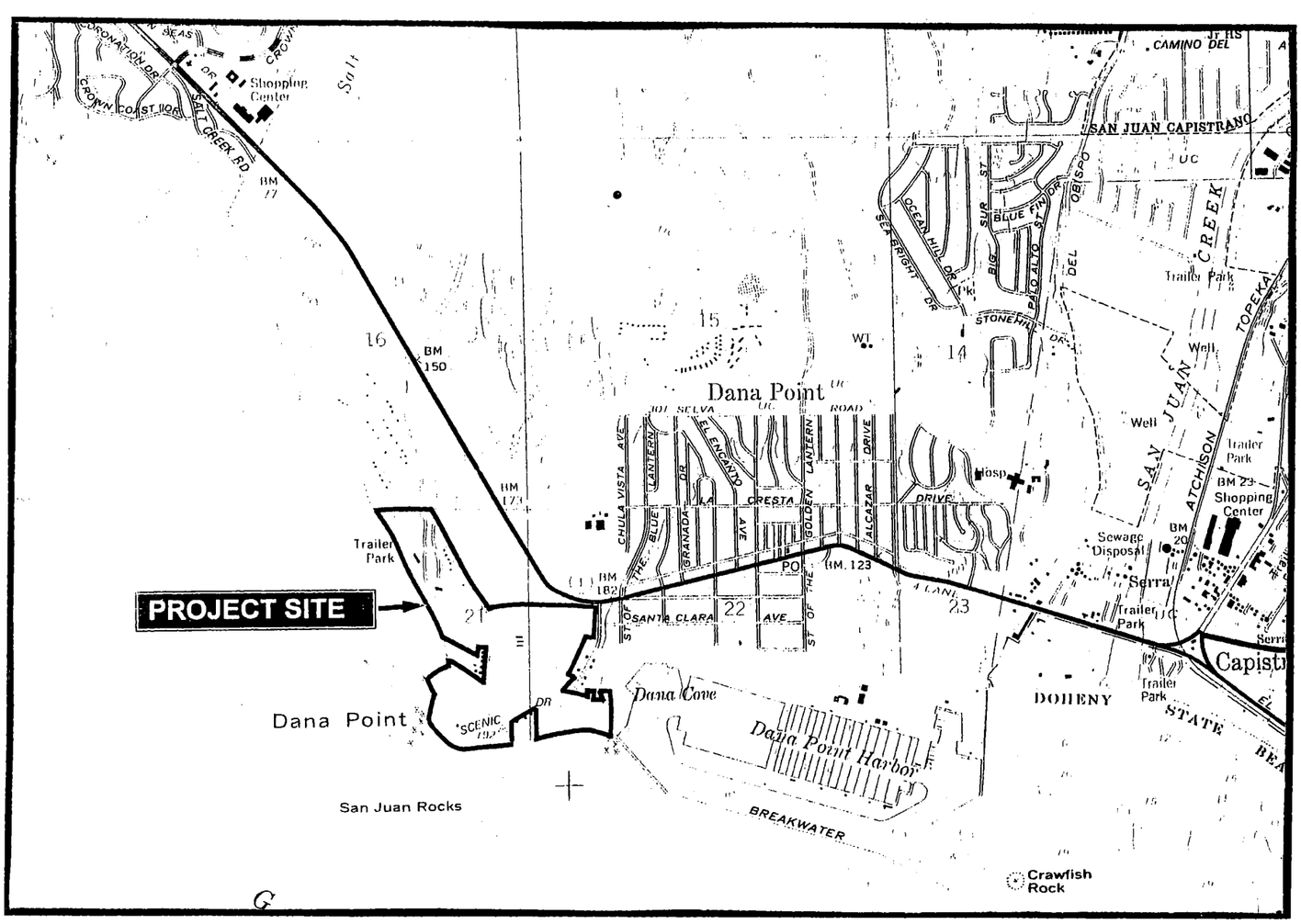
Sincerely,

GLENN LUKOS ASSOCIATES, INC.

Tony Bomkamp
Regulatory Specialist

Adapted from USGS Santa Ana Quadrangle


PROJECT SITE
COSTA MESA
Santa Ana Heights
Irvine
MCAS El Toro
El Toro
Laguna Hills
Mission Viejo
Trabuco Canyon
Lake Elsinore
Lakeland Village
ELSINORE PEAK
SITTON PEAK
LOS PINOS PEAK
NATIONAL FOREST
Laguna Beach
Laguna Niguel
South Laguna
San Juan Capistrano
Dana Point
Capistrano Beach
San Clemente
San Mateo Rocks
San Clemente State Beach
San Mateo Point
San Onofre
Powerplant
CAMP PENDLETON
SANTA MARGARITA
RIVERSIDE COUNTY
SAN DIEGO COUNTY
ORANGE COUNTY
MARGARITA PEAK
SQUAW MOUNTAIN
MILLER MOUNTAIN
REDONDA MESA
Crystal Cove
Emerald Bay
Balboa Island
Corona del Mar
Canyon Acres
Top of the World
Talega Canyon
San Mateo Canyon
San Juan Canyon
Verdugo Canyon
Los Alamos Canyon
Cristianitos Canyon
Gabino Canyon
Laguna Canyon
Aliso Creek
San Onofre Bluff
Roche
Lights
Dana Point
Capistrano Beach
Camp
Ranch
Towers
Windmill
Water
Ruins
Guard station
Nadis Camp
Ranch
Lookout Tower
Rancho
Devil Canyon
Jordine Canyon
Horno Canyon
Gas Canyon
Villa Canyon
Numpinus Towers
San Onofre State Park
Aliso Creek
Dana Point
Dana Point (closed)
Sahsta
Dehesa
St Beach
Corona Del Mar St Beach
Orange Co.
Aviation Tower
Windmill
Cemetery
Guard Station
Ranch
Water
Windmill
Towers
Camp
Water
Windmill
Water
Windmill
Water
Windmill



Adapted from USGS Dana Point Quadrangle

DANA POINT HEADLANDS

Vicinity Map

GLENN LUKOS ASSOCIATES

EXHIBIT 2

NOTE: BOUNDARY SHOWN REFLECTS FUTURE ESTIMATED DEVELOPMENT AREA AND DOES NOT NECESSARILY REFLECT EXACT OWNERSHIP AND ROAD R/W.

GRAPHIC SCALE

(IN FEET)
1 inch = 500 ft.

DRAINAGE C

DRAINAGE A

DRAINAGE B

GLENN LUKOS ASSOCIATES

EXHIBIT 3

DANA POINT HEADLANDS
Corp and CDFG Jurisdictional Delineation

TOPOGRAPHIC NOTE:

TOPOGRAPHIC FEATURES SHOWN HEREON ARE BASED ON AERIAL PHOTOGRAPHY PROVIDED TO THIS FIRM BY

DIGITAL MAPPING, INC.

COMPILED FROM PHOTOS DATED 7/21/98.

BOUNDARY NOTE:

BOUNDARY INFORMATION SHOWN HEREON HAS BEEN PREPARED SOLELY FROM RECORD DATA OBTAINED FROM OUTSIDE SOURCES, AND IS INCLUDED HEREON FOR VISUAL PURPOSES ONLY. THIS EXHIBIT DOES NOT REFLECT THE RESULTS OF A FIELD SURVEY, NOR SHOULD IT BE CONSTRUED AS AN ACCURATE REPRESENTATION OF TITLE OWNERSHIP. THEREFORE, NO CONCLUSIONS CAN BE MADE BY THE KEITH COMPANIES AS TO THE ACCURACY OR COMPLETENESS OF SAID INFORMATION AS DEPICTED.

DANA POINT HEADLANDS
ESTIMATED DEVELOPMENT AREA
1998 TOPO

The Keith Companies TKC

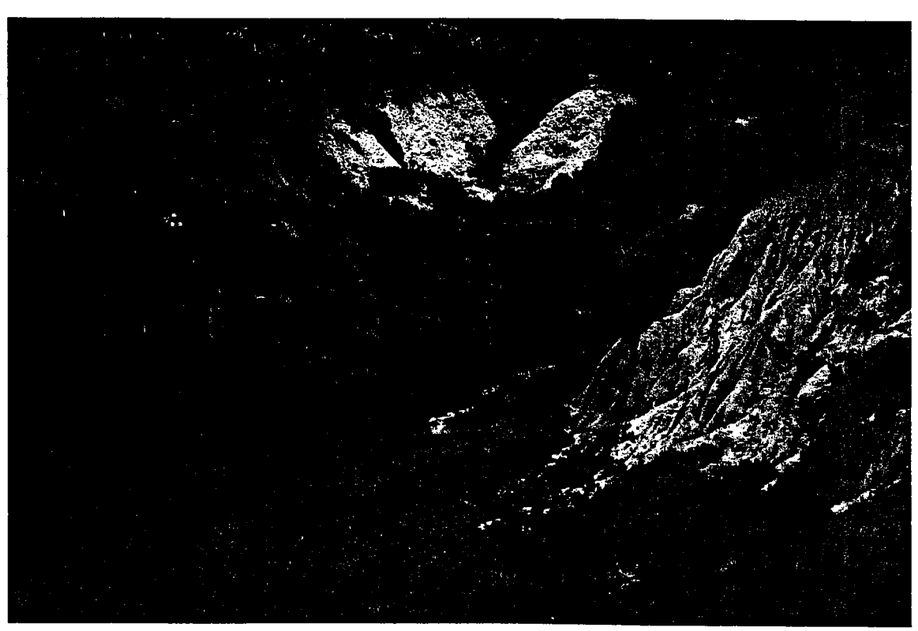
2655 Red Hill Avenue, Costa Mesa, CA (714) 540-6800
Water Resources Land Planning Civil Engineering Land Surveying Irrigation Environmental Services



Photograph 1 - Upper portion of Drainage A looking downstream. Note incised channel inbottom of ravine indicating flows.



Photograph 2 - Drainage A ravine below point where OHWM is no longer discernible. Note dense vegetation covering ravine bottom and labsence of indicators of flow.



Photograph 3 - Drainage A ravine below point where OHWM is no longer discernible Note dense vegetation covering ravine bottom and labsence of indicators of flow.



Photograph 4 - Upper portion of Drainage C looking at headcut that represents beginning of OHWM.

GLENN LUKOS ASSOCIATES

EXHIBIT 4

DANA POINT HEADLANDS

Site Photographs

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

3-201
(1/97)

FEDERAL FISH AND WILDLIFE PERMIT

1. PERMITTEE

HEADLANDS RESERVE, LLC
24849 DEL PRADO AVENUE
DANA POINT, CA 92629

2. AUTHORITY-STATUTES
16 USC 1539(A)
16 USC 1533(D)

REGULATIONS (Attached)
50 CFR 17.22
50 CFR 17.32
50 CFR 13

3. NUMBER
TE810581-1 TRANSFER

4. RENEWABLE
[X] YES
[ ] NO

5. MAY COPY
[X] YES
[ ] NO

6. EFFECTIVE
1/21/2000

7. EXPIRES
07/17/2071

8. NAME AND TITLE OF PRINCIPAL OFFICER (If not by a business)
SANFORD EDWARD
MANAGING MEMBER

9. TYPE OF PERMIT
THREATENED AND ENDANGERED SPECIES

10. LOCATION WHERE AUTHORIZED ACTIVITY MAY BE CONDUCTED
On lands specified within the body of the permit

11. CONDITIONS AND AUTHORIZATIONS:

GENERAL CONDITIONS SET OUT IN SUBPART D OF 50 CFR 13, AND SPECIFIC CONDITIONS CONTAINED IN FEDERAL REGULATIONS CITED IN BLOCK #2 ABOVE, ARE HEREBY MADE A PART OF THIS PERMIT. ALL ACTIVITIES AUTHORIZED HEREIN MUST BE CARRIED OUT IN ACCORD WITH AND FOR THE PURPOSES DESCRIBED IN THE APPLICATION SUBMITTED. CONTINUED VALIDITY, OR RENEWAL, OF THIS PERMIT IS SUBJECT TO COMPLETE AND TIMELY COMPLIANCE WITH ALL APPLICABLE CONDITIONS, INCLUDING THE FILING OF ALL REQUIRED INFORMATION AND REPORTS.

B. THE VALIDITY OF THIS PERMIT IS ALSO CONDITIONED UPON STRICT OBSERVANCE OF ALL APPLICABLE FOREIGN, STATE, LOCAL OR OTHER FEDERAL LAW.

C. VALID FOR USE BY PERMITTEE NAMED ABOVE.

D. Further conditions of authorization are contained in the attached Special Terms and Conditions.

ADDITIONAL CONDITIONS AND AUTHORIZATIONS ALSO APPLY

RTING REQUIREMENTS
See permit conditions for reporting requirements.

ISSUED BY	TITLE	DATE
Elizabeth H Stevens	DEPUTY MANAGER, CA/NV OPERATIONS OFFICE	1/21/00

D. Kobet

U.S. Fish & Wildlife Service
2730 Loker Avenue West
Carlsbad, CA 92008
(619) 431-9440
FAX: (619) 431-9618

CA Dept. of Fish & Game
1416 Ninth Street
PO Box 944209
Sacramento CA 94244-2090
(916) 653-9767
FAX: (916) 653-2588

March 17, 1995

Jurisdictions within the Natural Community Conservation Planning (NCCP) Area

CALIFORNIA ENVIRONMENTAL QUALITY ACT (CEQA) DETERMINATIONS OF SIGNIFICANT IMPACTS UNDER THE NATURAL COMMUNITY CONSERVATION PLANNING (NCCP) PROGRAM

The California Department of Fish and Game and the U.S. Fish and Wildlife Service have been requested to provide further guidance in interpreting Section 4.3 of the NCCP Process Guidelines (Interim Mitigation). In response to those requests, the Department and the Service provide the following additional guidance.

BACKGROUND

Section 4.3 (part of the discussion of the Process for Securing Interim Approvals) of the NCCP Process Guidelines declares that projects impacting

"...coastal sage scrub habitat and the target species must be mitigated to insignificant levels as required by the California Environmental Quality Act (CEQA) by using one or more of the following options:

- Acquisition of habitat
- Dedication of land
- Management agreements
- Restoration
- Payment of fees
- Transfer of development rights
- Other mitigation measures approved in writing by CDFG and USFWS

Appropriate mitigation must be identified in a mitigation plan prepared by the applicant. The applicant must demonstrate capacity for funding appropriate mitigation and the mitigation must be legally assured. Habitat acquisition and set asides should occur in areas with long-term conservation potential."

rcl Sharon Gail

ISSUE

The specific CEQA-related question posed regarding this section was the following: How should projects within NCCP subregions that impact CSS habitat and target species be addressed in terms of complying with the requirement that such impacts be substantially reduced, through local or subregional actions, or otherwise reduced to insignificant levels?

For purposes of determining "significant" impacts under CEQA for projects included within a subregional NCCP planning area, the following criteria and standards shall be applied.

- Impacts to CSS/Target Species Prior to Approval of a Subregional NCCP (Section 4.3 of the Guidelines)

Projects shall be considered to be mitigated to insignificant levels if:

- it can be demonstrated that the CSS/target species impacts related to the proposed action would not significantly impair the ability of the lead agency to prepare and implement an effective subregional NCCP, consistent with the provisions of the NCCP Planning Guidelines; and

- the project is otherwise consistent with the Interim Take provisions of the Federal 4(d) Rule for the coastal California gnatcatcher, and

- the project incorporates one or more of the mitigation measures cited in Section 4.3 of the NCCP Planning Guidelines to reduce its impacts

- Impacts to CSS/Target Species Following Approval of a Subregional NCCP

After a subregional NCCP has been prepared and approved, project-related impacts to CSS and target species (including all species receiving regulatory coverage under the NCCP) shall be considered to be mitigated to insignificant levels and consistent with the NCCP Guidelines if the project and its related impacts to CSS/target species are carried out (siting, mitigation, etc.) consistent with the subregional or subarea NCCP and its associated Implementing Agreement. This is based upon the Department, Service, and lead agency for a subregional NCCP making a finding that the approved subregional or subarea NCCP "...creates a system of interconnected reserves designed to:

- promote biodiversity
- provide for high likelihoods for persistency of target species in the subregion, and
- provide for no net loss of habitat value from the present, taking into account management and enhancement. No net loss of habitat value means no net reduction in the ability of the subregion to maintain viable populations of target species over the long-term."

Within the context of an approved subregional NCCP, it is neither necessary nor appropriate to attempt to determine the level of significance of CSS impacts on a project by project basis if the project is consistent with the approved subregional or subarea NCCP and associated Implementing Agreement.

Please direct questions you have regarding this information to the Department of Fish and Game, NCCP San Diego Office, 8885 Rio San Diego Drive, Suite 270, San Diego, California 92108, telephone (619) 688-4268, or the U.S. Fish and Wildlife Service, Carlsbad Field Office, 2730 Loker Avenue, Carlsbad, California 920098, telephone (619) 431-9440.

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Ms. Patty Wolf
Long Beach, California

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San Diego, California

APPENDIX D

GEOTECHNICAL ASSESSMENT AND RELATED DOCUMENTS

GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA

Submitted To:

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Suite 500
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Attention: Mr. Rob Balen

Prepared By:

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August 2001

Job No. 9-212-306100

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1.0 INTRODUCTION

This report summarizes AMEC Earth & Environmental, Inc.'s (AMEC, formerly AGRA Earth & Environmental, Inc.) geotechnical evaluation performed for the General Plan Amendment, Headlands Development and Conservation Plan, and the associated Draft EIR for the proposed project. The project site consists of approximately 121 acres and is located along the coastline westerly of Dana Point Harbor in the City of Dana Point. The project site includes most of the Dana Point promontory and much of the adjoining land to the north. During the on-going planning process, the Headlands project area has typically been divided into four areas: "Harbor Point", the "Headlands Promontory", the "Upper Headlands" and the "Strand". Although each of these areas are affected by the same general geotechnical constraints, some issues are pertinent only to specific portions of the project site. The approximate extent of the Headlands project site is shown on the Site Location Plan attached on the following page.

Although large portions of Harbor Point and the Headlands Promontory areas have previously been graded, these areas of the site are currently vacant land. Similarly, a large portion of the Upper Headlands was also graded in the mid-1960's, in conjunction with development of the site as a plant propogation/nursery facility. Although this facility is no longer in operation, the remaining buildings and much of the surrounding area are still used for offices and storage. The Strand area was originally developed as the Dana Strand Club Mobile Home park in the mid-1950's, and continued operations until the late 1980's. The mobile home pads and associated infrastructure improvements still exist on the Strand site, including several buildings associated with the Club's operations. Two existing residential enclaves are located within or adjoining the northerly and easterly portions of the Headlands Promontory, but these properties are not part of the project site. Similarly, an existing residential and commercial area adjoins the easterly side of the Upper Headlands.

The purpose of this report is three-fold:

1. Summarize the general geologic/geotechnical conditions comprising the project site.

2. Outline and discuss potential geotechnical impacts/constraints to the proposed development concept.

3. Develop and discuss opinions regarding the potential impact of geotechnical constraints on the proposed development concept, and outline project design features and/or mitigation measures to reduce the impact of these constraints.

Geologic/geotechnical conditions on the site are summarized on the basis of available published information and previous geologic/geotechnical reports specific to the project area. Previous studies of the project site are briefly summarized in the following section and pertinent references are listed at the end of the text. Evaluation of potential geotechnical impacts to the proposed development concept are based primarily on guidelines published by the California Department of Conservation, Division of Mines and Geology (CDMG Note 46, 1982).

2.0 PREVIOUS GEOTECHNICAL EVALUATIONS

Information and evaluations compiled and developed for this report are based primarily on several previous site specific studies of the project site. This information was supplemented by geotechnical reports for adjoining or nearby properties and also by available published references. Following is a brief outline of the previous geotechnical studies/reports specific to the project area. Specific references are listed following the text.

AMEC Earth & Environmental, Inc. (AMEC) has been responsible for most of the site-specific geologic/geotechnical study of the property, including work prior to 2000 that was performed under the firm's previous name of AGRA Earth & Environmental (AGRA), and prior to 1992 that was performed as Moore & Taber (M&T). AMEC/Moore & Taber's first involvement with the property dates back to the mid-to-late 1960's when minor grading improvements were made to several areas in the Strand and Upper Headlands. Geotechnical evaluation and construction review services were also provided by AMEC/Moore & Taber in the late 1960s and early 1970s, in conjunction with grading development of the Niguel Shores residential tract that adjoins the northerly boundary of the Strand area.

In 1979 Earth Research Associates performed a reconnaissance level geotechnical evaluation of the the Upper Headlands, Headlands Promontory and Harbor Point portion of the project site. Although no subsurface exploration was included in this evaluation, laboratory testing was performed on collected surface samples to generally characterize the earth materials. The compiled information is summarized in Earth Research Associates' report dated May 13, 1979 (Job No. 151-79).

Heavy storm surf during the winter storms of 1982-83 damaged the rip-rap shoreline protection in the Strand area. AMEC/Moore & Taber provided geotechnical assessment of the damages, and also construction review services during subsequent repairs. This information is summarized in reports dated March 24, 1983 (Job No. 383-415) and March 2, 1984 (Job No. 425-989).

The first significant subsurface exploration of the property was performed by AMEC/Moore & Taber in 1984 as a part of a preliminary investigation of the ancient landslide complex that occupies much of the Strand area. This information is summarized in a report dated November 29, 1984 (Job No. 384-414). This study was supplemented by a more extensive

program of exploration, testing and analyses that was completed in 1988. Investigation in 1988 was performed to demonstrate the geotechnical feasibility of a proposed Vesting Tentative Tract Map grading concept for the Strand area. The data and findings from this investigation are summarized in AMEC/Moore & Taber's report dated March 4, 1988 (Job No. 387-584). As a part of the 1987-88 exploration program in the Strand area, five rotary wash borings were also drilled and sampled in the Upper Headlands and Headlands Promontory areas of the project site. Although this information was not summarized in a report at that time, it has been included in a recently prepared submittal for the project (see AMEC, October 15, 1999).

Evaluation of the shoreline erosion conditions along the length of the City of Dana Point's coastline was performed by Zeiser Kling Consultants (ZKC), as a part of the City's General plan process in 1990. This evaluation is summarized in a "Coastal Erosion Technical Report" dated June 29, 1990, and it includes preliminary bluff setback recommendations for the Harbor Point and Headlands Promontory areas. ZKC's evaluation was based on review of available historic documentation and field reconnaissance. No subsurface exploration, testing or stability analyses were included in ZKC's work. Subsequent review of ZKC's erosion interpretations and the preliminary setback recommendations for the Headland area are summarized in AMEC/Moore & Taber's report dated November 29, 1990 (Job No. 387-584).

A reconnaissance level geotechnical assessment of the project site was performed by Leighton and Associates in 1992 as a part of previous EIR/Specific Plan processing. No subsurface exploration or laboratory testing was performed as a part of this general assessment, which is summarized in Leighton and Associates' report dated June 26, 1992 (Project No. 1920279-01).

Subsurface exploration and testing in the vicinity of the bluff between the Headlands Promontory and Harbor Point areas were performed by Petra Geotechnical in 1997-98. Petra's evaluation was performed for three residential lots at 34567 Scenic Drive that adjoin the southern portion of the project site. This evaluation is summarized in three reports dated October 28, 1997, December 18, 1997 and March 24, 1998.

A comprehensive update of AMEC/Moore & Taber's 1988 geotechnical feasibility evaluation of the Strand area was performed by AMEC/AGRA in 1999. This evaluation included additional subsurface exploration, testing and analyses. The grading concept that was evaluated was substantially modified from the Tentative Tract Map plan that as proposed in 1988. The additional information gathered during the 1999 study allowed a more refined model of the geologic conditions to be developed and analyzed. The compiled information, testing and analyses are summarized in AMEC/AGRA's report dated October 15, 1999 (Job No. 9-212-306100). Subsequent review responses to comments prepared by Zeiser Kling Consultants, on behalf of the City of Dana Point, are compiled in AMEC/AGRA's report dated February 4, 2000 (Job No. 9-212-306100).

Bluff stability evaluation of the Harbor Point area was performed by AMEC/AGRA in January-February, 2000. Subsurface exploration and testing included core sampling, and also strength testing of the bedrock comprising the coastal bluffs that rim the Harbor Point and Headlands Promontory areas. Stability analyses and evaluation included development of foundation setback recommendations from the bluff top. Information, analyses and conclusions compiled/developed as a part of this evaluation are presented in AMEC/AGRA's report dated February 21, 2000 (Job No. 9-212-306100).

The conceptual grading plan for the Strand area that was addressed in AMEC/AGRA's October 15, 1999 report, and also in the subsequent review response dated February 4, 2000, was modified slightly in February-March, 2000. Although changes to the Strand grading concept were minor, local modifications of the preliminary remedial grading design presented in AMEC/AGRA's previous reports were required. Each of the primary design sections were therefore reanalyzed using the revised grading concept in order to demonstrate the general geotechnical feasibility of the currently proposed conceptual design (see Plate II, in pocket). Information and analyses pertinent to this addendum stability evaluation are presented in AMEC/AGRA's report dated March 21, 2000.

As requested during an informal meeting on June 28, 2001 with ZKC, the City's geotechnical reviewer, an addendum to AMEC's February 21, 2000 report for the Harbor Point area was prepared. This addendum report presents stability analyses that are restricted to the terrace deposits that form the upper portion of the bluff slope in the westerly portion of the Harbor Point area. These analyses were not presented in the previous report (2/21/00) because they are not the critical cases (i.e., the Factors of Safety are higher than those when the whole height of the bluff is analyzed). AMEC's addendum report that briefly summarizes the slope stability analyses of the terrace deposits is dated July 9, 2001.

3.0 SCOPE OF WORK

The principal elements of AMEC's geotechnical evaluation for the environmental impact report process are briefly outlined below:

1. Available previous geotechnical reports for the project site were reviewed, including pertinent published references. A brief summary of these reports is presented above in Section 2.0 of the text. These previous reports and references provide the basis for AMEC's geotechnical evaluation. A complete list of references is attached as Section 8.0.

2. Geologic mapping of the Strand and Harbor Point areas has been performed at a scale of 1" = 40'. This mapping information is presented in AMEC/AGRA's reports dated October 15, 1999 and February 21, 2000. Reconnaissance level mapping was performed at a scale of 1" = 100' for the remainder of the bluff exposures that rim the Harbor Point and Headlands Promontory areas. Geologic contacts in the Upper Headlands area were inferred from the available boring data, topographic conditions and the available reference materials, including review of historic aerial photographs. A geologic map compilation (1" = 100') has been prepared and is enclosed as Plate IV, in pocket. A list of the aerial photographs that were reviewed is attached in the references section following the text.

3. Previous subsurface exploration of the project site includes excavation sampling and logging of 26 borings and 39 trenches/test pits. Ground Penetrating Radar (GPR) surveys/profiles were also performed at 9 locations. With the exception of one boring in the Harbor Point area and five borings in the Upper Headlands and Headlands Promontory areas, all of this work was performed in the Strand portion of the project site. Boring logs and trench/GPR profiles are presented in AMEC/AGRA's reports dated October 15, 1999 and February 21, 2000. The locations of the borings are shown on the enclosed Geologic Map (Plate IV, in pocket).

4. Field testing of the bedrock exposures around the base of the bluff in the Harbor Point and Headlands Promontory areas was performed using a Schmidt Hammer to estimate compressive strength. This information is presented in AMEC/AGRA's report dated February 21, 2000.

5. Laboratory testing was performed to characterize the engineering properties of the various earth materials comprising foundation areas for the proposed improvements. This characterization testing included: moisture-density determinations, maximum density/optimum moisture content, grain-size analyses, sand equivalent, Atterberg Limits, Expansion Index, consolidation, consolidation-time rates, direct shear, unconfined compression, consolidated-undrained triaxial compression, permeability, concentration of soluble sulphate, and corrosivity. The results of the laboratory testing are summarized in AMEC/AGRA's reports dated October 15, 1999 and February 21, 2000. Reference is also made to general test data for surface samples collected by Earth Research Associates, as a part of their reconnaissance level report dated May 31, 1979. The available information was supplemented with Expansion Index testing of a near surface sample of the bedrock in the Upper Headlands area that was recently collected by AMEC. The results of this test are presented in the following text.

6. The compiled observations, analyses, evaluations and conclusions from the previous reports and available references have been briefly summarized in this report. This information provides the basis for AMEC's geotechnical evaluations for the General Plan Amendment: Headlands Development and Conservation Plan, and the associated Draft EIR.

4.0 PROPOSED DEVELOPMENT/GRADING CONCEPT

The proposed development concept includes three primary land use designations: Recreation/conservation open space, visitor/recreation commercial, and residential. A copy of the proposed land use plan showing the location and approximate extent of the proposed land use areas is enclosed as Plate I, in pocket. A number of circulation/access improvements are also planned in conjunction with the various land use designations. Project plans include extension/realignment of the existing Selva Road and Scenic Drive roadways within the project area and construction of a network of private roads within the proposed residential areas. The proposed project includes plans for new and improved beach access, and also a public trail system for pedestrians and bicycles. A private pedestrian accessway is planned between the Upper Headlands and the Strand Residential areas via a short tunnel or bridge undercrossing beneath the extension of Selva Road. The proposed grading concept and other pertinent information for each of the major land use areas are briefly summarized below. The proposed grading concept for the project area is illustrated on Plate II, in pocket.

4.1 RECREATION/CONSERVATION OPEN SPACE LAND USE AREAS

Proposed recreation/open space is planned surrounding most of the other land use areas on the project site (Plate I). Grading for most of the proposed visitor/recreation and/or park areas will typically be minor in scope and generally limited to ground preparation for construction of planned public facilities. These facilities include trails, viewpoints and proposed public structures at four locations, including associated parking and/or other infrastructure improvements.

4.2 VISITOR/RECREATION COMMERCIAL LAND USE AREAS

Two visitor/recreation commercial land use areas are planned bordering the northeast and southeast corners of the proposed Upper Headlands Residential area (Plate I). Grading for these areas essentially consists of both cut and fill to create level building area from the sloping hillsides that presently exist. An MSE wall/slope is proposed along the south side of the northeasterly site, with two sections of MSE wall-facing about 10 feet in height and an intervening 2:1 fill slope. 2:1 slopes are also planned to accommodate grade differences on the edge of building pads in the southeast site. Although the conceptual grading plan shows these slopes as both cut and fill, geotechnical/drainage concerns will likely require that the cut portions of these slopes be locally overexcavated and constructed as a fill blanket. Typical excavation depths of about 20 feet, and

fill thicknesses of approximately 5 to 10 feet are proposed in the northeasterly area. In the southeasterly area a fill thickness up to about 15 feet is proposed, with average cut depths on the order of about 20 to 25 feet (Plate III).

4.3 UPPER HEADLANDS RESIDENTIAL AREA

The proposed Upper Headlands Residential area consists of 50 residential lots and associated access roads arranged in four tiers that will provide distant ocean views. The overall slope of the proposed ground surface is to the north and west, similar to general gradient of the existing ground surface. Access to the proposed Upper Headlands road system will be taken from Pacific Coast Highway at the northeastern extremity of the site. A private pedestrian accessway is planned from the north end of the cul-de-sac street on the lowest lot tier, to the adjacent portion of the Strand Residential area. This proposed accessway will extend between Lots 36 and 37 as a paved open structure, and will transition to a tunnel or bridge undercrossing beneath the planned extension of Selva Road. An overhead clearance of about 7 feet is currently planned for the tunnel/undercrossing with retaining walls along the adjoining lots.

Proposed slopes in the Upper Headlands Residential area will consist of fill with a surface gradient of 2:1 and maximum slope heights of about 20 to 25 feet. Small retaining walls or MSE walls/slopes are planned at some cul-de-sacs, and at a few other locations.

Grading to produce proposed lot and roadway elevations in the Upper Headlands area consists primarily of placement of fill, with only minor local cuts. The thickness of proposed fills typically tapers or thins to the west and south, with the greatest thickness in the central potion of the Upper Headlands area. Although removal and replacement of the potentially compressible surficial soils will be required, the typical depth of remedial grading in this portion of the project site will likely be limited to the upper 2 to 5 feet. The majority of the proposed fill in the Upper Headlands will be generated from planned cuts in the Strand area, with the remainder coming from planned grading in the surrounding Upper Headlands area.

Comparison of the proposed grades to the existing grades, and the approximate extent of planned fill and cut are illustrated on Plate III, in pocket. Proposed fill depths or thicknesses on the southerly and northerly sides of the planned Upper Headlands Residential area typically do not exceed about 20 feet. In the central and northerly portion of the Upper Headlands area typical fill thicknesses on the order of about 30 to 40 feet are proposed (Plate III).

4.4 STRAND RESIDENTIAL AREA

The proposed Strand Residential Area consists of 75 residential lots and associated access roads arranged in three tiers along the shoreline. An access road is planned at the southerly extremity of the Strand to provide emergency vehicle access to the beach. This road will also serve as part

of a new public beach walkway that descends from the proposed Selva Road extension. Primary access to the proposed Strand Residential area will also be taken from the Selva Road extension.

Grading to produce proposed lot and roadway elevations in the Strand area consists primarily of construction of fill in the central low area, and excavation or cut over most of the remainder of the Strand area. Remedial grading, including extensive landslide removals, will be required to provide adequate stability for the Strand area (see Sections 6.1.3 and 6.4.1). Lowering of the existing grades in the upper portions of the Strand is required to enhance the stability conditions of the ancient landslides that are present in this area. The approximate extent of the proposed grades is shown on Plates II and III. The approximate depths of cut and fill shown on Plate III are based on the difference between the existing and proposed grades. The approximate depth of landslide removal and replacement with compacted fill is also shown at selected locations on Plate III and is illustrated by geologic sections on Plates IV and V.

Several of the proposed slopes in the Strand area include mechanically stabilized earth (MSE) walls/slopes that will be supported/reinforced with geogrids. As currently planned, facing heights for the MSE wall portions of the reinforced slopes will be 10 feet or less in height. Intervening slope areas and other unreinforced slopes are planned at a gradient of 2:1. A contour graded slope that includes a beach access walkway is proposed at the south end of the Strand Residential area. Although the overall gradient of this slope is approximately 2:1 (horizontal:vertical), the slope gradient between the walkway/drainage benches is typically 1.5:1. Contour grading of this slope area will allow it to blend with the existing 1.5:1 fill/natural slope below the adjoining residential enclave.

Planned fills to create the proposed grades in the central portion of the Strand area are on the order of about 20 to 40 feet thick. However, removal and replacement of the existing landslide materials as compacted fill will produce typical fill thicknesses of about 20 to 60 feet across the entire Strand site. The approximate depths or thicknesses of recommended landslide removal and replacement as compacted fill below the proposed pad grade elevations are shown at several locations across the Strand on Plate III. These remedial grading recommendations are based on extensive stability evaluations summarized in AMEC's reports dated March 4, 1988; October 15, 1999; February 4, 2000; and March 21, 2000.

5.0 GEOLOGIC CONDITIONS

The proposed project site is located in the northeastern portion of the Peninsular Ranges Geomorphic Province, south of the San Joaquin Hills. This area is underlain by marine sedimentary rock of Miocene to Pliocene age (approximately 5 to 20 million years ago), that can be divided into three district units or formations: the San Onofre Breccia, the Monterey Formation and the Capistrano Formation. Subsequent regional uplift, beginning about 4 million years ago, was accompanied by folding, faulting and tilting of the bedrock strata (Ehlig, 1979).

Over the past several hundred thousand years, during the later stages of this regional uplift, wave erosion created several marine terrace platforms that were cut into the surface of the bedrock. Most of the project site is underlain by one of at least three terrace levels that were eroded in the bedrock during ancient stands of sea level. These buried bedrock erosion surfaces are analogous to the wave-cut abrasion platform extending from the base of the bluffs and slopes along the current shoreline. The remnants of ancient beach sands/deposits are present overlying the bedrock across most of the project site.

As a part of this erosion process along the ocean shoreline, ancient landslides developed across most of what is now known as Strand portion of the project site, producing a series of terraced slopes along the shoreline. Available radiocarbon dating information suggests that the groups of ancient landslides or ancient landslide complexes present in this portion of Orange County likely developed about 11,000 to 30,000 years ago when the rainfall rates and associated groundwater levels were much higher (Cann, 1989).

Erosion and deposition has continued to the present, creating relatively thin accumulations of Recent or Holocene age (i.e., less than about 11,000 years ago) deposits on both the terrace levels and on the current abrasion platform along the shoreline. Thin accumulations of non-marine sediments eroded from the adjacent highlands and minor thicknesses of wind deposited (eolian) sediments are present locally. Sand, gravel and cobbles deposited by the waves and ocean currents are also present covering the bedrock abrasion platform along the shoreline. The thickness of these beach deposits is variable, tending to be the greatest thickness during the summer months when wave action is more subdued. Over the previous 100 years the original topography has been modified to some degree by excavation and placement of fill to create roadways, level building areas and also to provide access to the beach.

5.1 TOPOGRAPHY

The project site can be divided into four general topographic regions that are described locally as: the "Strand," the "Upper Headlands," the "Headlands Promontory" and "Harbor Point" (Figure 1). The Strand consists of a number of terrace levels that were graded during development of the former mobile home park, stepping down to the ocean shoreline. In the ancient past (probably 11,000 to 30,000 years ago), the transition to the ocean shoreline from the terrace surface (approximate elevation 160 to 165 feet) was broken into a number of hummocky surfaces or levels by ancient landslides that occupy most of the Strand area. Although most of the Strand area has been graded, the existing seaward stepping topography is similar to the original natural landforms. Slope gradients along the margins of these terrace levels or steps typically range from about 1.5:1 to 2:1 (horizontal:vertical), comprising an overall landform that is distinct from the steep, high bluffs/sea cliffs that form the adjacent Headlands Promontory.

The highest point on the project site is a conical peak that extends up to approximately elevation 288 feet in the northeasterly portion of the Upper Headlands. The adjoining highland extends to the south and then curves to the west from this peak, forming a drainage divide between the Upper Headlands and the adjoining Harbor Point and Headlands Promontory areas. The crest of this highland area typically ranges in the elevation from about 230 to 260 feet.

A gently sloping terrace surface extends seaward from the curving ridgeline to the sea cliffs or coastal bluffs that rim the Harbor Point and Headlands Promontory areas. For the purposes of the Headlands project, the City of Dana Point has defined a "coastal bluff" as a natural oceanfront landform having a continuous slope of forty-five degrees (1:1, horizontal:vertical) or greater over a vertical height of at least 25 feet, and extending over a horizontal distance of at least 100 feet (The Headlands, Development and Conservation Plan, 2001). The coastal bluffs in the Harbor Point area range in height from about 155 feet at the easterly extremity, up to about 220 feet in the area to the west, adjacent to the existing southerly residential enclave. Similarly, the coastal bluffs in the Headlands Promontory area range in height from about 135 feet at the southwesterly extremity, and then increase in height to the north and east up to approximately 220 feet near the two existing offsite residential enclaves.

The ground slopes to the north and west from the central highland to a gently sloping terrace level that comprises the northwesterly portion of the Upper Headlands. The elevation of this terrace level ranges from about 165 to 185 feet and the overall drainage gradient is to the northwest towards the southerly end of the Strand area.

The base of the bluff/sea cliff in the Headlands Promontory and Harbor Point areas has an elevation of about 10 to 15 feet. A bedrock platform at about sea level comprises most of the intertidal zone around the headland. Although sand and cobble beach sediments form a narrow apron along the toe of most of the bluff, locally extensive beach sediments are present in some areas. The most landward portion of the beach area along the Strand also has a typical elevation of about 10 to 15 feet along the exposed face of the existing slope/revetment rock. The toe of the revetment rock is founded on a bedrock erosion surface beneath the beach sediments at an elevation near sea level.

5.2 PREVIOUS GRADING

The earliest available aerial photographs of the project site date back to the late 1920's (see References). At that time, a road had been graded in the Strand area from the edge of the terrace level down to a small parking area that had been constructed adjacent to the beach. Several roads crossed the adjoining terrace level to the east, including a roadway that was excavated along the crest of the slope between the Strand and the Upper Headlands. Similar unpaved roads were also present in the Harbor Point and Headlands Promontory areas, approximately along the existing alignment of Scenic Drive (Site Location Plan, page 2). An extension of this alignment

paralleled the top of the bluff in the Headlands Promontory area, including a number of roads that appear to have been graded across this area at sometime around the early 1920's as part of a subdivision of the property. A narrow road was also graded along the southerly and westerly sides of the Upper Headlands, up to a small turnaround at the conical peak that is the highest point on the property. One of the existing offsite residences in the southerly residential enclave adjoining the Headlands Promontory is present in the 1929 aerial photos and was reportedly constructed around 1927.

The easterly portion of the Harbor Point area consisted of a relatively large parking area in 1929. The original alignment of the Cove Road is also present in the 1929 aerial photos, crossing the northerly side of the Harbor Point parking area, and extending down to a pier in Dana Cove. In the mid-1950's the original alignment of Cove Road was abandoned when the current roadway was graded. Grading and residential construction along Street of the Green Lantern, on the hillside adjoining the easterly side of the Upper Headlands ridgeline, appears to have first occurred during the 1950's. Residential grading of the adjacent offsite property along Street of the Green Lantern has occurred intermittently until the present day.

Minor grading associated with farming of the terrace level and with additional grading/maintenance of the existing access roads and parking areas occurred between 1929 and 1955. Local grading associated with construction of two additional homes in the southerly, offsite residential enclave also occurred during this time period, along with construction of a U.S. Coast Guard Station on the Headlands Promontory during World War II.

Initial grading development of the Dana Strand Mobile Home Park occurred in the Strand area in 1955 and continued episodically until about 1968. Only small portions of the existing slopes in the central and southerly portions of the Strand appear to be in a generally natural condition, and essentially the entire Strand area was graded to some degree during this period. However, grading excavations (cut) and fill placement over the area generally involved depths of cut and thicknesses of fill that were typically less than ± 15 to 20 feet. The current topography is, therefore, generally similar to the original natural landforms. This grading development included construction of pads, streets, storm drains, sewage facilities and associated infrastructure and recreational improvements. With the exception of two areas of compacted fill constructed in the central section of the Strand area in 1965, no records of compaction testing or engineering control of the fill construction have been located (AMEC/M&T 6/15/65 and 12/31/65). Since 1968, grading at the Strand area has generally been limited to local maintenance, such as rip-rap/slope repairs following storm damage in 1983, including associated storm drain improvements/repairs. Also, minor grading for access road construction has been performed as a part of several geotechnical exploration programs.

A portion of the terrace level in the Upper Headlands was excavated as a borrow area in conjunction with grading/fill construction in the southerly portion of the Strand area in about 1960.

Approximately 6 to 7 years later, additional grading of the terrace level was performed during construction of a nursery facility. Although the grading construction affected a relatively large area, the depth of excavation and fill placement was relatively shallow. Documentation of compacted fill placed during this construction is summarized in AMEC/M&T's report dated May 26, 1967.

Grading development of the existing offsite residential enclave that adjoins the northerly extremity of the Headlands Promontory occurred between 1959 and 1962. Grading consisted primarily of excavating level building areas in terrace sands along the top of the descending slope. Shallow fill slopes appear to have been constructed at the crest of the slope to extend the building areas a short distance seaward. Aerial photographs indicated a large area of shallow fill was pushed or spilled down over the slope below the pads during grading. A separate episode of pad grading was undertaken sometime in the mid-1980's for construction of the most southerly of these offsite residences. No aerial photographs of this more recent construction were readily available, and it is not apparent from the topography how much of the slope below the pad was affected by the grading.

Grading for the Niguel Shores residential tract that adjoins the northerly boundary of the Strand was performed in 1969-1970. The northerly portion of the ancient landslide complex that exists in the Strand area extends several hundred feet to the north into the Niguel Shores property (AMEC/M&T 5/20/68, 1/02/69 and3/11/69). Grading stabilization of the northerly portion of the landslides was accomplished primarily by removal and redistribution of the upper portions of the landslide mass. The graded topography is relatively flat across the landslide area on the adjoining property, thereby balancing the forces in the underlying landslide mass. A buttress fill was also constructed along the shoreline and at other selected slope locations to enhance the slope stability conditions. The public beach access/walkway along the property line on the northerly side of the Strand appears to have been constructed as a part of the Niguel Shores development in the early 1970's.

5.3 STRATIGRAPHY

The project site earth materials can be divided into ten distinct stratigraphic units. In order of generally decreasing age they are: 1) San Onofre Breccia (Tso), 2) Monterey formation (Tm), 3) Capistrano formation (Tc) 4) marine terrace deposits (Qtm), 5) landslide deposits (Qls), 6) eolian deposits (Qeo), 7) beach deposits (Qbd), talus deposits (Qta), 8) undocumented artificial fill (af), and 9) compacted fill (afc). The bedrock formations were deposited during Middle Miocene to Pliocene time (i.e. approximately 5 to 20 million years ago). Terrace deposits consist of marine accumulations of primarily sandy material resting on gently seaward sloping, wave-cut benches in the bedrock. These ancient surfaces of erosion have been uplifted to their present location, and they are analogous to the wave-cut abrasion platform in bedrock along the existing shoreline. As such, the beach deposits are the recent equivalent of the marine terrace deposits. Landslide

deposits consist of displaced segments of the Monterey formation and terrace deposit units. The sandy surficial portion of all the Quaternary units (Qtm, Qbd, Qls, Qta) has probably been redistributed by wind action. However, the apparent depth of eolian (i.e., wind) deposits near the southern extremity of the Strand area was believed to warrant their distinction as a separate unit (Qeo). In conjunction with previous development of the project site, much of the natural terrain has been modified by previous grading operations (Section 5.2). In general, no attempt was made to map areas of undocumented artificial fill or alluvium within the project site due to the near identical character of all the surficial sand units, and to avoid unnecessary complication of the geologic map. In contact or overlapping areas, the boundaries between these sand deposits are generally very subtle and in most instances not readily distinguishable. However, local areas of previous fill construction that have appropriate documentation or that are easily distinguishable on the basis of the available information have been included on the geologic map.

The approximate surficial extent of these stratigraphic units is shown on the enclosed Geologic Map (Plate IV, In pocket). The subsurface distribution of these units is illustrated on three geologic sections (Plate V, in pocket). A descriptive summary of each of the stratigraphic units is presented below. A more detailed discussion of the engineering properties of these materials is presented in AMEC's reports dated October 15, 1999 and February 21, 2000.

Pertinent data regarding each of the stratigraphic units are discussed below. However, most of the sand units are presented as a single group due to their similar composition. The landslide deposits (Qls) in the Strand area have been divided into six areas of landsliding to facilitate discussion in the following text (i.e., Qls_1 through Qls_6). The locations of these landslide areas are shown on the Geologic Map and Sections (Plates IV and V, in pocket). As can be seen on the enclosed plates, although distinct areas of landsliding can be discerned, these areas typically consist of a complex combination of overlapping landslide blocks. The Strand landslide area can therefore be more accurately characterized as a "landslide complex" rather than several discrete landslides.

5.3.1 San Onofre Breccia (Tso)

The San Onofre Breccia (map symbol Tso) is a schist breccia generally composed of subrounded to subangular clasts, ranging in size from fine sand to small cobbles, in a silty matrix. Layers and lenses of massive silty sandstone are also present in some areas, including a relatively distinct sandstone subunit that has been mapped at the southeastern extremity of the headland. Surface exposures are typically green-brown to red-brown, but less weathered samples at depth tend to have a blue-gray coloration. Bedding is generally not well defined, but some crude layering is evident locally. The rock is generally very dense and weakly to moderately well indurated/cemented. The fine grained texture and typically well consolidated nature of the matrix material renders the unbroken rock relatively impermeable and seepage is likely only along fractures or faults.

Extensive outcrops of San Onofre Breccia are present in the southern portion of the project site, where it is prominently exposed in the steep sea cliffs of the Harbor Point and Headlands Promontory areas. Local outcrops are also present in the vicinity of the conical peak that comprises the highest elevation in the project area. Some interfingering with the overlying Monterey Formation is also evident in sea cliff exposures approximately 2,000 feet northwest of the project site below the Ritz Carlton Hotel. The entire property is likely underlain at depth by San Onofre Breccia.

5.3.2 Monterey Formation (Tm)

Within the study area, the Monterey formation (map symbol Tm) consists primarily of thinly interbedded, fissile siltstone, clayey siltstone, and shaly siltstone; abundant interbeds of cherty shale also occur locally. Minor thin layers or lenses of friable, fine sandstone and scattered beds of hard, well cemented limestone or dolostone are also evident. Surface exposures typically show cream to light gray-brown coloration, but subsurface samples tend to be dark brown and gray to black. Generally, bedding is very well defined with spacing between fissile planes on the order to 0.25 to 0.75 inches. Bedding plane shears (flexural slip) are common, but are likely to be most prevalent in the interval of shale and siltstone at the southerly extremity of the Strand near the contact with the underlying/adjoining San Onofre Breccia. Most of the rock is well fractured, with fractures or joints showing a preferred orientation normal to the bedding surfaces. Permeability of the rock is primarily a function of the degree of fracturing and/or weathering (i.e. unweathered, unfractured Tm would be essentially impermeable).

The Monterey formation is exposed at a number of locations in the area behind and above the landslide complex present in the Strand, and also in the intertidal zone at the northern end of the property. The most prominent outcrop is an interval of relatively more resistant cherty shale which forms the steep slope in the central portion of the Strand. The Strand and northwesterly portion of the Upper Headlands are underlain, at shallow depth, by Monterey siltstone and shale.

5.3.3 Capistrano Formation (Tc)

The Capistrano formation (map symbol Tc) is the youngest of the bedrock units on the site and it is present only beneath the northeasterly extremity of the property near the intersection of Street of the Green Lantern and Pacific Coast Highway (PCH). The Capistrano formation at this location consists of thinly bedded clayey siltstone and massive silty sandstone. This interval of Capistrano siltstone and adjoining sandstone has been juxtaposed with the San Onofre Breccia by the Dana Cove fault that trends approximately north-south across the westerly end of Dana Point Harbor. Although extensive exposures of the Capistrano formation are present in the bluffs along the northerly side of the harbor, exposures on the subject site are limited to local outcrops on an existing cut slope near PCH.

5.3.4 Marine Terrace Deposits (Qtm)

Marine terrace deposits (map symbol Qtm) are typically composed of fine to medium sand and silty sand with a basal layer of rounded to subangular gravel. Undisturbed surface exposures generally have orange-brown coloration and are weakly cemented. This deposit is easily degraded and at most locations is covered by a mantle of eroded sand and vegetation. The top of the terrace levels appear to have been reworked to some extent by wind action, but the depth of these eolian deposits appears to be relatively shallow in most areas. On the basis of the available data, the only area of eolian deposits that has been mapped is located near the southeast corner of the Strand.

In general, marine terrace deposits are exposed throughout the project site covering the ancient wave-cut erosion surfaces in the bedrock. In the sea cliffs and terraced slopes that comprise the site, the daylight of the contact between the terrace material and underlying bedrock is typically marked by an abrupt change in the slope gradient due to differential resistance to erosion. The elevation of the base of the terrace materials (i.e., the ancient wave-cut platform in the bedrock) is typically about 130 to 140 feet in the upper portion of the Strand. This terrace surface extends to the east beneath the Upper Headlands area, where the elevation of the buried bedrock surface increases to about 145 to 170 feet, reflecting the gentle seaward slope of this ancient erosion surface (see Section 2-2', Plate V, in pocket). This same terrace surface underlies most of the Headlands Promontory and Harbor Point areas where it has an elevation that ranges from about 140 to 165 feet. The remnant of a lower wave-cut platform at about elevation 105 feet has also been mapped at the southwest extremity of the Headlands Promontory. The flat topped ridgeline in the central portion of the project area also appears to be the remnant of a marine terrace at about elevations of 220 to 240 feet.

5.3.5 Landslide Deposits (Qls)

Ancient landslide deposits (map symbol Qls) comprise most of the Strand portion of the project area. The landslide deposits have been divided into six areas of landsliding to facilitate discussion (i.e., Qls, through Qls_6). The locations of these landslide areas are shown on the Geologic Map and Geologic Sections (Plates IV and V, in pocket). As can be seen on the enclosed plates, although distinct areas of landsliding can be discerned, these areas typically consist of a complex combination of overlapping landslide blocks. The Strand landslide area can therefore be more accurately characterized as a "landslide complex" rather than several discrete landslides.

The landslide deposits are composed of displaced and disturbed blocks of Monterey formation bedrock and overlying terrace deposits. In general, the basic material types are the same as the original constituents, but the overall fabric or structure of the units has been disrupted by landslide movement. Typically, much of the cohesion is absent from the terrace sand, and the disturbed bedrock is highly fractured with locally discordant bedding. The base of the landslide deposits is

generally characterized by zones or intervals or brecciated siltstone and shale in a matrix of clayey silt. Thin clayey shear surfaces are commonly associated with these intervals, but the heterogeneous character of the material would probably preclude formation of a discrete, continuous clay gouge zone over a significant distance. The permeability of materials in the landslide debris is no doubt significantly higher than in their pre-slide condition, particularly through sand infill zones along the margins of the failure blocks.

The landslide deposits occupy about two-thirds of the total area of the Strand. Each of 16 borings drilled on or into the slide masses penetrated the full depth of the landslide debris (Plate IV). In general, a noticeable increase in both the drilling resistance and in the consistency of bedding orientation was evident in bedrock below the slides. The head or backscarp of the landslides were also exposed in backhoe test trenches at a number of locations. Surface exposures of the backscarp and a prominent internal boundary are also present in the drainage ravines near the center of the slide area designated Qls_4. Sand infill which may occur along the headscarp of the slides cannot be distinguished from sandy terrace deposits comprising the upper portion of the landslide masses, and has been mapped as part of the landslide mass. Close examination of exposures of the weakly cemented sand infill along an upward projection of the back of the landslides showed no apparent evidence of recent displacement. No attempt was made to delineate on the geologic map the limits of material within the slide boundaries which has been reworked by natural erosive forces or previous grading.

The basal shear surfaces of the slide blocks in the northerly portion of the landslide complex were also encountered at a number of locations on the adjacent property, both in exploratory excavations and during remedial grading. In general, the basal shear zones were reported to be about one to four feet thick with abundant gypsum coating along fractures and remnant bedding surfaces. No evidence of recent slide movement was reportedly observed, and the overall appearance and condition of these exposures suggested an ancient age of failure.

A shallow landslide is also present southwest of the existing offsite residential enclave at the southerly end of the Strand. This failure first occurred in the early 1980's and enlarged significantly during the recent El Nino rainy seasons. Original failure was manifest primarily as rock/block fall along an existing fault zone, but over the last several years has included a significant volume of the overlying terrace sand that has formed a talus cone on the lower slope face. This relatively shallow landslide has not yet affected the top of the slope.

Topographic conditions suggest a similar failure may be present in the lower portion of the slope face immediately south of the shallow landslide. No site specific evaluation of this possible landslide has been performed, and the available information is inconclusive regarding its existence.

5.3.6 Eolian Deposits (Qeo), Beach Deposits (Qbd) Talus Deposits (Qta), Existing Artificial Fill (af and afc)

This group of stratigraphic units is typically composed of fine to medium sand with some areas of fine silty sand and minor scattered layers, lenses or pockets of sub-angular to well rounded gravel. The consistency of composition for these units is attributed to their being primarily derived from undisturbed and displaced terrace deposits. As such, the same basic engineering properties as terrace deposits are generally applicable to these materials.

The mapped area of eolian deposits (i.e., materials deposited by wind) is limited to the southerly extremity of the Strand. Similar deposits are likely present in other areas, but the thickness of these materials is likely to be relatively limited and cannot be distinguished on the basis of the available information. The eolian deposits are distinguished from the surrounding terrace deposits by their relatively dry and loose consistency and the absence of any basal gravels at the contact with underlying bedrock. With the exception of local dark brown staining near the basal contact with the bedrock, the eolian sand is the same buff color as nearby beach deposits. Little evidence of the orange-brown oxidation staining found in the terrace deposits was observed in the eolian sands.

The active beach deposits show a seasonal variation in depth and extent. Typical depths during the summer months generally range between about five and ten feet. Heavy surf during winter storms has been known to remove much of the beach cover leaving a typical thickness on the order of about three to four feet. The topographic base used for presentation of the geologic data in AMEC/M&T's March 4, 1988 report was generated from aerial photographs taken during the February, 1983 storm season, which had record high surf conditions. Therefore, the beach configuration shown on that map should be a reasonable approximation of the maximum beach erosion to be expected. Similar beach erosion conditions occurred again during the 1997-98 El Nino storms. Most beach sand is stored in off-shore banks during the storm season and migrates toward the surf zone in calmer weather/surf conditions during the summer months.

Talus deposits are accumulations of detritus at the base or toe of the existing bluffs. Small talus cones are present at many locations along the base of the sea cliffs that form the Dana Point headland. This material is derived from both the terrace deposits and San Onofre Breccia bedrock, and is therefore typically composed of sand- to cobble-size clasts. Much of the talus accumulations in the vicinity of the existing southerly residential enclave appear to be the result of terrace sands cast over the bluff edge during grading and construction of the homes.

Large areas of the property are covered by artificial fill. Much of the fill appears to consist of a relatively thin, surficial mantle, but in some areas of the Strand, may be as much as about 15 to 20 feet thick. Most of the existing fill appears to have been derived from the sandy terrace deposits, although intervals of fine grained materials from the bedrock are likely present locally

in the Strand area. An area of existing fill in the southeastern portion of the Strand also contains concrete rubble that appears to have been derived from previous demolition/construction projects in the mobile home park that operated on the site for several decades. In general, no attempt has been made to delineate extent of existing fills on the geologic map. The larger areas of the engineered/compacted fill are shown for those areas where appropriate background documentation is available.

5.3.7 Proposed Fill

Proposed fill material will be derived from planned cuts/excavations at several locations on the site (see Plate III, in pocket). The deepest cuts, including extensive landslide removals, will be made in the Strand area, and this portion of the project site will produce the greatest volume of fill materials. The proposed fill will therefore consist primarily of terrace sand and clayey siltstone/shaly siltstone derived from the Monterey formation. Proposed cuts near the northeast and southeast corners of the Upper Headlands will also generate material from the terrace deposits and the San Onofre Breccia bedrock.

5.4 STRUCTURE

In general, the Monterey formation conformably overlies the San Onofre Breccia in the Dana Point area. However, some local interfingering may occur, as evidenced by sea cliff exposures approximately 2,000 feet northwest of the site in the area below the Ritz Carlton Hotel. The younger Capistrano formation was similarly deposited on to the top of the Monterey formation, although on the project site the Capistrano formation has been juxtaposed with the San Onofre Breccia by the Dana Cove fault (Plate IV). Folding, local faulting and associated regional uplift has deformed bedding from its original near horizontal orientation that was present during deposition of the sediments millions of years ago. Post deformation attitudes are regionally consistent between the bedrock units, but local anomalies are evident, particularly near faults and/or the interformational contacts. The relative competence of the San Onofre Breccia compared to the Monterey and Capistrano formations has produced a differential response to tectonic stress. At some locations in the nearby region, gently folded/tilted, relatively undisturbed Sand Onofre Breccia, is juxtaposed with much more sharply folded, well fractured and sheared Monterey and Capistrano formation bedrock. Tectonic movement in the San Onofre Breccia has been accommodated by faults rather than folds because of its relative competence and lack of ductility. The internal structure of the San Onofre Breccia can therefore best be characterized as tilted or homoclinal strata within individual fault blocks.

5.4.1 Folds

The layers and strata comprising sedimentary bedrock in the region have been folded and/or tilted by tectonic forces over the several million years since deposition of the sediments. The dominant

structural feature of the regional geology is a broad structure trough in the bedrock, which extends northward from Capistrano Beach to El Toro, and is bounded on the east and west by the Peninsular Ranges and San Joaquin Hills, respectively (i.e., the Capistrano Syncline). Beneath the project site, the gross structure of strata in the Monterey formation and San Onofre Breccia is generally inclined to the east and north at low to moderate angles, which is consistent with its location on the western limb of the Capistrano Syncline. Attitudes in the north-central portion of the Strand, within the Monterey formation, indicate the presence of a smaller scale, easterly plunging syncline centered in the vicinity of Section 1-1' (See Plate IV). The limb to limb breadth of the fold appears to be on the order of 1,500 feet. Abrupt steepening of bedding is apparent locally in the Strand area, both in the subsurface excavations and at outcrops in the surf zone, suggesting an even tighter set of folds is also present at some locations.

Local departures from the regional structure occur near the geologic contacts or boundaries between the formations that are present at the margins of the Dana Point headland. An internal unconformity is present within the San Onofre Breccia on the westerly side of the headland, producing a moderate to steep, westerly to northwesterly inclination of the strata above the unconformity. This more westerly orientation of the structure appears to control the contact with the overlying Monterey formation in this area (Plates IV and V). Available information indicates that bedding in the adjoining section of the Monterey formation at the south end of the Strand also tends to show moderate dip angles with a more westerly orientation. Similarly, the Capistrano formation on the easterly side of the headland is typically inclined to the east at moderate to steep angles, conforming to the orientation of the Dana Cove fault that forms the contact with the adjoining San Onofre Breccia.

5.4.2 Faults

With the possible exception of the landslide shear surfaces, there were no continuous, well defined fault exposures recognized within the Monterey formation that comprises bedrock beneath the Strand area. A number of faults of probable tectonic origin have been identified in bedrock exposed in the bluffs around the perimeter of the Harbor Point and the Headlands Promontory areas (Plate IV). The most prominent of these is the northerly trending Dana Cove fault located near Pacific Coast Highway at the northeasterly corner of the project area. Truncation of the fault surface by the wave-cut bench at elevation 160 feet shows that no apparent displacement has taken place since deposition of the marine terrace (probably at least 125,000 years) and the fault is not considered active. Deformation and attendant fracturing and shearing of the Capistrano formation near the fault has made it particularly susceptible to landsliding, but the Breccia has remained relatively undisturbed (Kerwin, 1987).

Small faults and shears observed in sea cliff exposures of the San Onofre Breccia that rim the Headlands Promontory and Harbor Point areas are generally steep to vertical and strike to the north and northwest. The narrow zone of crushed rock along the faults tends to be more erodible,

so the faults typically coincide with small erosion gullies in the bluff face. A sea cave and sea-arch that were formed due to differential weathering along existing faults, are present at the southwestern corner of the Headlands Promontory. At those locations where offset beds or intervals could be observed, the apparent fault displacement is relatively small and generally does not exceed about 10 feet. Although the faults intersect locally, typical spacing between the faults is on the order of about 40 to 100 feet. The trend and orientation of the faults is neutral to the bluff face and they do not significantly impact the gross stability of the slope. Local observations indicate the faults do not displace the ancient wave-cut bedrock surface at the base of the terrace deposits (± 125,000 years old), and the faults would therefore not be considered active.

5.4.3 Landslides

The San Onofre Breccia is considered a relatively stable unit due to it is well cemented, very coarsely granular, chaotic texture. Although slope stability is generally not a common problem within the San Onofre Breccia, those landslides which have occurred are typically bounded, at least in part, by crush zones or fractures associated with existing faults. Surficial landsliding near the northerly extremity of the Headlands Promontory appears to be the headward enlargement of previous rockslide that failed, in part, along existing faults. This rockslide area was first observed during the 1983 storm season and noticeable enlargement occurred during the El Nino storm season of 1997-98. Sea cliff erosion in the San Onofre Breccia has likely occurred primarily as incremental deterioration and similar local rock/block falls. No deep-seated landsliding affects the San Onofre breccia within the project site.

The Monterey formation tends to be much more problematic from a slope stability standpoint. The thin, platy or fissile structure of the rock, in which soft clayey layers are interbedded with more competent strata, makes this unit particularly susceptible to landsliding. Typically, low shearing resistance along bedding is further reduced by groundwater, which may penetrate deeply into the well fractured rock. All six of the slide areas delineated within the Dana Strand landslide complex have developed within bedrock of the Monterey formation, but uncharacteristically, much of the failure surfaces appear to have broken across bedding. More detailed descriptions and discussion of the Strand landslide complex are presented in AMEC/AGRA' s reports dated October 15, 1999; February 4, 2000; and March 21, 2000.

5.5 GROUNDWATER

Sixteen simple standpipe observation wells have been installed in previous exploratory borings within the Strand area, and the earliest water level measurements in these wells dates back to 1984. Groundwater information in the adjoining headland portion of the property is primarily limited to observations of local high moisture conditions and/or surface seepage on the sea cliffs that rim this portion of the property. Water level monitoring information for the observation wells is presented and discussed in AMEC/AGRA's reports dated October 15, 1999 and February 4,

2000. Observations regarding local high moisture areas on the bluff face in the Harbor Point area are summarized in AMEC/AGRA's report dated February 21, 2000.

Although seasonal variation probably occurs, the large areal extent and general seaward inclination of the buried bedrock erosion surface easterly of the project site tends to produce a perennial seaward flow of groundwater. Residential development and attendant landscape irrigation in the area east of the project site provides a continual source of recharge to local groundwater. Local groundwater flow is likely present along the base of the marine terrace deposits, and has been observed at a similar location during development of adjoining properties.

In general, the measured water levels in the observation wells do not appear to have varied significantly over the monitoring period, although the more recent measurements are typically lower than those made in the 1980's. This slight decrease in the water levels in the Strand area is likely associated with discontinued use of the on-site sewage disposal systems that serviced the former Dana Strand Mobile Home Park. As depicted on the Geologic Sections (Plate V), water levels in the Strand slide area average about elevation 30 feet across the main cross-sectional areas of the failure blocks. Easterly of the landslide area, the projected groundwater levels approach the elevation of the ancient erosion surface that forms the top of the bedrock. Local groundwater flow may be present along the top of the bedrock beneath the lower terrace level in the Upper Headlands area. However, surface gradients on the remainder of the Headland area tend to promote runoff and the volume of infiltrating water does not appear to have produced a pervasive perched groundwater condition. The dense, indurated character of the San Onofre Breccia makes the unfractured rock essentially impermeable. Subsurface drainage to the ocean in the Headland area appears to occur along local faults and fractures that allow deep penetration of infiltrating groundwater. Although the San Onofre Breccia is likely saturated at elevations near sea level, this saturation front cannot be characterized as a conventional groundwater surface or "water table".

Local high moisture areas were observed along the bluff face that rims the Headland. Although these locations would typically be identified as seeps, they can better be described as high moisture areas because flowing/free water was not observed. Most of the observed high moisture areas are associated with faults, and are located at or near the toe of the bluff.

6.0 POTENTIAL GEOTECHNICAL IMPACTS

Potential geotechnical constraints/impacts identified below are based on guidelines for environmental impact reports published by the California Division of Mines and Geology (CDMG Note 46, 1982).

6.1 SEISMIC CONSIDERATIONS

In general, seismic exposure at the subject site is typical of coastal southern California. Possible sources or causes of earthquake related damage are addressed below.

6.1.1 Earthquakes/Ground Shaking

The proposed project site will potentially be subject to earthquake related damage due to ground shaking, and this is considered a potentially significant impact. Reasonably well-established historic records of earthquakes in California have been compiled for approximately the past two-hundred years. More accurate instrumental measurements have been available since 1933. As demonstrated by historic seismicity, earthquakes generated by displacement along nearby regional faults should be anticipated during the design life of the project. In general, displacements along faults within an approximately 100 kilometer (62-mile) radius are considered capable of generating ground shaking of engineering significance at a particular site. A summary of significant earthquakes (i.e. Magnitude 4.0 or greater) within a 100 kilometer radius of the project has been compiled from the available historic record using a computer program entitled "EQSEARCH" (Blake, 2000). A copy of this summary is attached in the Appendix.

Although there are some earthquakes in the earlier portion of the historic record that were larger, the most significant previous earthquake with regard to the project site was the Magnitude 6.3 Long Beach Earthquake on March 11, 1933. This earthquake occurred along the Newport-Inglewood fault zone at a location about 18 miles to the northwest, offshore from Newport Beach. The estimated peak horizontal ground acceleration generated at the project site by this earthquake was 0.11g.

The project site is located approximately 55 miles southwest of the active San Andreas fault zone (Southern Section). Other major "active" or potentially "active" faults of seismic concern in the region include: the Newport-Inglewood fault zone - Offshore, the Palos Verdes Fault and the Whittier/Elsinore fault system.

An "active" fault is defined by the State of California as having had displacement within Holocene time (about the last 11,000 years). Designation or zoning of "active" faults by the State of California follows requirements set forth in the Alquist-Priolo Earthquake Fault Zoning Act of 1972 (California Public Resources Code, Division 2, Chapter 7.5; summarized in Hart, 1997).

A brief discussion specific to each of these fault systems is presented below. Pertinent literature sources are cited where appropriate.

Newport-Inglewood Fault Zone - Offshore - The closest "active" fault to the site is the Newport-Inglewood fault, about 2.1 miles to the southwest. The fault consists of several near-

vertical breaks traceable from the Santa Monica Mountains, southeast to off-shore from Newport Beach (Barrows, 1974). Southern extension of this "Offshore Zone of Deformation" to join the Rose Canyon fault offshore of northern San Diego County has been more recently hypothesized (Jennings, 1994). Historic seismicity and evidence of Holocene displacement of shallow sediments indicate Holocene activity along the fault and the potential for seismic shaking of engineering significance (Bryant, 1988).

Palos Verdes Fault - The northwest trending Palos Verdes Fault zone is located about 18 miles offshore and extends from the Santa Monica Bay to offshore of San Clemente, a distance of approximately 60 miles. Some researchers show the Coronado Bank fault, or the Coronado Bank-Agua Blanca fault, as a southern extension of the Palos Verdes fault zone, but the degree of segmentation along this zone is not known. The fault segments are believed to generally dip steeply to the south near the surface and become near vertical at depth. Inferred fault movement is reverse (1,000 to 6,000 feet of vertical separation has been estimated), although more recent studies have indicated that right lateral slip is dominant (Stephenson, et al., 1995). Strike-slip motion is accommodated by several steps of the fault and en echelon folds in the San Pedro Shelf area south of the Palos Verdes Peninsula (Fischer, 1987). Well-developed surface scarps up to five feet in height, and up to 16 feet of vertical displacement of the basal Holocene reflector is reported offshore on the San Pedro Shelf, which would indicate Holocene activity along this fault zone (Fischer, 1987).

Whittier/Elsinore Fault System - The Whittier/Elsinore fault system consists of several steep to near vertical faults along a zone as much as one-half mile wide. The inferred sense of movement along these faults is predominately reverse slip west of the Chino area, and right-lateral strike-slip to the east. Offset of Holocene sediments and historic seismicity indicate that the fault system is "active" (Hart, 1994).

San Andreas Fault - Extending more than 700 miles, the San Andreas fault is the longest and most significant fault system in California. Within and south of the Transverse Ranges, the strike of the fault trends west-northwest, with a nearly vertical dip. Motion along the fault is right lateral with post-Oligocene (less than 22 million years) offset of more than 150 miles (Crowell, 1975). Historic seismicity, sag ponds, offset channels, and linear geomorphic features indicate Holocene activity.

A blind thrust fault model has recently been hypothesized to explain regional uplift of the nearby San Joaquin Hills (Grant, et al., 1999). Age dating of fossils from several localities in the northerly portion of the San Joaquin Hills provides the primary impetus for this hypothesis. On the basis of the current data, the existence and location of such a fault are primarily a matter of conjecture. Potential seismicity inferred from this blind thrust hypothesis is within the range of that for the nearby Newport-Inglewood fault zone, which is the fault structure that will govern seismic design

for the project (International Conference of Building Officials/California Division of Mines and Geology, 1998).

A deterministic seismic hazard analysis has been performed for the proposed project using the "EQFAULT" computer program (Blake, 2000). Peak ground motion parameters that might be generated at the project site by the maximum earthquake (equivalent to the maximum credible earthquake-MCE) have been estimated for active faults within the 100 kilometer search radius (see Appendix). The maximum credible earthquake (MCE) is defined by the State of California as the maximum earthquake that appears capable of occurring under the currently known tectonic frame-work, and is independent of time. More probable events would cause lower levels of ground shaking.

The largest estimated ground motion at the project site would be associated with a magnitude of 6.9 (Mmax) on the nearby portion of the Newport-Inglewood fault zone. A peak horizontal site acceleration of 0.41g was estimated using the attenuation relationships developed by Boore, et al. (1997).

Ground shaking generated by fault movement is considered a potentially significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact to a less than significant level.

Mitigation Measures - Appropriate seismic design provisions should be implemented with project design and construction in accordance with governing building codes. Unless superseded by other regulatory provisions or standards, seismic design criteria shall be developed on the basis of the requirements of the current Uniform Building Code (UBC). The following UBC design parameters are based on the 1997 UBC, Volume 2, Chapter 16, Divisions IV and V. These parameters are considered applicable for seismic design evaluation of proposed structures, pending any more recent updates of the UBC, or unless more site specific design values are required by the Project Structural Engineer (e.g. response spectra or site period).

PROJECT SITE SEISMIC DESIGN PARAMETERS

Seismic Zone Factor Z:	0.4
Soil Profile Type:	S_D
Design Fault:	Newport - Inglewood
Fault Type:	B
Fault Distance:	3 Kilometers

The fault type and estimated distance for the governing Newport - Inglewood fault are based on a UBC publication prepared by the California Division of Mines and Geology (International Conference of Building Officials, 1998).

6.1.2 Liquefaction

Seismic ground shaking of relatively loose, granular soils that are saturated or submerged can cause the soils to liquefy and temporarily behave as a dense fluid. Liquefaction is caused by a sudden temporary increase in pore water pressure due seismic densification or other displacement of submerged granular soils. Local areas of loose sand are present on the site that may be subject to liquefaction if these materials are or were to become submerged, and are also exposed to strong seismic ground shaking. Liquefaction is therefore considered a potentially significant impact.

The strength, density, consistency and other engineering properties of the bedrock units indicates that these materials would not be susceptible to liquefaction. Similarly, the available Standard Penetration Test (SPT) blow-count data for the undisturbed terrace deposits indicates these deposits have a medium dense to very dense consistency and would also not be subject to liquefaction (see Boring Logs: AMEC/AGRA, 10/15/99 and 2/21/2000). Other near-surface deposits derived from the terrace deposits are above the existing and anticipated groundwater levels and/or will be removed and replaced as compacted fill as a part of the remedial grading operations. Relatively thick intervals of displaced terrace deposits are present within the Dana Strand landslide complex. Although the upper portions of the these deposits and associated undocumented fill are locally loose, the SPT blow count data indicates the deeper portions of these deposits have a medium dense to very dense consistency, similar to the undisturbed terrace deposits. Undocumented fills and other loose sands within the landslide complex will be removed in conjunction with extensive landslide removals required to enhance the slope stability conditions.

On April 17, 2001, the California Department of Conservation, Division of Mines and Geology (CDMG) released a "Preliminary Map of Seismic Hazard Zones - Dana Point Quadrangle". As a "Preliminary" map, this publication is intended for review purposes only and will be superseded by an "Official" map in October 2001. The purpose of the State of California's Seismic Hazards Mapping Program is to identify areas possibly susceptible to earthquake-induced ground failure (i.e. landslides and/or liquefaction). The maps identify areas or zones where appropriate geotechnical evaluations and, if required, mitigation measures, should be considered as a part of the planning and design process for proposed development. The only portion of the project site that is identified as possibly susceptible to liquefaction during an earthquake is the beach deposits along the Strand shoreline. The only proposed improvements in this area would be reconstruction of the existing shoreline protection. The planned rip-rap revetment section will be founded on shale and siltstone below the beach deposits to prevent potential undermining by wave action, and will therefore not be subject to possible liquefaction (see Noble Consultants, 7/01).

Although there are no available data that indicate there is a potential for liquefaction at the project site, it is possible that local near-surface pockets or areas of loose sands could conceivably become saturated in the future. Liquefaction is therefore considered to be a potential significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact to a less than significant level.

Mitigation Measures - Mitigation will be necessary for any of the existing fills or other loose surficial soils that may become saturated in the future and are also intended for support of planned improvements. In general, the primary mitigation method would be removal and replacement of the potentially problematic soils as compacted fill within the proposed grading/development area. Removal and recompaction and, the addition of subdrains will eliminate any liquefaction potential that may be present within the proposed development area. Removal and recompaction of loose soils intended to support future development shall be performed during grading construction in conjunction with installation of appropriate subdrain facilities. Planned reconstruction of shoreline protection shall be founded on bedrock materials beneath the beach deposits in accordance with the design plans and recommendations of the Coastal Engineer. Site specific final design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. Design and grading construction shall be performed in accordance with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record for the project.

6.1.3 Seismically Induced Landslides Or Rockfall

The "Preliminary Map of Seismic Hazard Zones - Dana Point Quadrangle" was released by the California Department of Conservation, Division of Mines and Geology (CDMG) on April 17, 2001. As a "Preliminary" map, this publication is intended for review purposes only and will be superceded by the "Official" map in October 2001. The purpose of the State of California's Seismic Hazards Mapping Program is to identify areas possibly susceptible to earthquake-induced ground failure (i.e., landslides and/or liquefaction). The maps identify areas or zones where appropriate geotechnical evaluations and, if required, mitigation measures, should be considered as a part of the planning and design process for proposed development. A possible potential for earthquake-induced landslides is identified within the project site for the coastal bluffs around the perimeter of Harbor Point and the Headlands Promontory, and also for the ancient landslide complex in the Strand area. Both of these areas are discussed briefly below. Geotechnical evaluations of the landsliding/rockfall potential in these areas are summarized in AMEC/AGRA's reports dated October 15, 1999, February 4, 2000, February 21, 2000, March 21, 2000 and July 9, 2001 (see References).

The high, steep cliff faces that rim the Headlands Promontory and Harbor Point areas present a relatively high potential for seismically induced rockfall and possibly local shallow landsliding.

However, the extent of these slope failures will tend to be localized and surficial in nature because of the high strength and generally massive character of the bedrock.

The available information and observations regarding the Strand landslide complex suggests an ancient age of failure (i.e. 11,000 to 30,000 years ago, see Section 5.0). No evidence of recent slide activity has been observed. Analyses of the existing stability indicate portions of the landslide complex are marginally stable, particularly if groundwater levels were to rise substantially. Under these conditions, strong ground shaking from a large nearby earthquake could therefore potentially produce additional slide displacement. The possibility of seismically-induced landslides or rockfalls to occur on the project site is considered a potentially significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact to a less than significant level.

Mitigation Measures - The primary remedial design measures for stabilization of the ancient landslide complex in the Strand area are:

- redistribute the mass/forces acting on the landslide to a more stable configuration;
- lower and maintain the groundwater/pore pressure at levels that enhance the stability conditions with the installation of subdrain systems;
- remove and replace appropriate portions of the landslide deposits as higher strength compacted fill.

These stabilization measures have been effectively implemented on the northerly portion of the landslide complex that extends into the adjoining Niguel Shore property and also at the Ritz Cove residential development about 3,000 feet northwest of the site. Preliminary design evaluation and recommendations for the remedial grading are presented and discussed in AMEC/AGRA's reports dated October 15, 1999; February 4, 2000; and March 21, 2000. Stability evaluation and preliminary design recommendations presented in AMEC/AGRA's reports include pseudostatic analysis, which is a type of evaluation that considers the effects of seismic loading on the slope stability conditions. Pseudostatic stability analyses of the proposed preliminary remedial design configuration demonstrated a minimum Factor of Safety of 1.1 in accordance with regulatory standards and accepted geotechnical practice (see referenced AMEC/AGRA reports).

Additional geotechnical exploration, testing and evaluation shall be performed as a part of the final design phase of the project to refine and enhance the preliminary recommendations. Stability evaluations shall include appropriate analyses of potential seismic loading conditions. Site specific final design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. Grading shall be performed in

accordance with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record for the project.

Avoidance is the only practical mitigation measure with regard to potential rockfall/shallow landsliding of the bluffs and steep sea cliffs that rim the Harbor Point and Headlands Promontory areas. As presented, discussed, and analyzed in AMEC/AGRA's reports dated February 21, 2000 and July 9, 2001, a minimum shallow foundation setback of 50 feet from the top of the bluff shall be applicable to the Harbor Point area. Proposed structures that would encroach on the shallow setback area shall require site specific design evaluation and installation of the deep foundations. The Headlands Promontory area is planned as conservation open space; foundation setback recommendations are therefore not applicable to that area because no structures are planned. For the purpose of establishing the foundation setback, the "top" or "edge" of the coastal bluff in the Harbor Point and Headlands Promontory areas, as defined by the Coastal Act (see AMEC, 2/21/00), is shown on the attached Geologic Map (Plate IV, in pocket).

6.1.4 Seismically Induced Ground Settlement

Near surface soils and undocumented fill present in some areas of the project site may potentially be subject to seismically induced ground settlement. Undisturbed native deposits (terrace deposits, bedrock and the deeper landslide deposits) are considered to present a negligible potential for seismically induced ground settlement because of the medium dense to very dense (terrace deposits) and stiff to hard (bedrock and deeper landslide deposits) consistency of these materials. Similarly, controlled, compacted fill to be placed as a part of the proposed grading construction can be expected to exhibit a negligible potential for seismically induced settlement. The possibility for seismically induced settlement of the near surface soils and undocumented fill present in some areas is considered a potentially significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact to a less than significant level.

Mitigation Measures - Site specific design evaluation shall be performed by the Project Geotechnical Consultant to assess the depth and extent of potentially compressible soils within the proposed development area as a part of the final grading design process. Grading plan review shall also be performed by the Project Geotechnical Consultant prior to the start of grading to verify that recommendations developed during the geotechnical design evaluation have been appropriately incorporated in the project plans. Design and grading construction shall be performed in accordance with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record for the project.

6.1.5 Surface Fault Rupture

No potential impacts have been identified related to surface fault rupture. No "active" or potentially "active" faults are known to cross the site (Tan and Edgington, 1976; Morton, 1976; Jennings, 1994). Similarly, the project site is not located within a State designated "Earthquake Fault Zone" (Hart, 1997). Also, no evidence of "active" faulting was observed during geologic exploration and mapping for the project. The potential for surface fault rupture at the project site is therefore considered negligible.

Mitigation Measures - None necessary.

6.1.6 Tsunami

Tsunamis are sea waves induced by earthquakes or, less frequently, by very large submarine landslides. The proposed project may be subject to risk from tsunamis at the lower elevations along the ocean shoreline and this is considered a potentially significant impact.

Historic tsunami damage along the California coast has originated from events in the Gulf of Alaska and off the coast of Chile (Morton, 1976). The Orange County coastline is somewhat protected by the coastal configuration and by offshore islands, and large magnitude tsunamis have not been recorded. A recurrence interval of 50 to 100 years has been estimated for significant tsunami damage to harbors and low lying areas in coastal Orange County (Morton, 1976). On this basis, the potential for tsunami damage to most of the project site (i.e. above about elevation 20 to 25 feet) is considered negligible, and the damage potential at lower elevations would not likely exceed that for high storm waves, during the design life of the project.

Design and reconstruction of the existing rip-rap shoreline protection in accordance with current standards is planned as part of the proposed project. Engineering evaluation of the reconstructed shoreline protection design, the wave damage potential and other coastal processes has been performed by the Project Coastal Engineer, Noble Consultants. Noble Consultants' report dated July, 2001 should be referenced for more specific information regarding the potential impact from high storm waves. No impacts are anticipated for the portion of the project site above about elevation 20 to 25 feet. Potential impacts for the portion of the project site below elevation 25 feet will be reduced to less than significant levels by the mitigation measure presented below.

Mitigation Measures - All proposed structures shall be designed and constructed at elevations higher than 20 to 25 feet, in accordance with the design evaluation by Noble Consultants. Design recommendations developed by the Project Coastal Engineer should be implemented for those elements of the proposed design and construction that are located at lower elevations along the shoreline.

6.1.7 Seiches

Seiches are standing wave oscillations that can develop in lakes, reservoirs, on other confined bodies of water during seismic ground shaking. No confined bodies of water are present on, or in close proximity to the project.

Mitigation Measures - None necessary.

6.1.8 Flooding Due To Dam Or Levee Failure

No dams or levees are located on or in close proximity to the project.

Mitigation Measures - None necessary.

6.2 LOSS OF MINERAL RESOURCES

No significant mineral commodities are present at the project site (Morton, 1976).

Mitigation Measures - None necessary.

6.3 WASTE DISPOSAL

6.3.1 On-Site Sewage Disposal Systems

The former Dana Strand Mobile Home Park and the existing office and storage facilities in the Upper Headlands area was/are serviced by on-site sewage disposal systems. These systems will be removed as a part of planned grading operations. The proposed development will be served by a new sewer system that is connected to the local sanitation district's system.

Any retention of the existing on-site sewage disposal systems within the project site is considered a potentially significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact to less than significant levels.

Mitigation Measures - Existing on-site disposal facilities shall be removed and replaced with compacted fill in accordance with the recommendations of the Project Geotechnical Consultant and other pertinent local regulations and requirements.

6.3.2 Disposal Of Excavated Material

The project grading concept has been designed to balance the volumes of proposed excavation and fill placement (i.e., the total yardage of proposed excavation will be the same as the total

yardage of proposed compacted fill). Specific evaluation of the estimated grading quantities has been performed by the Project Civil Engineer, The Keith Companies.

Mitigation Measures - None necessary.

6.4 SLOPE AND/OR FOUNDATION INSTABILITY

6.4.1 Landslides And Mudflows

The proposed project may be subject to slope and/or foundation instability due to landslides, and this is considered a potentially significant impact. Existing landslides in the project area are discussed in Sections 5.3.5 and 5.4.3 of the preceding text. In general, the only area of significant existing landslides within the property is located in the Strand area. Approximately 70 percent of the Strand portion of the project site is occupied by ancient failures that have occurred in the shaly and clayey siltstone that comprises the Monterey formation bedrock (see Plates IV and V, in pocket). Most of the landslide area is covered by marine terrace sands that were also displaced by the ancient landslide movement. Detailed descriptions and discussion of the Strand landslide complex are presented in AMEC/AGRA's reports dated October 15, 1999; February 4, 2000; and March 21, 2000. General stabilization measures planned as a part of the proposed project are briefly summarized in the preceding text under Section 6.1.3 "Seismically Induced Landslides or Rockfall".

The bluffs and sea cliffs that rim the adjoining Harbor Point and Headlands Promontory areas are underlain by the San Onofre Breccia, which is much stronger and more resistant to landsliding than the Monterey formation. The steepness and general erosion resistance of the bedrock bluff face that forms the headland demonstrates the relative strength and competence of the San Onofre Breccia. Erosion and failure of the bluffs is therefore limited primarily to incremental degradation and local rock/block falls. The generally massive and unjointed character of the breccia is favorable for stability, and failure blocks of significant size are typically occur along or near existing faults in the bedrock. Local steeply dipping bedding (Section 5.4.1) and the presence of several faults paralleling much of the bluff face on the westerly side of the Headlands Promontory (Section 5.4.2) appears to make this area more susceptible to erosion/local rockfalls. Differential erosion along existing faults at the southwestern corner of the Headlands Promontory has created a sea cave and sea-arch in the bluff face. More detailed discussions of the San Onofre Breccia and the stability conditions of the headland bluffs are presented in AMEC/AGRA's reports dated February 21, 2000 and July 9, 2001.

Existing landslides on the coastal bluffs in the Harbor Point and Headlands Promontory areas are limited to a local rock/block failure of the bluff face that occurred in the early 1980's at the northerly extremity of the Headlands Promontory, near the southerly end of the offsite residential enclave.. An existing fault in this area appears to have influenced the bedrock failure. Significant

enlargement of the failure area occurred during the 1997-98 El Nino rainy season, including surficial sliding of the overlying terrace sands. Surficial landsliding is generally restricted to the bluff face and does not extend to the top of the overlying slope at the present time. A similar failure may be present in the bluff face immediately to the south, but the available information is not sufficient to confirm this inference (see Plate IV).

No mudslides are present within the project site, and the primarily granular character of the surficial materials is not conducive to the development of mudslides. However, under uncontrolled drainage conditions, the sandy surficial soils are susceptible to rapid erosion from concentrated surface flow.

Possible slope and/or foundation instability due to landslides or erosion are considered a potentially significant impact. Incorporation of the mitigation measures presented below will reduce this potential impact less than significant levels.

Mitigation Measures - Reference is made to Mitigation Measures presented under Section 6.1.3 of the preceding text. These mitigation measures shall also be applied to the potentially significant impact of possible slope and/or foundation instability due to landslides.

Appropriate drainage provisions shall be incorporated in final design plans for the project to mitigate the erosion potential of site soils. Design and construction of these drainage improvements shall conform to the requirements of the Uniform Building Code, appropriate local regulations and also to the recommendations for the Project Civil Engineer and the Project Geotechnical Consultant.

6.4.2 Proposed Cut And Fill Slopes

6.4.2.1 Proposed Cut Slopes

Proposed grading of cut slopes for the project may be subject to slope and/or foundation instability, and this is considered a potentially significant impact. The most significant cut slopes proposed for the project are the temporary construction slopes that will be excavated during remedial grading of the ancient landslides in the Strand area (see Plate V, in pocket). A temporary slope gradient of 2:1 is typically proposed for this grading, although the site boundary, the desire to minimize slope heights and other factors, will require steepening of some areas to 1.5:1. Temporary construction slopes for remedial grading in the Strand area typically average in height from about 80 to 100 feet. Temporary cut slopes will be buried beneath compacted fill during grading construction of the finished ground surface. Other minor temporary construction slopes will also be required behind the proposed conventional retaining walls. Specific details of proposed temporary construction slopes in the Strand area, including slope stability evaluations,

are summarized in AMEC/AGRA's reports dated October 15, 1999; February 4, 2000; and March 21, 2000.

Although cuts are planned at the back of the proposed pad areas for the visitor/recreation commercial sites, both of these slopes will likely be converted to fill. At the northeasterly site, near Pacific Coast Highway, the proposed slope will consist of two MSE walls with an intervening 2:1 fill slope. The other site includes a 2:1, combination cut/fill slope that ascends to the perimeter of the Upper Headlands Residential area. As shown on Plate III, the westerly portion of this proposed slope will consist of planned fill and the easterly portion will consist primarily of San Onofre Breccia bedrock with possible local terrace soils. Although a portion of this slope is presently shown as cut, overexcavation and replacement of the slope face with a compacted fill blanket and/or a "Loffel-type" landscaping wall will likely be recommended by the Geotechnical Consultant during the final design phase of the project. Replacement of the cut portion of the slope face with compacted fill will allow subdrain systems to be installed to collect groundwater seepage that may be present or that could develop after completion of the project. Construction of this fill blanket will also minimize the differential erosion potential along the contact between the bedrock and the fill materials.

Incorporation of the mitigation measures presented below will reduce the potential impact of possible slope and/or foundation instability due to grading of proposed cut slopes to less than significant levels.

Mitigation Measures - In general, proposed temporary cut slopes shall not exceed a gradient of 1:1 (horizontal:vertical), and shall be reviewed by the Geotechnical Consultant during excavation. Pending future additional evaluation by the Geotechnical Consultant, temporary cut slopes associated with remedial grading in the Strand area (i.e. landslide removals), shall not exceed a gradient of 1.5:1 (horizontal:vertical) and shall more typically maintain a gradient of 2:1. Local groundwater or other geologic conditions may require flattening, dewatering or installation of appropriate slope reinforcement, such as rock anchors. Additional geotechnical evaluation shall be performed as a part of the final design process to refine and enhance the preliminary construction slope design that was evaluated in the referenced AMEC/AGRA reports. These preliminary slope stability evaluations assumed that the existing groundwater levels locally daylight in the proposed temporary slope face, and the final geotechnical evaluation shall, therefore, include an assessment of the type, extent, and location of construction dewatering for the grading. Site specific final design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. The proposed combination cut and fill slope at the southeast perimeter of the Upper Headlands area shall be specifically evaluated for possible overexcavation and construction of a fill blanket and/or a "Loffel-type" landscaping wall. Design and grading construction of proposed cut slopes shall conform with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record for the project.

6.4.2.2 Proposed Fill Slopes/Mechanically Stabilized Earth

Proposed grading of fill/mechanically stabilized earth (MSE) slopes for the project may be subject to slope and/or foundation instability, and this is considered a potentially significant impact. Pending final design evaluations, essentially all proposed permanent slopes within the planned grading area will likely consist of compacted fill, although some small cut slopes may occur locally. Unreinforced fill slopes are planned at gradients that do not exceed 2:1 (horizontal:vertical). Any portion of a proposed fill slope with gradients steeper than 2:1 will be reinforced with geogrid, including proposed mechanically stabilized earth (MSE) walls/slopes. The proposed MSE walls/slopes will essentially consist of geogrid reinforcement of the compacted fill behind the wall/slope face. Proposed wall facing will include an open design that allows landscape planting, with a typical wall gradient or batter of 1:4 or 1:6 (horizontal:vertical). As appropriate, conventional retaining walls will also be utilized in local areas.

At the southerly end of the Strand, where the terraced ground surface in the Strand area approaches the adjoining offsite residential enclave, a contour graded slope is proposed. The gradient of this slope would vary from about 2.5:1 to 1.5:1, but the overall gradient with the proposed drainage benches/beach access walkway is approximately 2:1. The gradient of the existing fill/natural slope beyond the southerly edge of the proposed grading area is variable near the base, but typically averages about 1.6:1 in the upper portion. Geogrid reinforcement of the proposed slope will not only enhance the stability conditions, but will also facilitate "sculpting" of the slope face to more natural rounded contours.

Proposed fill slope heights between planned building tiers at the project site are typically about 20 to 30 feet in height. The highest proposed fill slopes are located in the upper-central portion of the Strand (Section 1-1, Plates II and V) and at the previously discussed southerly end of the Strand area. Proposed slope heights in these areas typically average about 70 feet and 100 feet, respectively. More detailed discussions of the proposed fill slopes, including stability evaluations, are presented in AMEC/AGRA's reports dated October 15, 1999; February 4, 2000; and March 21, 2000.

Incorporation of the mitigation measures presented below will reduce the potential impact of possible slope and/or foundation instability due to grading of proposed fill/mechanically stabilized earth slopes to less than significant levels.

Mitigation Measures - Unreinforced fill slopes shall not exceed a gradient of 2:1 (horizontal:vertical). Proposed fill slopes steeper than 2:1, including proposed MSE walls/slopes, shall require site-specific reinforcement design. Appropriate subdrain provisions shall be incorporated in the slope designs to maintain potential groundwater levels at acceptable elevations. Additional geotechnical evaluation shall be performed as a part of the final design process to refine and enhance the preliminary slope designs evaluated in the referenced

AMEC/AGRA reports. Site specific design evaluation and grading plan review shall be performed by the Geotechnical Consultant prior to the start of grading construction. Design and grading construction of proposed fill slopes shall conform with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record for the project.

6.4.3 Compressible Earth Materials

Compressible earth materials at the project site may produce slope and/or foundation instability, and this is considered a potentially significant impact.

The apparently uncontrolled construction of undocumented fills at several locations on the project site precludes accurate prediction of the future deformation behavior of these materials. Similarly, shallow surficial soils (i.e. the upper 2 to 5 feet) may also have highly variable compression characteristics. On the basis of the available field and laboratory test data, undisturbed native materials (i.e., terrace deposits, bedrock, and the deeper landslide deposits) are not considered unusually or excessively compressible under typical residential foundation loads. However, all earth materials do exhibit some type of compression characteristics under heavy loading conditions. Fill thicknesses greater than about 30 to 40 feet impart relatively large loads to the underlying earth materials and to the lower portions of the fill itself. Variations in the thickness of the fill, and discrete changes or variations in the underlying earth materials, can produce a differential response to the fill loads and a commensurate amount of differential settlement of the overlying ground surface. Available field and laboratory test data pertinent to the compressibility of site soils are summarized in AMEC/AGRA's reports dated October 15, 1999 and February 21, 2000.

Incorporation of the mitigation measures presented below will reduce the potential impact of possible slope and/or foundation instability due to compressible earth materials to less than significant levels.

Mitigation Measures - All existing undocumented fill within the proposed development area shall be removed and replaced as compacted fill. Additional geotechnical evaluation shall be performed as a part of the final design process to assess the compressibility of the proposed foundation materials and to develop appropriate recommendations to minimize the differential settlement potential. Site specific final design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. Design and grading construction shall conform with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record.

6.4.4 Expansive Earth Materials

Expansive soils contain types of clay minerals that occupy considerably more volume when they are wet or hydrated, than when they are dry or dehydrated. Volume changes associated with changes in the moisture content of near surface expansive soils can cause uplift or heave of the ground surface when they become wet or, less commonly, settlement when they dry out. Repeated cycles of wetting and drying in the vicinity of slopes composed of expansive soils can produce incremental lateral and downslope movement known as "slope creep". Potential variability in the soil moisture content typically decreases with increasing depth, and the weight of overlying soils also tends to reduce the amount of volume change that can occur. The deeper portion of the foundation soil profile therefore tends to be less problematic with regard to expansive soils. Expansive earth materials at the project site may produce slope and/or foundation instability, and this is considered a potentially significant impact.

Previous Expansion Index testing of samples of terrace deposits at the project site performed by Earth Research Associates (1979) indicated a "very low" expansion potential in accordance with the current UBC classification (UBC Table 18-1-B, 1997). Previous testing of materials generated from the Monterey formation bedrock indicated an Expansion Index of 86, which is equivalent to a "medium" expansion potential. This test value is very close to the "high" range of expansion potential, which begins at an Expansion Index value of 91. Earth Research's testing of a residual soil sample from the northeasterly portion of the project site showed a "high" expansion potential suggesting this soil was derived from the clayey/shaly siltstone that comprises portions of the Capistrano formation bedrock in this area. Recent testing of a sample obtained from the San Onofre Breccia in this same vicinity (sample A, see Plate IV, in pocket) indicated a "low" expansion potential. Earth Research's testing of two near-surface samples of the San Onofre Breccia in 1979 also showed a "low" expansion potential.

In summary, there is a marked contrast between the expansion characteristics of the more granular deposits and the materials derived from the clayey/shaly siltstone bedrock that is present in the area. A "very low" to "low" expansion potential is anticipated for typical terrace deposits and San Onofre Breccia in the area. "Medium" to "high" expansion characteristics are expected for most of the clayey/shaly siltstone derived from the Monterey formation and from the thin interval of Capistrano formation present of the northeast extremity of the project site. Minor localized intervals of "very high" expansion potential may also be present within the Monterey formation materials, and the sandstone within the Capistrano formation would be expected to have "very low" expansion characteristics. Variations in the expansion characteristics of the proposed foundation materials have the potential to produce a differential response to future moisture changes, particularly in the near surface soils.

Incorporation of the mitigation measures presented below will reduce the potential impact of possible slope and/or foundation instability due to expansive soils to less than significant levels.

Mitigation Measures - Proposed grading shall strive to construct relatively uniform soil conditions in the upper portion of the building areas. A moderate level of moisture shall be installed and maintained in the fill/foundation soils to minimize future volume changes. Appropriate drainage provisions, as designed and/or recommended by the Project Civil Engineer and Geotechnical Consultant, shall be implemented to minimize future soil moisture changes.

Additional geotechnical evaluation shall be performed as a part of the final design process to assess the expansion characteristics of the proposed foundation materials and to develop appropriate recommendations to minimize the differential heave/settlement potential. Site specific design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. Final design evaluation and recommendations shall be based on testing and analyses of the near-surface soils following the completion of grading. Design and grading construction shall conform with the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record.

6.5 EXCAVATABILITY

Proposed grading primarily consists of excavations in the terrace deposits, Monterey formation and displaced intervals of these units in the Strand landslide complex. Local excavations up to depths of about 15 to 25 feet in the San Onofre Breccia are also planned in the two visitor/recreation commercial land use areas proposed at the northeast and southeast extremities of the Upper Headlands. Although the San Onofre Breccia at depth could present some excavation difficultly, conventional grading equipment should be adequate for planned excavations.

Mitigation Measure - None necessary.

6.6 UNCONTROLLED GROUNDWATER LEVELS/FLOW

The proposed project may be subject to possible moisture/surface seepage related problems, and also possible slope and/or foundation instability, due to the presence of uncontrolled groundwater levels/flow. Uncontrolled groundwater levels/flow beneath the project site is considered a potentially significant impact.

As discussed under Section 5.5, groundwater levels have been measured in observation wells in the Strand portion of the site beginning in 1984. This groundwater has originated from infiltration and recharge in the area easterly of the project site, and is flowing towards the ocean. Projection of water levels from the Strand observation wells suggests that groundwater levels may be at or near the top of the buried bedrock surface in the area to the east.

The presence of small amounts of groundwater flowing along the top of the buried bedrock surface is a common condition for marine terrace terrain along coastal California. This condition results from the difference in permeability between the overlying, sandy terrace materials and the relatively impervious bedrock. Infiltrating surface water moving down though the terrace deposits tends to collect on the top of the bedrock. The generally seaward inclination of the ancient wave-cut erosion surface in the bedrock directs the accumulated water towards the coastline. Minor seasonal variations in the depth and extent of groundwater are anticipated. Groundwater information is summarized in AMEC/AGRA's reports dated October 15, 1999 and February 4, 2000.

The lower portion of proposed temporary excavations for remedial grading in the Strand area are below currently projected groundwater levels. On this basis, it is presently anticipated that construction dewatering will be required. Construction dewatering would be most efficient and favorable for temporary stability conditions if groundwater is collected and discharged from wells behind or east of the excavation. Collected groundwater can be stored in temporary reservoirs for use in dust control, moisture conditioning of fill for compaction, and other construction related activities.

Proposed excavations in the Upper Headlands portion of the project area could also encounter localized seepage at locations where the buried bedrock surface is exposed at lower relative elevations. Most of the planned excavations in this area are at relatively high elevations, so the probability of encountering localized seepage during grading is low.

Landscape irrigation associated with development can create localized perched groundwater conditions and/or raise the local groundwater levels. The permeability contrast between the sandy terrace materials and the finer-grained bedrock materials is also applicable to the materials derived from these units. Local perched groundwater levels, therefore, also have the potential to form within proposed compacted fill.

As briefly discussed above, most of the groundwater in the vicinity of the project site is likely flowing in a westerly direction, from the areas of existing development/landscape irrigation, towards the ocean shoreline.. However, a northerly component of moisture migration could develop beneath the Upper Headlands in the years following construction and landscaping of the proposed residences.

As briefly discussed in Section 5.1 of the preceding text, the boundary between the Upper Headlands and the adjoining Headlands Promontory and Harbor Point areas is a topographic drainage divide. This drainage divide is formed by an arc-shaped highland composed of the San Onofre Breccia bedrock that forms a bowl-like topographic depression (see Plate IV). This extended highland of bedrock will essentially separate subsurface drainage beneath the proposed Upper Headlands Residential area from the surrounding bluff areas of the Headlands Promontory,

Harbor Point, and along Street of the Green Lantern. The bowl shape of this bedrock topography will, however, tend to concentrate subsurface drainage at the southerly end of the Strand in the vicinity of the existing Selva Road cul-de-sac. Subdrain design must therefore consider possible northerly and westerly subsurface flow directions beneath the proposed Upper Headlands Residential area. Proposed lots near the crest of the slope, along southerly and easterly perimeter of the Upper Headlands Residential area, are in the transition area for the subsurface drainage divide described above. Additional subdrain provisions will therefore likely be required beneath these lots to control potential subsurface flow of perched groundwater to the south and east. Potential subsurface moisture migration from the proposed commercial areas near Pacific Coast Highway and Harbor Point must also be considered in design of the subdrain systems.

Incorporation of the mitigation measures presented below will reduce the potential impact of uncontrolled groundwater to less than significant levels.

Mitigation Measures - In general, subdrains shall be installed behind all fill slopes and retaining walls, and shall be considered/evaluated for installation in other areas where the proposed ground surface is near the buried bedrock surface. In general, at least a 10-foot thickness of compacted fill shall be maintained over the buried bedrock surface in these areas. This will allow appropriate installation of subdrains, and will also provide enough separation between the groundwater and the overlying ground surface to minimize the potential for capillary wetting of the near surface foundation soils.

Specific areas to be considered in the final design evaluation for overexcavation and installation of subdrain systems shall include:

- The area beneath Lots 1 through 7, Lots 9, 10, and 36 through 45, and Lots 48, 49 and 50 in the Upper Headlands Residential area (see Plate II).

- The visitor/recreation commercial areas at the northeast and southeast corners of the Upper Headlands.

A subdrain system shall be designed and installed beneath the proposed Upper Headlands fill area to collect and discharge potential future subsurface flow. The main elements of this subdrain system shall extend along the base of the buried bedrock ridge on the east, south and west sides of this area. A subdrain shall also be considered during final design evaluation along the northerly boundary of the Upper Headlands.

A subdrain system shall also be designed and installed in the Strand area to maintain groundwater levels at or below acceptable levels for stability. A combination of conventional subdrain designs along the back of the proposed removal excavation, and a sand drainage blanket across the lowest, low gradient portion of the proposed landslide removal area is currently anticipated (see

Section 3-3', Plate V). The general rule of maintaining a minimum 10-foot thickness of compacted fill over the buried bedrock surface shall also be applied to the Strand area (see AMEC/AGRA, October 15, 1999).

Appropriate drainage/soil moisture control measures shall be designed, implemented, and maintained as a part of the proposed development to minimize future infiltration (see AMEC/AGRA, February 21, 2000). These measures shall conform to the recommendations of the Geotechnical Consultant and Civil Engineer of record for the project.

Additional geotechnical evaluation shall be performed as a part of the final design process to further assess the groundwater conditions, to evaluate construction dewatering parameters/alternatives, and to develop appropriate subdrain/groundwater control recommendations and designs. This geotechnical evaluation shall include installation of additional observation/monitoring wells and appropriate pump testing of the wells/boreholes to assess probable flow volumes. Surface discharge of excess water from the dewatering process that cannot be used in the construction operations shall conform to the requirements of the Regional Water Quality Control Board. Site specific final design evaluation and grading plan review shall be performed by the Project Geotechnical Consultant prior to the start of grading construction. Design and grading construction shall conform to the requirements of the Uniform Building Code, appropriate local grading regulations and the recommendations of the Geotechnical Consultant of record.

6.7 EROSION, SEDIMENTATION, AND FLOODING

Although portions of the property are currently vacant land, the area within and near the proposed development/grading area has been urbanized for several decades. The provisions for collection and disposal of surface water are relatively well developed, although much of the storm drain system in the Strand area is in disrepair. Remedial grading of the Strand will remove the remaining storm drain facilities in this area. As appropriate, the geotechnical aspects of surface drainage considerations are discussed briefly below. Any additional information and evaluation that is required on this subject is within the purview of the Project Civil Engineer and the Project Hydrologist.

6.7.1 Erosion Of Graded Areas

The graded areas of the proposed project will be subject to erosion, and this is considered a potentially significant impact.

As presented and discussed in the preceding text, most of the graded area in the tract will consist of compacted fill. Fills derived from the sandy terrace deposits will tend to be easily eroded under conditions of uncontrolled, concentrated surface runoff. The bedrock materials generally have

a significant percentage of silt and clay, and compacted fill derived from the bedrock will tend to be more resistant to erosion. Incorporation of the mitigation measures presented below will reduce the potential impact of erosion of graded areas to less than significant levels.

Mitigation Measures - The surficial stability/erosion potential of the proposed slopes shall be evaluated by the Project Geotechnical Consultant as a part of future geotechnical design evaluation. Best management practices (BMP) shall be employed during construction to minimize the potential for erosion and the project shall conform to applicable NPDES requirements and regulations. Appropriate landscape planting shall be installed as soon as is practical after completion of grading, particularly in the graded slope areas. Erosion control recommendations and design provisions shall be developed and incorporated in grading plans prepared by the Project Civil Engineer for implementation during construction. Grading plans shall be reviewed and approved by the Geotechnical Consultant prior to the start of grading construction.

6.7.2 Alteration of Runoff, Unprotected Drainage Ways, Increased Impervious Surfaces

These general surface drainage considerations may affect or influence groundwater levels and associated geologic conditions beneath the project site, and are considered a potentially significant impact (see Section 6.6 of the preceding text). Incorporation of the mitigation measures presented below will reduce these potential impacts to less than significant levels.

Mitigation Measures - Reference is made to Mitigation Measures regarding surface drainage that are presented in the preceding text under Sections 6.4.1 and 6.4.4, respectively. These mitigation measures shall also be applied to the potentially significant impacts of the subject general drainage considerations.

Surface drainage provisions for the project shall be evaluated and designed by the Project Civil Engineer and shall be reviewed and approved by the project Geotechnical Consultant, prior to the start of grading construction. Design and grading construction shall conform to the requirements of the Uniform Building Code, appropriate local grading and drainage design regulations, and to the recommendations of the Civil Engineer and Geotechnical Consultant of record.

6.8 LAND SUBSIDENCE

Land subsidence in this context refers to broad scale changes in the elevation of the land that occur in response to mineral extraction or due to the presence of natural organic deposits (peat). No potential exists for ground subsidence at the project site due to extraction of groundwater, gas, or oil. Similarly, no peat deposits are present beneath the project and subsidence due to peat oxidation is not considered a potential problem (Morton, 1976).

Mitigation Measures - None necessary.

6.9 VOLCANIC HAZARDS

No potential source of volcanic activity that would produce such hazards as lava flow or ash fall are known to exist in southern California.

Mitigation Measures - None necessary.

7.0 CLOSURE AND GENERAL CONDITIONS

On the basis of AMEC Earth & Environmental's geotechnical evaluation of the project geologic conditions, no aspects of construction and anticipated operation of the proposed project are considered to have a significant impact on geotechnical aspects of the adjacent and nearby properties. This conclusion is made with the provision that recommended mitigation measures and/or resulting geotechnical recommendations are implemented during design and construction of the project. Similarly, this conclusion assumes future operation of the project conforms to the design and construction recommendations.

AMEC Earth & Environmental's geotechnical recommendations are made contingent upon the opportunity for AMEC to complete planned geotechnical evaluation of the final project design, including grading plan review and observation/review services during construction. If parties other than AMEC are engaged to provide such services, they must be notified that they will be required to assume complete responsibility for the geologic and geotechnical aspects of the project.

This report is based on the geotechnical data as described herein, including information obtained from the referenced documents. AMEC Earth & Environmental, Inc. should be notified of any pertinent change or discrepancy in the conditions discussed in this report, as additional evaluation of the conclusions and recommendations may be required.

This report has not been prepared for use for other projects, or by parties other than LSA Associates, Inc., Headlands Reserve LLC, the City of Dana Point, and their designated representatives. This document may not contain sufficient information for other parties or other purposes. The report has been prepared in accordance with generally accepted geotechnical practices, and makes no other warranties, either express or implied as to the professional advice or data included.

Respectfully submitted,

AMEC Earth & Environmental, Inc.

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Aerial Photographs

Vertical stereo pair photographs: 2/29 (Scale 1"=1500'); 10/13/39 (1" = 2000'); 8/23/47 (Scale 1"=600'); 9/2/47 (1" = 1200'); 12/12/52 (Scale 1"=2000'); 5/12/56, one photo only (Scale 1"=2000'); 3/23/57 (1" = 3333'); 2/21/58 (Scale 1"=3000'); 4/29/59 (1" = 5280'); 11/29/62 (Scale 1"=500'); 1/13/68 (Scale 1"=400'); 2/10/83 (Scale 1"=200'); 7/21/98 (1" = 300').

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APPENDIX

Historic Seismicity And Estimated Peak Horizontal Ground Acceleration From Regional Faults/Earthquakes (Blake, 2000)

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*    E Q S E A R C H     *
*                        *
*     Version 3.00       *
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ESTIMATION OF
PEAK ACCELERATION FROM
CALIFORNIA EARTHQUAKE CATALOGS

JOB NUMBER: 9-212-3061

DATE: 05-02-2001

JOB NAME: Dana Point Headlands

EARTHQUAKE-CATALOG-FILE NAME: ALLQUAKE.DAT

SITE COORDINATES:
   SITE LATITUDE: 33.4630
   SITE LONGITUDE: 117.7120

SEARCH DATES:
           START DATE: 1800
           END DATE: 2001

SEARCH RADIUS:
           62.0 mi
           99.8 km

ATTENUATION RELATION: 2) Boore et al. (1997) Horiz. - NEHRP C (520)
   UNCERTAINTY (M=Median, S=Sigma): M   Number of Sigmas: 0.0
   ASSUMED SOURCE TYPE: DS [SS=Strike-slip, DS=Reverse-slip, BT=Blind-thrust]
   SCOND: 1 Depth Source: A
   Basement Depth: 5.00 km   Campbell SSR: Campbell SHR:
   COMPUTE PEAK HORIZONTAL ACCELERATION

MINIMUM DEPTH VALUE (km): 0.0

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.0000	117.3000	11/22/1800	2130 0.0	0.0	6.50	0.065	VI	39.8(64.1)
MGI	32.8000	117.1000	05/25/1803	0 0 0.0	0.0	5.00	0.022	IV	57.9(93.1)
T-A	34.0000	118.2500	09/23/1827	0 0 0.0	0.0	5.00	0.026	V	48.3(77.7)
MGI	34.1000	118.1000	07/11/1855	415 0.0	0.0	6.30	0.050	VI	49.3(79.3)
T-A	34.0000	118.2500	01/10/1856	0 0 0.0	0.0	5.00	0.026	V	48.3(77.7)
T-A	34.0000	118.2500	05/02/1856	810 0.0	0.0	4.30	0.018	IV	48.3(77.7)
MGI	33.0000	117.0000	09/21/1856	730 0.0	0.0	5.00	0.024	V	52.1(83.8)
T-A	34.0000	118.2500	01/17/1857	1 0 0.0	0.0	4.30	0.018	IV	48.3(77.7)
T-A	34.0000	118.2500	05/04/1857	6 0 0.0	0.0	4.30	0.018	IV	48.3(77.7)
MGI	34.0000	117.5000	12/16/1858	10 0 0.0	0.0	7.00	0.087	VII	39.0(62.8)
T-A	34.1700	117.3200	12/02/1859	2210 0.0	0.0	4.30	0.016	IV	53.7(86.5)
MGI	34.1000	118.2000	01/27/1860	830 0.0	0.0	4.30	0.017	IV	52.1(83.9)
T-A	34.0000	118.2500	03/26/1860	0 0 0.0	0.0	5.00	0.026	V	48.3(77.7)
DMG	32.7000	117.2000	05/27/1862	20 0 0.0	0.0	5.90	0.035	V	60.4(97.3)
T-A	34.0800	117.2500	10/07/1869	0 0 0.0	0.0	4.30	0.017	IV	50.2(80.7)
T-A	34.0000	118.2500	03/21/1880	1425 0.0	0.0	4.30	0.018	IV	48.3(77.7)
DMG	33.9000	117.2000	12/19/1880	0 0 0.0	0.0	6.00	0.048	VI	42.1(67.8)
T-A	33.5000	117.0700	12/29/1880	7 0 0.0	0.0	4.30	0.022	IV	37.1(59.6)
T-A	34.1700	118.1700	03/07/1888	1554 0.0	0.0	4.30	0.016	IV	55.4(89.2)
T-A	34.0000	117.4200	04/12/1888	1315 0.0	0.0	4.30	0.020	IV	40.7(65.5)
DMG	34.2000	117.9000	08/28/1889	215 0.0	0.0	5.50	0.031	V	52.0(83.7)
DMG	34.2000	117.5000	06/14/1892	1325 0.0	0.0	4.90	0.023	IV	52.3(84.2)
DMG	34.3000	117.6000	07/30/1894	512 0.0	0.0	6.00	0.038	V	58.1(93.6)
DMG	34.2000	117.4000	07/22/1899	046 0.0	0.0	5.50	0.031	V	53.9(86.8)
DMG	34.3000	117.5000	07/22/1899	2032 0.0	0.0	6.50	0.048	VI	59.1(95.0)
DMG	33.8000	117.0000	12/25/1899	1225 0.0	0.0	6.40	0.055	VI	47.1(75.8)
MGI	34.1000	117.3000	12/27/1901	11 0 0.0	0.0	4.60	0.020	IV	49.9(80.4)
MGI	33.8000	117.9000	05/22/1902	740 0.0	0.0	4.30	0.029	V	25.7(41.3)
DMG	33.7000	117.1000	06/11/1902	245 0.0	0.0	4.50	0.023	IV	38.8(62.5)
MGI	33.7000	117.9000	07/08/1902	945 0.0	0.0	4.00	0.030	V	19.6(31.6)
DMG	33.8000	117.6000	09/16/1903	1210 0.0	0.0	4.00	0.026	V	24.1(38.8)
MGI	34.0000	118.0000	12/25/1903	1745 0.0	0.0	5.00	0.029	V	40.6(65.3)
MGI	34.1000	117.3000	07/15/1905	2041 0.0	0.0	5.30	0.029	V	49.9(80.4)
MGI	34.0000	118.3000	09/03/1905	540 0.0	0.0	5.30	0.029	V	50.1(80.7)
DMG	33.0000	117.0000	03/03/1906	2025 0.0	0.0	4.50	0.019	IV	52.1(83.8)
MGI	32.7000	117.2000	04/19/1906	028 0.0	0.0	4.30	0.015	IV	60.4(97.3)
MGI	34.0000	117.4000	05/22/1907	652 0.0	0.0	4.60	0.023	IV	41.2(66.3)
DMG	34.2000	117.1000	09/20/1907	154 0.0	0.0	6.00	0.036	V	61.8(99.5)
DMG	34.0000	117.5000	07/03/1908	1255 0.0	0.0	4.00	0.018	IV	39.0(62.8)
DMG	33.7000	117.4000	04/11/1910	757 0.0	0.0	5.00	0.043	VI	24.3(39.1)
DMG	33.7000	117.4000	05/13/1910	620 0.0	0.0	5.00	0.043	VI	24.3(39.1)
DMG	33.7000	117.4000	05/15/1910	1547 0.0	0.0	6.00	0.074	VII	24.3(39.1)
MGI	34.1000	117.3000	11/22/1911	257 0.0	0.0	4.00	0.015	IV	49.9(80.4)
MGI	34.2000	117.3000	04/13/1913	1045 0.0	0.0	4.00	0.013	III	56.1(90.3)
DMG	33.8000	118.0000	10/21/1913	938 0.0	0.0	4.00	0.023	IV	28.6(45.9)
DMG	34.0000	118.5000	11/08/1914	1140 0.0	0.0	4.50	0.017	IV	58.5(94.1)
MGI	33.0000	117.0000	12/29/1914	10 0 0.0	0.0	4.00	0.014	IV	52.1(83.8)
MGI	33.8000	118.5000	06/18/1915	15 5 0.0	0.0	4.00	0.014	IV	50.9(81.9)
MGI	32.7000	117.2000	09/08/1915	742 0.0	0.0	4.00	0.013	III	60.4(97.3)
MGI	34.1000	118.2000	05/02/1916	1432 0.0	0.0	4.00	0.014	IV	52.1(83.9)
MGI	33.5000	116.8000	11/26/1916	17 5 0.0	0.0	4.00	0.014	IV	52.6(84.6)
MGI	34.0000	118.2000	02/13/1917	13 5 0.0	0.0	4.60	0.021	IV	46.5(74.8)
MGI	33.8000	117.8000	05/19/1917	635 0.0	0.0	4.00	0.026	V	23.8(38.3)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
MGI	33.8000	117.8000	05/19/1917	719 0.0	0.0	4.00	0.026	V	23.8(38.3)
MGI	33.8000	117.8000	05/20/1917	945 0.0	0.0	4.00	0.026	V	23.8(38.3)
MGI	33.5000	116.8000	05/31/1917	435 0.0	0.0	4.00	0.014	IV	52.6(84.6)
MGI	33.5000	116.8000	06/02/1917	435 0.0	0.0	4.00	0.014	IV	52.6(84.6)
MGI	34.0000	118.2000	06/26/1917	424 0.0	0.0	4.00	0.016	IV	46.5(74.8)
MGI	34.0000	118.2000	06/26/1917	2115 0.0	0.0	4.60	0.021	IV	46.5(74.8)
MGI	34.0000	118.2000	06/26/1917	2120 0.0	0.0	4.60	0.021	IV	46.5(74.8)
MGI	34.0000	118.2000	06/26/1917	2130 0.0	0.0	4.60	0.021	IV	46.5(74.8)
DMG	34.0000	118.5000	03/06/1918	1820 0.0	0.0	4.00	0.013	III	58.5(94.1)
MGI	34.0000	118.5000	03/08/1918	1230 0.0	0.0	4.00	0.013	III	58.5(94.1)
MGI	33.5000	116.8000	03/30/1918	16 5 0.0	0.0	4.60	0.019	IV	52.6(84.6)
DMG	33.7500	117.0000	04/21/1918	223225.0	0.0	6.80	0.069	VI	45.5(73.2)
MGI	33.8000	117.6000	04/22/1918	2115 0.0	0.0	5.00	0.044	VI	24.1(38.8)
MGI	33.8000	116.9000	04/23/1918	1415 0.0	0.0	4.00	0.014	IV	52.2(83.9)
MGI	33.8000	116.9000	04/29/1918	2 0 0.0	0.0	4.00	0.014	IV	52.2(83.9)
DMG	33.7500	117.0000	06/06/1918	2232 0.0	0.0	5.00	0.027	V	45.5(73.2)
MGI	33.8000	116.9000	06/14/1918	1024 0.0	0.0	4.00	0.014	IV	52.2(83.9)
MGI	33.1000	116.8000	06/22/1918	557 0.0	0.0	4.00	0.013	III	58.3(93.8)
MGI	34.0000	118.5000	11/19/1918	2018 0.0	0.0	5.00	0.022	IV	58.5(94.1)
DMG	33.2000	116.7000	01/01/1920	235 0.0	0.0	5.00	0.021	IV	61.1(98.4)
MGI	34.0000	118.4000	02/22/1920	1610 0.0	0.0	4.60	0.019	IV	54.2(87.2)
MGI	32.7000	117.2000	05/20/1920	1330 0.0	0.0	4.00	0.013	III	60.4(97.3)
DMG	33.5000	118.2500	06/18/1920	10 8 0.0	0.0	4.50	0.028	V	31.1(50.0)
DMG	34.0000	118.5000	06/22/1920	248 0.0	0.0	4.90	0.021	IV	58.5(94.1)
MGI	34.0000	118.3000	06/22/1920	2035 0.0	0.0	4.00	0.015	IV	50.1(80.7)
MGI	34.0000	118.5000	06/23/1920	1220 0.0	0.0	4.00	0.013	III	58.5(94.1)
MGI	34.0000	118.3000	06/30/1920	350 0.0	0.0	4.00	0.015	IV	50.1(80.7)
MGI	34.0800	118.2600	07/16/1920	18 8 0.0	0.0	5.00	0.024	IV	52.9(85.2)
MGI	34.1000	118.3000	07/16/1920	2022 0.0	0.0	4.60	0.019	IV	55.4(89.2)
MGI	34.1000	118.3000	07/16/1920	2127 0.0	0.0	4.60	0.019	IV	55.4(89.2)
MGI	34.1000	118.3000	07/16/1920	2130 0.0	0.0	4.60	0.019	IV	55.4(89.2)
MGI	34.1000	118.3000	07/26/1920	1215 0.0	0.0	4.00	0.014	III	55.4(89.2)
T-A	34.0000	117.4200	09/10/1920	1415 0.0	0.0	4.30	0.020	IV	40.7(65.5)
MGI	33.8000	116.9000	12/18/1920	1726 0.0	0.0	4.00	0.014	IV	52.2(83.9)
MGI	34.2000	118.0000	01/09/1921	530 0.0	0.0	4.60	0.019	IV	53.5(86.1)
MGI	34.1000	118.2000	04/21/1921	1538 0.0	0.0	4.00	0.014	IV	52.1(83.9)
MGI	34.1000	117.2000	04/23/1923	2113 0.0	0.0	4.00	0.014	IV	52.9(85.1)
DMG	34.0000	117.0000	06/30/1923	022 0.0	0.0	4.50	0.018	IV	55.2(88.8)
MGI	33.2000	117.0000	07/20/1923	7 0 0.0	0.0	4.00	0.016	IV	44.9(72.3)
DMG	34.0000	117.2500	07/23/1923	73026.0	0.0	6.25	0.052	VI	45.6(73.4)
DMG	33.5000	117.0000	08/08/1925	1013 0.0	0.0	4.50	0.022	IV	41.1(66.1)
MGI	33.8000	117.8000	11/04/1926	2238 0.0	0.0	4.60	0.036	V	23.8(38.3)
MGI	33.8000	117.8000	11/07/1926	1948 0.0	0.0	4.60	0.036	V	23.8(38.3)
MGI	33.8000	117.8000	11/09/1926	1535 0.0	0.0	4.60	0.036	V	23.8(38.3)
MGI	33.8000	117.8000	11/10/1926	1723 0.0	0.0	4.60	0.036	V	23.8(38.3)
MGI	34.0000	118.4000	01/29/1927	2324 0.0	0.0	4.00	0.014	IV	54.2(87.2)
MGI	34.0000	118.4000	02/07/1927	429 0.0	0.0	4.60	0.019	IV	54.2(87.2)
DMG	34.0000	118.5000	08/04/1927	1224 0.0	0.0	5.00	0.022	IV	58.5(94.1)
MGI	33.9000	118.2000	10/08/1927	1914 0.0	0.0	4.60	0.023	IV	41.2(66.3)
MGI	33.8000	118.3000	12/31/1928	1045 0.0	0.0	4.00	0.017	IV	41.0(66.0)
MGI	34.0000	118.0000	05/05/1929	1 7 0.0	0.0	4.60	0.024	IV	40.6(65.3)
MGI	34.0000	118.0000	05/05/1929	735 0.0	0.0	4.00	0.017	IV	40.6(65.3)
DMG	33.9000	118.1000	07/08/1929	1646 6.7	13.0	4.70	0.027	V	37.5(60.4)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.6300	118.2000	09/13/1929	132338.2	0.0	4.00	0.022	IV	30.4(48.8)
MGI	34.0000	117.7000	12/03/1929	9 5 0.0	0.0	4.00	0.019	IV	37.1(59.7)
MGI	34.1000	118.0000	01/27/1930	2026 0.0	0.0	4.60	0.021	IV	47.0(75.6)
DMG	33.2000	116.7200	05/12/1930	172548.5	0.0	4.20	0.014	IV	60.0(96.6)
MGI	34.0000	118.4000	10/01/1930	040 0.0	0.0	4.60	0.019	IV	54.2(87.2)
DMG	34.1000	117.3000	02/16/1931	1327 0.0	0.0	4.00	0.015	IV	49.9(80.4)
DMG	34.1000	117.8000	03/31/1931	2033 0.0	0.0	4.00	0.016	IV	44.3(71.2)
DMG	33.7700	118.4800	04/24/1931	182754.8	0.0	4.40	0.018	IV	49.0(78.8)
DMG	33.8000	118.3000	11/03/1931	16 5 0.0	0.0	4.00	0.017	IV	41.0(66.0)
DMG	34.0000	117.2500	11/01/1932	445 0.0	0.0	4.00	0.016	IV	45.6(73.4)
DMG	33.6170	117.9670	03/11/1933	154 7.8	0.0	6.30	0.107	VII	18.1(29.2)
DMG	33.7500	118.0830	03/11/1933	2 4 0.0	0.0	4.90	0.036	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	2 5 0.0	0.0	4.30	0.026	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	2 9 0.0	0.0	5.00	0.038	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	210 0.0	0.0	4.60	0.031	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	211 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	216 0.0	0.0	4.80	0.034	V	29.1(46.9)
DMG	33.6000	118.0000	03/11/1933	217 0.0	0.0	4.50	0.040	V	19.1(30.7)
DMG	33.7500	118.0830	03/11/1933	222 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	227 0.0	0.0	4.60	0.031	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	230 0.0	0.0	5.10	0.040	V	29.1(46.9)
DMG	33.6000	118.0000	03/11/1933	231 0.0	0.0	4.40	0.038	V	19.1(30.7)
DMG	33.7500	118.0830	03/11/1933	252 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	257 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	258 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	259 0.0	0.0	4.60	0.031	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	3 5 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	3 9 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	311 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	323 0.0	0.0	5.00	0.038	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	336 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	339 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	347 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	436 0.0	0.0	4.60	0.031	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	439 0.0	0.0	4.90	0.036	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	440 0.0	0.0	4.70	0.032	V	29.1(46.9)
DMG	33.7000	118.0670	03/11/1933	51022.0	0.0	5.10	0.043	VI	26.2(42.1)
DMG	33.7500	118.0830	03/11/1933	513 0.0	0.0	4.70	0.032	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	515 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.5750	117.9830	03/11/1933	518 4.0	0.0	5.20	0.062	VI	17.4(28.0)
DMG	33.7500	118.0830	03/11/1933	521 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	524 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	553 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	555 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	611 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	618 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.8500	118.2670	03/11/1933	629 0.0	0.0	4.40	0.021	IV	41.6(67.0)
DMG	33.7500	118.0830	03/11/1933	635 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.6830	118.0500	03/11/1933	658 3.0	0.0	5.50	0.056	VI	24.7(39.7)
DMG	33.7500	118.0830	03/11/1933	751 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	759 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	8 8 0.0	0.0	4.50	0.029	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	832 0.0	0.0	4.20	0.025	V	29.1(46.9)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/11/1933	837 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7000	118.0670	03/11/1933	85457.0	0.0	5.10	0.043	VI	26.2(42.1)
DMG	33.7500	118.0830	03/11/1933	910 0.0	0.0	5.10	0.040	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	911 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	926 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1025 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1045 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	11 0 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.1330	03/11/1933	11 4 0.0	0.0	4.60	0.029	V	31.3(50.3)
DMG	33.7500	118.0830	03/11/1933	1129 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1138 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1141 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1147 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.6830	118.0500	03/11/1933	1250 0.0	0.0	4.40	0.031	V	24.7(39.7)
DMG	33.7330	118.1000	03/11/1933	1350 0.0	0.0	4.40	0.028	V	29.1(46.8)
DMG	33.7500	118.0830	03/11/1933	1357 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.8500	118.2670	03/11/1933	1425 0.0	0.0	5.00	0.029	V	41.6(67.0)
DMG	33.7330	118.1000	03/11/1933	1447 0.0	0.0	4.40	0.028	V	29.1(46.8)
DMG	33.8830	118.3170	03/11/1933	1457 0.0	0.0	4.90	0.026	V	45.3(72.8)
DMG	33.7330	118.1000	03/11/1933	15 9 0.0	0.0	4.40	0.028	V	29.1(46.8)
DMG	33.7500	118.0830	03/11/1933	1547 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1653 0.0	0.0	4.80	0.034	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1944 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	1956 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	22 0 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	2231 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	2232 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	2240 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/11/1933	23 5 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	027 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	034 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	448 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	546 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	6 1 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	616 0.0	0.0	4.60	0.031	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	740 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	835 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	15 2 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	1651 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	1738 0.0	0.0	4.50	0.029	V	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	1825 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	2128 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/12/1933	2354 0.0	0.0	4.50	0.029	V	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	343 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	432 0.0	0.0	4.70	0.032	V	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	617 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	131828.0	0.0	5.30	0.044	VI	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	1532 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/13/1933	1929 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/14/1933	036 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/14/1933	1219 0.0	0.0	4.50	0.029	V	29.1(46.9)
DMG	33.6170	118.0170	03/14/1933	19 150.0	0.0	5.10	0.052	VI	20.5(33.0)
DMG	33.7500	118.0830	03/14/1933	2242 0.0	0.0	4.10	0.024	IV	29.1(46.9)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7500	118.0830	03/15/1933	2 8 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/15/1933	432 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/15/1933	540 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.6170	118.0170	03/15/1933	111332.0	0.0	4.90	0.047	VI	20.5(33.0)
DMG	33.7500	118.0830	03/16/1933	1456 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	03/16/1933	1529 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/16/1933	1530 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/17/1933	1651 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/18/1933	2052 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/19/1933	2123 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	03/20/1933	1358 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/21/1933	326 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/23/1933	840 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/23/1933	1831 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/25/1933	1346 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	03/30/1933	1225 0.0	0.0	4.40	0.028	V	29.1(46.9)
DMG	33.7500	118.0830	03/31/1933	1049 0.0	0.0	4.10	0.024	IV	29.1(46.9)
DMG	33.7500	118.0830	04/01/1933	642 0.0	0.0	4.20	0.025	V	29.1(46.9)
DMG	33.7500	118.0830	04/02/1933	8 0 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.0830	04/02/1933	1536 0.0	0.0	4.00	0.022	IV	29.1(46.9)
DMG	33.7500	118.1670	05/16/1933	205855.0	0.0	4.00	0.020	IV	32.8(52.8)
DMG	33.7500	118.1830	08/04/1933	41748.0	0.0	4.00	0.020	IV	33.6(54.0)
DMG	33.7830	118.1330	10/02/1933	91017.6	0.0	5.40	0.043	VI	32.8(52.7)
DMG	33.6170	118.0170	10/02/1933	1326 1.0	0.0	4.00	0.029	V	20.5(33.0)
DMG	33.9500	118.1330	10/25/1933	7 046.0	0.0	4.30	0.020	IV	41.4(66.6)
DMG	33.8670	118.2000	11/13/1933	2128 0.0	0.0	4.00	0.018	IV	39.5(63.6)
DMG	33.7830	118.1330	11/20/1933	1032 0.0	0.0	4.00	0.020	IV	32.8(52.7)
DMG	34.1000	117.6830	01/09/1934	1410 0.0	0.0	4.50	0.021	IV	44.0(70.8)
DMG	34.1000	117.6830	01/18/1934	214 0.0	0.0	4.00	0.016	IV	44.0(70.8)
DMG	33.6170	118.1170	01/20/1934	2117 0.0	0.0	4.50	0.032	V	25.6(41.2)
DMG	33.5670	117.9830	04/17/1934	1833 0.0	0.0	4.00	0.033	V	17.2(27.6)
DMG	33.6330	118.4000	10/17/1934	938 0.0	0.0	4.00	0.017	IV	41.3(66.4)
DMG	33.7500	118.0000	11/16/1934	2126 0.0	0.0	4.00	0.024	V	25.8(41.6)
DMG	33.2670	117.0170	06/07/1935	1633 0.0	0.0	4.00	0.017	IV	42.3(68.1)
DMG	33.7170	117.5170	06/19/1935	1117 0.0	0.0	4.00	0.029	V	20.8(33.5)
DMG	34.2000	117.9000	07/13/1935	105416.5	0.0	4.70	0.021	IV	52.0(83.7)
DMG	34.0330	117.3170	09/03/1935	647 0.0	0.0	4.50	0.021	IV	45.4(73.1)
DMG	33.5000	116.9170	11/04/1935	355 0.0	0.0	4.50	0.020	IV	45.8(73.8)
DMG	33.6000	118.0170	12/25/1935	1715 0.0	0.0	4.50	0.039	V	19.9(32.1)
DMG	34.1270	117.3380	02/23/1936	222042.7	10.0	4.50	0.019	IV	50.6(81.5)
DMG	34.1400	117.3390	02/26/1936	93327.6	10.0	4.00	0.014	IV	51.4(82.7)
DMG	33.4540	116.8980	07/29/1936	142252.8	10.0	4.00	0.015	IV	46.9(75.5)
DMG	33.7670	117.8170	08/22/1936	521 0.0	0.0	4.00	0.028	V	21.8(35.1)
DMG	33.5610	118.0580	01/15/1937	183547.0	10.0	4.00	0.029	V	21.0(33.8)
DMG	34.1120	117.4260	03/19/1937	12338.4	10.0	4.00	0.015	IV	47.7(76.8)
DMG	33.5670	117.9830	07/07/1937	1112 0.0	0.0	4.00	0.033	V	17.2(27.6)
DMG	34.2110	117.5300	09/01/1937	1348 8.2	10.0	4.50	0.018	IV	52.7(84.8)
DMG	34.1830	117.5480	09/01/1937	163533.5	10.0	4.50	0.019	IV	50.6(81.4)
DMG	32.7180	118.1720	04/28/1938	6 728.0	10.0	4.50	0.017	IV	57.9(93.2)
DMG	33.6170	118.0330	05/21/1938	944 0.0	0.0	4.00	0.028	V	21.3(34.3)
DMG	33.6990	117.5110	05/31/1938	83455.4	10.0	5.50	0.066	VI	20.0(32.1)
DMG	33.4560	116.8960	06/16/1938	55916.9	10.0	4.00	0.015	IV	47.0(75.6)
DMG	33.6820	117.5530	07/05/1938	18 655.7	10.0	4.50	0.042	VI	17.7(28.4)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	33.7170	117.5070	08/06/1938	22 056.0	10.0	4.00	0.028	V	21.1(34.0)
DMG	33.7590	118.2530	08/31/1938	31814.2	10.0	4.50	0.024	V	37.2(59.9)
DMG	33.9030	118.4310	11/29/1938	192115.8	10.0	4.00	0.014	IV	51.3(82.5)
DMG	34.0000	118.4170	12/07/1938	338 0.0	0.0	4.00	0.014	III	54.9(88.3)
DMG	34.1270	117.5210	12/27/1938	10 928.6	10.0	4.00	0.015	IV	47.1(75.9)
DMG	34.0430	117.2280	04/03/1939	25044.7	10.0	4.00	0.015	IV	48.7(78.4)
DMG	32.5830	117.8000	04/19/1939	741 0.0	0.0	4.50	0.016	IV	61.0(98.1)
DMG	32.7500	118.2000	06/25/1939	149 0.0	0.0	4.50	0.017	IV	56.7(91.3)
DMG	33.7670	118.1170	11/04/1939	2141 0.0	0.0	4.00	0.021	IV	31.3(50.4)
DMG	34.0000	117.2830	11/07/1939	1852 8.4	0.0	4.70	0.023	IV	44.5(71.6)
DMG	33.7830	118.2000	12/27/1939	192849.0	0.0	4.70	0.028	V	35.7(57.5)
DMG	33.7830	118.1330	01/13/1940	749 7.0	0.0	4.00	0.020	IV	32.8(52.7)
DMG	33.7000	118.0670	02/08/1940	165617.0	0.0	4.00	0.024	V	26.2(42.1)
DMG	33.9830	118.3000	02/11/1940	192410.0	0.0	4.00	0.015	IV	49.3(79.3)
DMG	34.0170	117.0500	02/19/1940	12 655.7	0.0	4.60	0.019	IV	53.9(86.8)
DMG	34.0330	117.3500	04/18/1940	184343.9	0.0	4.40	0.020	IV	44.5(71.6)
DMG	33.8330	117.4000	06/05/1940	82727.0	0.0	4.00	0.021	IV	31.2(50.2)
DMG	33.7000	118.0670	07/20/1940	4 113.0	0.0	4.00	0.024	V	26.2(42.1)
DMG	33.7670	118.4500	10/11/1940	55712.3	0.0	4.70	0.022	IV	47.3(76.2)
DMG	33.7830	118.4170	10/12/1940	024 0.0	0.0	4.00	0.016	IV	46.2(74.3)
DMG	33.7830	118.4170	10/14/1940	205111.0	0.0	4.00	0.016	IV	46.2(74.3)
DMG	33.7830	118.4170	11/01/1940	725 3.0	0.0	4.00	0.016	IV	46.2(74.3)
DMG	33.6330	118.2000	11/01/1940	20 046.0	0.0	4.00	0.022	IV	30.4(49.0)
DMG	33.7830	118.4170	11/02/1940	25826.0	0.0	4.00	0.016	IV	46.2(74.3)
DMG	33.9670	118.0500	01/30/1941	13446.9	0.0	4.10	0.018	IV	39.8(64.1)
DMG	33.5170	118.1000	03/22/1941	82240.0	0.0	4.00	0.027	V	22.6(36.4)
DMG	34.2170	117.4670	03/25/1941	234341.0	0.0	4.00	0.014	IV	53.9(86.8)
DMG	33.9500	117.5830	04/11/1941	12024.0	0.0	4.00	0.020	IV	34.4(55.4)
DMG	33.8170	118.2170	10/22/1941	65718.5	0.0	4.90	0.029	V	37.9(61.1)
DMG	33.7830	118.2500	11/14/1941	84136.3	0.0	5.40	0.038	V	38.0(61.2)
DMG	32.8000	117.8330	01/24/1942	214148.0	0.0	4.00	0.016	IV	46.3(74.5)
DMG	33.3670	118.1500	04/16/1942	72833.0	0.0	4.00	0.024	V	26.1(42.0)
DMG	32.8500	117.4830	02/23/1943	92112.0	0.0	4.00	0.016	IV	44.3(71.4)
DMG	33.9330	117.3670	10/24/1943	02921.0	0.0	4.00	0.018	IV	38.0(61.2)
DMG	33.8670	118.2170	06/19/1944	0 333.0	0.0	4.50	0.023	IV	40.2(64.8)
DMG	33.8670	118.2170	06/19/1944	3 6 7.0	0.0	4.40	0.021	IV	40.2(64.8)
DMG	33.9500	116.8500	09/28/1946	719 9.0	0.0	5.00	0.022	IV	59.8(96.3)
DMG	34.1670	117.5330	03/01/1948	81213.0	0.0	4.70	0.021	IV	49.7(79.9)
DMG	34.1830	117.5830	10/03/1948	24628.0	0.0	4.00	0.015	IV	50.3(80.9)
DMG	33.4830	116.7000	12/28/1948	125341.0	0.0	4.00	0.013	III	58.3(93.8)
DMG	33.9390	118.2050	01/11/1950	214135.0	0.4	4.10	0.017	IV	43.4(69.8)
DMG	33.6500	116.7500	09/05/1950	191956.0	0.0	4.80	0.020	IV	56.8(91.5)
DMG	32.7170	117.8330	11/06/1950	205546.0	0.0	4.40	0.018	IV	52.0(83.6)
DMG	34.1180	117.3410	09/22/1951	82239.1	11.9	4.30	0.017	IV	50.0(80.4)
DMG	32.8170	118.3500	12/26/1951	04654.0	0.0	5.90	0.036	V	57.9(93.1)
DMG	32.8670	118.2500	02/13/1952	151337.0	0.0	4.70	0.021	IV	51.6(83.0)
DMG	33.9960	117.2700	02/17/1952	123658.3	16.0	4.50	0.021	IV	44.7(71.9)
DMG	33.7330	117.4670	10/26/1954	162226.0	0.0	4.10	0.028	V	23.4(37.6)
DMG	33.4500	116.6830	04/25/1955	25515.0	0.0	4.00	0.013	III	59.3(95.4)
DMG	34.1240	117.4800	05/15/1955	17 326.0	7.6	4.00	0.015	IV	47.5(76.5)
DMG	33.7250	117.4980	01/03/1956	02548.9	13.7	4.70	0.040	V	21.9(35.2)
DMG	33.4880	116.7770	06/12/1959	11 313.0	5.7	4.00	0.014	IV	53.9(86.7)
DMG	33.9680	116.8820	06/27/1959	162211.1	13.8	4.00	0.013	III	59.1(95.0)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
DMG	34.1160	117.4750	06/28/1960	20 048.0	12.0	4.10	0.016	IV	47.1(75.8)
DMG	33.8540	117.7520	10/04/1961	22131.6	4.3	4.10	0.025	V	27.1(43.6)
DMG	33.6540	117.9940	10/20/1961	194950.5	4.6	4.30	0.034	V	20.9(33.6)
DMG	33.6590	117.9810	10/20/1961	20 714.5	6.1	4.00	0.029	V	20.6(33.1)
DMG	33.6650	117.9790	10/20/1961	214240.7	7.2	4.00	0.029	V	20.7(33.4)
DMG	33.6710	118.0120	10/20/1961	223534.2	5.6	4.10	0.029	V	22.4(36.1)
DMG	33.6800	117.9930	11/20/1961	85334.7	4.4	4.00	0.028	V	22.0(35.5)
DMG	33.7380	117.1870	04/27/1962	91232.1	5.7	4.10	0.020	IV	35.7(57.4)
DMG	33.5430	118.3400	09/14/1963	35116.2	2.2	4.20	0.021	IV	36.6(58.9)
DMG	33.7100	116.9250	09/23/1963	144152.6	16.5	5.00	0.026	V	48.4(77.8)
DMG	34.1400	117.5150	01/01/1965	8 418.0	5.9	4.40	0.019	IV	48.1(77.4)
DMG	34.1320	117.4260	04/15/1965	20 833.3	5.5	4.50	0.019	IV	49.0(78.9)
DMG	33.6320	118.4670	01/08/1967	73730.4	11.4	4.00	0.016	IV	45.0(72.4)
DMG	33.6630	118.4130	01/08/1967	738 5.3	17.7	4.00	0.017	IV	42.6(68.6)
DMG	33.9960	117.9750	06/15/1967	458 5.5	10.0	4.10	0.018	IV	39.8(64.0)
DMG	34.3040	117.5700	05/05/1969	16 2 9.6	8.8	4.40	0.016	IV	58.6(94.4)
DMG	33.5450	117.8070	10/27/1969	1316 2.3	6.5	4.50	0.075	VII	7.9(12.7)
DMG	34.2670	117.5180	09/12/1970	141011.2	8.0	4.10	0.014	IV	56.6(91.1)
DMG	34.2700	117.5400	09/12/1970	143053.0	8.0	5.40	0.028	V	56.6(91.1)
DMG	34.2810	117.5520	09/13/1970	44748.6	8.0	4.40	0.016	IV	57.2(92.1)
DMG	33.7480	117.4790	06/22/1971	104119.0	8.0	4.20	0.029	V	23.8(38.3)
DMG	32.6800	118.0770	10/28/1973	22 0 2.7	8.0	4.50	0.017	IV	58.0(93.4)
PAS	32.7560	117.9880	01/12/1975	212214.8	15.3	4.80	0.022	IV	51.4(82.6)
PAS	33.9650	117.8860	01/01/1976	172012.9	6.2	4.20	0.021	IV	36.1(58.0)
PAS	32.7140	117.9100	10/18/1976	172652.6	15.1	4.20	0.016	IV	53.0(85.2)
PAS	32.7590	117.9060	10/18/1976	172753.1	13.8	4.20	0.016	IV	49.9(80.3)
PAS	33.4200	116.6980	06/05/1978	16 3 3.9	11.9	4.40	0.016	IV	58.5(94.1)
PAS	33.7010	116.8370	08/22/1979	2 136.3	5.0	4.10	0.015	IV	52.9(85.2)
PAS	34.2110	117.5300	10/19/1979	122237.8	4.9	4.10	0.015	IV	52.7(84.8)
PAS	32.6250	118.0090	07/11/1981	215029.4	5.0	4.30	0.015	IV	60.4(97.1)
PAS	33.5380	118.2070	05/25/1982	134430.3	13.7	4.10	0.024	IV	29.0(46.6)
PAS	33.5580	116.6670	06/15/1982	234921.3	12.2	4.80	0.019	IV	60.5(97.4)
PAS	34.1350	117.4480	01/08/1983	71930.4	4.6	4.10	0.016	IV	48.8(78.5)
PAS	33.0330	117.9440	02/22/1983	21830.4	10.0	4.30	0.024	V	32.6(52.4)
PAS	32.6270	117.3770	06/29/1983	8 836.4	5.0	4.60	0.017	IV	60.9(98.0)
PAS	33.4710	118.0610	02/27/1984	101815.0	6.0	4.00	0.030	V	20.1(32.4)
PAS	32.9450	117.8060	09/07/1984	11 313.4	6.0	4.30	0.022	IV	36.2(58.2)
USG	32.7700	118.3340	06/16/1985	1027 0.7	5.0	4.14	0.014	IV	59.9(96.3)
PAS	34.0230	117.2450	10/02/1985	234412.4	15.2	4.80	0.023	IV	47.0(75.7)
PAS	32.9710	117.8700	07/13/1986	1347 8.2	6.0	5.30	0.038	V	35.2(56.6)
PAS	32.9900	117.8490	07/13/1986	14 133.0	12.0	4.60	0.027	V	33.6(54.1)
PAS	32.9700	117.8030	07/14/1986	03246.2	10.0	4.00	0.020	IV	34.4(55.4)
USG	33.0170	117.8170	07/14/1986	11112.6	10.0	4.12	0.022	IV	31.4(50.5)
USG	33.0170	117.8170	07/16/1986	1247 3.7	10.0	4.11	0.022	IV	31.4(50.5)
PAS	32.9330	117.8410	07/29/1986	81741.6	10.0	4.30	0.022	IV	37.3(60.1)
PAS	32.9450	117.8310	07/29/1986	81741.8	10.0	4.10	0.020	IV	36.4(58.6)
PAS	32.9860	117.8440	10/01/1986	201218.6	6.0	4.00	0.020	IV	33.8(54.4)
USG	34.1390	117.3860	02/21/1987	231530.1	2.6	4.07	0.015	IV	50.3(80.9)
PAS	34.0610	118.0790	10/01/1987	144220.0	9.5	5.90	0.042	VI	46.3(74.6)
PAS	34.0490	118.1010	10/01/1987	144541.5	13.6	4.70	0.023	IV	46.2(74.4)
PAS	34.0760	118.0900	10/01/1987	1448 3.1	11.7	4.10	0.016	IV	47.6(76.5)
PAS	34.0600	118.1000	10/01/1987	1449 5.9	11.7	4.70	0.022	IV	46.8(75.4)
PAS	34.0520	118.0900	10/01/1987	151231.8	10.8	4.70	0.023	IV	46.1(74.2)

EARTHQUAKE SEARCH RESULTS

FILE CODE	LAT. NORTH	LONG. WEST	DATE	TIME (UTC) H M Sec	DEPTH (km)	QUAKE MAG.	SITE ACC. g	SITE MM INT.	APPROX. DISTANCE mi [km]
PAS	34.0500	118.0870	10/01/1987	155953.5	10.4	4.00	0.016	IV	45.9(73.8)
PAS	34.0730	118.0980	10/04/1987	105938.2	8.2	5.30	0.030	V	47.6(76.6)
PAS	34.0770	118.0470	02/11/1988	152555.7	12.5	4.70	0.022	IV	46.5(74.9)
PAS	34.1360	117.7090	06/26/1988	15 458.5	7.9	4.60	0.021	IV	46.5(74.8)
PAS	33.5080	118.0710	11/20/1988	53928.7	6.0	4.50	0.037	V	20.9(33.6)
PAS	34.1490	118.1350	12/03/1988	113826.4	13.3	4.90	0.023	IV	53.2(85.6)
PAS	32.9470	117.7360	01/15/1989	153955.2	6.0	4.20	0.021	IV	35.6(57.4)
PAS	33.9190	118.6270	01/19/1989	65328.8	11.9	5.00	0.021	IV	61.3(98.6)
PAS	34.0060	117.7390	02/18/1989	717 4.8	3.3	4.30	0.021	IV	37.5(60.4)
GSP	33.6200	117.9000	04/07/1989	200730.2	13.0	4.50	0.047	VI	15.3(24.6)
GSP	34.0300	118.1800	06/12/1989	165718.4	16.0	4.40	0.019	IV	47.5(76.4)
GSP	34.0200	118.1800	06/12/1989	172225.5	16.0	4.10	0.016	IV	46.9(75.5)
GSP	33.6500	116.7400	12/02/1989	231647.8	14.0	4.20	0.015	IV	57.4(92.4)
GSP	34.1900	117.3900	12/28/1989	094108.1	15.0	4.50	0.018	IV	53.5(86.1)
GSP	34.1400	117.7000	02/28/1990	234336.6	5.0	5.20	0.029	V	46.7(75.2)
GSP	34.1300	117.7000	03/01/1990	003457.1	4.0	4.00	0.016	IV	46.1(74.1)
GSP	34.1500	117.7200	03/01/1990	032303.0	11.0	4.70	0.022	IV	47.4(76.3)
GSP	34.1400	117.6900	03/02/1990	172625.4	6.0	4.60	0.021	IV	46.8(75.2)
GSP	32.9700	117.8100	04/04/1990	085439.3	6.0	4.00	0.020	IV	34.5(55.5)
GSP	34.1100	117.7200	04/17/1990	223227.2	4.0	4.60	0.022	IV	44.7(71.9)
GSP	34.2620	118.0020	06/28/1991	144354.5	11.0	5.40	0.028	V	57.6(92.7)
GSP	34.2500	117.9900	06/28/1991	170055.5	9.0	4.30	0.016	IV	56.6(91.1)
GSP	33.0700	116.8000	12/04/1991	071057.5	15.0	4.20	0.014	IV	59.2(95.3)
GSP	34.1200	116.9980	06/29/1992	144126.0	4.0	4.40	0.016	IV	61.1(98.4)
GSP	34.0850	116.9890	06/30/1992	214900.3	3.0	4.40	0.016	IV	59.7(96.1)
GSP	34.1920	117.0950	04/06/1994	190104.1	7.0	4.80	0.019	IV	61.5(99.0)
GSP	32.9850	117.8180	06/21/1995	211736.2	6.0	4.30	0.023	IV	33.6(54.0)
GSP	32.6810	118.1090	06/20/1997	043540.5	6.0	4.70	0.019	IV	58.7(94.4)
GSP	32.6850	118.1380	06/20/1997	053855.0	6.0	4.20	0.014	IV	59.1(95.1)
GSP	34.1680	117.3370	06/28/1997	214525.1	9.0	4.20	0.016	IV	53.2(85.6)
GSP	34.0970	116.9960	12/05/1997	170438.9	4.0	4.10	0.013	III	60.0(96.6)
GSP	33.9510	117.7090	01/05/1998	181406.5	11.0	4.30	0.023	IV	33.7(54.2)
GSP	34.0240	117.2300	03/11/1998	121851.8	14.0	4.50	0.020	IV	47.6(76.6)
PDP	33.6320	116.7190	07/19/1999	220927.5	14.0	4.20	0.014	IV	58.3(93.8)

****

-END OF SEARCH- 405 EARTHQUAKES FOUND WITHIN THE SPECIFIED SEARCH AREA.

TIME PERIOD OF SEARCH: 1800 TO 2001

LENGTH OF SEARCH TIME: 202 years

THE EARTHQUAKE CLOSEST TO THE SITE IS ABOUT 7.9 MILES (12.7 km) AWAY.

LARGEST EARTHQUAKE MAGNITUDE FOUND IN THE SEARCH RADIUS: 7.0

LARGEST EARTHQUAKE SITE ACCELERATION FROM THIS SEARCH: 0.107 g

COEFFICIENTS FOR GUTENBERG & RICHTER RECURRENCE RELATION:
a-value= 3.435
b-value= 0.792
beta-value= 1.825

TABLE OF MAGNITUDES AND EXCEEDANCES:

Earthquake Magnitude	Number of Times Exceeded	Cumulative No. / Year
4.0	405	2.01493
4.5	153	0.76119
5.0	55	0.27363
5.5	19	0.09453
6.0	12	0.05970
6.5	4	0.01990
7.0	1	0.00498

```
**********************
*                    *
*    E Q F A U L T   *
*                    *
*    Version 3.00    *
*                    *
**********************
```

DETERMINISTIC ESTIMATION OF
PEAK ACCELERATION FROM DIGITIZED FAULTS

JOB NUMBER: 9-212-306100

DATE: 05-02-2001

JOB NAME: Dana Point Headlands

CALCULATION NAME: Test Run Analysis

FAULT-DATA-FILE NAME: C:\EQFaultW\Cdmgflte.dat

SITE COORDINATES:
SITE LATITUDE: 33.4630
SITE LONGITUDE: 117.7120

SEARCH RADIUS: 62 mi

ATTENUATION RELATION: 2) Boore et al. (1997) Horiz. - NEHRP C (520)
UNCERTAINTY (M=Median, S=Sigma): M Number of Sigmas: 0.0
DISTANCE MEASURE: cd_2drp
SCOND: 1
Basement Depth: 5.00 km Campbell SSR: Campbell SHR:
COMPUTE PEAK HORIZONTAL ACCELERATION

FAULT-DATA FILE USED: C:\EQFaultW\Cdmgflte.dat

MINIMUM DEPTH VALUE (km): 0.0

EQFAULT SUMMARY

DETERMINISTIC SITE PARAMETERS

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE mi (km)	ESTIMATED MAX. EARTHQUAKE EVENT: MAXIMUM EARTHQUAKE MAG. (Mw)	ESTIMATED MAX. EARTHQUAKE EVENT: PEAK SITE ACCEL. g	ESTIMATED MAX. EARTHQUAKE EVENT: EST. SITE INTENSITY MOD.MERC.
CHINO-CENTRAL AVE. (Elsinore)	23.1(37.1)	6.7	0.111	VII
CLAMSHELL-SAWPIT	52.1(83.8)	6.5	0.053	VI
CLEGHORN	59.8(96.3)	6.5	0.039	V
COMPTON THRUST	25.4(40.9)	6.8	0.108	VII
CORONADO BANK	18.3(29.4)	7.4	0.157	VIII
CUCAMONGA	45.8(73.7)	7.0	0.076	VII
ELSINORE-GLEN IVY	23.2(37.3)	6.8	0.095	VII
ELSINORE-JULIAN	40.7(65.5)	7.1	0.073	VII
ELSINORE-TEMECULA	24.4(39.3)	6.8	0.092	VII
ELYSIAN PARK THRUST	29.1(46.8)	6.7	0.093	VII
HOLLYWOOD	54.3(87.4)	6.4	0.049	VI
MALIBU COAST	61.5(98.9)	6.7	0.052	VI
NEWPORT-INGLEWOOD (L.A.Basin)	15.7(25.3)	6.9	0.135	VIII
NEWPORT-INGLEWOOD (Offshore)	1.7(2.8)	6.9	0.408	X
NORTH FRONTAL FAULT ZONE (West)	61.9(99.6)	7.0	0.061	VI
PALOS VERDES	17.6(28.3)	7.1	0.138	VIII
RAYMOND	51.1(82.3)	6.5	0.054	VI
ROSE CANYON	28.3(45.6)	6.9	0.086	VII
SAN ANDREAS - 1857 Rupture	59.5(95.8)	7.8	0.078	VII
SAN ANDREAS - Mojave	59.5(95.8)	7.1	0.054	VI
SAN ANDREAS - San Bernardino	56.3(90.6)	7.3	0.063	VI
SAN ANDREAS - Southern	56.3(90.6)	7.4	0.066	VI
SAN JACINTO-ANZA	49.6(79.9)	7.2	0.066	VI
SAN JACINTO-SAN BERNARDINO	46.6(75.0)	6.7	0.053	VI
SAN JACINTO-SAN JACINTO VALLEY	46.4(74.6)	6.9	0.059	VI
SAN JOSE	40.9(65.9)	6.5	0.064	VI
SANTA MONICA	58.7(94.4)	6.6	0.051	VI
SIERRA MADRE	45.6(73.4)	7.0	0.077	VII
VERDUGO	52.8(84.9)	6.7	0.058	VI
WHITTIER	27.3(44.0)	6.8	0.084	VII

****

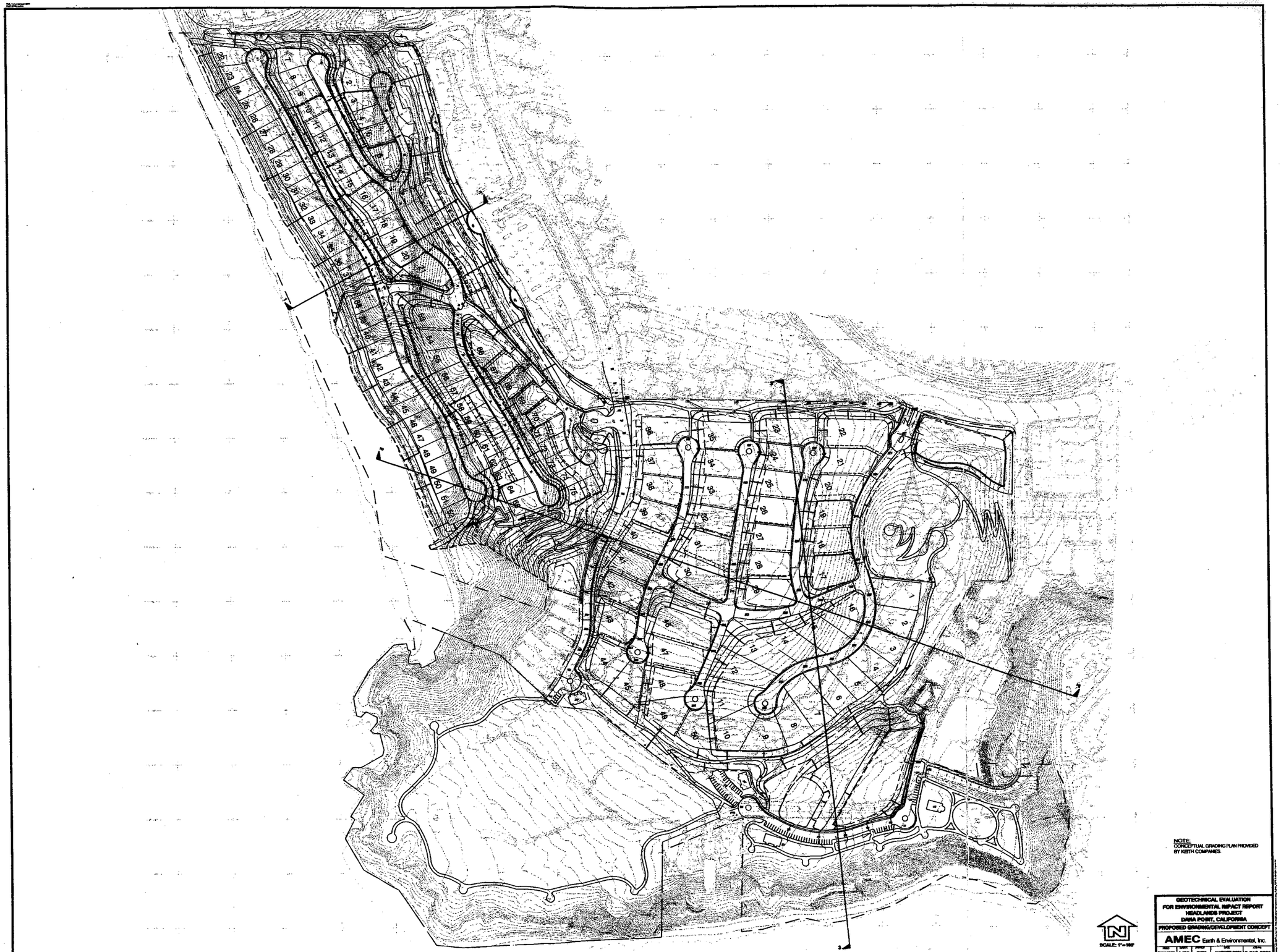
-END OF SEARCH- 30 FAULTS FOUND WITHIN THE SPECIFIED SEARCH RADIUS.

THE NEWPORT-INGLEWOOD (Offshore) FAULT IS CLOSEST TO THE SITE.
IT IS ABOUT 1.7 MILES (2.8 km) AWAY.

LARGEST MAXIMUM-EARTHQUAKE SITE ACCELERATION: 0.4082 g

FIGURES

PLATES



NOTE:
CONCEPTUAL GRADING PLAN PROVIDED BY KEITH COMPANIES.

SCALE: 1"=160'

GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA

PROPOSED GRADING/DEVELOPMENT CONCEPT

AMEC Earth & Environmental, Inc.

STA/STL	LBG	STK	AUGUST 2001 | 9-213-3661

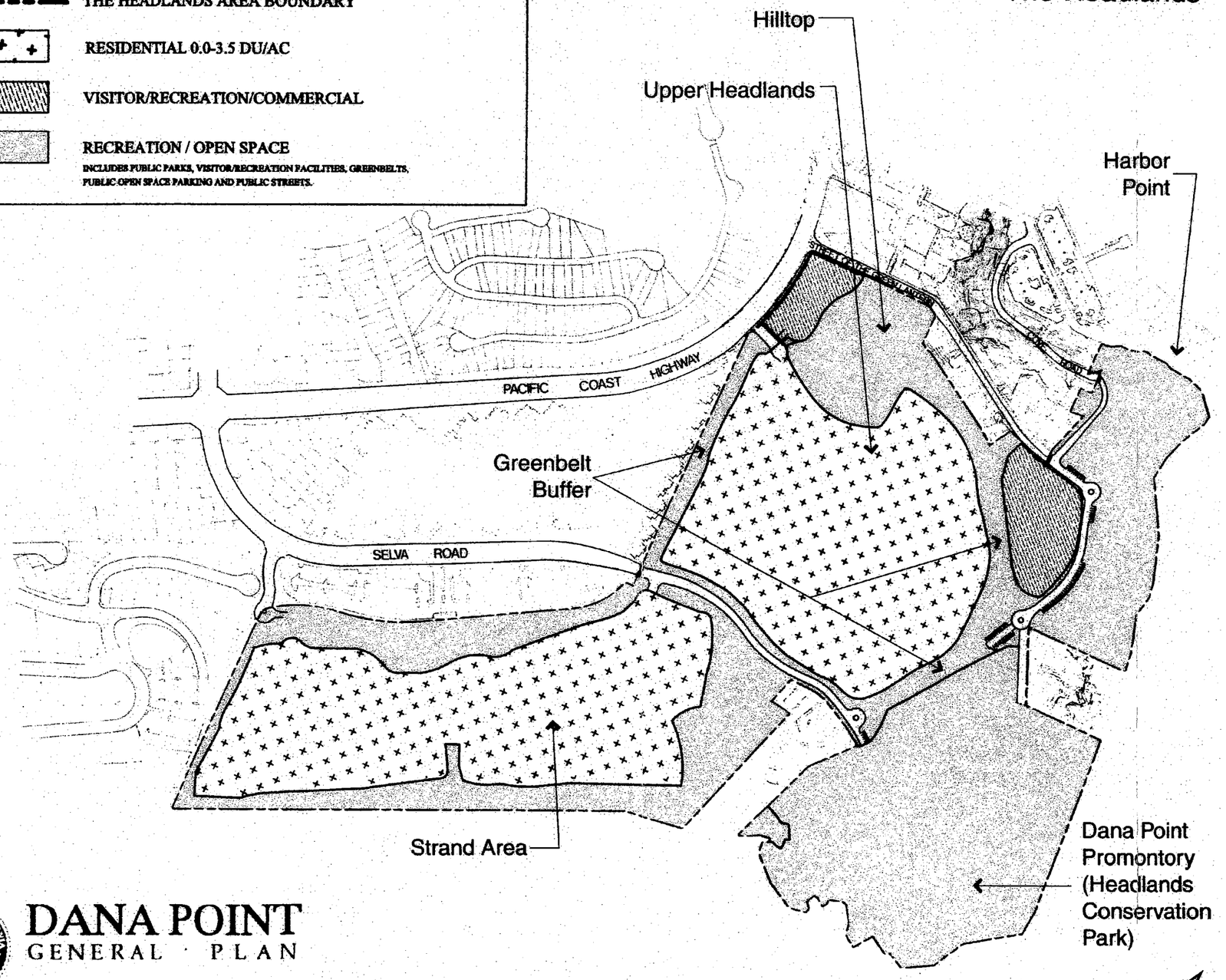
PLATE II

Figure LU-6
The Headlands

LEGEND

- THE HEADLANDS AREA BOUNDARY
- RESIDENTIAL 0.0-3.5 DU/AC
- VISITOR/RECREATION/COMMERCIAL
- RECREATION / OPEN SPACE

INCLUDES PUBLIC PARKS, VISITOR/RECREATION FACILITIES, GREENBELTS, PUBLIC OPEN SPACE PARKING AND PUBLIC STREETS.



DANA POINT
GENERAL PLAN

NOTE: FIGURE LU-6A PROVIDED BY PBR

SCALE: 1"=200'

GEOTECHNICAL EVALUATION FOR ENVIRONMENTAL IMPACT REPORT HEADLANDS PROJECT DANA POINT, CALIFORNIA				
LAND USE PLAN				
AMEC Earth & Environmental, Inc.				
FIELD	DRAFT	APPROV.	DATE	JOB No.
—	LEG	STK	AUGUST 2001	9-212-3061

PLATE 1

September 13, 2001
Job No. 9-212-306100

LSA Associates
One Park Plaza
Suite 500
Irvine, California 92614

Attention: Mr. Rob Balen

Re: Potential Geologic Impacts
Uncontrolled Shoreline Erosion
Environmental Impact Report (EIR)
Headlands Project
Dana Point, California

1 INTRODUCTION

In response to recent inquiries, AMEC Earth & Environmental, Inc. (AMEC) has prepared the following brief summary regarding the necessity of shoreline protection to control erosion at the Strand portion of the project site. Reference is made to a letter prepared by the California Coastal Commission staff entitled "Comments – Notice Of Preparation (NOP), Dana Point Headlands Development and Conservation Plan (HDCP), City of Dana Point, Orange County, SCH #2001071015". Page 7 of the referenced letter indicates the proposed project "should be designed to avoid reliance upon existing, repaired, expanded, or new shoreline protective works", and that "alternatives for removal of any unneeded portions" of the existing revetment should be investigated. The purpose of this letter is to briefly summarize AMEC's opinions regarding the potential geologic impacts of uncontrolled shoreline erosion. Reference is also made to AMEC's geotechnical evaluation report for the EIR dated August 2001, and the associated background geotechnical evaluation reports for the project site.

2 POTENTIAL GEOLOGIC IMPACTS

Geologic conditions comprising the Stand portion of the project site, including evaluations of the existing stability conditions, are summarized in AMEC/AGRA's report dated October 15, 1999 (Job No. 9-212-306100). Approximately 70 percent of the Strand area has been affected by ancient landsliding. The easterly portion of this landslide complex extends several hundred feet into the adjoining Niguel Shores residential tract to the north, which was stabilized by remedial grading in the early 1970's. Analyses of the existing stability conditions indicates that the central and southerly portions of the ancient slide area are marginally stable (i.e. the Factor of Safety is near a value of 1.0, and the forces resisting landslide movement are approximately equal to the forces tending to drive landslide movement). Under these conditions, significant erosion of the toe area along the shoreline could precipitate movement of the landslides. It is anticipated that significant erosion of the shoreline slope would occur if the existing revetment rock is removed or is not adequately maintained. Failure to implement appropriate remedial measures could result in displacement of the landslides, and protection of the shoreline slope from future erosion is considered necessary to maintain the geologic stability of the area.

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www.amec.com

Proposed remedial grading design for the Strand portion of the project site includes redistribution the mass/forces acting on the landslide to a more stable configuration, and installation of subdrain systems to control the groundwater/pore pressure at levels that enhance the stability conditions. Appropriate portions of the landslide deposits will also be removed and replaced as higher strength compacted fill, including reconstruction of the shoreline slopes and improvement of the existing rock revetment to meet the current design standards. Uncontrolled erosion of these slopes, resulting from a failure to install and/or maintain adequate shoreline protection, could ultimately disrupt or damage planned subdrain systems and surface drainage/storm drain systems. Erosion and failure of the shoreline slopes will also compromise the integrity of the proposed remedial earthworks. The long-term geologic impact of uncontrolled shoreline erosion to the proposed project is that the stability of the Strand site would fall below accepted engineering standards and could locally become a hazard to public safety.

3 CLOSURE AND GENERAL CONDITIONS

This report is based on the geotechnical data as described herein, including information obtained from the referenced documents. AMEC Earth & Environmental, inc. should be notified of any pertinent change or discrepancy in the conditions discussed in this report, as additional evaluation of the conclusions and recommendations may be required. This report has not been prepared for use for other projects, or by parties other than LSA Associates, Inc., Headlands Reserve LLC, the City of Dana Point, and their designated representatives. This document may not contain sufficient information for other parties or other purposes. The report has been prepared in accordance with generally accepted geotechnical practices, and makes no other warranties, either express or implied as to the professional advice or data included.

If you have any questions or comments, please contact Scott Kerwin at AMEC's Anaheim office.

Respectfully submitted,

Douglas Dahncke
Senior Engineer
GE 2279 (Expires December 31, 2003)

Scott T. Kerwin
Principal Engineering Geologist
CEG 1267

DD/STK/dc

Encl.: None

c: Mr. Robert Balen, LSA Associates, Inc., Addressee (3)
Mr. Chia-chi Lu, Noble Consultants, Inc. (2)

APPENDIX E

PHASE I ENVIRONMENTAL SITE ASSESSMENT

October 20, 2000

Phase I Environmental Site Assessment
Transaction Screen Report
Headlands Reserve Property
Selva Road and the Street of the Green Lantern
Dana Point, California 92629

Prepared for:

Headlands Reserve LLC
Mr. Kevin Darnall
24849 Del Prado Avenue
Dana Point, CA 92629

Prepared by:

Aqua Science Engineers, Inc.
17895 Sky Park Circle, Suite E
Irvine, CA 92614

AQUA SCIENCE ENGINEERS, INC. ▪ 17895 SKY PARK CIRCLE ▪ SUITE E ▪ IRVINE, CALIFORNIA 92614
TEL (949) 833-3667 ▪ (800) 540-6816 ▪ FAX (949) 833-3468

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1.0 EXECUTIVE SUMMARY

On-Site

Based upon the site reconnaissance, an aerial photograph review, historical map reviews, file reviews, Vista report review, and an interview with Mr. Kevin Darnall, ASE identified the following environmental concerns on the subject property:

- A cinder-block wall secondary enclosure system for an above-ground storage tank (AST) for waste oil is heavily stained with waste oil (see Sections 6.2 and 6.6 for details).
- The subject property contains two electric transformers and five high-voltage switches located inside the former laundry room ("High Voltage" locked room) and office trailer enclosure that may contain polychlorinated biphenyls (PCBs) (see Section 6.4 for details).
- Materials used for the construction of existing buildings and former trailer park building structures on the subject property could contain asbestos (see Section 6.5 for details).
- A nursery that operated on part of the subject property could have used pesticides and/or herbicides that could have impacted the subsurface soils on the subject property (see Section 6.8 for details).
- Several 55-gallon steel drums containing greasy substance were observed lying on the ground on the extreme southern portion of the subject property within the former nursery area.

Off-Site

Based upon the site reconnaissance, aerial photograph reviews, historical map reviews, file reviews, business directory reviews, and the Vista report review, ASE did not identify any environmental concerns in connection to the subject property from off-site sources at this time.

2.0 INTRODUCTION

2.1 Purpose

The objective of this Transaction Screen Report (TSR) is to identify, to the extent feasibly possible, recognized environmental conditions in connection with the subject property. This Transaction Screen contains four major components (1) records review; (2) site reconnaissance; (3) interviews with property owners; and (4) reporting. This TSR has been prepared using the guidelines within the American Society for Testing and Materials (ASTM) Designation: E 1528-00.

2.2 Special Terms and Conditions

No special terms or conditions were made between Aqua Science Engineers, Inc. (ASE) and Headlands Reserve LLC for this report. This TSR was produced by ASE to be within the scope of the American Society for Testing and Materials (ASTM) *Standard Practice for Environmental Assessment: Transaction Screen Process* document (Designation: E 1528-00).

2.3 Limitations and Exceptions of Assessment

As noted in the ASTM E 1528-00 Standard Practice document, it is up to the environmental professional conducting the Transaction Screen to determine the content of the report. Therefore, ASE, with extensive experience in conducting TSRs, has strategically designed this TSR to provide a site-specific evaluation of the environmental conditions affecting the subject property. This TSR has been prepared for use solely by Headlands Reserve LLC. This report shall not be relied upon by or transferred to any other party, or used for any other purpose, without the express written authorization Headlands Reserve LLC and ASE.

3.0 SITE DESCRIPTION

3.1 Location and Description

The subject property is an approximately 121-acre, irregular-shaped, coastal land consisting of a former trailer park and nursery area. . The former nursery is located at 34352 Dana Strand Road located west of Green Lantern Street in Dana Point, California 92629. The former trailer park is located west, and accessible from Selva Road. The former nursery and service building can be accessible from Pacific Coast Highway and Green Lantern Street, located at approximately 1,200 feet west of the intersection of Pacific Coast Highway and Green Lantern Street and approximately 0.25 miles north of the Dana Point Harbor.

The subject property is located in Township 8 South, Range 8 West in Section 21, and the western quarter of Section 22. See Appendix A for Maps and Figures.

3.2 Description of Structures, Roads, and Improvements

On October 10, 2000, ASE environmental assessor Henry Nakayama conducted a site reconnaissance for the subject property, which indicated that the subject property has the following structures, roads, and improvements:

- Asphalt-paved roads and parking lots, club house, backfilled swimming pool, tennis courts, electrical power room, six-car garage, office and cabana are located within the former trailer park facility on the northern 50 acres of the subject property.
- The asphalt-paved Dana Strand Road extends approximately 2,400 feet south from Selva Road at the northern end of the subject property to the asphalt-paved Marguerita Avenue.
- Marguerita Avenue extends approximately 800 feet southeast from the southern end of Dana Strand Road to the asphalt-paved Scenic Drive
- Scenic Drive extends approximately 500 feet west from the southeastern end of Marguerita Avenue to the intersection of Green Lantern Street and Cove Road.
- Three rectangular-shaped green houses, a long service building for storage and several small offices for tenants, a rectangular-shaped concrete paved area, several small wooden sheds, and a 300-gallon waste oil AST, which is enclosed within a cinder-block wall secondary containment system.
- The areas of the subject property located southwest of Marguerita Avenue and south of Scenic Drive were not inspected, because ASE was not granted access to those areas.

3.3 Information Regarding Environmental Liens

No environmental liens for the subject property were identified during the preparation of this TSR.

3.4 Current Use of Property

The subject property is currently being used for the following:

- The northern part of the subject property is an abandoned, inaccessible trailer park consisting of a clubhouse, high voltage electrical room, an office building, a six-car garage and a cabana building structure.
- Most of the southern part of the subject property consists of undeveloped lands and cliffs.
- A former nursery, currently used for miscellaneous storage within three greenhouses, service building, truck and heavy equipment maintenance, construction, lumber and plumbing equipment storage sheds, concrete and masonry area, lobster trap storage area and temporary waste oil AST.

3.5 Former Uses and History of Property

Based on site reconnaissance, aerial photograph reviews, historical map reviews, file reviews, and business directory reviews, the subject property had the following uses:

- Undeveloped vacant land from at least 1924 until Scenic Drive and a few small dwellings were constructed on the southern part of the subject property sometime prior to 1931.
- Some unpaved roads were constructed on the southern part of the subject property between 1931 and 1946.
- In 1957, a trailer park and Dana Strand Road were constructed on the northern part of the subject property. The trailer park operated on the subject property until sometime between 1989 and 1991, when it was abandoned.
- Marguerita Avenue was constructed by the mid 1960s.
- During the 1960s Chandler-Sherman Corporation owned the subject property.
- In 1967 and 1968, three large green houses, a shade house, and a service building were constructed for an approximately ten-acre nursery that operated on the subject property from 1968 until sometime between 1986 and 1989. The building permits indicated that the green houses and the shade house (60 feet by 140 feet) were being used for growing grounds and plant propagation.
- The green houses, service building, the concrete pad for the former shade house, some small wooden sheds and the area in the vicinity of the green houses and service building have been used for miscellaneous storage and equipment maintenance from the mid-1980s to the present.
- In 1998, approximately twenty (20) one-cubic yard stockpiled soils were identified along the northeastern side of Marguerita Avenue. The soil stockpiles originated from several sources. It was unknown whether or not the soil stockpiles contained hazardous waste or hazardous materials.

3.5.1 Rationale

The purpose of the historical review is to obtain Sanborn Fire Insurance Maps, Historical USGS Topographic Maps, and/or other related historical documents that will assist in the identification

of recognized environmental conditions in connection with the subject property. The objective of consulting historical sources is to develop a history of the property and surrounding area, in order to help identify the likelihood of past uses having led to recognized environmental conditions in connection with the property. The following are recommended sources/databases used to investigate the history of the subject property.

3.5.2 Historical Maps Review (Sanborn Fire Insurance and USGS)

Sanborn Fire Insurance Maps were not reviewed for this report, because the maps would not be available for the subject property.

The 1946, 1967, and 1975 Dana Point Quadrangle USGS topographic maps were reviewed for the subject property.

1946

No structures or roads existed on the northern part of the subject property. Some unpaved roads existed on the southern part of the subject property. Scenic Drive extended west from Cove Road to near the southwestern property corner. Two small buildings existed at the western end of Golden Lantern Street. All of the surrounding areas were vacant, undeveloped lands.

1967

A trailer park occupied most of the northern part of the subject property. Several dwellings existed on the western side of the southern end of Dana Strand Road. A few dwellings existed on the southern side of Scenic Drive west of Marguerita Avenue.

1975

Three green houses were constructed near the middle of the subject property east of Dana Strand Road. Numerous roads and dwellings were constructed north and northeast of the subject property. Dana Point Harbor was constructed southeast of the subject property.

3.5.3 Building Permit Review

On October 19, 2000, ASE reviewed available building permits with the City of Dana Point for the address of 34352 Dana Strand Road, the former nursery that occupied the subject property. The review of the building permits made available by microfiche indicated the following:

- 1967-1968: Two 1,470 square-foot green houses, two 2,800 square-foot green houses, a 3,625 square-foot single-story service building for office and storage, and a 8,400 square-foot shade house were constructed for the Chandler-Sherman Corporation.
- 1967: A grading permit indicated that 3,630 cubic yards of soil were cut and that 3,260 cubic yards of soil were filled for the Chandler-Sherman Corporation for the construction of the green houses.
- Several plumbing and electrical permits were purged for the service building and nursery.

4.0 SURROUNDING PROPERTIES

4.1 Description

A general description of the usage of surrounding and/or adjoining properties is determined by the environmental professional during the site visit, through interviews or from the records review. This is performed to help identify recognized environmental concerns that may have the potential to impact the subject property.

4.1.1 Current Uses of Adjoining Properties and Surrounding Areas

Adjoining properties to subject property are being used for the following:

- North and northeast are tracts of single-family dwellings (Chelsea Point), apartment buildings, and condominiums occupied by Niguel Beach Terrace and Cape Cove.
- East of the northern part of the subject property to the western side of Selva Road is an Orange County public parking lot used by Salt Creek Park.
- East of Green Lantern Street is a strip center and several restaurants.
- East of the southeastern corner of the subject property is Dana Cove Park and the Marine Studies Institute.
- Several apartment buildings and condominiums, which are not part of the subject property, are located in the middle of the western part of the subject property.
- Several single-family dwellings, which are not part of the subject property, are located in the middle of the southern part of the subject property.
- South, southwest, west, and northwest is the Pacific Ocean.

The surrounding areas to the subject property are being used for: single-family dwellings, condominiums, apartment buildings, a commercial district, Dana Point Harbor, and beaches.

4.1.2 Former Uses of Adjoining Properties and Surrounding Areas

Based on site reconnaissance, aerial photograph reviews, historical map reviews, file reviews, and business directory reviews, the adjoining properties and the surrounding areas had the following uses:

- All of the adjoining properties and surrounding areas were undeveloped vacant lands from at least 1924 until Pacific Coast Highway was constructed east and north of the subject property and Santa Clara Road was constructed east of the subject property sometime prior to 1931.
- Apartment buildings that exist on the western side of the southern end of Dana Strand Road, single-family dwellings that exist at the western end of Scenic Drive, and single-family homes that exist on the western side of Golden Lantern Street were constructed during the early 1960s.
- Tracts of single-family dwellings, apartment buildings, and condominiums were constructed north, northeast, and east of the subject property from the early 1970s through the mid 1990s.

5.0 REGULATORY REVIEW

5.1 Purpose

The purpose of the regulatory review is to obtain and review regulatory agency records that will assist in the identification of recognized environmental conditions in connection with the subject property and neighboring properties within a one-mile radius. The regulatory review also includes visiting or contacting local regulatory agency representatives for interviews regarding the subject property or surrounding properties. The regulatory review is split into two major components (1) federal and (2) state. The following are recommended sources/databases used to investigate the regulatory issues of the subject property and surrounding properties. The following information is based on a report supplied to ASE by Vista Information Solutions, Inc. (VISTA). See Appendix D for a copy of the VISTA report and drawings.

5.2 Federal

5.2.1 The National Priorities List (NPL)

No NPL sites were identified within approximately one mile of the subject property.

5.2.2 Comprehensive Environmental Response Conservation and Liability Act (CERCLA)

No CERCLA sites were identified within approximately ½ mile of the subject property.

5.2.3 Resource, Conservation and Recovery Act (RCRA)

No RCRA corrective actions (CORRACTS) sites were identified within approximately 1-mile of the subject property.

No RCRA permitted treatment, storage, or disposal (TSD) facilities were identified within approximately 1/2 mile of the subject property.

No RCRA violations/enforcement actions were identified within approximately 1/4 mile of the subject property.

No RCRA hazardous waste generators were identified within approximately 1/8 mile of the subject property.

5.2.4 Emergency Response Notification System (ERNS)

No ERNS sites were identified within approximately 1/8 mile of the subject property.

5.2.5 Toxic Release Inventory Database (TRIS)

No TRIS sites were identified within approximately 1/4 mile of the subject property.

5.3 State

5.3.1 State Equivalent CERCLIS List (SCL)

No SCL sites were identified within approximately 1/2 mile of the subject property.

5.3.2 State Equivalent Priority List (SPL)

No SPL sites were identified within approximately one mile of the subject property.

5.3.3 State Permitted Solid Waste Landfills, Incinerators, or Transfer Stations (SWLF)

No SWLF sites were identified within approximately 1/2 mile of the subject property.

5.3.4 Leaking Underground Storage Tank List (LUST)

No LUST sites were identified within approximately 1/2 mile of the subject property.

5.3.5 CORTESE

No CORTESE sites were identified within approximately 1/2 mile of the subject property.

5.3.6 Registered Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs)

No registered USTs or ASTs were identified within 1/4 mile of the subject property.

6.0 SITE RECONNAISSANCE AND INTERVIEWS

6.1 Hazardous Substances/Materials Usage, Storage, and Disposal

The use, storage, or disposal of hazardous substances or materials were identified on the subject property. Several 55-gallon steel drums containing a grease substance were observed laying on the ground on the extreme southern portion of the former nursery area. According to Mr. Jo Jo Marinas, the drummed substance is currently used by the lobster fishermen to coat the galvanized steel lobster cages/traps to prevent oxidation.

6.2 Hazardous Waste Storage and Disposal

An approximately 300-gallon waste oil AST was identified on the former nursery property. The AST was enclosed within a low cinder-block secondary containment system. Based on ASEs Phase I ESA report, no file records exist with the Orange County Fire Authority to determine whether the AST is in regulatory compliance or not.

6.3 Underground Storage Tanks (USTs) and Aboveground Storage Tanks (ASTs)

A 300-gallon waste oil AST was identified on the former nursery property as indicated above in Section 6.2.

No USTs were identified on the subject property.

6.4 Identification of Polychlorinated Biphenyls (PCBs)

On October 10, 2000, ASE personnel conducted a site reconnaissance with Ms. Erin Moore with Superior Special Services (SSS) inspected the locked or inaccessible buildings located throughout the former trailer park area previously identified in ASEs Phase I ESA report. SSS and ASE observed five (5) oil-filled wall mounted high-voltage switches and two (2) floor mounted electrical transformers. Appendix E contains the Transformer PCB Certification Form prepared by SSS. One operating electrical transformer and three of the five switches were located inside the single-story building located near the northern property border in the former trailer park with a posted sign that indicated "Danger High Voltage" room. The other 2 switches and transformer were located within the rear of the office single story building wooden located within the former trailer park. Identification plates mounted on the high-voltage switches dated 1956, indicated that the switches contained an oily fluid, potentially PCBs.

The former clubhouse and cabana were inspected and no equipment was identified which may contain potential PCBs.

The former nursery contains two transformers which are mounted on a utility pole located southwest of the service building. Based on conversation with SD G & E personnel it is highly unlikely that the transformers contain PCBs. Any PCBs that may be contained by the transformers is not an environmental concern unless it is released. No leaks or stains were identified on the overhead transformers which appeared to be in good condition.

6.5 Identification of Asbestos Containing Materials (ACMs)

Asbestos containing materials (ACMs) are not an environmental concern unless they are damaged or friable. It is assumed that materials of construction used after 1985 should not contain asbestos. The four existing buildings of the former trailer park were constructed during the late 1950s. The existing service building of the former nursery was constructed during the early 1960s. Therefore, materials used for the construction of the existing buildings on the subject property could contain ACMs including materials used for covering the roofs, ceilings, walls, and floors, except for any carpeting. Insulating materials and mastics used in the construction of the buildings could also contain ACMs.

The roofs of the four buildings of the former trailer park experienced severe weather damage. The roof the service building of the former nursery appeared to be in fair condition.

6.6 Surface Staining and Distressed Vegetation

Heavy dark staining was observed in two areas located within the former nursery property.

- Waste oil staining from spilled waste oil was observed on the interior concrete surface of the 300-gallon waste oil AST secondary containment area located north of the green houses. It is unknown whether or not any of the waste oil has impacted the soil beneath the secondary containment system.
- Molygrease surface staining was observed adjacent to the 55-gallon drums south of the greenhouses. The molygrease substance was used to coat the lobster traps.

Distressed vegetation was not identified on the subject property.

6.7 Summary of Interviews

On October 10, 2000, ASE environmental assessor Anthony Lizzi interviewed Mr. Kevin Darnall and Mr. Jo Jo Marinas (security guard for the property) concerning the past and current uses of the subject property. Mr. Marinas indicated the following:

- The former nursery area is currently used by several occupants to store plumbing, concrete and masonry equipment, construction and lumber area, sand and gravel trucking, trap storage for lobster fisherman, and three greenhouses.

- According to Mr. Kevin Darnall, the former nursery was previously leased by Sherman Gardens, located in Corona Del Mar, California, as a growing ground for botanical research.
- According to Mr. Marinas, several 55-gallon steel drums containing a greasy oil substance within the former nursery area are currently used by the lobster fishermen to coat the galvanized steel lobster traps in preventing oxidation.
- The waste oil AST is currently used by the tenants for maintenance purposes.
- Mr. Marinas was unaware of the 20 stockpiled soils measuring approximately one cubic yard formerly identified along the northeastern side of Marguerita Avenue in 1998.
- All of the buildings for the former trailer park were used for recreational purposes and are no longer in use. The six-car garage located within the former trailer park is currently vacant.

6.8 Summary of Environmental Questionnaire

On October 12, 2000, a Transaction Screen (TS) Questionnaire was completed by Mr. Kevin Darnall, the contact person for the subject property. Appendix F contains a copy of the TS Questionnaire. Based on the contents of the TS questionnaire, he indicated the following:

- No ASTs or USTs were ever identified on the subject property.
- No stained soil was ever been observed on the property.
- No hazardous wastes or materials were ever stored, used, or disposed of at the subject property.
- No fill dirt has ever been brought on to the subject property which originated from contaminated site or that is of an unknown origin.

6.9 Other Conditions of Concern

The nursery operated on an approximately 20-acre parcel of the subject property from the spring of 1967 to the late 1980s located at 34352 Dana Strand Road in Dana Point, California. In the early to late 1970's, the Dana Strand nursery (observed in aerial photograph dated April 17, 1978) was leased by the Sherman Company. Per conversation with Mr. Wade Roberts, the director of Sherman Gardens, located in Corona Del Mar, California, the nursery was previously leased as a growing ground and botanical research for trees, shrubs, plants and flowers. According to Mr. Roberts, herbicides were not used since the weeds and herbs were mechanically or manually removed from the nursery. Pesticides such as malathion, lindane and kelphane were mainly applied to the smaller container plants located within the three greenhouses. In the early 1980's, Weyerhauser Corporation was occupying the nursery. Pesticides and /or herbicides may have been used by Weyerhauser. Chlorinated pesticides and herbicides are constituents listed with the U.S. EPA, which are generally considered hazardous materials which may impact the subsurface soils of the subject property.

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 Subject Site

Based upon the site reconnaissance, aerial photograph reviews, historical map reviews, file reviews, Vista report review, and an interview, ASE identified the following environmental concerns on the subject property:

- A cinder-block wall secondary enclosure system for an aboveground storage tank (AST) for waste oil is heavily stained with waste oil. During removal of the AST and concrete pad, the soils should be inspected for any discoloration or staining.

- Heavy dark greasy stains were observed on the ground surface adjacent to the 55-gallon drums located south of the greenhouses used for lobster trap coating. During removal of the drums, the underlying soils should be inspected for any deeper discoloration or staining. The empty drums should be properly disposed of at a permitted disposal facility.

- The subject property contains two surface mounted electric transformers and five high-voltage switches located inside the "High Voltage" electrical room and office building enclosure that may contain PCBs. The switches were observed to be leaking with fluids. The switches and transformers should be removed by experienced professionals.

- Materials used for the construction of existing buildings and former trailer park building structures on the subject property could contain asbestos. An asbestos survey is recommended prior to demolition activities of the existing wooden structures within the former trailer park. Care should be taken during the demolition where airborne particles could be released into the atmosphere.

- A nursery that operated on part of the subject property by several tenants could have used pesticides and/or herbicides that could have impacted the subsurface soils. Following remedial grading of the former nursery, ten representative surface soil samples should be collected at approximately one-foot BGS for chlorinated pesticides and herbicides analysis (which are listed in the US EPA Region IX Preliminary Remediation Goals) to confirm whether the subsurface soils have been impacted with pesticide/herbicide residues.

7.2 Off-Site

Based upon the site reconnaissance, aerial photograph reviews, historical map reviews, file reviews, business directory reviews, and the Vista report review, ASE did not identify any environmental concerns in connection to the subject property from off-site sources at this time.

8.0 REPORT LIMITATIONS

The findings and analysis contained in this TSR have been prepared by the professional staff of ASE in accordance with generally accepted professional practices and from the guidance within the standard practice of ASTM E 1528-00.

Some of the information provided in this TSR is based upon personal interviews and research of available documents, records, and maps held by appropriate government and private agencies. This is subject to the limitations of the historical documentation, availability, and accuracy of pertinent records and the recollection of those persons contacted and interviewed. The information contained in this report has received appropriate technical and peer review. The findings and analysis representing professional judgments are based upon the investigations conducted and the reviews and interpretations of such data based on our experience and expertise according to the existing standard. No warranty or guarantee is expressed or implied. The scope of services within this TSR did not include sample collection and/or analysis for hazardous materials. In addition, it did not include a property title search, testing for asbestos, testing for lead, radon evaluation, or seismic risk evaluation.

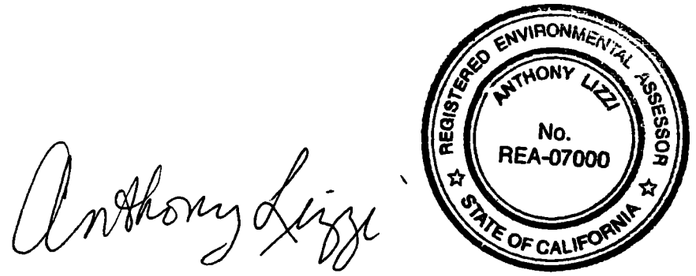
The findings and analysis set forth in this report are strictly limited in time and scope to the date of the evaluation(s), and for the sole use of our client.

9.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONAL(S)

Aqua Science Engineers, Inc. appreciates the opportunity to have prepared this TSR for our client. Should any questions or comments arise, please feel free to call us at (949) 833-3667.

Respectfully submitted,

ASE ENVIRONMENTAL



Anthony Lizzi, B.S., R.E.A.
Senior Project Manager

APPENDICES

APPENDIX A

Figures

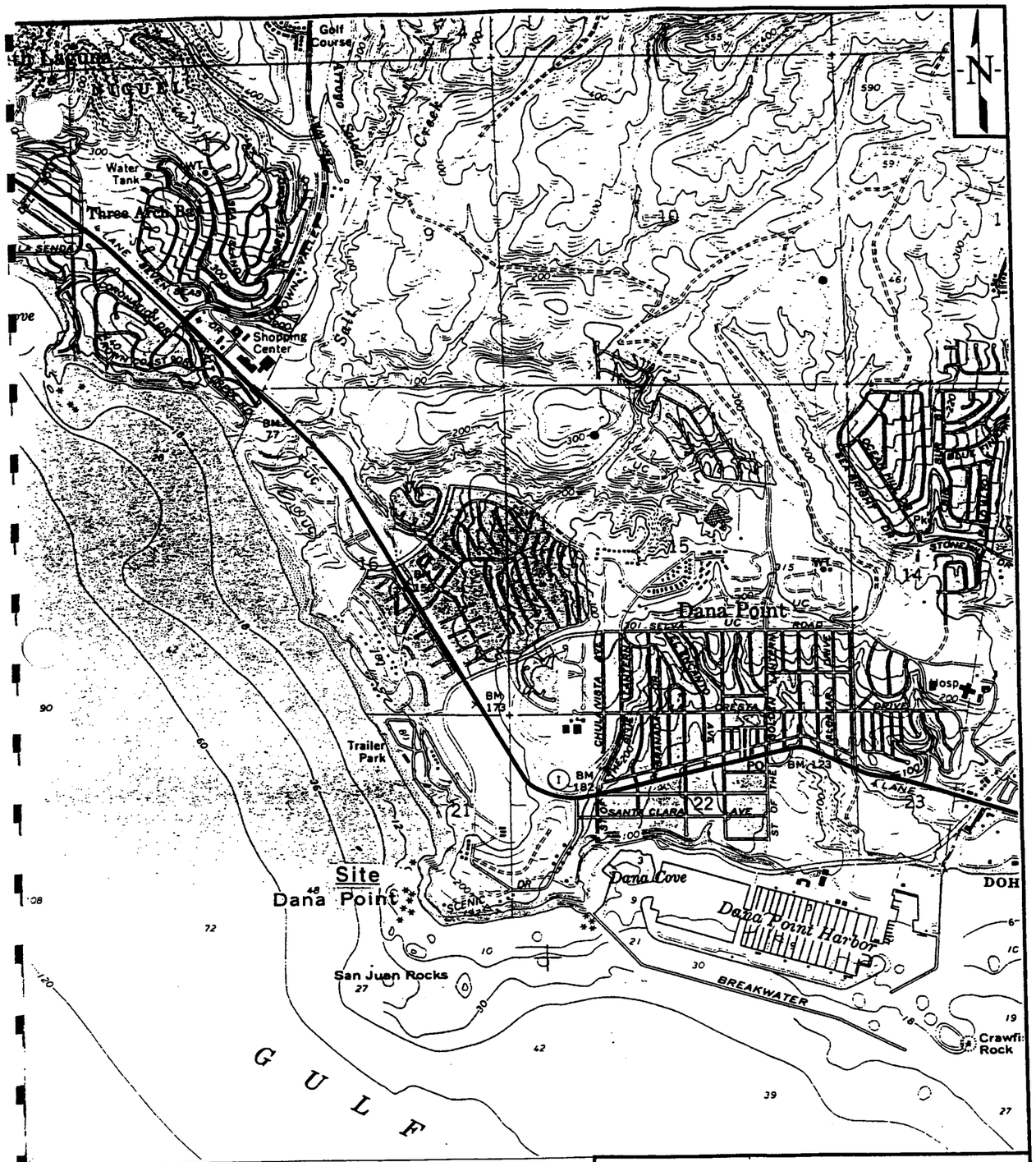
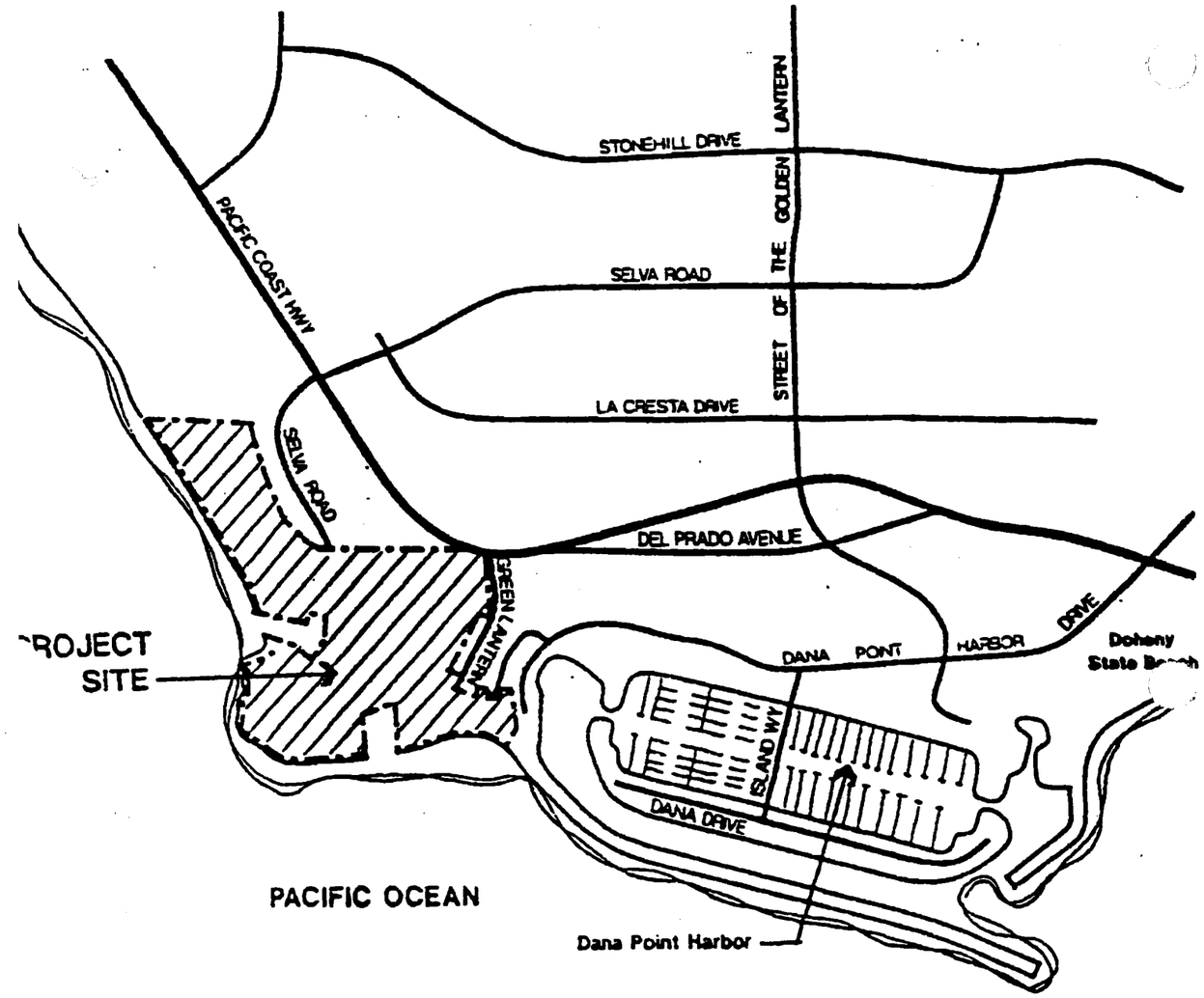


FIGURE: 1
U.S.G.S. TOPOGRAPHIC SITE LOCATION MAP
HEADLANDS PROPERTY
SELVA ROAD/STREET OF THE GREEN LANTERN
DANA POINT, CALIFORNIA 92629
AQUA SCIENCE ENGINEERS, INC.



DANA POINT HEADLANDS

EXPLANATION OF MAP SYMBOLS:

- APPROXIMATE DEPTH OF PROPOSED CUT FROM EXISTING TO PLANNED GRADES
- APPROXIMATE DEPTH OR THICKNESS OF PROPOSED FILL FROM EXISTING TO PLANNED GRADES
- APPROXIMATE DEPTH OR THICKNESS OF PROPOSED REMEDIAL GRADING BELOW PLANNED GRADES (i.e. DEPTH OF REMOVAL AND REPLACEMENT AS COMPACTED FILL)

NOTE:
CONCEPTUAL GRADING PLAN PROVIDED BY KEITH COMPANIES.

SCALE: 1"=100'

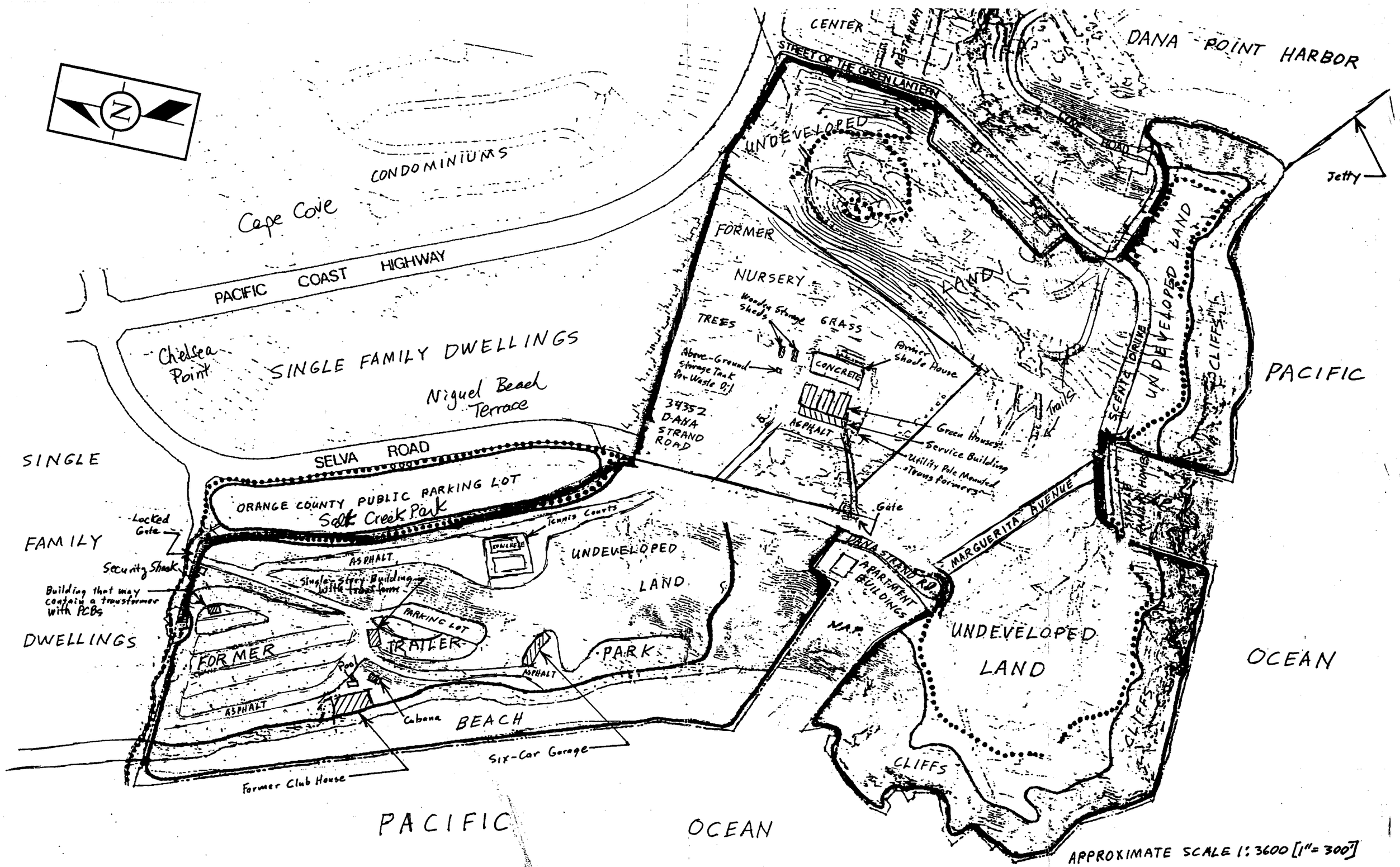
GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA

APPROXIMATE EXTENT OF CUT & FILL

AMEC Earth & Environmental, Inc.

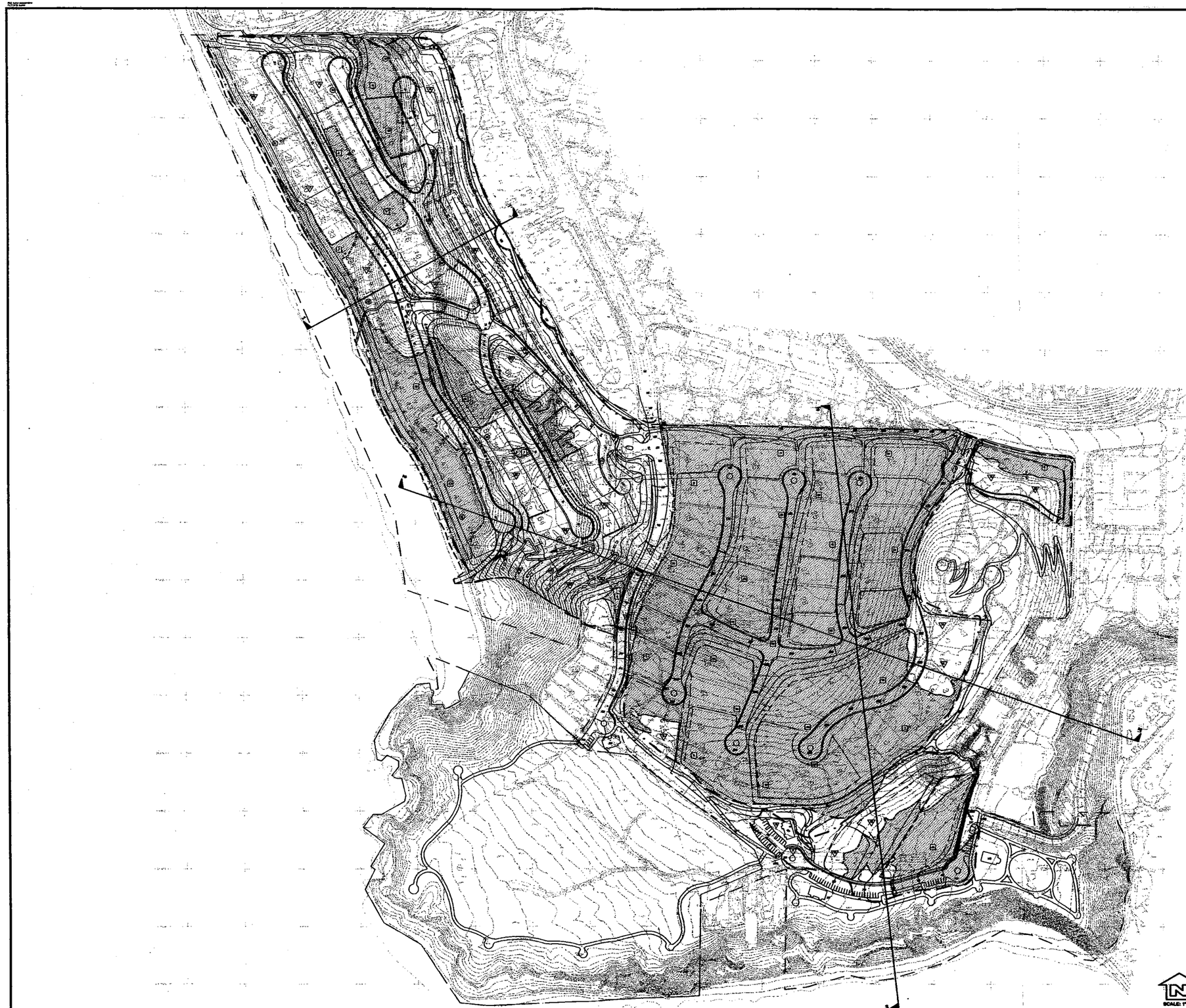
Work	Drawn	Check	Date	Job No.
SW/VDTL	LEG	STK	AUGUST 2001	9-212-3691

PLATE III



APPROXIMATE SCALE 1: 3600 [1" = 300']

Revised: Oct. 20, 2000 by Aqua Science Engineers


EXPLANATION OF MAP SYMBOLS
APPROXIMATE DEPTH OF PROPOSED CUT FROM EXISTING TO PLANNED GRADES
APPROXIMATE DEPTH OR THICKNESS OF PROPOSED FILL FROM EXISTING TO PLANNED GRADES
APPROXIMATE DEPTH OR THICKNESS OF PROPOSED REMEDIAL GRADING BELOW PLANNED GRADES (i.e. DEPTH OF REMOVAL AND REPLACEMENT AS COMPACTED FILL)
NOTE:
CONCEPTUAL GRADING PLAN PROVIDED BY KEITH COMPANIES.
SCALE: 1"=100'
GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA
APPROXIMATE EXTENT OF CUT & FILL
AMEC Earth & Environmental, Inc.
PROJ STR/GTL
DSGN LEG
DRAWN STK
CHK'D
DATE AUGUST 2001
JOB NO. 9-212-2691
PLATE III

EXPLANATION OF MAP SYMBOLS

- CONTACT, EXPOSED OR WELL LOCATED
- CONTACT, APPROXIMATELY LOCATED
- CONTACT, INFERRED; QUERIED WHERE UNCERTAIN
- CONTACT, BURIED/PROJECTED BENEATH OTHER MAP UNIT
- FAULT, DASHED WHERE APPROXIMATE, DOTTED WHERE BURIED, SHOWING DIP
- INFERRED LARGE SCALE SYNCLINAL FOLD AXIS, SHOWING PLUNGE DIRECTION
- STRIKE AND DIP OF BEDDING
- STRIKE AND DIP, SUBSURFACE OR BURIED
- STRIKE AND DIP OF JOINT
- VERTICAL JOINT
- B-301 BORING LOCATION-2000 EXPLORATION PROGRAM (COMPILED IN AMEC/AGRA 2/21/00 REPORT)
- B-205 BORING LOCATION-1998 EXPLORATION PROGRAM (COMPILED IN AMEC/AGRA 10/15/98 REPORT)
- B-101 BORING LOCATION-1987-88 EXPLORATION PROGRAM (COMPILED IN AMEC/AGRA 10/15/98 REPORT)
- B-2 BORING LOCATION-1984 EXPLORATION PROGRAM (COMPILED IN AMEC/AGRA 10/15/98 REPORT)
- **afc** COMPACTED FILL WITH APPROPRIATE DOCUMENTATION
- **af** UNDOCUMENTED ARTIFICIAL FILL
- **Qta** TALUS DEPOSITS
- **Qbd** BEACH DEPOSITS
- **Qeo** EOLIAN DEPOSITS
- **Qls** LANDSLIDE DEPOSITS
- **Qtm** TERRACE DEPOSITS, MARINE
- **Tc** CAPISTRANO FORMATION
- **Tm** MONTEREY FORMATION
- **Tso_{ss}** SAN ONOFRE BRECCIA (SANDY FACIES)
- **Tso** SAN ONOFRE BRECCIA
- **Tms** MAP SYMBOL OF COVERED OR BURIED MAP UNIT
- BULK SAMPLE LOCATION
- TOP OF BLUFF (SEE AMEC/AGRA 2/21/00)

SCALE: 1"=100'

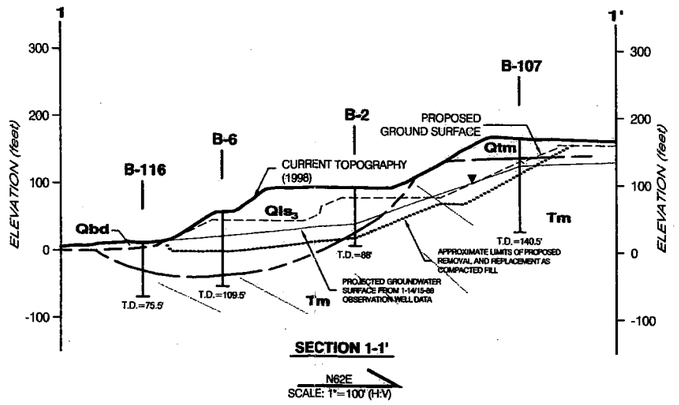
GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA

GEOLOGIC MAP

AMEC Earth & Environmental, Inc.

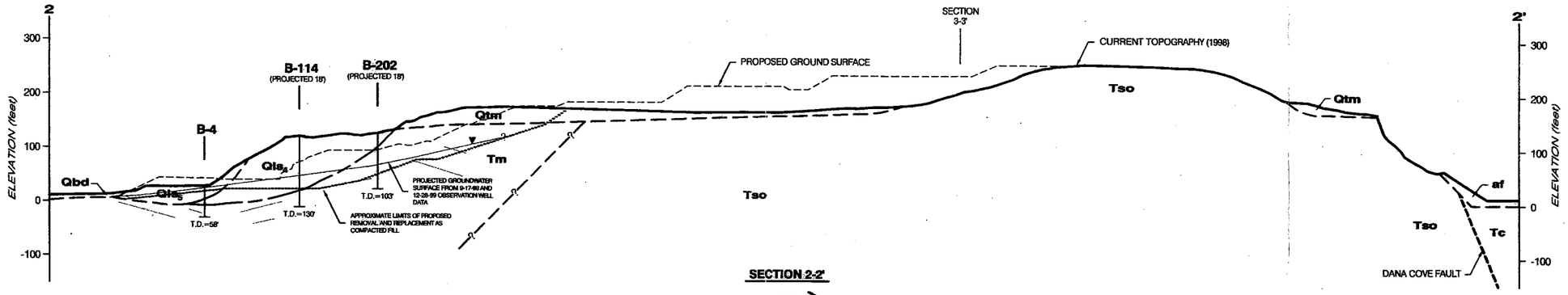
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PLATE IV



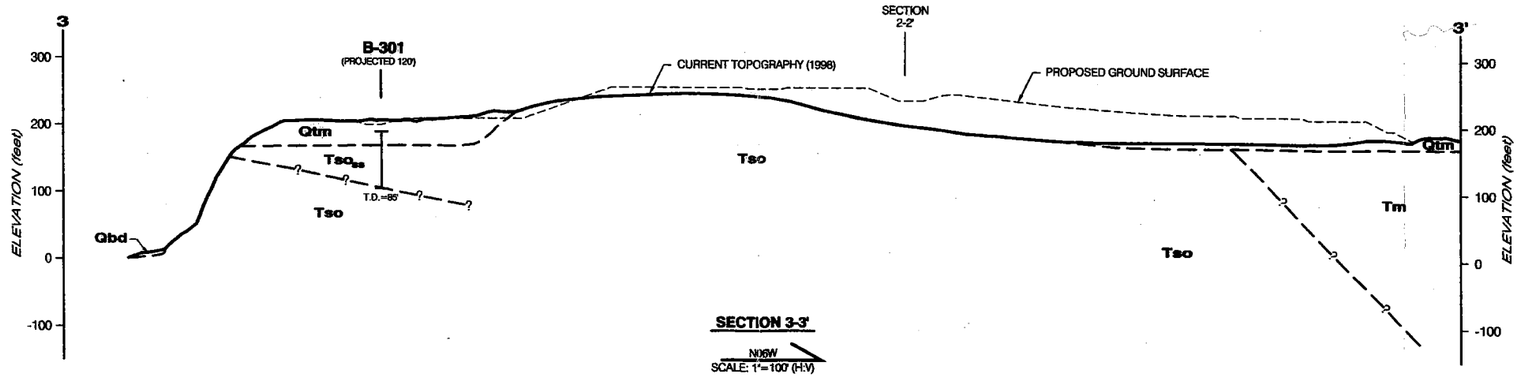
SECTION 1-1'

N62E
SCALE: 1"=100' (H:V)



SECTION 2-2'

N71W
SCALE: 1"=100' (H:V)



SECTION 3-3'

N06W
SCALE: 1"=100' (H:V)

-SEE PLATE IV FOR EXPLANATION OF MAP SYMBOLS-

GEOTECHNICAL EVALUATION
FOR ENVIRONMENTAL IMPACT REPORT
HEADLANDS PROJECT
DANA POINT, CALIFORNIA

GEOLOGIC CROSS SECTIONS

AMEC Earth & Environmental, Inc.

FIELD	DRAFT	APPROV.	DATE	JOB No.
STK/GTL	LEG	STK	AUGUST 2001	9-212-3061

PLATE V

N

CONDOMINIUMS

Cape Cove

PACIFIC COAST HIGHWAY

Chelsea Point

SINGLE FAMILY DWELLINGS

Niguel Beach Terrace

SELVA ROAD

SINGLE FAMILY DWELLINGS

ORANGE COUNTY PUBLIC PARKING LOT

Salt Creek Park

Locked Gate

Security Shack

Building that may contain a transformer with PCBs

Tennis Courts

CONCRETE

ASPHALT

Single-story Building with trash room

PARKING LOT

TRAILER PARK

UNDEVELOPED LAND

FORMER

ASPHALT

Pool

Cabana

BEACH

Six-Car Garage

Former Club House

PACIFIC OCEAN

CENTER

STREET OF THE GREEN LANTERN

RESTAURANT

DANA POINT HARBOR

UNDEVELOPED

COVE ROAD

Jetty

FORMER NURSERY LAND

Wooden Storage Sheds

TREES

GRASS

Above-Ground Storage Tank for Waste Oil

34352 DANA STRAND ROAD

CONCRETE

Former Shade House

ASPHALT

Green Houses

Service Building

Utility Pole Mounted Transformers

Trails

SCENIC DRIVE

UNDEVELOPED LAND

CLIFFS

PACIFIC

Gate

DANA STRAND RD.

MARGUERITA AVENUE

APARTMENT BUILDINGS

MAR

UNDEVELOPED LAND

CLIFFS

OCEAN

APPROXIMATE SCALE 1: 3600 [1" = 300']

Revised: Oct. 20, 2000 by Aqua Science Engineers


N
Site

APPENDIX B

Permits and Licenses
(None were copied for this report)

APPENDIX C

Photographs



Photograph #1
View towards the north of three green houses, a service building of a former nursery located at 34352 Dana Strand Drive, which is being used for storage and equipment maintenance.



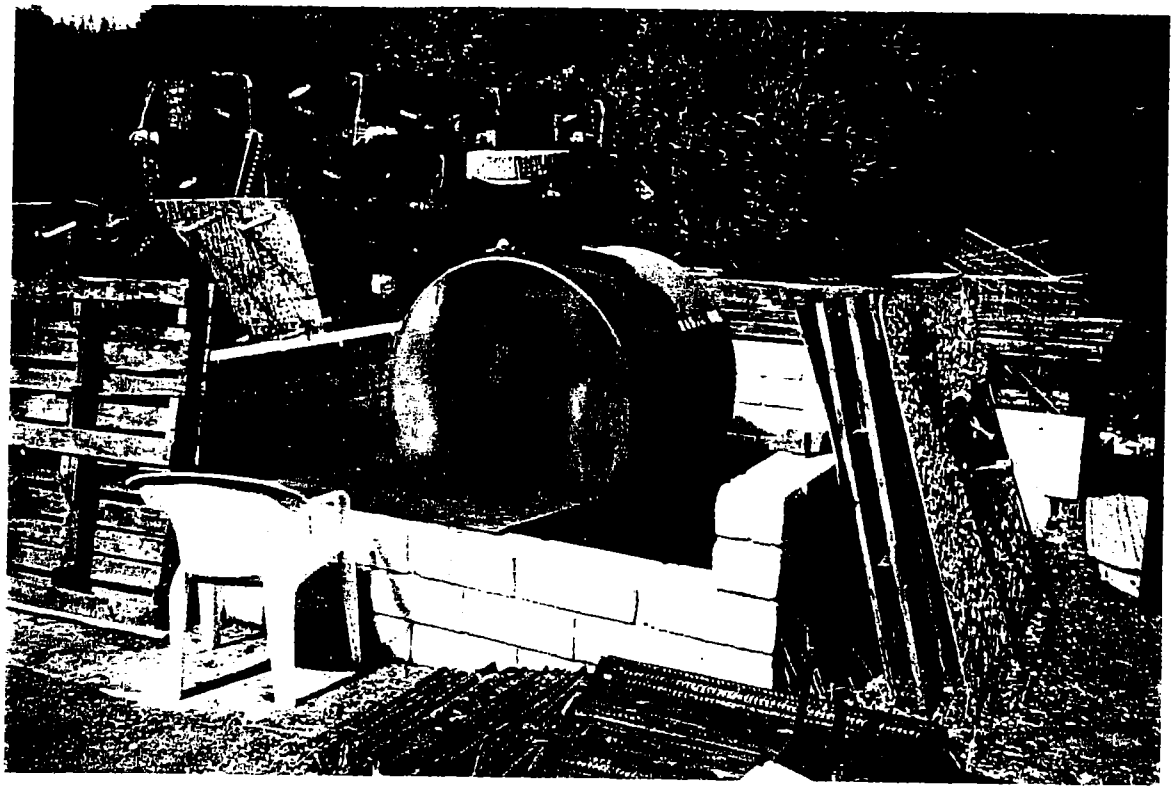
Photograph #2
View towards the east of the entrance of the former nursery showing asphalt paved driveway located at 34352 Dana Strand Drive.



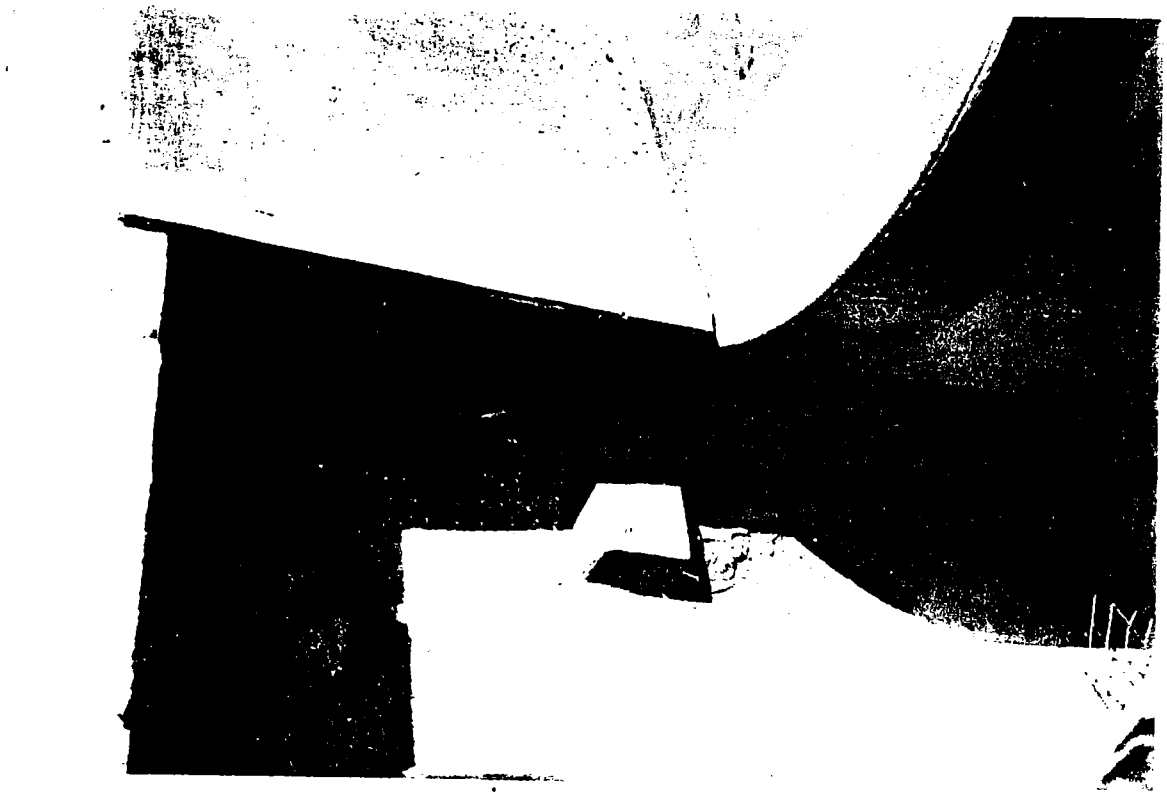
Photograph #3
View towards the south of single-story clubhouse and cabana located on the western side of the approximate northern half of the former trailer park (Note that the roofs, which may contain asbestos, have severe weather damage).



Photograph #4
View towards the south of the former single-story clubhouse office that contained a transformer and switch located at the middle of the northern half of the former trailer park.



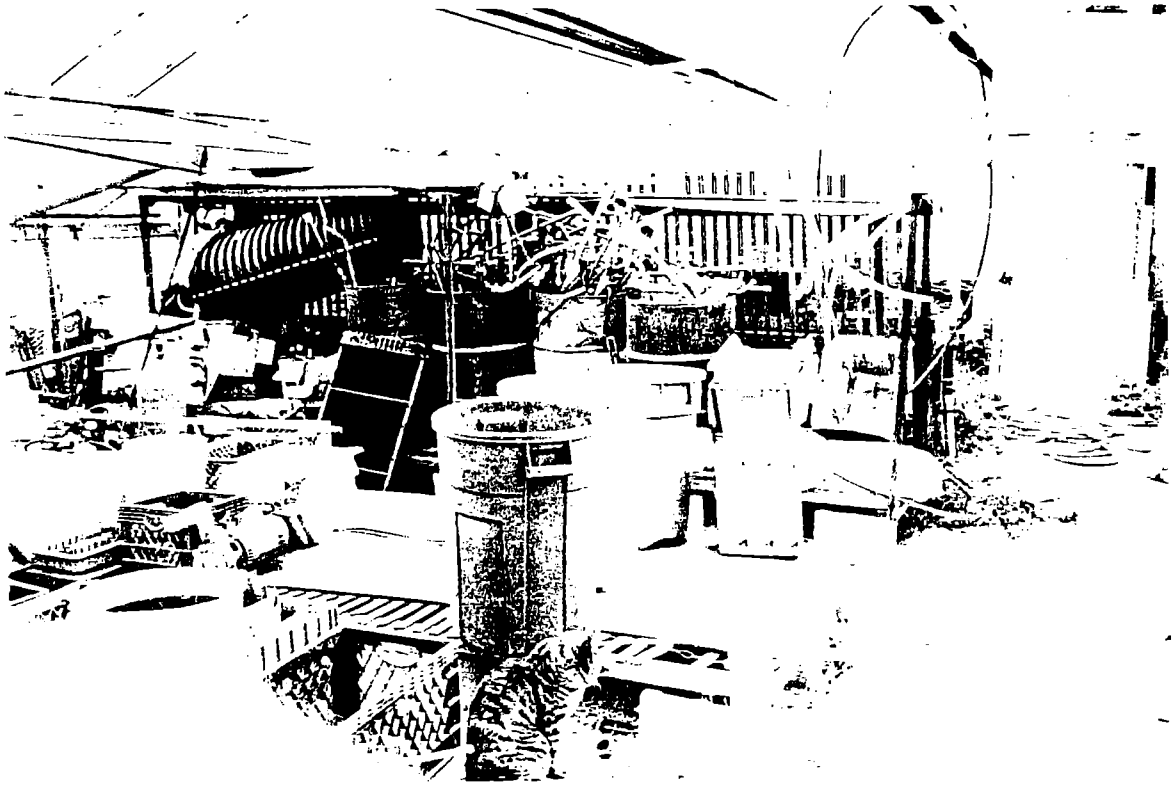
Photograph #5
View towards the north of an above-ground waste oil storage tank (AST) enclosed by a cinder-block wall secondary containment system located north of the three green houses used by current tenants



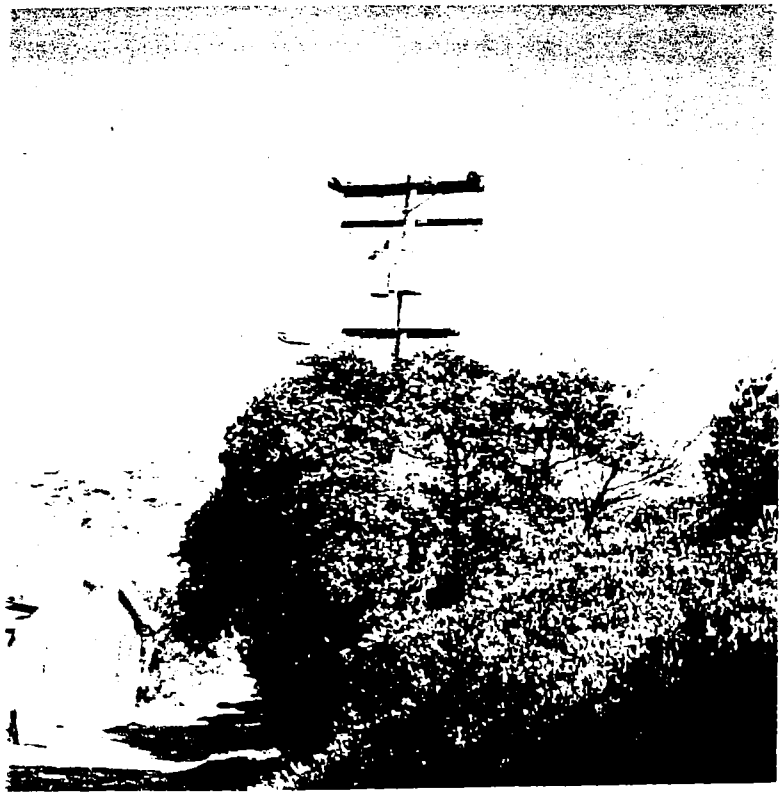
Photograph #6
View towards the north showing heavy waste oil stains inside of the waste oil AST secondary containment system.



Photograph #7
View of the storage area showing several 55-gallon grease storage drums used by lobster fishermen to coat the lobster cages (Note the heavy grease stains on the ground surface).



Photograph #8
View towards the west of the interior of a greenhouse showing miscellaneous materials being stored at the former nursery located on the subject property.



Photograph #11
View towards the south showing two transformers mounted on a utility pole that may contain PCBs located southwest of the service building on the former nursery.



Photograph #12
View towards the south of the "Danger High Voltage" room located next to the northern property border showing switches with fluid and a transformer (not shown). Note the leaking fluid may contain PCBs.



Photograph #9
View towards the southeast of a former nursery area showing the asphalt paved road used for vehicular access.

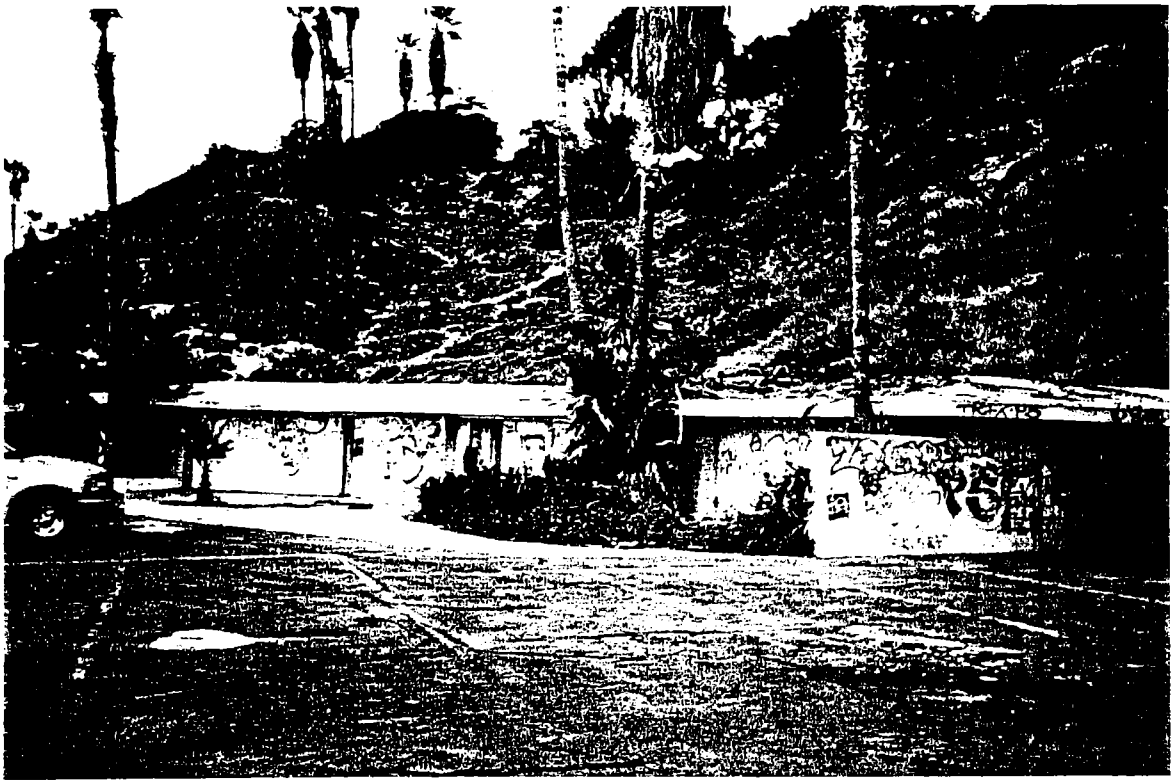


Photograph #10
View towards the north showing the asphalt paved parking stalls of the former mobile trailer park adjacent to the beach access.



Photograph #13

View towards the northwest of Marguerita Ave. showing the residential homes on Dana Strand Drive in the background, and the former location of the stockpiled soils on the northern side of Marguerita Ave.



Photograph #14

View towards the east of the vacant six-car garage located on the western side of the middle of the southern portion of the former trailer park (Note that the roof, which may contain asbestos, has severe weather damage

APPENDIX D

Vista Report

SITE ASSESSMENT PLUS REPORT

PROPERTY INFORMATION	CLIENT INFORMATION
Project Name/Ref #: 3696 Headlands Reserve Property Selva Road/Street of the Green Lantern Dana Point, CA 92629 Cross Street: Green Lantern Latitude/Longitude: (33.464270, 117.711366)	Anthony Lizzi Aqua Science 17895 Sky Park Cir Ste E Irvine, CA 92714

Site Distribution Summary Agency / Database - Type of Records			within 1/8 mile	1/8 to 1/4 mile	1/4 to 1/2 mile	1/2 to 1 mile
A) Databases searched to 1 mile:						
US EPA	NPL	National Priority List	0	0	0	0
US EPA	CORRACTS	RCRA Corrective Actions	0	0	0	0
STATE	SPL	State equivalent priority list	0	0	0	0
B) Databases searched to 1/2 mile:						
STATE	SCL	State equivalent CERCLIS list	0	0	0	-
US EPA	CERCLIS / NFRAP	Sites currently or formerly under review by US EPA	0	0	0	-
US EPA	TSD	RCRA permitted treatment, storage, disposal facilities	0	0	0	-
STATE REG CO	LUST	Leaking Underground Storage Tanks	0	0	0	-
STATE/ REG/CO	SWLF	Permitted as solid waste landfills, incinerators, or transfer stations	0	0	0	-
STATE	DEED RSTR	Sites with deed restrictions	0	0	0	-
STATE	CORTESE	State index of properties with hazardous waste	0	0	0	-
STATE	TOXIC PITS	Toxic Pits cleanup facilities	0	0	0	-
USGS/STATE	WATER WELLS	Federal and State Drinking Water Sources	0	0	0	-
C) Databases searched to 1/4 mile:						
US EPA	RCRA Viol	RCRA violations/enforcement actions	0	0	-	-
US EPA	TRIS	Toxic Release Inventory database	0	0	-	-
STATE	UST/AST	Registered underground or aboveground storage tanks	0	0	-	-

Site Distribution Summary Agency / Database - Type of Records			within 1/8 mile	1/8 to 1/4 mile	1/4 to 1/2 mile	1/2 to 1 mile
D) Databases searched to 1/8 mile:						
US EPA	ERNS	Emergency Response Notification System of spills	0	-	-	-
US EPA	GNRTR	RCRA registered small or large generators of hazardous waste	0	-	-	-
STATE	SPILLS	State spills list	0	-	-	-

This report meets the ASTM standard E-1527 for standard federal and state government database research in a Phase I environmental site assessment. A (-) indicates a distance not searched because it exceeds these ASTM search parameters.

LIMITATION OF LIABILITY
Customer proceeds at its own risk in choosing to rely on VISTA services, in whole or in part, prior to proceeding with any transaction. VISTA cannot be an insurer of the accuracy of the information, errors occurring in conversion of data, or for customer's use of data. VISTA and its affiliated companies, officers, agents, employees and independent contractors cannot be held liable for accuracy, storage, delivery, loss or expense suffered by customer resulting directly or indirectly from any information provided by VISTA.

NOTES

SITE ASSESSMENT PLUS REPORT

SITE INVENTORY

MAP ID	PROPERTY AND THE ADJACENT AREA (within 1/8 mile)	A			B									C			D		
	VISTA ID DISTANCE DIRECTION	NPL	CORRACTS	SPL	SCL	CERCLIS/NFRAP	TSD	LUST	SWLF	DEED RSTR	CORTESE	TOXIC PITS	WATER WELLS	RCRA VIOL	TRIS	UST/AST	ERNS	GNRTR	SPILLS
No Records Found																			

MAP ID	SITES IN THE SURROUNDING AREA (within 1/8 - 1/4 mile)	A			B									C			D		
	VISTA ID DISTANCE DIRECTION	NPL	CORRACTS	SPL	SCL	CERCLIS/NFRAP	TSD	LUST	SWLF	DEED RSTR	CORTESE	TOXIC PITS	WATER WELLS	RCRA VIOL	TRIS	UST/AST	ERNS	GNRTR	SPILLS
No Records Found																			

MAP ID	SITES IN THE SURROUNDING AREA (within 1/4 - 1/2 mile)	A			B									C			D		
	VISTA ID DISTANCE DIRECTION	NPL	CORRACTS	SPL	SCL	CERCLIS/NFRAP	TSD	LUST	SWLF	DEED RSTR	CORTESE	TOXIC PITS	WATER WELLS	RCRA VIOL	TRIS	UST/AST	ERNS	GNRTR	SPILLS
No Records Found																			

MAP ID	SITES IN THE SURROUNDING AREA (within 1/2 - 1 mile)	A			B									C			D		
	VISTA ID DISTANCE DIRECTION	NPL	CORRACTS	SPL	SCL	CERCLIS/NFRAP	TSD	LUST	SWLF	DEED RSTR	CORTESE	TOXIC PITS	WATER WELLS	RCRA VIOL	TRIS	UST/AST	ERNS	GNRTR	SPILLS
No Records Found																			

UNMAPPED SITES	VISTA ID	A			B										C			D		
		NPL	CORRACTS	SPL	SCL	CERCLIS/NFRAP	TSD	LUST	SWLF	DEED RSTR	CORTESE	TOXIC PITS	WATER WELLS	RCRA VIOL	TRIS	UST/AST	ERNS	GNRTR	SPILLS
THRIFTY OIL S S #390 34306 COAST HWY DANA POINT, CA 92629	3491916							X											

SITE ASSESSMENT PLUS REPORT

DETAILS

PROPERTY AND THE ADJACENT AREA (within 1/8 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 1/8 - 1/4 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 1/4 - 1/2 mile)
No Records Found

SITES IN THE SURROUNDING AREA (within 1/2 - 1 mile)
No Records Found

UNMAPPED SITES

VISTA Address*:	**THRIFTY OIL S S #390** **34306 COAST HWY** **DANA POINT, CA 92629**	VISTA ID#:	3491916
County LUST - County Leaking Underground Storage Tank / SRC# 160		Agency ID:	87UT214
Agency Address:	*SAME AS ABOVE*		
Substance:	*WASTE OIL*		
Remediation Status:	*CASED CLOSED*		
Funding:	*FEDERAL*		
County LUST - County Leaking Underground Storage Tank / SRC# 160		Agency ID:	87UT214
Agency Address:	*SAME AS ABOVE*		
Substance:	*GASOLINE*		
Remediation Status:	*CASED CLOSED*		
Funding:	*FEDERAL*		

SITE ASSESSMENT PLUS REPORT

DESCRIPTION OF DATABASES SEARCHED

A) DATABASES SEARCHED TO 1 MILE

NPL
SRC#: 19

VISTA conducts a database search to identify all sites within 1 mile of your property.
The agency release date for National Priorities List was April, 2000.

The NPL Report is the US EPA's registry of the nation's worst uncontrolled or abandoned hazardous waste sites. NPL sites are targeted for possible long-term remedial action under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980.

SPL
SRC#: 113

VISTA conducts a database search to identify all sites within 1 mile of your property.
The agency release date for CalSites Database was January, 2000.

This database is provided by the Cal. Environmental Protection Agency, Dept. of Toxic Substances Control. The agency may be contacted at: 916-323-3400.

CORRACTS
SRC#: 14

VISTA conducts a database search to identify all sites within 1 mile of your property.
The agency release date for RCRIS Corrective Action Sites was December, 1999.

The CORRACTS database contains information concerning RCRA facilities that have conducted, or are currently conducting a corrective action. A Corrective Action Order is issued pursuant to RCRA Section 3008 (h) when there has been a release of hazardous waste or constituents into the environment from a RCRA facility. Corrective actions may also be imposed as a requirement of receiving and maintaining a TSDF permit.

RCRIS-TSDC
SRC#: 556

VISTA conducts a database search to identify all sites within 1 mile of your property.
The agency release date for RCRIS TSDs Subject to Corrective Action was December, 1999.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDCs are treatment, storage and/or disposal facilities that are subject to corrective action under RCRA.

B) DATABASES SEARCHED TO 1/2 MILE

CERCLIS
SRC#: 17

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Comprehensive Environmental Response, Compensation and Liability Information Sys was April, 2000.

The CERCLIS database is a comprehensive listing of known or suspected uncontrolled or abandoned hazardous waste sites. These sites have either been investigated, or are currently under investigation by the U.S. EPA for the release, or threatened release of hazardous substances. Once a site is placed in CERCLIS, it may be subjected to several levels of review and evaluation, and ultimately placed on the National Priorities List (NPL).

NFRAP
SRC#: 18

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for No Further Remedial Action Planned was April, 2000.

The No Further Remedial Action Planned Report (NFRAP), also known as the CERCLIS Archive, contains information pertaining to sites which have been removed from the U.S. EPA's CERCLIS database. NFRAP sites may be sites where, following an initial investigation, either no contamination was found, contamination was removed quickly without need for the site to be placed on the NPL, or the contamination was not serious enough to require federal Superfund action or NPL consideration.

SCL
SRC#: 112

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for CalSites Database was January, 2000.

This database is provided by the Department of Toxic Substances Control. Two- thirds of these sites have been classified, based on available information, as needing "No Further Action" (NFA) by the Department of Toxic Substances Control. The remaining sites are in various stages of review and remediation to determine if a problem exists at the site. Several hundred sites have been remediated and are considered certified. Some of these sites may be in long term operation and maintenance.

RCRIS-TSD
SRC#: 12

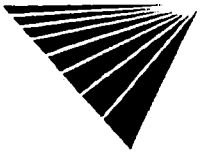
VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for RCRIS Treatment, Storage and Disposal Facilities was December, 1999.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA TSDs are facilities which treat, store and/or dispose of hazardous waste.

SWLF
SRC#: 23

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for USGS Solid Waste Landfills was December, 1991.

This database is provided by the United States Geological Survey. The agency may be contacted at: 703-648-5613.



SWLF
SRC#: 163

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Solid Waste Inventory System was November, 1999.

This database is provided by the Integrated Waste Management Board. The agency may be contacted at: 916-255-4021.

SWLF-CO
SRC#: 70

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for City of Los Angeles Landfills Transfer Stations was April, 1999.

This database is provided by the City of Los Angeles, Environmental Affais Department. The agency may be contacted at: 213-580-1070.

SWLF-CO
SRC#: 130

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Orange County Landfills was April, 1999.

This database is provided by the Orange County Health Care Agency. The agency may be contacted at: 714-834-3446.

WMUDS
SRC#: 68

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Waste Management Unit Data System was February, 1999.

This database is provided by the State Water Resources Control Board. The agency may be contacted at: 530-892-0323. This is used for program tracking and inventory of waste management units. This system contains information from: Facility, Waste Management Unit, SWAT Program and Report Summary Information, Chapter 15 (formerly Subchapter 15), TPCA and RCRA Program Information, Closure Information; also some information from the WDS (Waste Discharge System).

LUST
SRC#: 164

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Leaking Underground Storage Tank Information System was January, 2000.

This database is provided by the California Environmental Protection Agency. The agency may be contacted at: 916-445-6532.

LUST-REG
SRC#: 108

VISTA conducts a database search to identify all sites within 1/2 mile of your property.
The agency release date for Region 6 Leaking Underground Storage Tanks was August, 1999.

This database is provided by the Lahontan Region Six South Lake Tahoe. The agency may be contacted at: 530-542-5400.

LUST-REG
SRC#: 120

VISTA conducts a database search to identify all sites within 1/2 mile of your property. **The agency release date for Region 9 Leaking Underground Storage Tanks was February, 2000.**

This database is provided by the Regional Water Quality Control Board, Region #9. The agency may be contacted at: 619-467-2980.

LUST-REG
SRC#: 162

VISTA conducts a database search to identify all sites within 1/2 mile of your property. **The agency release date for Region 8 Leaking Underground Storage Tanks was January, 2000.**

This database is provided by the Regional Water Quality Control Board, Region #8. The agency may be contacted at: 909-782-4499.

LUST-CO-OR
SRC#: 160

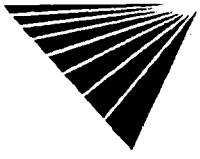
VISTA conducts a database search to identify all sites within 1/2 mile of your property. **The agency release date for Orange County Groundwater Cleanup List was January, 2000.**

This database is provided by the Orange County Health Care Agency. The agency may be contacted at: 714-834-3446.

CORTESE
SRC#: 53

VISTA conducts a database search to identify all sites within 1/2 mile of your property. **The agency release date for Cortese List - Hazardous Waste Substance Site List was April, 1998.**

This database is provided by the Office of Environmental Protection, Office of Hazardous Materials. The agency may be contacted at: 916-445-6532. The California Governor's Office of Planning and Research annually publishes a listing of potential and confirmed hazardous waste sites throughout the State of California under Government Code Section 65962.5. This database (CORTESE) is based on input from the following: (1)CALSITES-Department of Toxic Substances Control, Abandoned Sites Program Information Systems; (2)SARA Title III Section III Toxic Chemicals Release Inventory for 1987, 1988, 1989, and 1990; (3)FINDS; (4)HWIS-Department of Toxic Substances Control, Hazardous Waste Information System. Vista has not included one time generator facilities from Cortese in our database.; (5)SWRCB-State Water Resources Control Board; (6)SWIS-Integrated Waste Management Control Board (solid waste facilities); (7)AGT25-Air Resources Board, dischargers of greater than 25 tons of criteria pollutants to the air; (8)A1025-Air Resources Board, dischargers of greater than 10 and less than 25 tons of criteria pollutants to the air; (9)LTANK-SWRCB Leaking Underground Storage Tanks; (10)UTANK-SWRCB Underground tanks reported to the SWEEPS systems; (11)IUR-Inventory Update Rule (Chemical Manufacturers); (12)WB-LF- Waste Board - Leaking Facility, site has known migration; (13)WDSE-Waste Discharge System - Enforcement Action; (14)DTSCD-Department of Toxic Substance Control Docket.



BORDER-ZON VISTA conducts a database search to identify all sites within 1/2 mile of your property.
SRC#: 46 **The agency release date for Deed Restriction Properties Report was April, 1994.**

The Deeds Restrictions list, also known as the Border Zone Property List, contains information concerning voluntary deed restriction. These agreements are made with owners of property who propose building residences, schools, hospitals, or day care centers on property that is on or within 2,000 feet of potentially hazardous waste site.

TOXICPITS VISTA conducts a database search to identify all sites within 1/2 mile of your property.
SRC#: 49 **The agency release date for Toxic Pits was February, 1995.**

This database is provided by the Water Quality Control Board, Division of Loans Grants. The agency may be contacted at: 916-227-4396.

USGS-WELLS VISTA conducts a database search to identify all sites within 1/2 mile of your property.
SRC#: 3 **The agency release date for USGS Water Wells was March, 1998.**

The Ground Water Site Inventory (GWSI) database was provided by the United States Geological Survey (USGS). The database contains information for over 1,000,000 wells and other sources of groundwater which the USGS has studied, used or documented during research.

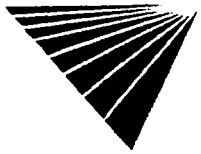
C) DATABASES SEARCHED TO 1/4 MILE

RCRIS-VIOL VISTA conducts a database search to identify all sites within 1/4 mile of your property.
SRC#: 11 **The agency release date for RCRIS Facilities with Violations was December, 1999.**

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. The RCRIS Other report contains information concerning facilities that are "unclassified" within the RCRIS database (not classified as a Large Quantity Generator, Transporter, etc.).

UST VISTA conducts a database search to identify all sites within 1/4 mile of your property.
SRC#: 45 **The agency release date for Underground Storage Tanks was January, 1994.**

This database is provided by the State Water Resources Control Board, Office of Underground Storage Tanks. The agency may be contacted at: 916-227-4364. Be advised that some states do not require registration of heating oil tanks, especially those used for residential purposes.



UST-FULL
SRC#: 59

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for City of Fullerton Underground Storage Tanks was December, 1998.**

This database is provided by the Fullerton Fire Department. The agency may be contacted at: 714-738-3160. Be advised: Many states do not require registration of heating oil tanks, especially those used for residential purposes.

UST-ANAH
SRC#: 84

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for City of Anaheim Underground Storage Tanks was September, 1999.**

This database is provided by the City of Anaheim. The agency may be contacted at: 714-765-4049. Be advised: Many states do not require registration of heating oil tanks, especially those used for residential purposes.

UST-ORAN
SRC#: 88

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for City of Orange Underground Storage Tanks was September, 1999.**

This database is provided by the City of Orange Fire Department. The agency may be contacted at: 714-288-2541. Be advised: Many states do not require registration of heating oil tanks, especially those used for residential purposes.

UST-SA
SRC#: 123

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for City of Santa Ana Underground Storage Tanks was January, 2000.**

This database is provided by the City of Santa Ana Fire Department. The agency may be contacted at: 714-647-5761. Be advised: Many states do not require registration of heating oil tanks, especially those used for residential purposes.

UST-CO-ORA
SRC#: 139

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for Orange County Underground Storage Tanks was December, 1999.**

This database is provided by the Orange County Health Care Agency. The agency may be contacted at: 714-834-3446. Be advised: Many states do not require registration of heating oil tanks, especially those used for residential purposes.

AST
SRC#: 60

VISTA conducts a database search to identify all sites within 1/4 mile of your property. **The agency release date for Aboveground Storage Tanks was December, 1999.**

This database is provided by the State Water Resources Control Board. The agency may be contacted at: 916-227-4364.

TRIS
SRC#: 2

VISTA conducts a database search to identify all sites within 1/4 mile of your property.
The agency release date for Toxic Release Inventory System was January, 1998.

All facilities that manufacture, process, or import toxic chemicals in quantities in excess of 25,000 pounds per year are required to register with the EPA under Section 313 of the Superfund Amendments and Reauthorization Act (SARA Title III) of 1986. Data contained in the TRIS system covers approximately 20,000 sites and 75,000 chemical releases.

D) DATABASES SEARCHED TO 1/8 MILE

ERNS
SRC#: 8

VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for Emergency Response Notification System was August, 1999.

ERNS is a national computer database system that is used to store information on the sudden and/or accidental release of hazardous substances, including petroleum, into the environment. The ERNS reporting system contains preliminary information on specific releases, including the spill location, the substance released, and the responsible party.

RCRA-LQG
SRC#: 16

VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for RCRIS Large Quantity Generators was December, 1999.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Large Generators are facilities which generate at least 1000 kg./month of non-acutely hazardous waste (or 1 kg./month of acutely hazardous waste).

RCRIS-SQG
SRC#: 15

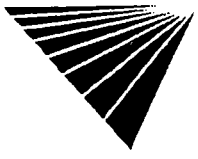
VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for RCRIS Small Quantity Generators was December, 1999.

The EPA's Resource Conservation and Recovery Act (RCRA) Program identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRA Facilities database is a compilation by the EPA of facilities which report generation, storage, transportation, treatment or disposal of hazardous waste. RCRA Small Quantity Generators are facilities which generate less than 1000 kg./month of non-acutely hazardous waste.

SPILLS
SRC#: 67

VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for Orange County Industrial Cleanups was January, 1999.

This database is provided by the Orange County Health Care Agency. The agency may be contacted at: 714-834-3446.



SPILLS
SRC#: 69

VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for Region 9 SLIC Listing was March, 1994.

This database is provided by the Regional Water Quality Control Board, Region #9. The agency may be contacted at: 619-467-2980.

SPILLS
SRC#: 110

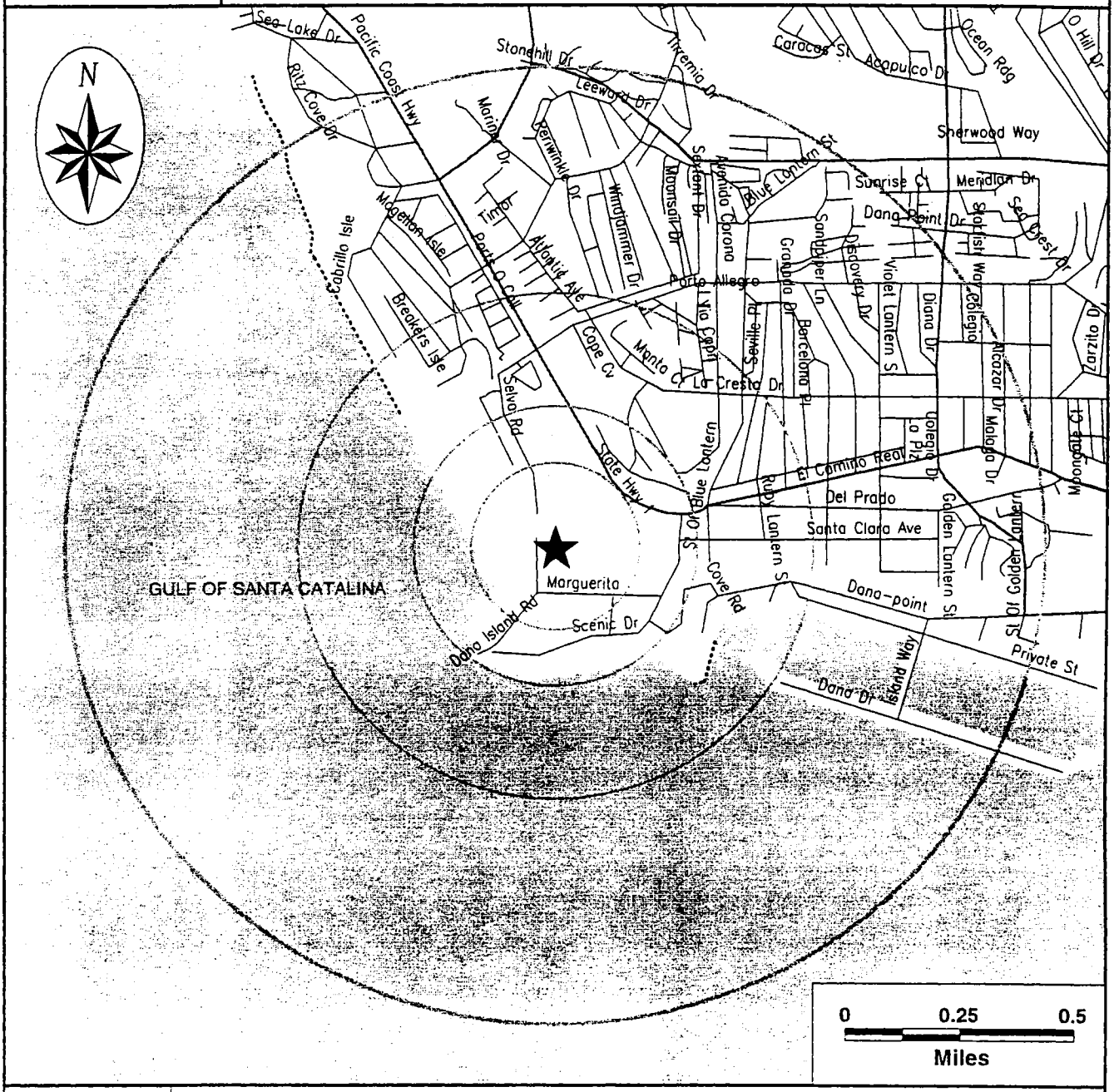
VISTA conducts a database search to identify all sites within 1/8 mile of your property.
The agency release date for Region 8 SLIC Listing was July, 1999.

This database is provided by the Regional Water Quality Control Board, Region #8. The agency may be contacted at: 909-782-4499.

End of Report

SITE ASSESSMENT PLUS REPORT

Map of Sites within One Mile



Subject Site	Category:	A	B	C	D
★	Databases Searched to:	1 mi.	1/2 mi.	1/4 mi.	1/8 mi.
	Single Sites	◆	▣	△	○
	Multiple Sites	◆	▣	△	○
		NPL, SPL, CORRACTS (TSD)	CERCLIS\ NFRAP, TSD, LUST, SWLF, SCL	RCRA VIOL, TRIS, UST	ERNS, GENERATORS

Highways and Major Roads
Roads
Railroads
Rivers or Water Bodies
Utilities

If additional databases are listed in the cover page of the report they are also displayed on this map. The map symbol used corresponds to the database category letter A,B,C,D.

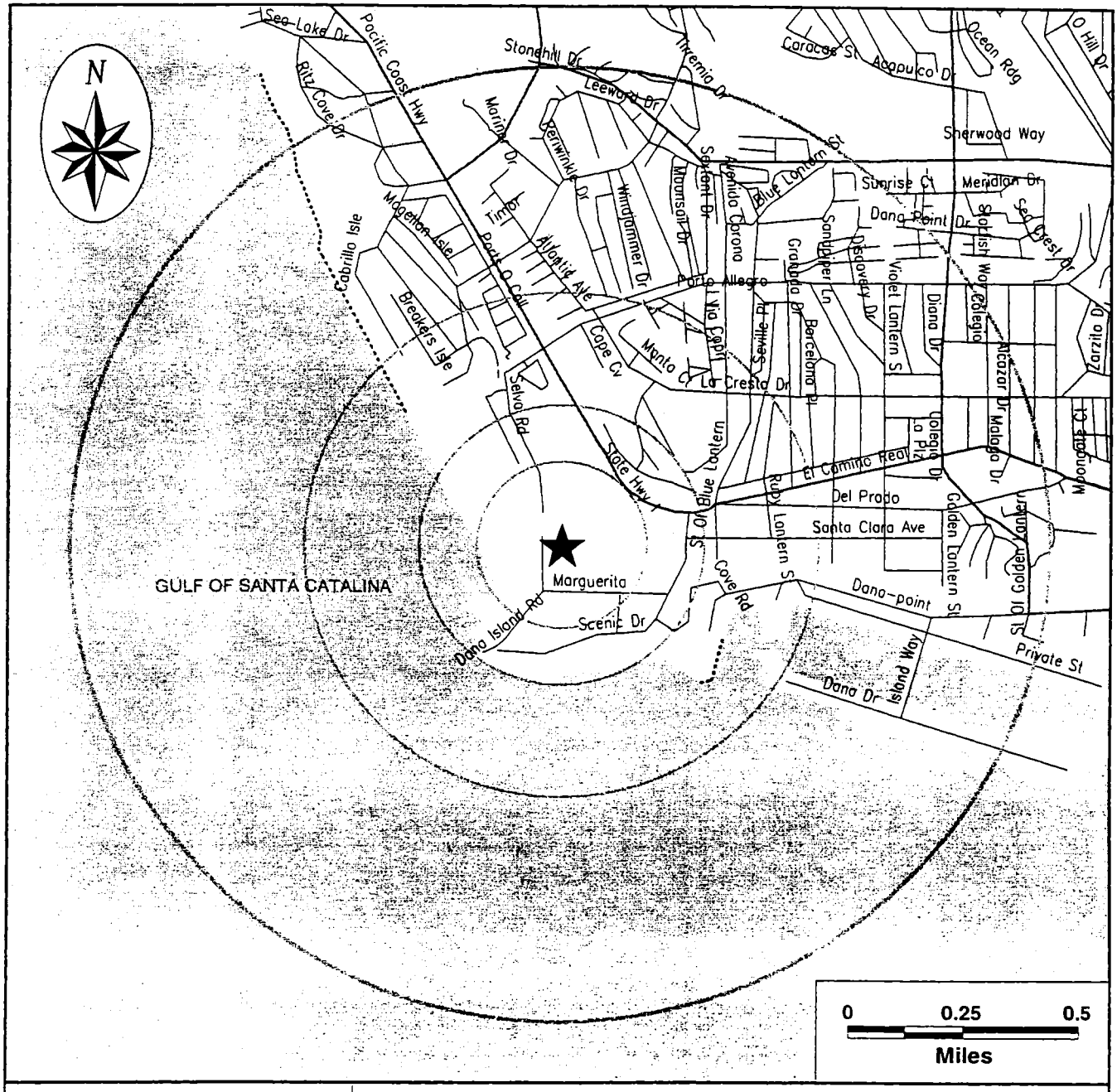
For More Information Call VISTA Information Solutions, Inc. at **1 - 800 - 767 - 0403**

Report ID: **751201901**

Date of Report: **September 27, 2000**

SITE ASSESSMENT PLUS REPORT

Street Map



APPENDIX E

Completed Transaction Screen Questionnaire

BY: ;

Transaction Screen Questionnaire (E 1528)

Description of Site: Address: HEADLANDS, DANA POINT, CA.

Unk = "unknown" or "no response"

Question	Owner			Occupants (if applicable)			Observed During Site Visit		
1. Is the *property* or any *adjoining property* used for an industrial use?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
2. To the best of your knowledge, has the *property* or any *adjoining property* been used for an industrial use in the past?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
3. Is the *property* or any *adjoining property* used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
4. To the best of your knowledge has the *property* or any *adjoining property* been used as a gasoline station, motor repair facility, commercial printing facility, dry cleaners, photo developing laboratory, junkyard or landfill, or as a waste treatment, storage, disposal, processing, or recycling facility?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
5. Are there currently, or to the best of your knowledge have there been previously, any damaged or discarded automotive or industrial batteries, or pesticides, paints, or other chemicals in individual containers of greater than 5 gal (19 L) in volume or 50 gal (190 L) in the aggregate, stored on or used at the *property* or at the facility?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
6. Are there currently, or to the best of your knowledge have there been previously, any industrial *drums* (typically 55 gal (208 L) or sacks of chemicals located on the property or at the facility?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
7. Has *fill dirt* been brought onto the property that originated from a contaminated site or that is of an unknown origin?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
8 Are there currently, or to the best of your knowledge have there been previously, any *pits, ponds,* or *lagoons* located on the *property* in connection with waste treatment or waste disposal? Unk = "unknown" or "no response"	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk

Question	Owner			Occupants (if applicable)			Observed During Site Visit		
9. Is there currently, or to the best of your knowledge have there been previously, any stained soil on the *property*?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
10. Are there currently, or to the best of your knowledge have there been previously, any registered or unregistered storage tanks (above or underground) located on the *property*?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
11. Are there currently, or to the best of your knowledge have there been previously, any vent pipes, fill pipes, or access ways indicating a fill pipe protruding from the ground on the *property* or adjacent to any structure located on the *property*?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
12. Are there currently, or to the best of your knowledge have there been previously, any flooring, drains, or walls located within the facility that are stained by substances other than water or are emitting foul odors?	Yes	No	(Unk)	Yes	No	Unk	Yes	No	Unk
13. If the *property* is served by a private well or non-public water system, have contaminants been identified in the well or system that exceed guidelines applicable to the water system or has the well been designated as contaminated by any government environmental/health agency?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
14. Does the *owner* or *occupant* of the *property* have any knowledge of *environmental liens* or governmental notification relating to past or recurrent violations of environmental laws with respect to the *property* or any facility located on the *property*?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
15. Has the *owner* or *occupant* of the *property* been informed of the past or current existence of *hazardous substances* or *petroleum products* or environmental violations with respect to the *property* or any facility located on the *property*?	Yes	(No)	Unk	Yes	No	Unk	Yes	No	Unk
16. Does the *owner* or *occupant* of the property have any knowledge of any *environmental site assessment* of the *property* or facility that indicated the presence of *hazardous substances* or *petroleum products* on, or contamination of, the *property* or recommended further assessment of the *property*?	(Yes)	No	Unk	Yes	No	Unk	Yes	No	Unk

Unk = "unknown" or "no response"

Government Records/Historical Source Inquiry

21. Do any of the following Federal government record systems list the property or any property within the circumference of the area noted below:

National Priorities List---within 1.0 miles (1.6 Km)?	Yes	(No)
CERCLIS List---within 0.5 mile (0.8 Km)?	Yes	(No)
RCRA TSD Facilities---within 1.0 mile (1.6 Km)?	Yes	(No)

22. Do any of the following state record systems list the property or any property within the circumference of the area noted below:

List maintained by state environmental agency of hazardous waste sites identified for investigation or remediation that is the state agency equivalent to NPL---within approximately 1.0 mile (1.6 Km)?	Yes	(No)
List maintained by state environmental agency of sites identified for investigation or remediation that is the state equivalent to CERCLIS within 0.5 mile (0.8 Km)?	Yes	(No)
Leaking Underground Storage Tank (LUST) List---within 0.5 mile (0.8 Km)?	Yes	(No)
Solid Waste/Landfill Facilities---within 0.5 mile (0.8 Km)?	Yes	(No)

23. Based upon a review of fire insurance maps or consultation with the local fire department serving the property, all as specified in the guide, are any buildings or other improvements on the property or on an adjoining property identified as having been used for an industrial use or uses likely to lead to contamination of the property? Yes (No) N/A

The preparer of the transaction screen questionnaire must complete and sign the following statement.

The Questionnaire was completed by:
Name: Kevin Darnall
Title: _____
Firm: Headlands Reserve LLC
Address: 24849 Del Prado Ave, Dana Point, CA 92629
Phone number: 949- 488-8800
Date: 10-12-00

If the preparer is different than the user, complete the following:
Name of user: Anthony Lizzi, Agua Science Eng.
User's address: 17895 Skypark Circle, #E, Irvine, CA
User's phone number: 949- 833- 3667
Preparer's relationship to site: _____
Preparer's relationship to user: Client

Copies of completed questionnaire have been filed at: NA

Copies of completed questionnaire have been mailed or delivered to: Headlands Reserve LLC

Preparer represents that to the best of the preparer's knowledge the above statement and facts are true and correct and to the best of the preparer's actual knowledge no material facts have been suppressed or misstated.

Signature	Date 10.12.00
Signature	Date
Signature	Date

APPENDIX F

Superior Special Services Letter and Electrical Transformer PCB Certification Form

Formerly Salesco Systems USA
5736 West Jefferson
Phoenix, AZ 85043

Erin Moore
#800 368-9095
Fax # 602 233-6883

October 19, 2000

Anthony Lizzi
Aqua Science Engineers
17895 Sky Park Circle, Suite E
Irvine, CA 92614

Dear Tony,

Thank you for your interest in Superior Special Services, formerly Salesco Systems, recycling services! Please see the following information. An official quotation with the standard terms and conditions will be mailed this week.

Scope of Work:

On Tuesday, October 10, 2000, Tony Lizzi of Aqua Science Engineers and Erin Moore of Superior Special Services identified two oil-filled transformers, five oil-filled wall mounted units, nine switch boxes, and some telephone equipment. Please see the following Transformer PCB Certification Form.

The transformers and wall units may or may not have high ppm PCB oil. However, it is assumed that they are over 500 ppm PCB due to the date of manufacture. The switch gear and phone equipment, less than 49 ppm PCB (non PCB) if any, can be disposed of along with the other equipment.

Both the transformers must be tested for PCB's. Because the wall mounted units are the same, and unlike the transformers they are not serviced on a regular basis, we only need to test one. However, if they cannot be opened for a test, we will assume they are PCB contaminated and test one unit when we break it open during processing. We will apply the test to all the units. The switches do not need to be tested.

If you choose to have Superior do the tests, it costs $125 per test. We will assume all the equipment is PCB contaminated (49-499 ppm) to ship, and then charge accordingly after we receive the analytical results. However, it is much more economical to have the tests done by the electrical contractor who disconnects the transformers. I suggest contacting the power company (Edison or SDGE). Oftentimes they have had the units tested and can provide analysis, or they can recommend a contractor.

The pricing includes transportation to our facility in Phoenix, Arizona. As we discussed, the transformers must be strapped to pallets with metal strapping, as per DOT regulations. The oil-filled wall mounted units must either be shrink wrapped on a pallet or inside 55 gallon drums. The switches and other equipment must be in drums as well. We can provide the hazardous waste manifests and, upon completion of the process, we will provide Certificates of Recycling / Disposal. All work will be done in accordance with all state and federal regulations, specifically the Mega Rule, pertaining to the specific material.

Code	Description	Unit Price
F-92	Oil Filled Equipment (under 49 ppm PCB)	$0.33 per LB
A-98	Oil Filled Equipment (50-499 ppm PCB's)	$0.45 per LB
A-99	Oil Filled Equipment (over 500 ppm PBC's)	$0.62 per LB
F-93	Dry Electrical Equipment (under 49 ppm PCB)	$0.12 per LB

Please do not hesitate to call me at 800-368-9095, for more information regarding Superior capabilities, pricing, or services! Thanks again for your consideration of Superior Special Services.

Sincerely,

Erin Moore
Regional Sales Manager

Oct-19-00 03:41P SALESCO SYSTEMS USA 602 415 3030 P.03

TRANSFORMER PCB CERTIFICATION FORM

DATE:	10/10/2000		
CUSTOMER:	Aqua Science Engineers	**GENERATOR:**	Headlands Reserve
ADDRESS:	17895 Sky Park Circle, Suite E	**ADDRESS:**	
CITY, ST, ZIP:	Irvine, CA 92614	**CITY, ST, ZIP:**	Dana Point, CA
EPA ID#		**EPA ID#**	
PHONE:	949-833-3667	**PHONE:**	

								Oil Filled		Analytical	
Bldg #1 Room 1											
Line	Serial #	Manufacturer	Weight	KVA	Pole	Pad	LxWxH	Y / N	PPM*	Y / N	Comments
1	1054-1 PLEM	Sierra Transformer		75		X	3x3x4 est.	Y		N	live transformer
2	FC31R 5-1956	C&W			wall mount		appx. 1 gallon	Y		N	2500 volts
3	FC31R 5-1956	C&W			wall mount		appx. 1 gallon	Y		N	2500 volts
4	FC31R 5-1956	C&W			wall mount		appx. 1 gallon	Y		N	2500 volts
5	FC31R 5-1956	C&W			wall mount		appx. 1 gallon	Y		N	2500 volts
Bldg #1 Room 2											
1	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
2	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
3	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
4	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
5	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
6	B105387				wall mount		large cabinet	N		N	phone equipment?
Bldg #2	**Area 1**										
1	1054-1 PLEM	Sierra Transformer		50		X	3x3x4 est.	Y		N	rusted, not live
2	FC31R 5-1956	C&W			wall mount		appx. 1 gallon	Y		N	2500 volts
Bldg #2	**Area 2**										
1	B568673	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
2	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
3	B568085	Vacu-Break Switch			wall mount		1 Sq. Foot est.	N		N	250 volts
4	B568085	Vacu-Break Switch			wall mount		1/2 Sq. Ft. est.	N		N	240 volts

*** If PPM is unknown assume 50-499 ppm per CDF 761.2**

This inventory is based on the observations made by Erin Moore of Superior Special Services and Tony Lizzi of Aqua Science Engineers on October 10, 2000. The units must be tested to confirm ppm of PCB.

ASE environmental

May 11, 1998

Attn.: Mr. Jay Pruitt
Institutional Housing Partners
19800 MacArthur Blvd., Suite 700
Irvine, California 92612

RE: ADDENDUM TO THE APRIL 28, 1998
PHASE I ENVIRONMENTAL SITE ASSESSMENT
FOR HEADLANDS PROPERTY, DANA POINT, CALIFORNIA 92629

Dear: Mr. Pruitt:

The Clerk of the Authority's Office for the Orange County Fire Authority (OCFA) responded to the April 27, 1998 record search request by Aqua Science Engineers, Inc. (ASE) for chemicals at business and for either underground storage tanks (USTs) or above-ground storage tanks (ASTs) at 34352 Dana Strand Road, Dana Point, California, which is the part of the subject property that has a waste oil AST. The response from the OCFA indicated that the OCFA did not find any files for 34352 Dana Strand Road. The waste oil AST would be regulated by the OCFA. Therefore, it is not likely that records would be found for the waste oil AST.

Thank you for selecting ASE for environmental services. If you have any questions, please contact either Mr. Chang Lee or myself at (714)833-3667.

Sincerely yours,

Henry Nakayama, R.E.A.
Chemical Engineer

cc: Chang Lee, ASE Business Development Officer

"COMMUNITY RIGHT TO KNOW" RECORDS SEARCH FORM

Mail/Fax to: Clerk of the Authority's Office
180 S. Water St., Orange, CA 92866-2175
Fax #: (714) 289-7428
Telephone #: (714) 289-7425 for information

Complete the HMDO and/or Code Enforcement section(s). **Use one form for each address.** You may photocopy this form if additional forms are needed.

Records Search Requested for the Following Address

Mike Frances or Chandler + Sherman Corp (4/27/98)
Name of Business (former/current occupant) Date Submitted

34352 Dana Strand Rd.
Address (if applicable, indicate suite(s) for business) Street Suite #

Dana Point CA 92629
City State Zip

HMDO (Hazardous Materials Disclosure Office) Information Requested

☑ **Printout of Chemicals at Business**

☒ **Other** Specify Underground and Above-ground tanks

Code Enforcement Information Requested

☐ **Initial Request:**

☐ **Fire Code Violations:** current occupant ( ) previous occupant ( ) **Permits** ☐

Specify _____

☐ **Other (Complete if violations/permits are not checked):**

Specify _____

☐ **Subsequent Request** (Complete if records received from initial request are inadequate):

Specify _____

Information Requested By:

Henry Nakayama (949) 833-3667 (949) 833-3468
Print Name of Requester Phone Number Fax Number

Aqua Science Engineers, Inc
Requester's Company Name

17895 Sky Park Circle, Suite E
Company Address Street Suite #

Irvine, CA 92614
City State Zip

You would like the information: ✓ Mailed/Faxed to you ____ Held for pickup

HMDO Section:
Request received 4/27/98 Processed by Marilee Freville Insp. #____

Code Enforcement Section:
Request received __/__/__ Processed by _____ Insp. # _____

RECORDS: Yes ____ No File X Multiple ____ No information per request X

Clerk of the Authority's Office:

Completed/Records sent _____ Total $_____ (_____ pages @ $0.15 per page)

Rev 10/97

ORANGE COUNTY FIRE AUTHORITY
HAZARDOUS MATERIALS DISCLOSURE OFFICE
180 South Water St. • Orange, CA 92866-2175 • (714) 744-0463

Chip Prather, Fire Chief

Subject: HMDO Community Right to Know Records Search

Dear Requestor:

Your request for Community Right to Know information has been processed and we have determined that there are no records on file for the address you requested.

Additional information may be obtained by contacting other Orange County agencies.

- Orange County Health Care Agency (714) 667-3700 handles the underground storage tank program: plan check, leaks, mitigation and clarifiers.

- Orange County Health Care Agency Custodian of Records (714) 834-3536 handles hazardous waste, infectious waste and industrial cleanup sites.

If you have any questions or need further assistance, please contact the Clerk of the Fire Authority at (714) 289-7425.

Sincerely,

Christine Boyd

Christine Boyd
Hazardous Materials Disclosure Office
Program Manager

CRTKLET.3

APPENDIX F

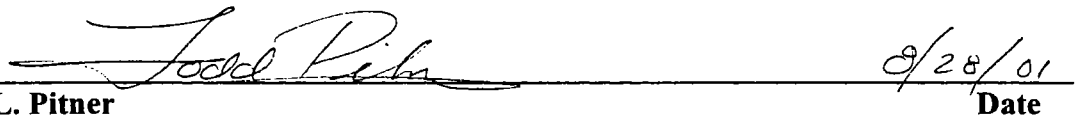
DRAINAGE STUDY

DRAINAGE STUDY
for
THE HEADLANDS

City of Dana Point
County of Orange

Prepared By:

The Keith Companies, Inc.
2955 Red Hill Avenue
Costa Mesa, CA 92626
(714) 540-0800



9/28/01

Todd L. Pitner **Date**
RCE 58606
Expires 12/31/02

Job No. 13266.000
August 28, 2001

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A. Rational Method Calculations – 100 Year Storm

B. Rational Method Calculations – 10 Year Storm

HYDROLOGY EXHIBITS:

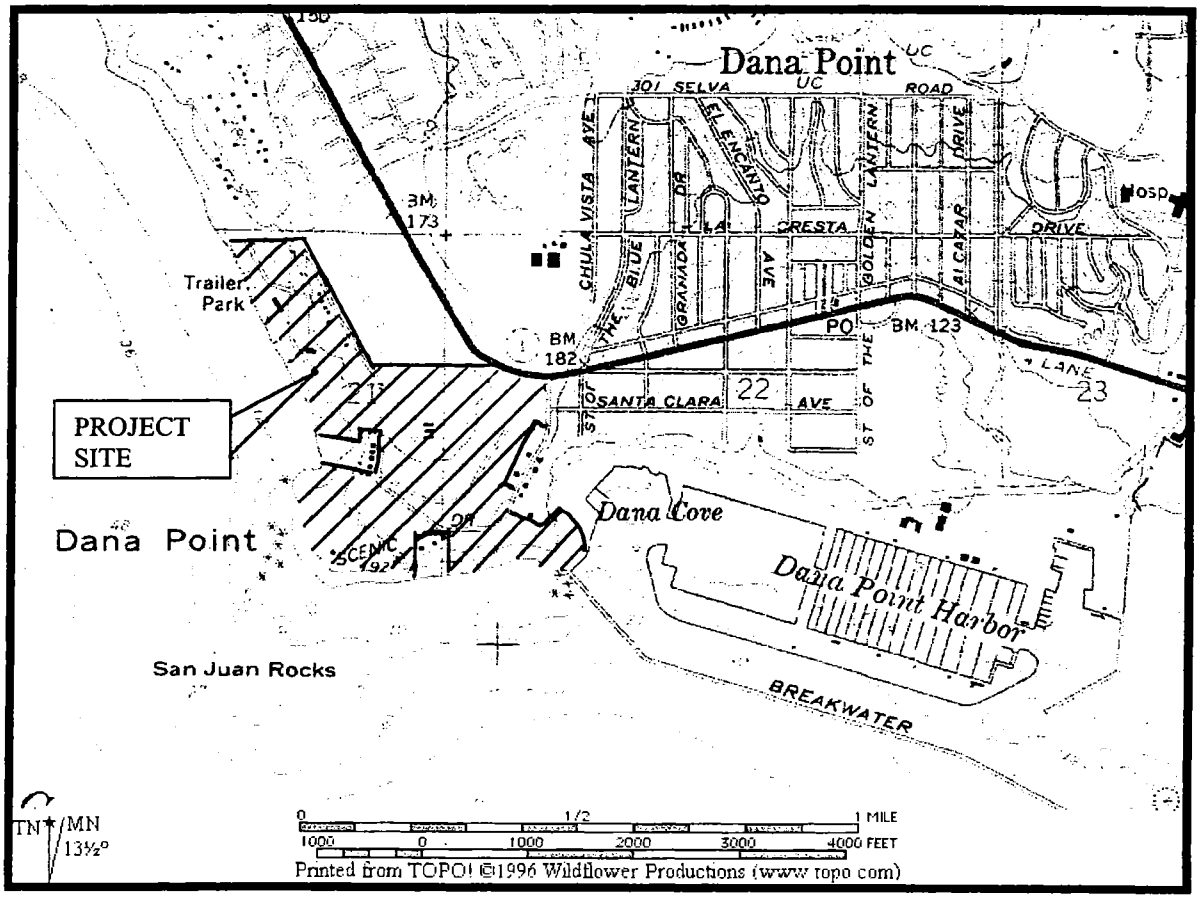
Sheet 1 and 2 – Existing conditions

Sheet 3 and 4 – Developed conditions

INTRODUCTION

The Headlands ("Project") is located on the most southwesterly point in the City of Dana Point. The Project is surrounded by the Pacific Ocean to the west and to the south, Dana Point Harbor to the southeast, a development to the northeast and the Pacific Coast Highway to the east. (See Figure 1, Project Location Map)

The purpose of this report is to provide preliminary hydrology and hydraulic calculations for the design of a conceptual storm drain layout to serve the Project. In addition, hydrology calculations have been performed to provide supporting information for a water quality analysis prepared by URS Corporation and Richard F. Ford, Ph.D, and the conceptual design of structural BMP's (Best Management Practices) to remove pollutants to an acceptable level prior to outletting into the waterways.



PROJECT LOCATION MAP

FIGURE 1

EXISTING CONDITIONS

The Headlands property consists of approximately 121.3 acres, of which 113.6 acres make up the on-site watershed that have been analyzed in this report. The remaining 7.7 acres of onsite area consist of the beach area immediately adjacent to the Pacific Ocean and therefore not included in the hydrology analysis. An additional 34.0 acres of off-site area is also included in the watershed analyzed in this report. Stormwater runoff is disbursed to three primary zones: Strand Beach, Dana Point Harbor, and over the coastal bluff edges in the vicinity of the Headlands Promontory (Dana Point) and Harbor Point.

As shown on Sheets 1 and 2 of the Hydrology Exhibits (attached), there are nine watershed drainage areas for the Project and adjoining property in the existing condition, identified as Areas A, B, C, D, E, F, G, H, and I. Area A flows to Dana Point Harbor. Areas C, D, and E flow over the bluff edges to the south. The remaining Areas, B, F, G, H, and I flow to Strand Beach.

Strand Beach:

The watershed draining to Strand Beach (Areas B, F, G, H, and I) is located at the north end of the site. This watershed consists of an abandoned mobile home park along the beachfront, greenhouses, parking lots, material storage areas and a commercial building surrounded by vacant land along the southern boundary and offsite development, located northeast of the Project.

The entire watershed makes up 76.6 acres. The offsite development comprises approximately 12.8 acres, approximately 17 percent of the total drainage area to the beach. The offsite development consists of streets, a public parking lot, and an apartment complex located on the east side of Selva Road. This offsite area generates considerable stormwater runoff due to the high percentage of impervious area associated with this type of development. A field investigation concludes that there are no catch basins or similar improvements designated to accept the runoff from the offsite development. This runoff generally flows on the surface, through the Project and onto Strand Beach. At one time, this flow was directed to a catch basin where it entered the mobile home storm drain system, however, over the years, the deterioration of this storm drain system has resulted in onsite erosion within the project.

A field investigation revealed a stormdrain system was constructed for the mobile home Park, however, in several areas, this system has become ineffective due to deterioration and clogging. Although there are signs that the system accepts some of the runoff, its capacity has been severely impaired over the years. The investigation also revealed several broken pipes. In one location, the existing storm drain pipe has been undermined and outlets the flow, prematurely, onto a slope face. As a result, soil around the pipe has eroded leaving the pipe section protruding out the side of the slope.

Due to the absense of a properly functioning storm drain system in several areas, erosion is evident throughout the site. The most severe cases are present along the flow path from the offsite development to Strand Beach.

Along Strand Beach, various existing outlets have been identified, most of which are between 12 to 18 inches in diameter, with the exception of a 42" pipe. Without as-built drawings of the existing storm drain system, it is difficult to determine the flow in each system and the corresponding velocities at the outlets. In addition, in some locations, clogging of the pipes and inlets make it impossible to calculate how much flow actually gets into the pipes. There is one exception and that is the 42" storm drain outlet located west of the parking lot in Area I, as shown in the Hydrology Exhibit, Sheet 2. Based on a field investigation, the 42" outlet, the storm drain pipe and the inlet are working as originally designed. The outlet is encased in concrete at the revetment, therefore has not been damaged over the years from erosion. The inlet is a large riser located in the parking lot and has sufficient capacity to handle the flow generated from Area I. The flow rate to this riser has been calculated to be 23.2 cfs. (Refer to Node 904 in the hydrology file for Area I.) The pipe is approximately 90 feet in length and carries the runoff from Area I to Strand Beach. An analysis has been conducted on this pipe to determine the velocity at the culvert outlet. The results indicate the velocity to be approximately 8.7 fps, which exceeds the recommended velocity of approximately 6.0 fps. Therefore, sand scour at the existing outfall is expected.

Dana Point Harbor:

Area A watershed generally flows in a southeasterly direction down hillsides, through streets and existing storm drain systems and eventually outlets into the harbor. This runoff comes from the project site and portions of Green Lantern, Cove Road, Santa Clara Avenue, Blue Lantern, Harbor Drive, Scenic Drive, and the adjoining offsite properties in the vicinity of Harbor Point. Under existing conditions, approximately 13.59 acres of the 30.57-acre drainage area is within the Headlands project site. Storm drain improvements currently exist on Green Lantern, Blue Lantern, Cove Road and in the Harbor Drive vicinity that minimize the amount of erosion. Erosion is more evident in the undeveloped area within the project site north of Scenic Drive.

Most of the flow from the Project flows across Scenic Drive and enters a v-ditch located adjacent to Cove Road. This ditch carries the flow along Cove Road until it enters a headwall, approximately 400 feet east of Scenic Drive. A corrugated metal pipe carries the flow from the headwall to the lower parking lot. A hydraulic analysis reveals that the original design of the headwall was insufficient in preventing water from flowing over the wall and down the bluff face. Sandbags have been placed on top of the wall to increase the height in an attempt to provide a temporary solution to the problem.

Most of the runoff down the bluff face above the harbor is contained in existing storm drain pipes. The pipes outlet the runoff into a v-ditch located at the back of the parking lot at the bottom of the bluffs. Several inlets within the v-ditch accept the flow and carry it through a 24" pipe where it outlets into the harbor on the north side of the fishing pier. Along the way to the outlet location, the pipe accepts runoff from various inlets located in the parking lot and on Dana Point Harbor Drive. The peak runoff for a 10 year storm event at the outlet of the 24" pipe is 66.3 cfs. Due to the small diameter of the pipe and the topography, this calculated peak flow cannot be contained within the pipe. According to Tom Rossmiller of the County of Orange, ponding within the parking lots adjacent to the harbor is a common occurrence during storm events. The County is on an on-call basis to monitor this system in regards to water quality and safety control during rainstorms. Ponding on Dana Point Harbor Drive has also been observed during several storm events. According to the County, water has been known to bypass the intended inlets on Dana Point Harbor Drive, which connect with the 24" outlet pipe and flow down the street to another outlet location. The invert elevation of the pipe at the outfall is also a contributing factor to its inadequacy to handle the flow from a storm. During high tides, the outlet of the pipe is submerged under water creating a tailwater condition. A combination of a high tide with heavy rains would produce the greatest ponding within the parking lot. The parking lot is receiving water at a greater rate than the storm drain system can physically discharge the water. In summary, the parking lot is acting as a detention basin, thus reducing the peak flow rate outletting into the Harbor. Utilizing a parking lot for a detention basin to reduce peak flow rates is not uncommon. Perhaps, this was the intent of the U.S. Army Corps when the Harbor was designed.

According to Mr. Rossmiller, the riprap at the outlet of the 24" pipe into the harbor may be undersized. During high swells, strong currents within the harbor dislodge the riprap. The calculated maximum flow rate for the 24" outlet, based on the available hydraulic head, is approximately 30 cfs. At this flow rate, the velocity at the outlet is around 10 fps. Based on the U.S. Army Corps method to determine rip rap size, the existing riprap at the outlet is of sufficient size to dissipate the energy for this velocity. In conclusion, it appears to be the strong currents during high swells in the harbor that are largely responsible for the riprap being dislodged. The pipe outlet does not appear to be a contributing factor.

The San Diego Water Quality Control Board requires the County to prevent nuisance flow from entering the Harbor during the summer months. Since there is not a mechanical diverter incorporated into the current system, an alternative method is employed. Nuisance flow is controlled by manually plugging the end of the 24" pipe, and detaining the flow inside the storm drain system until the capacity has been reached. The runoff is then pumped into a nearby sewer manhole. Apparently, this method requires considerable maintenance on the part of the County since the storm drain reaches capacity approximately every two

weeks. This method also increases the potential for severe flooding if the outlet is not unplugged prior to a rainstorm.

Bluffs:

Drainage Areas C, D, and E are mostly undeveloped with moderate vegetation. These drainage areas produce surface runoff or sheet flow over the bluffs and into the Pacific Ocean. Included in these drainage areas are the southerly residential enclave, a portion of the residential enclave above Strand Beach as well as Marguerita Avenue and a small portion of Dana Strand Road. As a result of runoff from these streets, gullies have formed in a seaward direction from Dana Strand Road within the pocket mouse preserve.

DEVELOPED CONDITIONS

The storm drain system for the proposed project will be designed to comply with the requirements of the General Plan of the City of Dana Point and the Orange County's Local Drainage Manual. In addition to designing a system for the quantity of runoff, structural Best Management Practices (BMP's) will be constructed to improve the quality of the runoff. The storm drain improvements include catch basins in the streets, storm drain lines sized to serve the project site and adjoining tributary areas, energy dissipating structures, three 42" outlets to Strand Beach and structural BMP's located throughout the project with the use of diversion structures. The proposed structural BMP's include underground media filtration systems, also referred to as sand filters, a split flow structure and devices to divert dry season, nuisance flow to the sanitary sewer system. Refer to Figure 2 for a conceptual layout of the proposed storm drain system.

Several structural BMP's were considered for this project. These included infiltration systems, catch basin inserts, storm drain inserts and others. Given Project constraints, sand filters are shown to be the best solution for water quality. Due to the geotechnical issues associated with groundwater, infiltration is not appropriate. Sand filter systems for this project will not allow for collected runoff to infiltrate from the sand filter into the ground. After the runoff has been treated, the water will discharge from the sand filter and flow back into the storm drain system. The sand filter system was chosen due to its high pollutant removal capability and the fact that they can be constructed underground. (Refer to Figure 3 for a conceptual design of the sand filter.) Field research in the City of Austin, Texas indicates that sand filters have a removal efficiency of suspended solids that is similar to wet ponds and extended detention basins. Sand filter systems incorporate two methods of pollutant removal. The first of which is a pretreatment settling basin where the water is stored and due to gravity, colloidal impurities, which carry the vast majority of pollutants, fall to the bottom of the basin. From the settling basin, the water is then filtered through a bed of sand, which removes the finer impurities through a complex procedure consisting of interception, straining, flocculation, and sedimentation. The sand filters are designed to accept the runoff and detain it for an extended period of time. Since the water is being detained and stored, the rate of outfall from the sand filter is minimal.

Clogging of the sand bed from sediment is the number one cause of failure with a sand filter system. Each sand filter will incorporate a pre-chamber settlement basin to allow the removal of sediments from the storm water prior to treatment The settlement basin will extend the maintenance interval associated with the sand filter and will allow the sand filter to operate as efficiently as possible. In addition, prior to entering the sand filters, a dry season nuisance water diversion system will be installed to direct these flows to the sewer system for treatment. The combination of the nuisance water diversion and the sand filter will prove to be a highly effective method for water quality treatment.

The proposed sand filters will be designed to treat the water volume generated by an 85th percentile storm event. This means that the runoff from 85 percent of all storms will be treated in their entirety. The initial runoff from the larger storms will also be treated, however, not the entire volume of runoff generated throughout the storm's duration. During the early stages of a storm, most pollutants are washed off the impervious areas into the storm drain system. This volume of water, referred to as the "first flush" carries the vast majority of pollutants. Typically, the pervious areas do not generate runoff during the early stages of a storm due to infiltration. As the storm continues, the concentration of pollutants decrease, due to the fact that most of the pollutants have already been washed away. For this reason, there is little or no incremental benefit from sizing a BMP facility to treat the entire storm volume.

Runoff from a storm event within the 85th percentile will be collected by various catch basins located throughout the project. The runoff will flow into the storm drain system and flow to a diversion structure where it will be directed to one of four sand filters for treatment. Since the sand filters will be designed for the 85th percentile storm, the entire volume of water from this storm will flow into the sand filter detention system and will be treated. Refer to Figure 4 for a conceptual design of the diversion structure.

During storm events greater than the 85th percentile, runoff will also be collected by the same catch basins and flow through the same storm drain system to the diversion structure. From the diversion structure, runoff will flow into the sand filter system until it reaches capacity. At this time, the calculated "first flush" volume has entered the sand filter and the diversion structure will re-direct additional flow away from the sand filters and carry it to its intended outlet location.

As shown on Sheets 3 and 4 of the Hydrology Exhibits (attached), the drainage flow patterns in the developed condition will continue to drain to the same three zones as they did in the existing condition. The eastern boundary for the watershed at the north end of the project has changed slightly as a result to the development. The watershed boundary in the developed condition has been pushed approximately 50 feet further east. This new boundary follows the shifted, top of slope adjacent to the off-site public parking lot. As a result, the overall watershed analyzed in this report has increased from 147.60 acres in the existing condition to 148.06 acres in the developed condition.

The developed condition watershed consists of eight drainage areas for the Project and adjoining property, identified as Areas A, B1, B2, B3, C, D, E, and F. Area A flows to Dana Point Harbor. Areas C, D, and E flow over the bluff edges to the south. The remaining Areas, B1, B2, B3, and F, flow to Strand Beach. Note that in the developed condition, there are fewer drainage areas due to the combining of drainage areas in the design of the Strand residential area.

Strand Beach:

The total watershed in the developed condition, which drains to Strand Beach, includes 81.4 acres, an increase of 4.8 acres from the existing condition. Storm drain improvements proposed for the project will eliminate most of the existing surface runoff to Strand Beach and have been designed to accept the offsite flow. This watershed includes the proposed single-family neighborhoods and the proposed commercial site located at Pacific Coast Highway and "A" Street.

As an additional level of water quality protection, storm runoff from Area B1, will be redirected away from the sensitive cove area located at the south end of Strand Beach. The entire Area B1 drains to Node 214, as shown on Sheet 4 of the Hydrology Exhibits. At this location, there will be a diversion structure ("smart box") and a split flow structure. (Refer to Figure 4 for a conceptual design of the smart box. The smart box is designed to divert the "first flush" from Area B1, to the sand filters as previously described. Since the outfall from this sand filter drains to the outlet on the middle of the beach, first flush runoff from Area B1, will never discharge at the outlet near the cove. During the larger storms, after the first flush is captured for treatment, the sand filter has reached capacity and the water will bypass the diversion and flow to the split flow structure. This structure is intended to distribute the runoff more evenly along the beach by splitting the flow among the two, southern outlets, resulting in a less overall impact at any one location.

Dana Point Harbor:

Within watershed A, new storm drain improvements will be constructed to capture the storm runoff. These improvements will include catch basins in Scenic Drive, the Seaside Inn site and Green Lantern, structural BMP's, and a storm drain line extending from Green Lantern to an existing inlet along Cove Road, approximately 400 feet east of Green Lantern. The structural BMP's will include a sand filter system and devices to divert nuisance flow to the sanitary sewer system.

The proposed commercial development at PCH and "A" Street will be graded in a manner that will direct stormwater flow into new abutting storm drain systems within the project boundary rather than on to Green Lantern or Pacific Coast Highway ("PCH") where only limited storm drain improvements currently exist. The new storm drains serving the PCH commercial site will carry storm water away from Dana Point Harbor, where it currently flows, to Strand Beach. This was done to lessen the quantity of stormwater runoff to the harbor and to the vicinity of Baby Beach.

Under developed conditions, approximately 12.3 acres of the 29.30-acre watershed will originate from the proposed project. Of this area, approximately 2.9 acres will be the Seaside Inn site, 1.5 acres will be Scenic Drive, Green

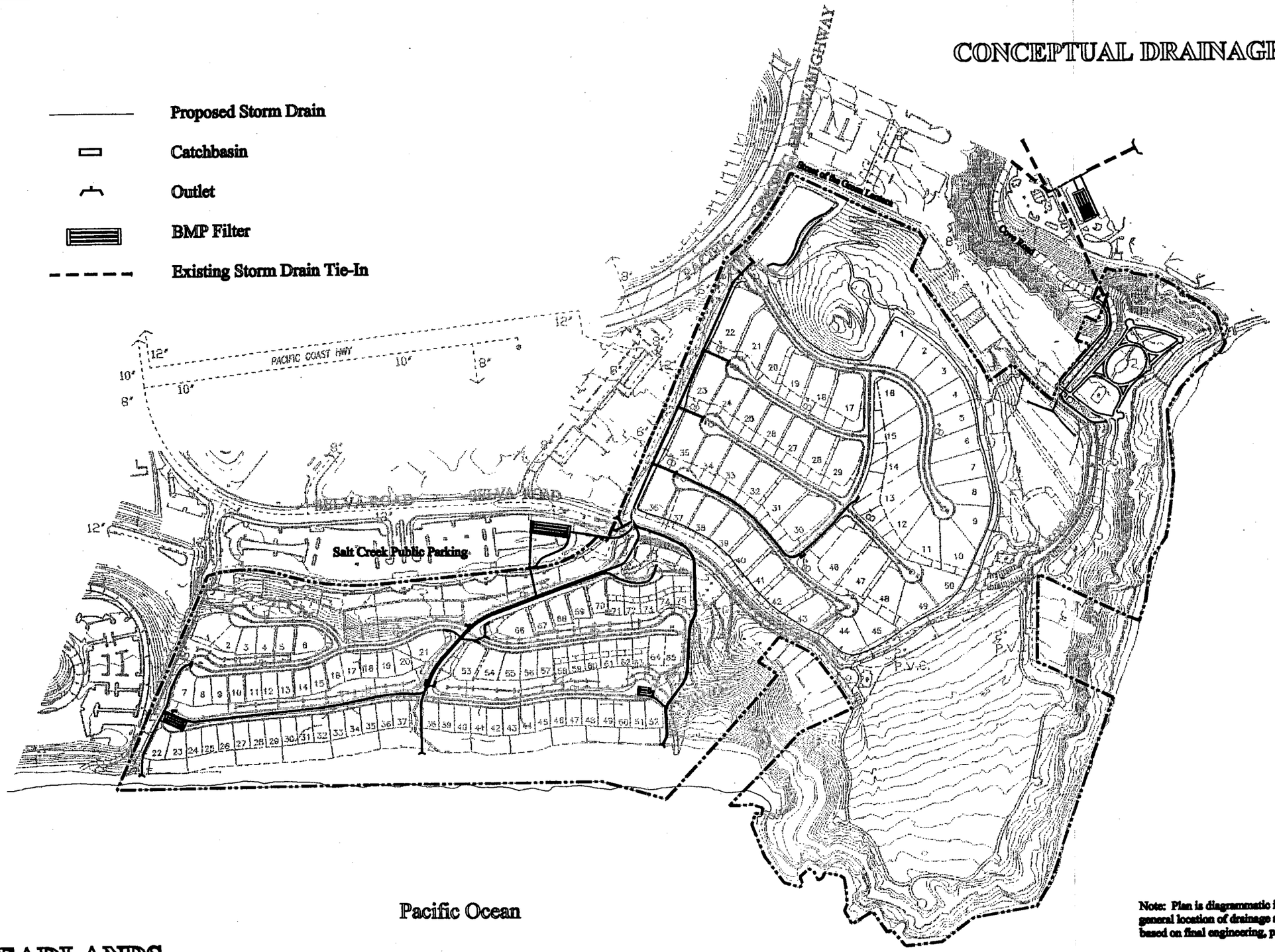
Lantern and Cove Road, and the remaining on-site area consists of landscaped slopes and undeveloped open space. Thus the project designates only 4.4 acres of developed area onsite within this watershed but proposes to construct a BMP system sized to treat 29.3 acres, of which 17 acres is offsite. This is made possible by locating the sand filter and nuisance water diversion at the down-stream end of the watershed near the outlet in the Harbor.

Coastal Bluffs:

In the developed condition, little change will occur to the existing surface flow conditions for areas C, D, and E. The removal of pavement on Marguerita Road and restoration in Area C, to a more natural condition, will slightly reduce runoff surface flow by 0.7 cfs. Due to the reduction of Area D, surface runoff over the bluff is reduced by 7.0 cfs. The realignment of Scenic Drive will slightly reduce the amount of surface flow from Area E by 0.7 cfs. The surface flow from this area is directed over the adjoining bluffs into Harbor Point Park. Due to the proposed development, these drainage areas will have an overall reduction of the watersheds by approximately 3 acres, which now drain into Area A and Area B1.

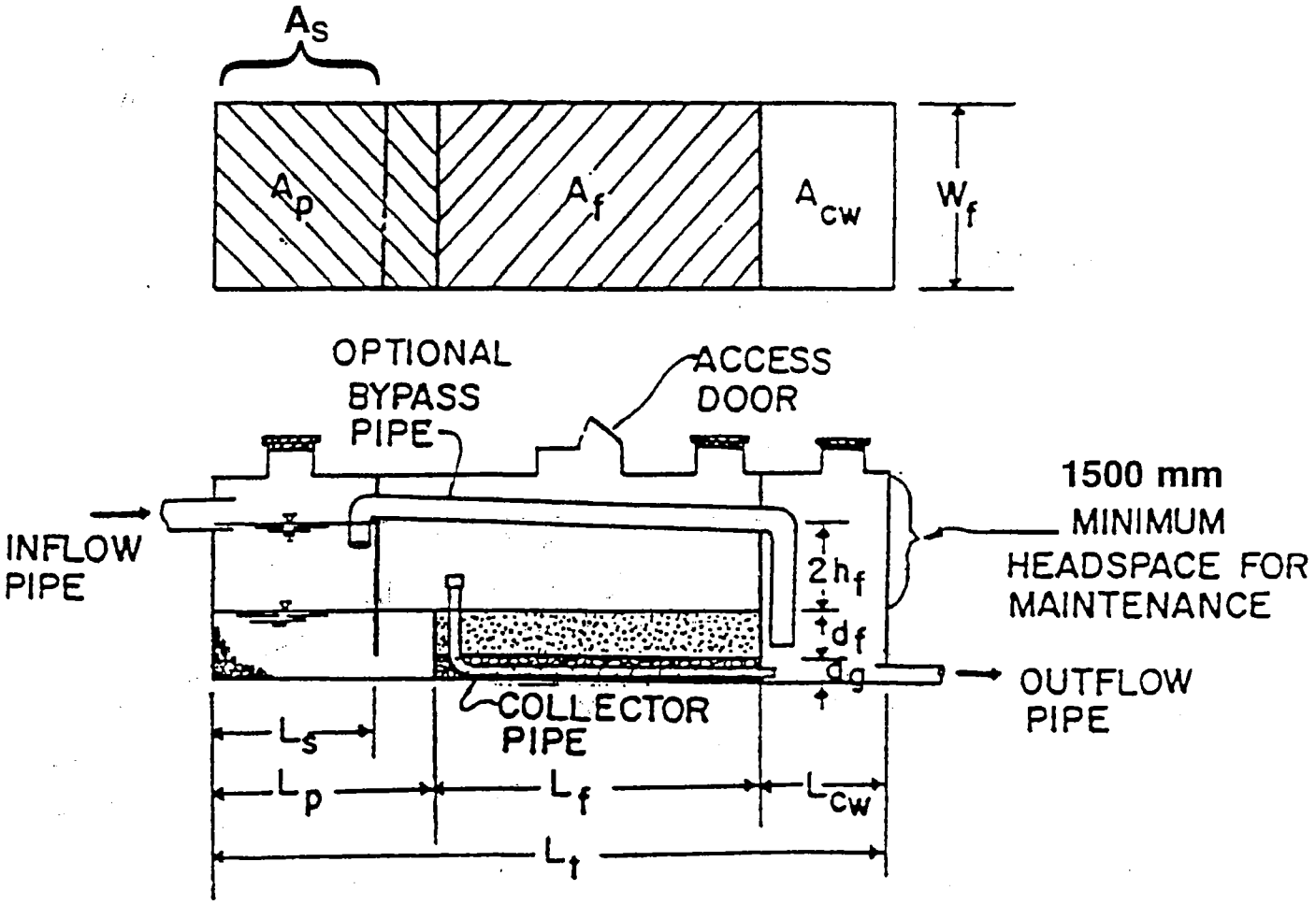
CONCEPTUAL DRAINAGE SYSTEM

FIGURE 2



Note: Plan is diagrammatic in nature and intended to show the general location of drainage system. It is subject to change based on final engineering, planning, and design.

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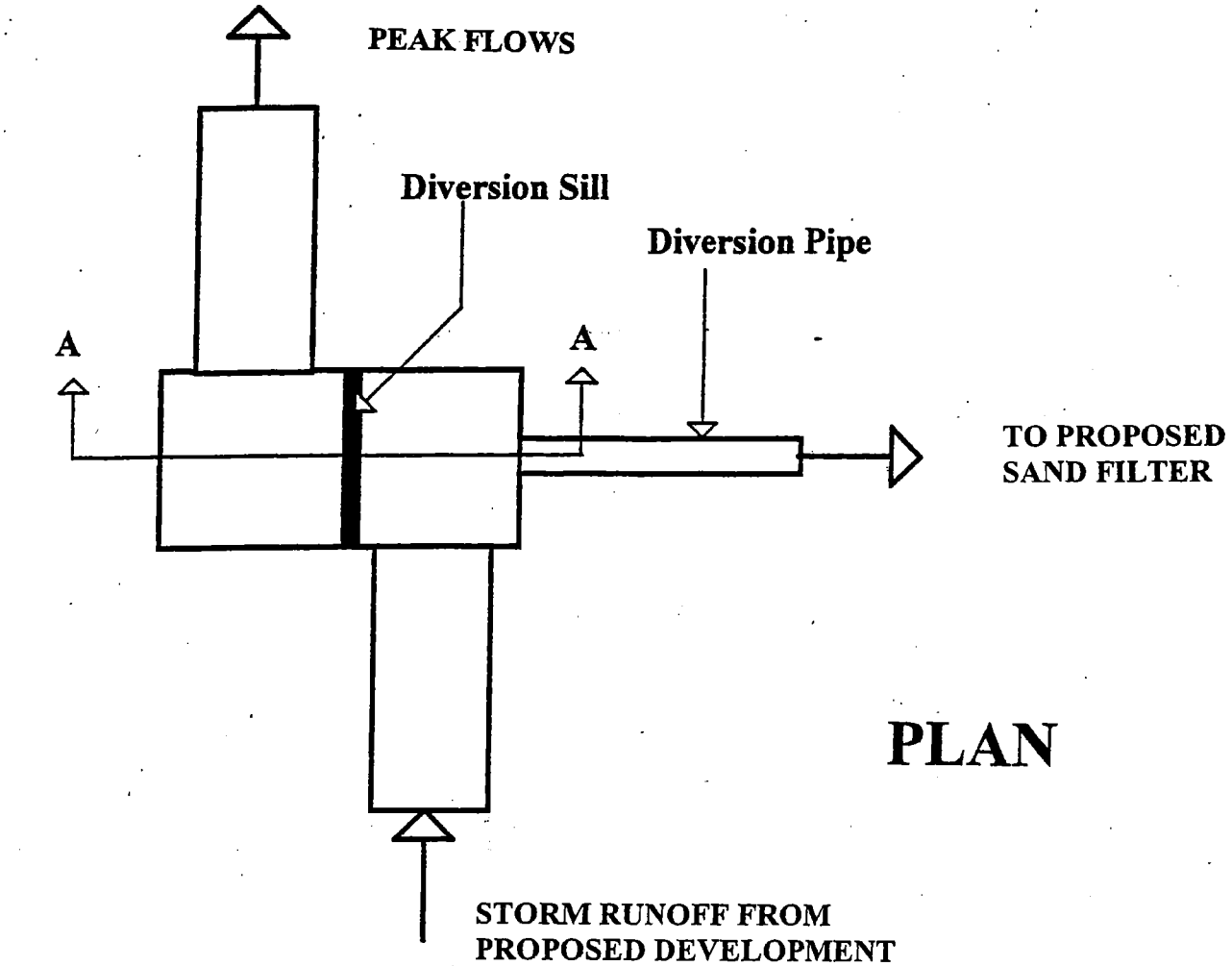


As = Sedimentation basin surface area
Af = Area of sand filter bed
Acw = Area of clear well
Wf = Width of filter bed
Lt = Total length of sand filter system
df = sand filter bed depth
Ls = Length of sedimentation basin
Lp = Min. length of permanent pool
Lf = Length of filter bed
Lcw = Length of clear well
hf = Ave. height of water above sand bed
dg = collector pipe media depth

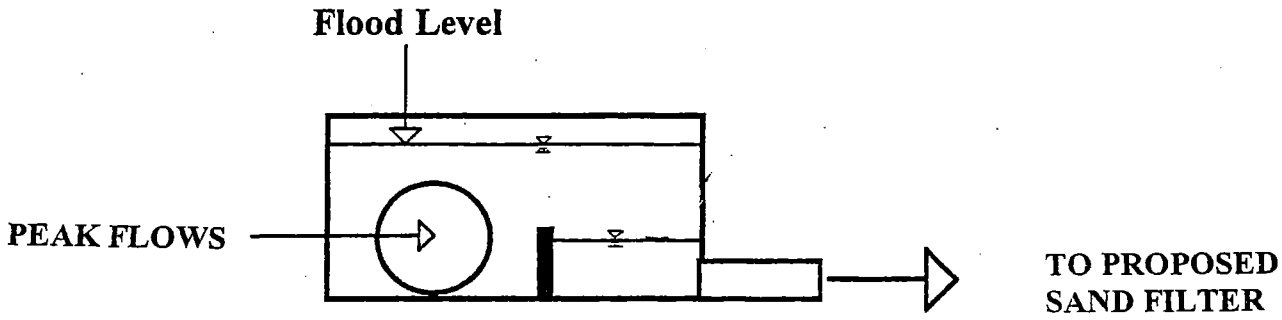
NOTE: FOR CONCEPTUAL PURPOSES ONLY. ACTUAL DESIGN MAY VARY.

SAND FILTER

FIGURE 3



PLAN



SECTION A-A

NOTE: FOR CONCEPTUAL PURPOSES ONLY. ACTUAL DESIGN MAY VARY.

SMART BOX DETAIL

FIGURE 4

HYDROLOGY

The hydrologic calculations were performed using "CIVILDESIGN" software developed by Joseph Bonadiman & Associates, Inc., of San Bernardino, which is in accordance with the County of Orange Hydrology Manual (October 1986).

Table 1 summarizes the results of the hydrology study for a 10-year and 100-year storm event for existing conditions and developed conditions. Note that in the developed conditions, there are fewer total drainage areas due to the combining of drainage areas in the design of the Strand residential area.

The following is a brief explanation of input data used in the hydrology calculations:

Rainfall

The computer program stores a rainfall database corresponding to the County of Orange Hydrology Manual (October 1986), which provides the required time vs. intensity data for Orange County.

Infiltration

Infiltration is described in the Orange County Hydrology Manual as the process of water entering the soil surface during a precipitation event and percolating downward into the soil. The major factor affecting the infiltration rate is the type of soil. Soils that consist of clayey material will have a low infiltration rate, therefore produce a high runoff. Soils that consist of poorly-graded sands or gravel will have a high infiltration rate and will not generate as much surface runoff.

The County of Orange has classified the various soil types into four groups: A, B, C and D. Group A has a high infiltration rate, group B has a moderate infiltration rate, group C has a slow infiltration rate and group D has a low infiltration rate. Maps are included in the Orange County Hydrology Manual that designate the location of the various soil groups.

A soils map based on "Plate A, Hydrologic Classification of Soils" from the Orange County Hydrology Manual is included in this report. (Figure 5, Soil Identification Map). Soil type "B" was used in the hydrologic computations. For further explanation of soil characteristics as it relates to surface runoff, refer to the Orange County Hydrology Manual.

Land Use Designation

The land use type is a significant factor in calculating surface runoff. The higher the amount of impervious area in a watershed, the greater the

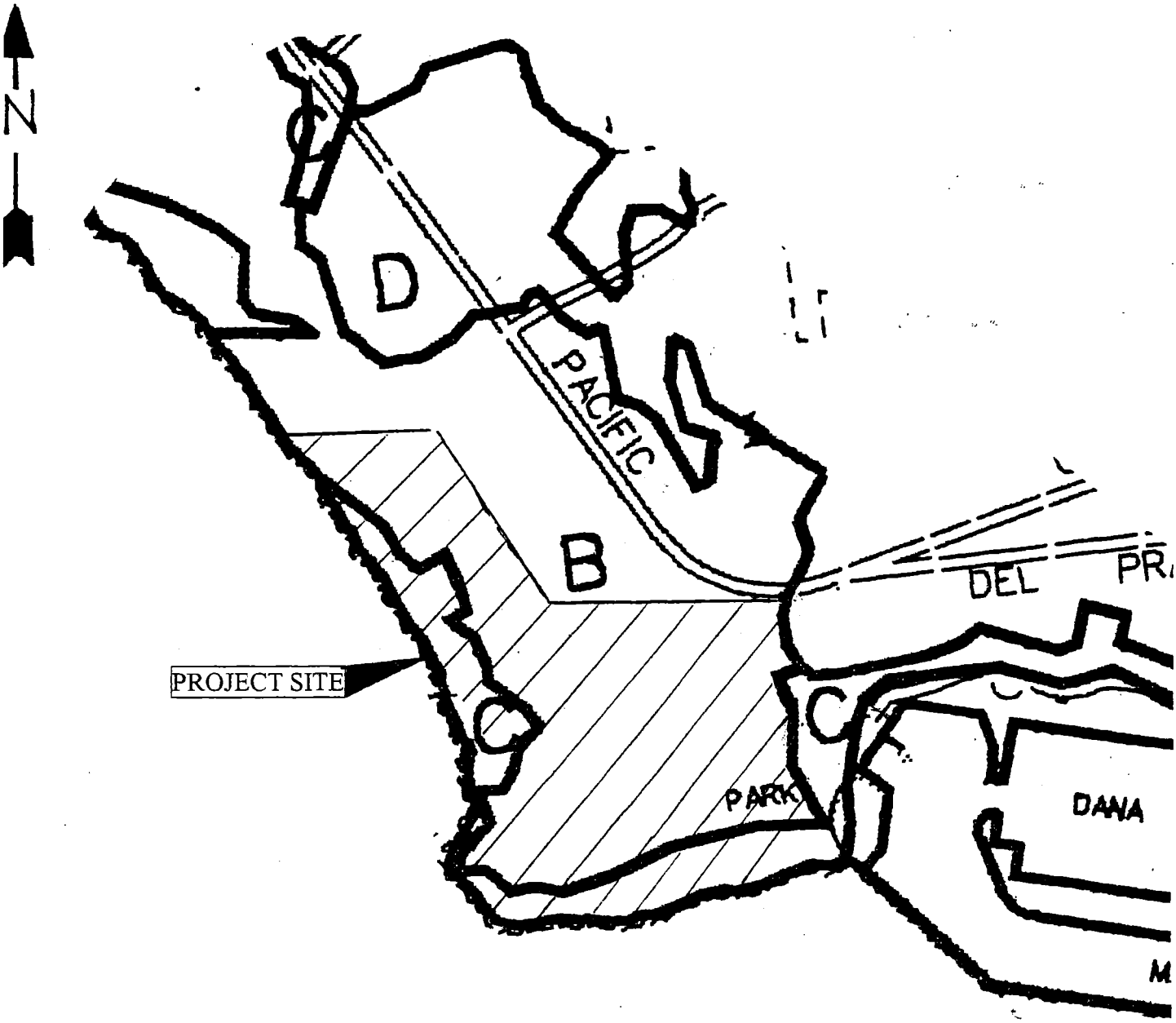
amount of runoff. For residential development, as the number of dwelling units per acre increases, the amount of impervious area also increases which contributes to higher stormwater runoff. Likewise, parks and open space contribute minimal runoff due to their low impervious ratio. For comparison purposes, each drainage area has been broken down into various land designations: commercial, apartment, single family, etc. The results for the existing conditions are summarized in Table 2 and the results for the developed conditions are summarized in Table 3.

TABLE 1:
COMPARISON OF CONDITIONS

EXISTING CONDITIONS:				
Drainage Basin	**Area (Acres)**	**Q_{10} (CFS)**	**Q_{100} (CFS)**	**Comments**
Area A	30.57	66.3	102.1	Outlet to Harbor
Area B	36.86	54.2	92.2	Existing storm drain/Surface flow to Strand Beach
Area C	10.61	16.3	26.7	Surface flow over bluff
Area D	18.66	35.5	59.4	Surface flow over bluff
Area E	11.17	18.5	29.7	Surface flow over bluff
Area F	19.08	41.5	66.1	Existing storm drain/Surface flow to Strand Beach including offsite flow
Area G	8.08	22.6	35.2	Existing storm drain/Surface flow to Strand Beach
Area H	2.24	7.2	11.2	Existing storm drain/Surface flow to Strand Beach
Area I	10.33	23.9	38.1	Existing storm drain/Surface flow to Strand Beach
DEVELOPED CONDITIONS:				
Drainage Basin	**Area (Acres)**	**Q_{10} (CFS)**	**Q_{100} (CFS)**	**Comments**
Area A	29.30	65.5	103.6	Outlet to Harbor
Area B1	42.36	73.5*	118.7*	To Node 214 *
Area B2	10.18	53**	86.2**	Proposed storm drain system to Strand Beach including offsite flow
Area B3	5.34	45.2**	73**	Proposed storm drain system to Strand Beach, including offsite flow
Area C	9.86	15.6	25.9	Surface flow over bluff
Area D	17.36	28.5	47.3	Surface flow over bluff
Area E	10.18	17.8	28.6	Surface flow over bluff
Area F	23.50	54.9	87.5	Proposed storm drain system to Strand Beach

* Refer to Hydrology Exhibit, Sheet 4. The entire area of B1 flows to Node 214. At Node 214, there is a diversion structure and a split flow structure. The diversion structure, located upstream of the split flow structure, diverts the flow from Area B1 to the sand filter. For storms larger than the 85th percentile, runoff will flow to the split flow structure and be divided between two outfalls. Half will flow to the Area B2 outfall at the south end of the beach and half will flow to the Area B3 outfall at the center of Strand Beach. The flow from Area B1 is accounted for in the values for Area B2 and Area B3.

**Includes half the flow from Area B1.



SOIL IDENTIFICATION MAP

FIGURE: 5

TABLE 2
LAND DESIGNATION - AREA (ACRES)
EXISTING CONDITION

LAND USE	A	B	C	D	E	F	G	H	I	TOTAL ACRES
Commercial	11.04	2.05	0.43	0.47		4.75		0.97	1.67	**21.38**
Mobile Home						0.59	6.96		1.38	**8.93**
Apartments						7.77				**7.77**
Condominiums	1.15	0.92	0.64							**2.71**
Single Family (8-10 d.u./acre)	0.23									**0.23**
Single Family (2 d.u./acre)					1.14					**1.14**
Undeveloped-poor cover	12.82	21.48	1.95	1.07		0.37	1.12	1.27	0.36	**40.44**
Undeveloped-average cover	5.33	12.41	7.59	17.12	10.03	5.60			6.92	**65.00**
TOTAL ACRES	**30.57**	**36.86**	**10.61**	**18.66**	**11.17**	**19.08**	**8.08**	**2.24**	**10.33**	**147.60**

NOTES:

The above acreages include onsite and offsite areas.

Per the Orange County Hydrology Manual, the land use indicated as "commercial" is defined as an area consisting of 80 to 100 percent impervious area. In addition to commercial development, this includes streets and parking lots.

TABLE 3

LAND DESIGNATION - AREA (ACRES)

DEVELOPED CONDITION

LAND USE	A	B1	B2	B3	C	D	E	F	TOTAL ACRES
Commercial	14.53	2.47		3.68	0.25	0.24		1.46	**22.63**
Mobile Home									**0.00**
Apartments		7.77							**7.77**
Condominiums	1.15	1.20			0.64				**2.99**
Single Family (8-10 d.u./acre)	0.23								**0.23**
Single Family (3-4 d.u./acre)			4.71					15.44	**20.15**
Single Family (2 d.u./acre)		25.48					1.14		**26.62**
Single Famile (40 percent Imp.)									**0.00**
Undeveloped-poor cover	4.15	2.29							**6.44**
Undeveloped-average cover	6.61		1.48		7.59	17.12	9.04		**41.84**
50% street, 50% landscape		0.61							**0.61**
Park	1.40								**1.40**
Landscape Area	1.23	2.54	3.99	1.66	1.38			6.60	**17.40**
TOTAL ACRES	**29.30**	**42.36**	**10.18**	**5.34**	**9.86**	**17.36**	**10.18**	**23.50**	**148.08**

NOTES:

The above acreages include onsite and offsite areas.

Per the Orange County Hydrology Manual, the land use indicated as "commercial" is defined as an area consisting of 80 to 100 percent impervious area. In addition to commercial development, this includes streets and parking lots.

HYDRAULICS

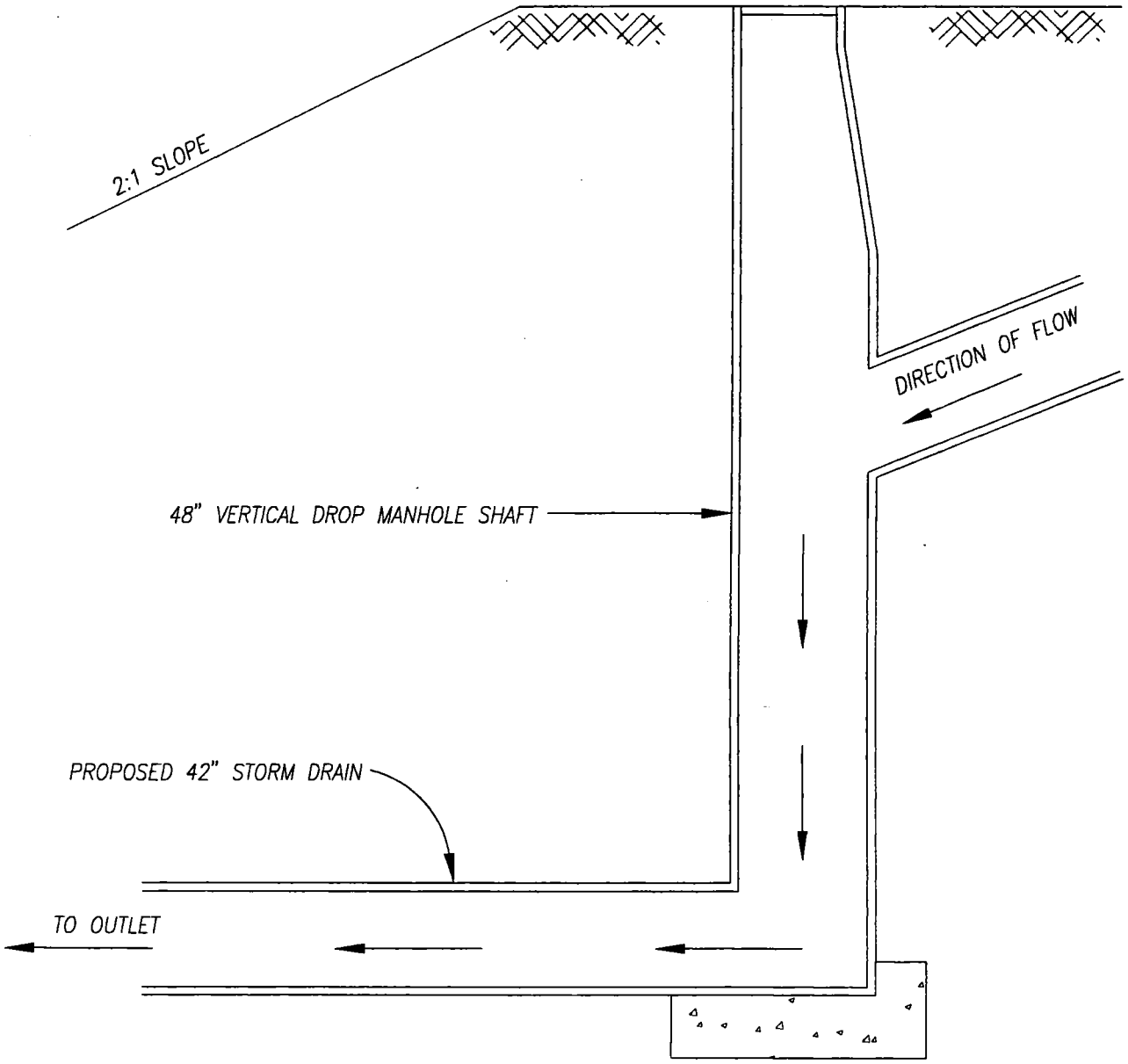
A hydraulic study was conducted to determine the most appropriate method to reduce the velocities of the storm drain outlets along Strand Beach to non-erodible levels, based on the calculated peak flow rates. A target velocity of approximately six feet per second is recommended by Noble and Associates, at each outlet location, to minimize the potential for erosion of beach sand. Once the method of energy dissipation was determined, preliminary calculations were done to determine the required pipe outlet diameter to achieve the target velocity.

The most common method of reducing velocities for drainage areas of the size similar to the Headlands would be an "impact energy dissipater." This is a relatively large, baffled, concrete outlet structure, and is generally used at the base of large fill slopes and in canyon bottoms that are remote from lines of sight and public contact. Use of a large concrete structure like this on a public beach would not typically be appropriate.

A lengthy riprap apron immediately downstream of the outlet is another option. However, a design criteria is to avoid encroachment onto the beach, so this option is not appropriate.

Velocity control rings have also been used to reduce velocities at the outlet and may prove to be effective if utilized in the design of the storm drain system for this project. These are rings of concrete that fit inside the pipe, upstream of the outlet. They are intended to create a hydraulic jump inside the pipe, thus increasing the wetted area and reducing the velocity inside the pipe and at the outlet.

A less common option is a vertical drop structure. This design calls for an internal vertical drop in the storm drain system, near the outlet. The topography of the site lends itself to this design. The vertical drop transfers all of the water's velocity into a vertical component, and dissipating the energy as it hits the flat bottom of the structure. The outlet would be a storm drain pipe on a relatively flat slope, sized for the outlet velocity criteria. (See Figures 6 and 7, Vertical Drop Structure and Outlet Detail, respectively). For the Headlands, a vertical drop structure is proposed above each outlet at Strand Beach. The analysis indicates that outlet velocities in the range of 6.0 fps or less are projected. The pipe is designed to outlet through the reconstructed rip rap revetment at the anticipated winter level of the sand. In summer months when sand levels are higher, the outlets will be at least partially obscured and possibly buried in the sand. Outletting on the revetment, as shown in Figure 7, will also serve to further reduce velocity levels below that shown on Table 4, further reducing the potential for sand erosion.



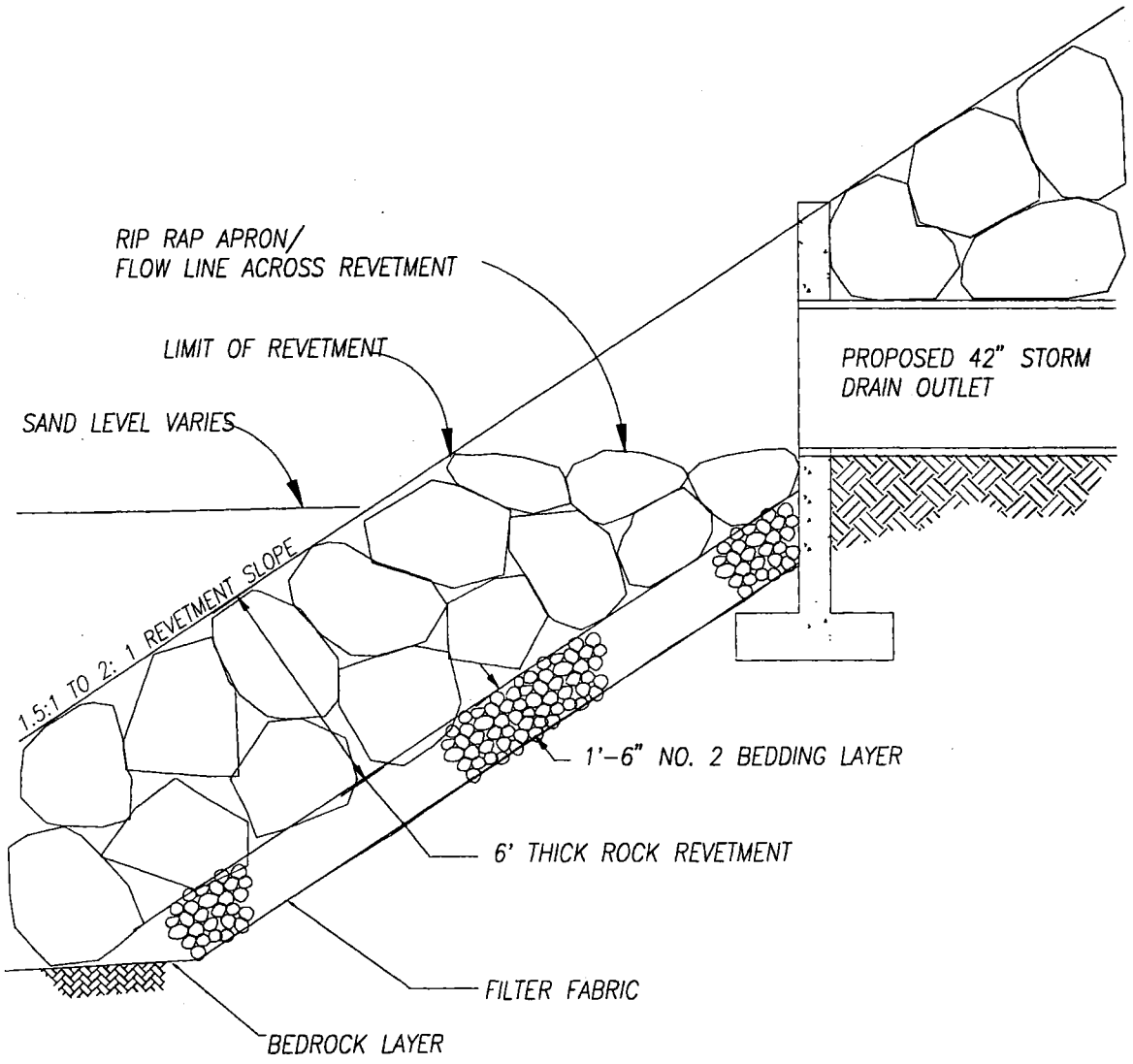
NOT TO SCALE

Project:	VERTICAL DROP STRUCTURE
Description:	FIGURE 6

The Keith Companies TKC
2955 Red Hill Avenue, Costa Mesa, CA 92626 (714) 540-0800

Job No.: 13266.00	Date: 5/18/01

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NOT TO SCALE

Project:	OUTLET DETAIL
Description:	FIGURE 7
The Keith Companies	TKC
2955 Red Hill Avenue, Costa Mesa, CA 92626 (714) 540-0800	
Job No.: 13266.00	Date: 12/13/00

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TABLE 4:
VELOCITIES AT OUTLETS

VELOCITIES AT OUTLETS			
Drainage Area	**Q_{10} (CFS)**	**OUTLET SIZE**	**VELOCITY (FPS)**
B2 (South)	44.9	42"	5.4
B3 (Central)	43.6	42"	5.3
F (North)	51.3	42"	6.1

SUMMARY OF RESULTS

This report summarizes the hydrologic analysis and provides important hydraulic information to assist in the design of the drainage facilities for the Project. In addition, the data generated, herein, will be used by URS Corporation and Richard F. Ford, Ph.D., to prepare a water quality analysis.

The storm drain improvements will be designed to provide protection as required by the City of Dana Point City Plan and the Orange County Local Drainage Manual. In fact, additional protection will be achieved since the storm drain system will be designed to handle the runoff from a 100-year storm event. As a result of the proposed development, existing erosion resulting from unrestricted offsite flow and some clogged or failing storm drain pipes onsite, will be eliminated. Moreover, erosive velocities at one or more of the existing outlets at Strand Beach will be replaced by outlets which will discharge the runoff at non-erosive levels. All the flow from the proposed development, with the exception of slopes in or adjoining natural open space areas, will now be directed to new storm drain systems. The storm drain improvements, including sand filters and nuisance water diversion systems, will also accept flow from off-site development of approximately 34.0 acres.

As previously mentioned, the combination of the sewer diversion and the sand filter will prove to be a highly effective method for water quality treatment. The project proposes to locate the BMP structures in locations, which will have the maximum beneficial impact.

Strand Beach

As indicated in Table 7, non-erodible velocities at the outlet locations along Strand Beach can be achieved for the 10-year storm event. This can be accomplished by utilizing a vertical drop structure to dissipate the energy before outletting onto the beach. The vertical drop structure would not be visible from the beach since it is located internal to the system. Velocities will be further reduced by outletting onto the revetment.

A slight increase in peak flow will be generated to Strand Beach due to the proposed development. As with most developments, this increase is contributed from higher impervious areas associated with development. It is expected and is not a cause for concern, as long as measures are taken, as we have done, to prevent potential adverse impacts.

Dana Point Harbor

The peak flows to the Harbor will not increase as a result of the proposed development. Although there is an increase in impervious area as a result of the development, storm flows from some of the areas has been diverted away from the Harbor, thus reducing the size of the watershed. As a result, the total peak

flow at the harbor has slightly decreased for the 10-year storm event. Improvements will be required along Cove Road. The development will contribute to increased runoff on Cove Road. The proposed improvements will consist of extending a storm drain from the development along Cove Road, removing the existing headwall and replacing it with a junction structure and an inlet. As mentioned earlier, in its existing condition, the height of this headwall has been increased with the use of sandbags. The removal of this headwall or improvements to the headwall is necessary for public safety. At best, sandbags are an interim solution. This improvement will enhance the aesthetics of the area and provide a long-term public safety improvement.

The outlet pipe into the harbor will remain. The parking lot will continue to detain water as it does in the existing condition. Ponding is expected to the same elevation as in the existing condition, therefore, the flow outletting the existing 24" pipe will not change as a result of the proposed development. Since the velocity at the pipe outlet remains unchanged, the discharge from the pipe will not contribute to additional dislodging of the riprap at the outlet to the Harbor. (See section, "Existing Conditions.")

The proposed sand filter in the harbor parking lot will provide several advantages. First of all, it will enhance the quality of the runoff into the harbor. In addition, maintenance will be reduced by incorporating a mechanical diversion structure and ponding should be lessened during storm events within the 85th percentile.

The sand filter system is one of the most effective methods in treating storm water runoff. It will be designed to treat the entire tributary area of watershed A of which 17.0 acres or 58 percent is not a part of the project. In the existing condition, the runoff flows directly into the Harbor, without any structural BMP's to ensure the water is treated. By incorporating a sand filter system, not only is the water treated, but also due to detention within the pre-treatment settlement basin and sand filter, it is outletted into the receiving water body at a significantly reduced rate from the existing conditions. As a result, the receiving water body is not inundated with a high volume of untreated, which could lead to unacceptable levels of pollution. The detention characteristic significantly reduces the rate at which the receiving water body accepts the runoff, thus further minimizing the potential for impacts.

Dry season nuisance flow will be diverted into the sewer system by a mechanical iversion structure. Currently, diversion of the first flush is done manually by plugging the outlet and holding the runoff in the storm drain system until a pump is brought on site. Incorporating a permanent mechanical diversion structure for nuisance flow, as proposed, eliminates considerable maintenance on the part of the County and eliminates the potential for flooding if the outlet is not unplugged prior to a rainstorm.

Ponding in the parking lot will not occur during storm events within the 85 Th percentile. The sand filters are designed to provide storage for the entire volume of storm water runoff generated by this event.

Bluffs

As a result of the proposed development, the overall tributary area flowing over the bluff has decreased by approximately 3 acres. A combination of a reduction of overall tributary area and the removal of existing asphalt on Marguerita Avenue will reduce the flow over the bluff. This will decrease the rate of erosion at the end of Dana Strand Road within the proposed Headlands Conservation Park.

POTENTIAL IMPACTS

Following is a list of potential impacts of the proposed project and a description of design features of the project, which minimize or eliminate the impacts:

1. **Downstream Flooding Risk.**

   The safety of downstream properties is an important issue for new development. The only downstream area with a potential for flooding is the Harbor at the base of Cove Road. The risk of flooding in the developed condition has been reduced from that of the existing condition with the proposed project improvements. These improvements include the replacement of the headwall at Cove Road and the permanent diversion of nuisance flows, which will replace the temporary plugging of the storm drain outlet. The outlet into the Harbor will no longer require manual diversion of the water from the storm drain system to the sewer system. This eliminates the risk of not removing the plug at the outlet prior to a storm event. Ponding will continue to occur in the parking lot, however, the development will not contribute to additional ponding, and this ponding does not impact any habitable structures.

   The storm drain improvements on Cove Road include the removal of the existing headwall at the top of the bluff and the construction of a new storm drain pipe and junction structure. Since this headwall was not properly designed, these improvements will eliminate the potential for water to overtop the existing headwall.

2. **Bluff Erosion**

   Areas C, D, and E currently flow over the top of the bluff into the ocean. Except for the existing residential enclaves, these areas are proposed conservation open space and park areas and will have minimal impervious area. Except for a small area on Dana Strand Road, all of the proposed parking areas, that serve the parks and visitor recreation facilities along Scenic Drive, will be directed to the storm drain system to the Harbor. The project plans to reduce the total area, which drains to the bluffs, by diverting approximately three acres into the storm drain system and reduce the amount of impervious area in these watersheds by the removal of the existing pavement on Marguerita Avenue. Based on these project features, the proposed project will not contribute to additional bluff erosion.

3. **The Amount of On Site Erosion**

   The existing site has experienced considerable erosion as a result of deterioration of the storm drains built for the former mobile home park. Off site development has introduced unrestricted flow onto erodable areas of the

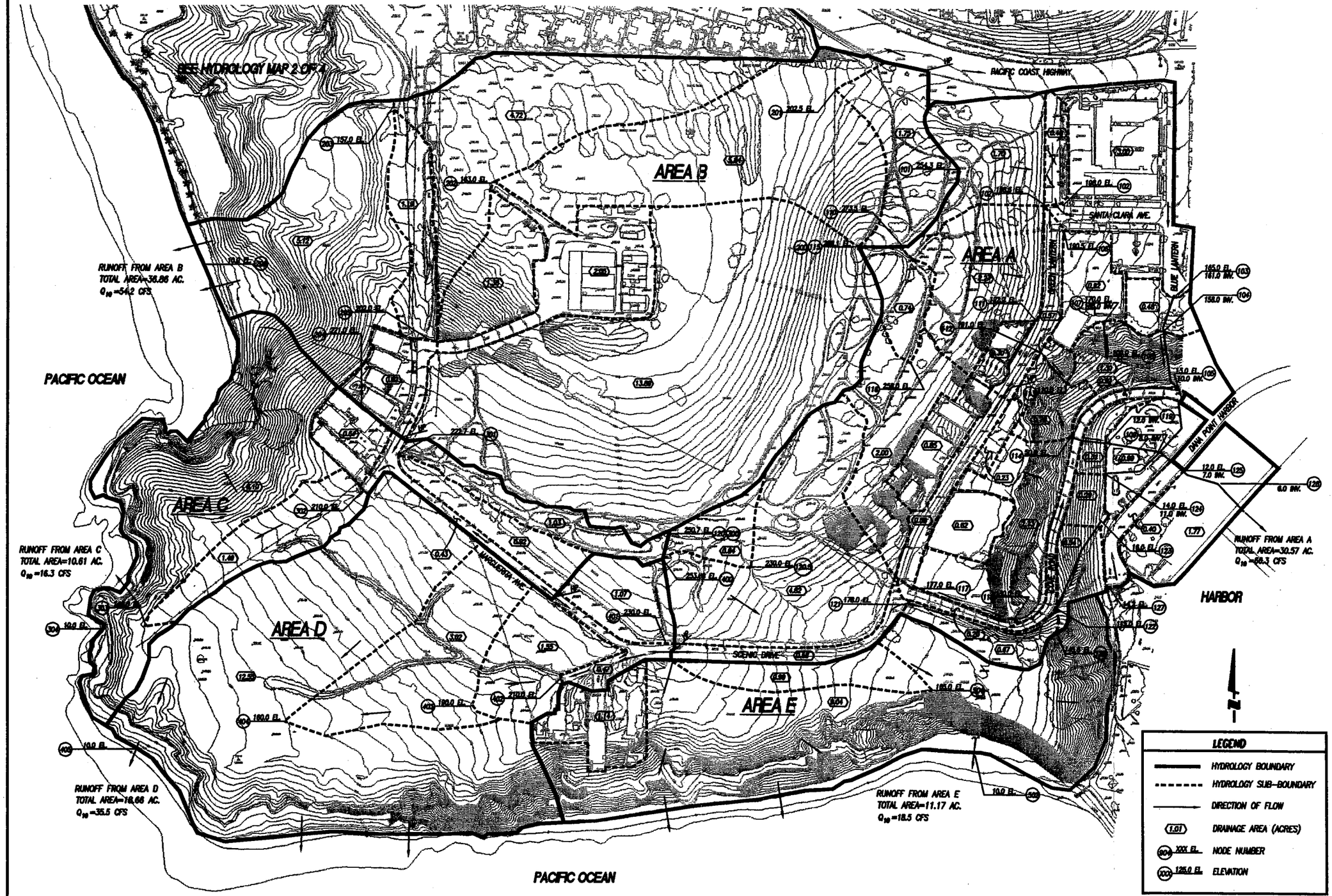
property. The storm drain improvements for the project include the removal of the deteriorating storm drains and the construction of new and improved drainage structures, which also accept off-site flow. These improvements will confine offsite flow into the storm drain system, therefore, minimizing the potential for erosion.

4. Beach Erosion

In the existing condition, there are five storm drain outlets on Strand Beach. However, in some areas, drainage from the watershed to the beach is surface flow. Construction of the proposed project will eliminate most of the surface flow and outlet the runoff into three points on the beach revetment. To minimize concentrated flow, the project proposes to provide a spilt flow structure to spread the flow evenly among the three outlets and construct internal, energy dissipaters to reduce the velocity at the outlets to approximately 6 feet per second, during a 10-year storm event. The riprap revetment, downstream of the pipe outlet, will further reduce the velocities. The coastal process assessment prepared by Noble Consultants, Inc., deals with this issue in more detail.

5. On-Site Flooding

All proposed habitable structures will be protected from flooding during the 100-year storm. All pad elevations will be designed to be at a minimum of one foot above the 100-year flood elevation.



4/9/01

NOT TO SCALE

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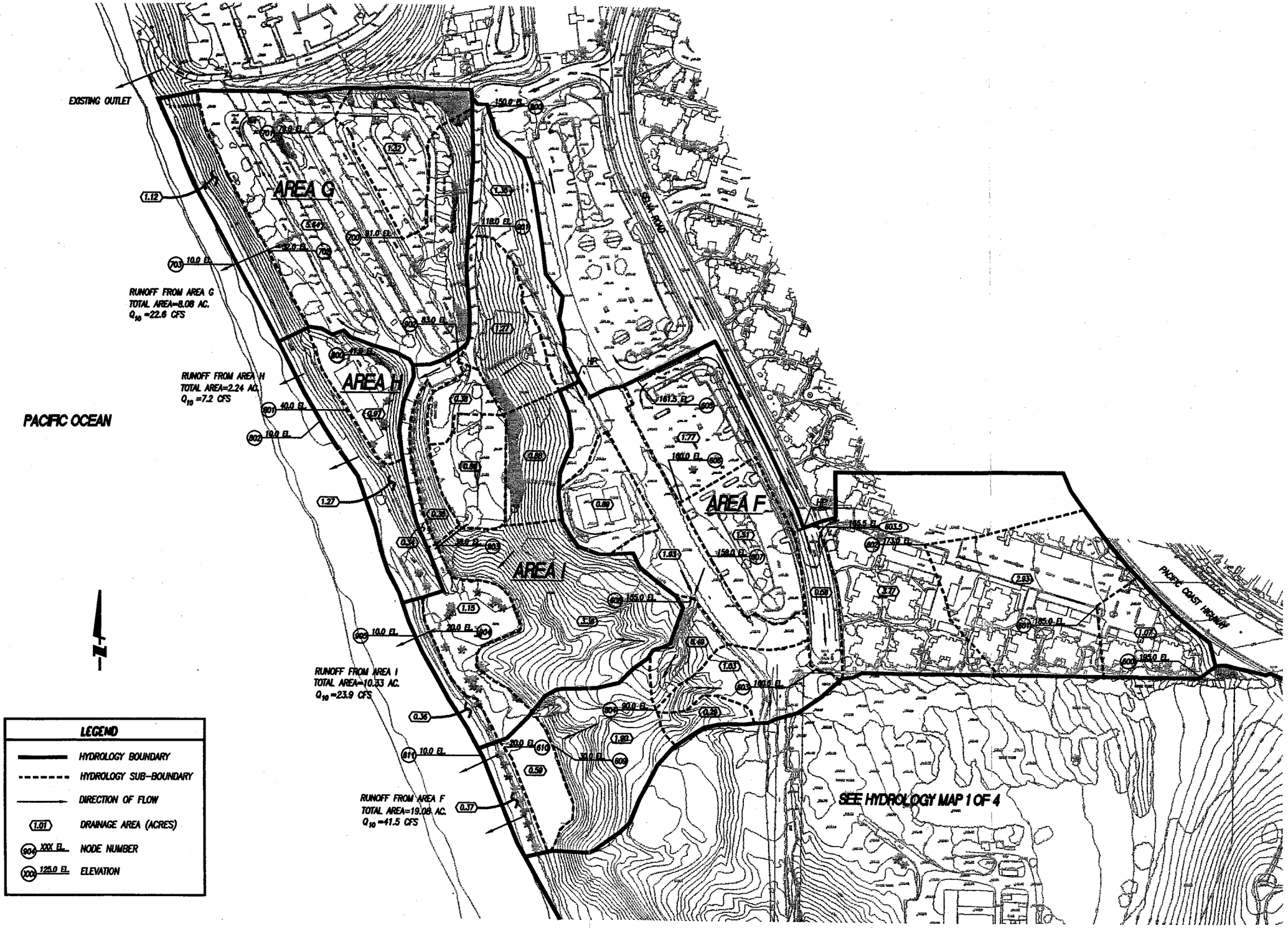
DESIGNED BY:
DRAFTED BY:
CHECKED BY:
DATE:

The Keith Companies TKC
2955 Red Hill Avenue, Costa Mesa, CA 92626 (714) 540-0900

DANA POINT HEADLANDS
HYDROLOGY EXHIBIT
EXISTING CONDITIONS

PROJECT NO. 92268.000

SHEET 1 OF 4



LEGEND

- HYDROLOGY BOUNDARY
- HYDROLOGY SUB-BOUNDARY
- DIRECTION OF FLOW
- (1.01) DRAINAGE AREA (ACRES)
- (904) XXX El. NODE NUMBER
- (XXX) 125.0 El. ELEVATION

4/9/01

NOT TO SCALE

NO.	DATE	REVISIONS

DESIGNED BY:
DRAFTED BY:
CHECKED BY:
DATE:

The Keith Companies TKC
2955 Red Hill Avenue, Costa Mesa, CA 92626 (714) 540-0800

DANA POINT HEADLANDS
HYDROLOGY EXHIBIT
EXISTING CONDITIONS

PROJECT NO. 13266.000

SHEET 2 OF 4

J:\13266\007\DWG\PRO13266

PACIFIC COAST HIGHWAY

SANTA CLARA AVE.

SEE HYDROLOGY MAP 4 OF 4

AREA A

AREA C

AREA D

AREA E

PACIFIC OCEAN

SCENIC DRIVE

HIGHLAND DRIVE

DANA POINT HARBOR

HARBOR

RUNOFF FROM AREA C
TOTAL AREA=9.86 AC.
Q_{10}=15.8 CFS

RUNOFF FROM AREA D
TOTAL AREA=17.36 AC.
Q_{10}=28.5 CFS

RUNOFF FROM AREA E
TOTAL AREA=10.18 AC.
Q_{10}=17.8 CFS

RUNOFF FROM AREA A
TOTAL AREA=29.30 AC.
Q_{10}=65.5 CFS

LEGEND

- HYDROLOGY BOUNDARY
- HYDROLOGY SUB-BOUNDARY
- DIRECTION OF FLOW
- (1.01) DRAINAGE AREA (ACRES)
- (904) XXX FL. NODE NUMBER
- (XXX) 125.0 FL. ELEVATION
- SAND FILTER

4/9/01

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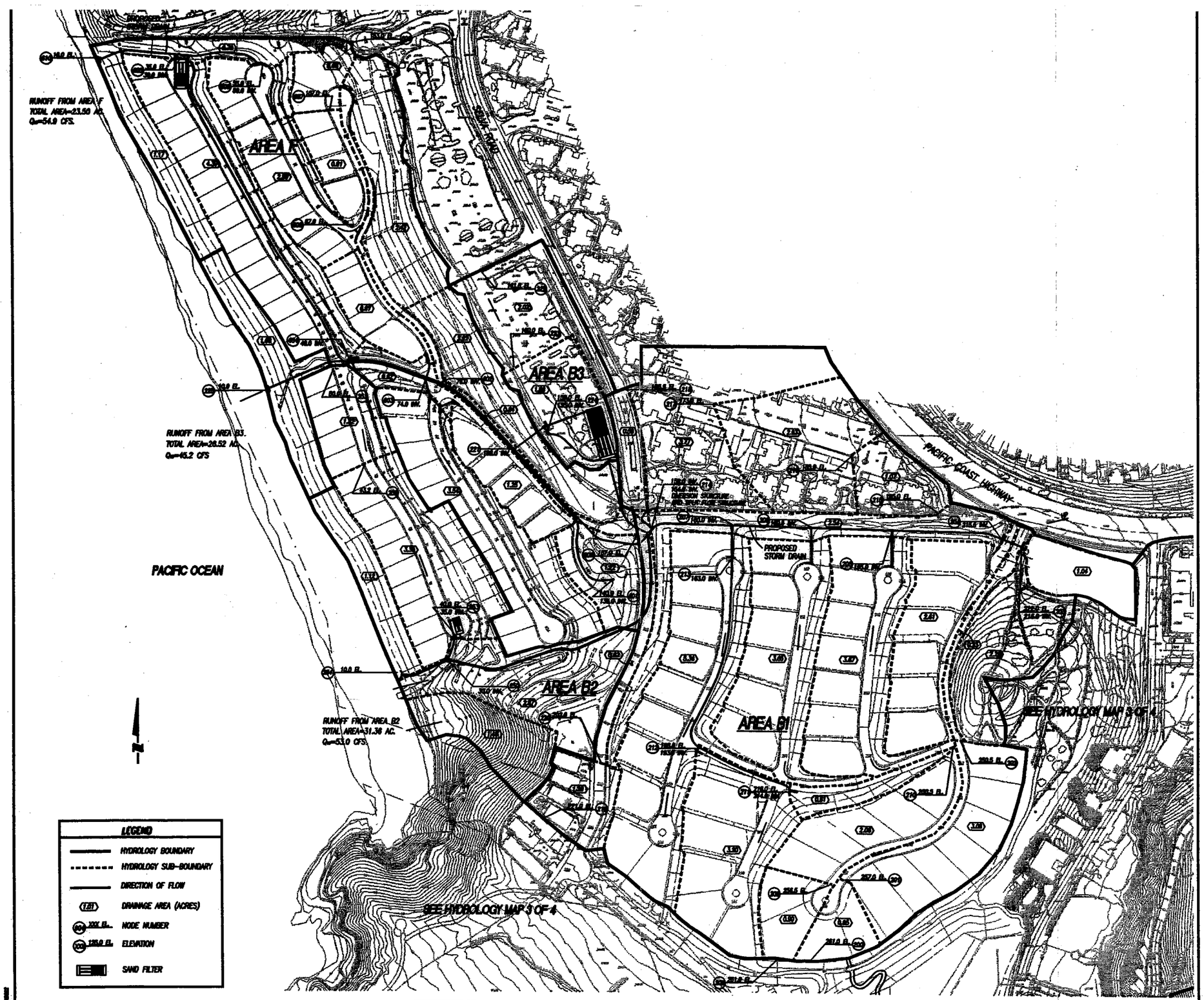
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DANA POINT HEADLANDS
HYDROLOGY EXHIBIT
DEVELOPED CONDITIONS

PROJECT NO. 12206.000

SHEET 3 OF 4



4/10/01

NOT TO SCALE

NO.	DATE	REVISIONS

DESIGNED BY:
DRAFTED BY:
CHECKED BY:
DATE:

The Keith Companies TKC
2560 Red Hill Avenue, Costa Mesa, CA 92626 (714) 540-0809

DANA POINT HEADLANDS
HYDROLOGY EXHIBIT
DEVELOPED CONDITIONS

PROJECT NO. 92000.000
SHEET 4 OF 4

APPENDIX F

DRAINAGE STUDY

Appendix A, Rational Method Calculations – 100 Year Storm and Appendix B, Rational Method Calculations – 10 Year Storm, both part of EIR Appendix F, Drainage Study, are contained in Volume IIA, Additional Appendices.

APPENDIX G

NOISE MODEL DATA

APPENDIX G

NOISE MODEL DATA

Appendix G, Noise Model Data, is contained in Volume IIA, Additional Appendices.

APPENDIX H

TRAFFIC STUDY

HEADLANDS
TRAFFIC STUDY
DANA POINT, CALIFORNIA

Prepared for:

LSA ASSOCIATES, INC.
One Park Plaza, Suite 500
Irvine, CA 92614

Prepared by:

RK ENGINEERING GROUP, INC.
1301 Dove Street, Suite 370
Newport Beach, CA 92660

Ann Cadavona
Robert Kahn, P.E.

September 14, 2001

JN:1110-99-01
RK:AC:kd/311

RK engineering group, inc.

transportation planning ▪ traffic engineering
acoustical / air quality studies

September 14, 2001

Mr. Rob Balen
LSA ASSOCIATES, INC.
One Park Plaza, Suite 500
Irvine, CA 92614

Subject: Headlands Traffic Study

Dear Mr. Balen:

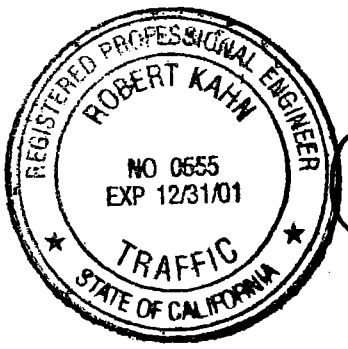
RK ENGINEERING GROUP, INC. is pleased to submit the Headlands Traffic Study. The project site is located west of Pacific Coast Highway between Selva Road and Street of the Green Lantern in the City of Dana Point. This report provides a summary of the findings, analysis procedures and evaluation of the proposed project with respect to on-site and off-site traffic impacts pursuant to City of Dana Point requirements. The report has been revised based on new land uses for the Monarch Beach project.

Based upon this review, the proposed project can be accommodated within the planned circulation system, if the recommended improvements are implemented. These recommendations are included in the "Findings" section of this report.

RK ENGINEERING GROUP, INC. is pleased to provide this Traffic Study to LSA ASSOCIATES, INC. for use in assessing the circulation features of the Headlands development. If you have any questions regarding this study, please do not hesitate to call at (949) 474-0809.

Sincerely,

RK ENGINEERING GROUP, INC.



Ann Cadavona
Senior Transportation Planner

Robert Kahn, P.E.
Principal

RK:AC:kd/311
JN:1110-99-01
Attachments

1301 dove street, suite 370
newport beach, california 92660
tel 949.474.0809 fax 949.474.0902
http://www.rkengineer.com

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HEADLANDS
TRAFFIC STUDY
DANA POINT, CALIFORNIA

1.0 INTRODUCTION

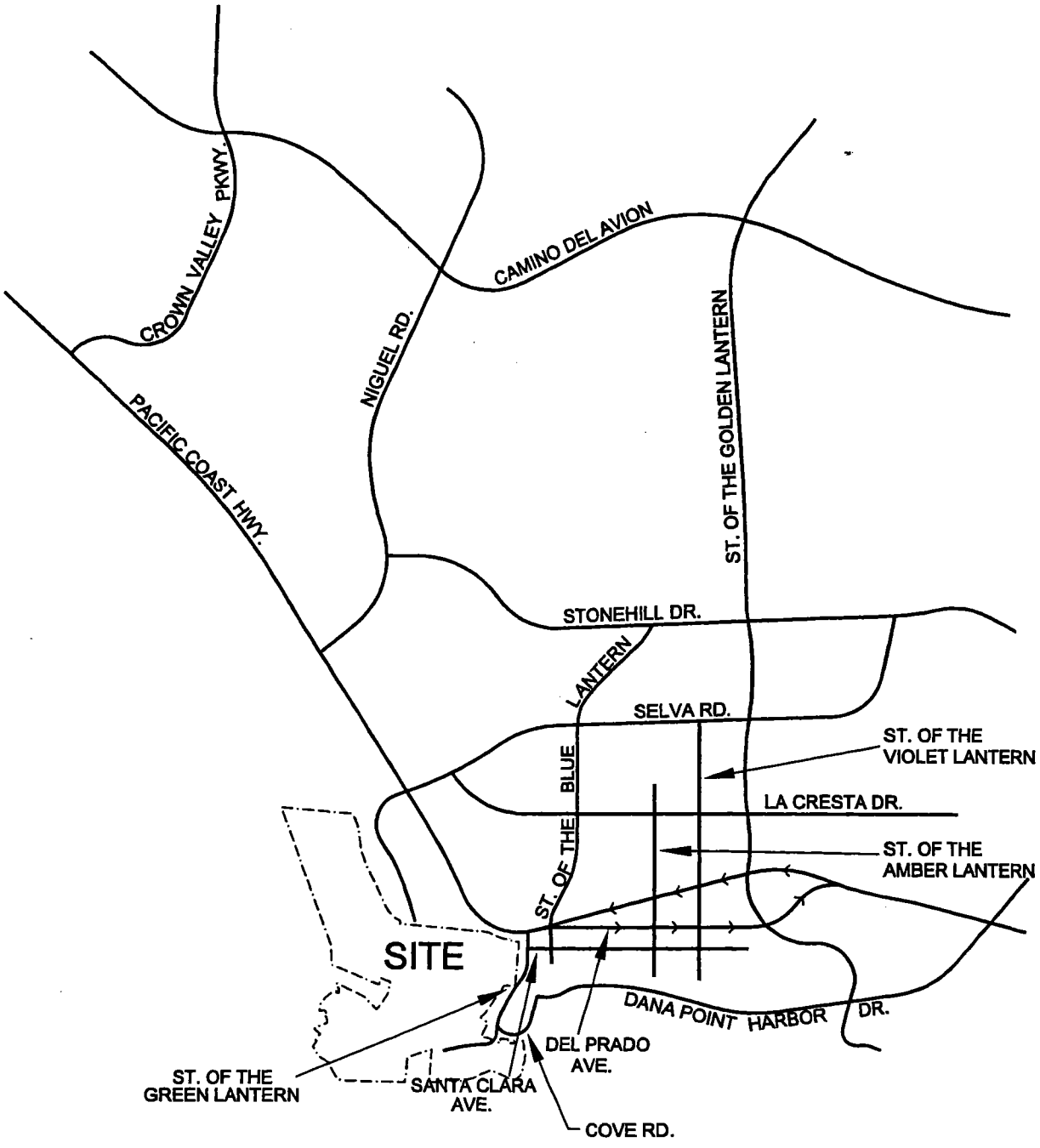
The purpose of this Traffic Study is to evaluate the development of the proposed Headlands project from a traffic circulation standpoint. The project is located west of Pacific Coast Highway generally between Selva Road and Street of the Green Lantern in the City of Dana Point ("City") (see Exhibit 1-A).

The proposed project is projected to generate significantly less traffic than the currently approved City General Plan. The current City General Plan daily trip generation is 16,350 vehicles per day with 820 vehicle trips during the AM peak hour and 1,485 vehicles trips during the PM peak hour. The proposed project is expected to generate approximately 4,599 vehicle trips per day with 214 vehicle trips during the AM peak hour and 397 vehicle trips during the PM peak hour.

Based upon discussions with City staff, this Traffic Study includes the following evaluations: existing traffic conditions; existing plus project traffic conditions; short-term traffic conditions without and with the proposed project; and buildout traffic conditions without and with the proposed project. An evaluation of summertime traffic conditions without and with the proposed project is also included.

The study area was selected in consultation with City staff based upon reviewing the GMP (Growth Management Program) and CMP (Congestion Management Plan) criteria. Study intersections were identified based upon those intersections where the project would have the potential for increasing the existing ICU (Intersection Capacity Utilization) by more than one percent. By reviewing the existing and existing plus project traffic volumes (Exhibits 3C/3D and 6B/6C) and the intersection ICU levels shown on Table 2, the appropriate

EXHIBIT 1-A
LOCATION MAP



intersections were determined. The project will not have a significant impact to signalized intersections with the I-5 Freeway or it's ramp connections with arterial highways in the study area. A direct link is provided to the I-5 by the connection of SR-1 to the south of the project without providing any conflicting traffic movements. As a result of this evaluation, the following intersections have been included in the study area. Intersections beyond this area would not be significantly affected by the project.

The study area was analyzed for the following sixteen (16) intersections:

Crown Valley Parkway (NS) at:

- Pacific Coast Highway (EW)

Niguel Road (NS) at:

- Pacific Coast Highway (EW)

Pacific Coast Highway (NS) at:

- Selva Road (EW)
- Proposed Project Entrance (EW)

Street of the Green Lantern (NS) at:

- Pacific Coast Highway (EW)

Street of the Blue Lantern (NS) at:

- Pacific Coast Highway (EW)

Street of the Amber Lantern (NS) at:

- Pacific Coast Highway (EW)
- Del Prado (EW)

Street of the Violet Lantern (NS) at:

- Pacific Coast Highway (EW)
- Del Prado (EW)

Street of the Golden Lantern (NS) at:

- Selva Road (EW)
- La Cresta Drive (EW)
- Pacific Coast Highway (EW)
- Del Prado (EW)
- Dana Point Harbor Drive (EW)

Dana Point Harbor Drive (NS) at:

- Pacific Coast Highway (EW)

The proposed project will be served regionally by the I-5 Freeway. The I-5 Freeway is considered part of the Orange County Congestion Program Highway System (CMPHS). As such, CalTrans collects the necessary data and performs any required calculations for freeway LOS as part of the ongoing monitoring efforts. Individual cities are not responsible for freeway mainline volume data collection.

The CMP traffic impact analysis methodology guidelines defines a significant impact as a project's traffic contribution equivalent to three percent of the Level of Service "E" capacity. Based on the Headlands project trip assignment, the project has the potential to add approximately 100 PM peak hour trips to the intersection of Pacific Coast Highway/Dana Point Harbor, the most proximate signalized intersection to the I-5 Freeway interchange. This 100 PM peak hour trip contribution is roughly comparable to a total daily traffic contribution of 1,000 trips. The LOS "E" capacity of an eight-lane freeway is greater than 150,000 daily trips. Therefore, the contribution of the proposed project's traffic to the I-5 Freeway is well below the three percent threshold and would not constitute a significant project impact.

In addition to intersection capacity utilization (ICU) analysis, roadway segments were also evaluated. This traffic study also includes a review of project access, internal circulation, and project parking. Traffic signal warrants were also evaluated for the project entrance/exit at Pacific Coast Highway and "A" Street.

2.0 FINDINGS

The following findings have been reached for the existing conditions and for the future conditions with implementation of the proposed project.

Existing Conditions

1. The project site is generally unoccupied with the exception of the existing greenhouse site. This greenhouse site currently generates a very small amount of traffic (under 50 trips per day) to Dana Strand Road, Cove Road and Street of the Green Lantern.

2. Adjacent to and surrounded by the project site are approximately 28 multi-family residential units and three single-family homes in two residential enclaves. Access to the residential enclaves is currently from Scenic Drive, Street of the Green Lantern or Cove Road.

3. Existing highways in the vicinity of the project site include Pacific Coast Highway (PCH), Crown Valley Parkway, Niguel Road, Selva Road, Street of the Green Lantern, Street of the Blue Lantern, Santa Clara Avenue, Street of Amber Lantern, Street of Violet Lantern, Street of the Golden Lantern, and Dana Point Harbor Drive. Other local roads include Cove Road, Dana Strand Road and Scenic Drive.

4. Existing intersections within the study area are currently operating at acceptable levels of service during peak hours.

5. Additional development in the study area is currently planned or in progress.

6. The County of Orange, in conjunction with the City, has existing funding and implementation programs to construct the circulation system in southern Orange County.

Proposed Project

1. The proposed project allows for implementation of a development and conservation plan consisting of 125 single-family detached residential dwelling units; a 65 room Seaside Inn that includes meeting/function space, restaurant and lounge and related amenities amounting to 13,000 square feet of visitor/recreation commercial uses; park and recreation areas, visitor/recreation (community) facilities, recreation/open space and a visitor/recreation commercial area of up to 40,000 square feet at PCH and project entrance/exit Street "A".

2. The proposed project is projected to generate approximately 4,599 trip-ends per day with 214 vehicles per hour during the AM peak hour and 397 vehicles per hour during the PM peak hour.

3. As shown in Table 2-1, for the typical weekday and during the summer, the study area intersections are projected to continue to operate at acceptable levels of service during peak hours for existing plus project traffic conditions.

4. As shown in Table 2-1, for the typical weekday and during the summer, the study area intersections are projected to operate at acceptable levels of service during peak hours for short-range with project traffic conditions, with improvements.

5. As shown in Table 2-1, for the typical weekday and during the summer, the study area intersections are projected to operate at acceptable levels of service during peak hours for buildout with project traffic conditions, with improvements.

6. As shown in Table 2-2, Pacific Coast Highway north of Crown Valley Parkway, Pacific Coast Highway, east of Dana Point Harbor Drive and Street of Golden Lantern, and north of Del Prado are projected to be over the City's link volume threshold. This is mitigated by the fact that all of the adjacent intersections are projected to operate at acceptable levels of service and, therefore, the highway segments should operate at acceptable levels of service. It has been found that

TABLE 2-1

PROJECT IMPACTS UPON INTERSECTION CAPACITY UTILIZATION

TYPICAL WEEKDAY

INTERSECTION	EXISTING				EXISTING PLUS PROJECT				SHORT-RANGE								BUILDOUT							
									WITHOUT PROJECT				WITH PROJECT				WITHOUT PROJECT				WITH PROJECT			
	ICU[1]		LOS[2]		ICU		LOS		ICU		LOS		ICU		LOS		ICU		LOS		ICU		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																								
• Pacific Coast Hwy. (EW)	0.54	0.56	A	A	0.55	0.57	A	A	0.64	0.65	B	B	0.64	0.66	B	B	0.72	0.77	C	C	0.74	0.78	C	C
Niguel Rd. (NS) at:																								
• Pacific Coast Hwy. (EW)																								
-w/o Improvements	0.60	0.60	A	A	0.62	0.63	B	B	0.71	0.75	C	C	0.72	0.78	C	C	0.68	0.84	B	D	0.70	0.86	B	D
-w/ Improvements	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.62	0.79	B	C	0.63	0.80	B	C
Pacific Coast Hwy. (NS) at:																								
• Selva Rd. (EW)	0.42	0.48	A	A	0.43	0.52	A	A	0.48	0.58	A	A	0.51	0.63	A	B	0.54	0.62	A	B	0.57	0.67	A	B
• Street "A" (EW)	--	--	--	--	0.41	0.51	A	A	--	--	--	--	0.46	0.59	A	A	--	--	--	--	0.50	0.58	A	A
Street of the Green Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.38	0.42	A	A	0.40	0.44	A	A	0.44	0.50	A	A	0.45	0.53	A	A	0.45	0.50	A	A	0.47	0.53	A	A
Street of the Blue Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.44	0.48	A	A	0.48	0.60	A	A	0.52	0.61	A	B	0.53	0.64	A	B	0.53	0.63	A	B	0.54	0.66	A	B
Street of the Amber Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.36	0.37	A	A	0.37	0.39	A	A	0.39	0.45	A	A	0.40	0.46	A	A	0.36	0.40	A	A	0.37	0.42	A	A
• Del Prado (EW)	0.34	0.46	A	A	0.35	0.47	A	A	0.39	0.52	A	A	0.40	0.54	A	A	0.43	0.51	A	A	0.44	0.52	A	A
Street of the Violet Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.36	0.43	A	A	0.37	0.44	A	A	0.40	0.50	A	A	0.41	0.51	A	A	0.35	0.43	A	A	0.37	0.45	A	A
• Del Prado (EW)	0.31	0.40	A	A	0.32	0.41	A	A	0.35	0.47	A	A	0.36	0.48	A	A	0.37	0.46	A	A	0.38	0.48	A	A
Street of the Golden Lantern (NS) at:																								
• Selva Rd. (EW)	0.30	0.31	A	A	0.30	0.31	A	A	0.35	0.34	A	A	0.36	0.34	A	A	0.42	0.45	A	A	0.42	0.46	A	A
• La Cresta Dr. (EW)	0.30	0.37	A	A	0.31	0.38	A	A	0.35	0.41	A	A	0.35	0.41	A	A	0.41	0.63	A	B	0.42	0.63	A	B
• Pacific Coast Hwy. (EW)	0.39	0.46	A	A	0.41	0.47	A	A	0.45	0.58	A	A	0.47	0.60	A	A	0.58	0.75	A	C	0.58	0.75	A	C
• Del Prado (EW)	0.40	0.49	A	A	0.41	0.50	A	A	0.45	0.58	A	A	0.45	0.59	A	A	0.48	0.75	A	C	0.50	0.76	A	C
• Dana Point Harbor Dr. (EW)	0.22	0.29	A	A	0.23	0.29	A	A	0.29	0.44	A	A	0.30	0.45	A	A	0.27	0.83	A	D	0.27	0.84	A	D
Dana Point Harbor Dr. (NS) at:																								
• Pacific Coast Hwy. (EW)																								
-w/o Improvements	0.62	0.74	A	C	0.62	0.76	B	C	0.69	0.84	B	D	0.70	0.86	B	D	1.00	1.31	E	F	1.01	1.33	F	F
-w/ Improvements	--	--	--	--	--	--	--	--	0.65	0.79	B	C	0.66	0.80	B	C	0.61	0.79	B	C	0.62	0.81	B	D

[1] Intersection Capacity Utilization (ICU)

[2] Level of Service (LOS)

-- = Not Applicable

TABLE 2-1 (CONT'D)

PROJECT IMPACTS UPON INTERSECTION CAPACITY UTILIZATION

SUMMER

INTERSECTION	EXISTING				EXISTING PLUS PROJECT				SHORT-RANGE								BUILDOUT							
									WITHOUT PROJECT				WITH PROJECT				WITHOUT PROJECT				WITH PROJECT			
	ICU[1]		LOS[2]		ICU		LOS		ICU		LOS		ICU		LOS		ICU		LOS		ICU		LOS	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																								
• Pacific Coast Hwy. (EW)	0.61	0.62	B	B	0.61	0.62	B	B	0.69	0.71	B	C	0.69	0.72	B	C	0.80	0.84	C	D	0.80	0.84	C	D
Niguel Rd. (NS) at:																								
• Pacific Coast Hwy. (EW)																								
-w/o Improvements	0.66	0.66	B	B	0.67	0.69	B	B	0.78	0.80	C	C	0.80	0.83	C	D	0.74	0.93	C	E	0.77	0.94	C	E
-w/ Improvements	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.67	0.87	B	D	0.69	0.88	B	D
Pacific Coast Hwy. (NS) at:																								
• Selva Rd. (EW)	0.45	0.53	A	A	0.46	0.57	A	A	0.51	0.63	A	B	0.54	0.67	A	B	0.59	0.68	A	B	0.61	0.72	B	C
• Street "A" (EW)	--	--	--	--	0.44	0.54	A	A	--	--	--	--	0.50	0.63	A	B	--	--	--	--	0.54	0.63	A	B
Street of the Green Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.42	0.46	A	A	0.43	0.48	A	A	0.47	0.54	A	A	0.49	0.57	A	A	0.49	0.55	A	A	0.51	0.57	A	A
Street of the Blue Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.47	0.53	A	A	0.53	0.64	A	B	0.55	0.65	A	B	0.56	0.69	A	B	0.57	0.67	A	B	0.61	0.71	B	C
Street of the Amber Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.38	0.41	A	A	0.39	0.43	A	A	0.43	0.47	A	A	0.44	0.49	A	A	0.40	0.43	A	A	0.40	0.45	A	A
• Del Prado (EW)	0.37	0.49	A	A	0.38	0.51	A	A	0.41	0.57	A	A	0.42	0.59	A	A	0.46	0.56	A	A	0.47	0.57	A	A
Street of the Violet Lantern (NS) at:																								
• Pacific Coast Hwy. (EW)	0.38	0.46	A	A	0.40	0.48	A	A	0.44	0.54	A	A	0.45	0.55	A	A	0.40	0.47	A	A	0.40	0.49	A	A
• Del Prado (EW)	0.33	0.43	A	A	0.34	0.45	A	A	0.37	0.51	A	A	0.38	0.52	A	A	0.40	0.51	A	A	0.41	0.52	A	A
Street of the Golden Lantern (NS) at:																								
• Selva Rd. (EW)	0.33	0.34	A	A	0.33	0.34	A	A	0.38	0.36	A	A	0.38	0.37	A	A	0.45	0.50	A	A	0.46	0.50	A	A
• La Cresta Dr. (EW)	0.33	0.40	A	A	0.34	0.40	A	A	0.38	0.45	A	A	0.38	0.45	A	A	0.45	0.69	A	B	0.45	0.70	A	B
• Pacific Coast Hwy. (EW)	0.44	0.50	A	A	0.44	0.53	A	A	0.50	0.62	A	B	0.50	0.65	A	B	0.65	0.81	B	D	0.65	0.82	B	D
• Del Prado (EW)	0.43	0.53	A	A	0.43	0.54	A	A	0.48	0.64	A	B	0.49	0.65	A	B	0.52	0.82	A	D	0.53	0.83	A	D
• Dana Point Harbor Dr. (EW)	0.28	0.38	A	A	0.24	0.33	A	A	0.30	0.47	A	A	0.30	0.47	A	A	0.29	0.90	A	D	0.29	0.90	A	D
Dana Point Harbor Dr. (NS) at:																								
• Pacific Coast Hwy. (EW)																								
-w/o Improvements	0.68	0.81	B	D	0.68	0.83	B	D	0.75	0.93	C	E	0.76	0.94	C	E	1.10	1.44	F	F	1.11	1.46	F	F
-w/ Improvements	--	--	--	--	--	--	--	--	0.70	0.86	B	D	0.71	0.87	C	D	0.61	0.79	B	C	0.68	0.87	B	D

[1] Intersection Capacity Utilization (ICU)

[2] Level of Service (LOS)

-- = Not Applicable

SUMMARY OF ROADWAY LINK ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	EXISTING VOLUME	EXISTING THRESHOLD	EXISTING PLUS PROJECT VOLUME	EXISTING PLUS PROJECT THRESHOLD	SHORT-RANGE WITHOUT PROJECT VOLUME	SHORT-RANGE WITHOUT PROJECT THRESHOLD	SHORT-RANGE WITH PROJECT VOLUME	SHORT-RANGE WITH PROJECT THRESHOLD	BUILDOUT WITHOUT PROJECT VOLUME	BUILDOUT WITHOUT PROJECT THRESHOLD	BUILDOUT WITH PROJECT VOLUME	BUILDOUT WITH PROJECT THRESHOLD
Pacific Coast Hwy.[1]															
• North of Crown Valley Pkwy.			37,500	34,800	UNDER	35,200	UNDER	40,000	**OVER**	40,400	**OVER**	45,600	**OVER**	46,000	**OVER**
• South of Crown Valley Pkwy.			56,250	25,000	UNDER	25,800	UNDER	30,600	UNDER	31,500	UNDER	43,200	UNDER	44,000	UNDER
• North of Niguel Rd.			56,250	25,000	UNDER	25,800	UNDER	31,000	UNDER	31,800	UNDER	43,200	UNDER	44,000	UNDER
• North of Selva Rd.			56,250	25,700	UNDER	27,500	UNDER	32,300	UNDER	34,000	UNDER	44,200	UNDER	46,000	UNDER
• South of Selva Rd.			56,250	24,600	UNDER	26,300	UNDER	30,800	UNDER	32,500	UNDER	35,300	UNDER	37,000	UNDER
• West of St. of the Green Lantern			56,250	24,600	UNDER	26,900	UNDER	30,800	UNDER	33,000	UNDER	35,700	UNDER	38,000	UNDER
• West of St. of the Blue Lantern			56,250	27,700	UNDER	29,800	UNDER	34,200	UNDER	36,300	UNDER	37,250[2]	UNDER	39,400[2]	UNDER
• West of St. of the Amber Lantern			28,100	14,900	UNDER	15,900	UNDER	18,700	UNDER	19,700	UNDER	19,400	UNDER	20,400	UNDER
• West of St. of the Violet Lantern			28,100	17,100	UNDER	18,000	UNDER	20,700	UNDER	21,700	UNDER	18,750[2]	UNDER	19,700[2]	UNDER
• West of St. of the Golden Lantern			28,100	17,600	UNDER	18,500	UNDER	21,300	UNDER	22,200	UNDER	18,100	UNDER	19,000	UNDER
• West of Del Prado Ave.			28,100	14,900	UNDER	15,600	UNDER	17,200	UNDER	17,900	UNDER	24,300	UNDER	25,000	UNDER
• East of Del Prado Ave.			56,200	35,100	UNDER	36,500	UNDER	40,200	UNDER	41,600	UNDER	48,800	UNDER	50,000	UNDER
• West of Dana Point Harbor Dr.			56,200	35,100	UNDER	36,300	UNDER	40,300	UNDER	41,400	UNDER	48,800	UNDER	50,000	UNDER
• East of Dana Point Harbor Dr.			56,200	40,000	UNDER	41,200	UNDER	45,900	UNDER	47,100	UNDER	74,800	**OVER**	76,000	**OVER**
Crown Valley Pkwy															
• East of Pacific Coast Hwy.		50,600		18,200	UNDER	18,700	UNDER	21,500	UNDER	22,000	UNDER	36,500	UNDER	37,000	UNDER
Niguel Rd.															
• East of Pacific Coast Hwy.		50,600		13,100	UNDER	13,900	UNDER	18,500	UNDER	19,300	UNDER	29,200	UNDER	30,000	UNDER
St. of the Green Lantern															
• South of Pacific Coast Hwy.	5,000			2,600	UNDER	2,800	UNDER	2,800	UNDER	3,000	UNDER	--	--	--	--
St. of the Blue Lantern															
• North of Pacific Coast Hwy.	5,000			1,500	UNDER	1,900	UNDER	1,800	UNDER	2,200	UNDER	2,600	UNDER	3,000	UNDER
• North of Santa Clara Ave.	5,000			2,100	UNDER	2,700	UNDER	3,000	UNDER	3,600	UNDER	--	--	--	--
St. of the Amber Lantern															
• North of Pacific Coast Hwy.	5,000			2,300	UNDER	2,300	UNDER	2,500	UNDER	2,500	UNDER	--	--	--	--
• North of Del Prado Ave.	5,000			4,200	UNDER	4,200	UNDER	4,600	UNDER	4,700	UNDER	--	--	--	--
• North of Santa Clara Ave.	5,000			1,100	UNDER	1,100	UNDER	1,200	UNDER	1,200	UNDER	--	--	--	--
St. of the Violet Lantern															
• North of Pacific Coast Hwy.	5,000			2,400	UNDER	2,400	UNDER	2,700	UNDER	2,700	UNDER	--	--	--	--
• North of Del Prado Ave.	5,000			3,800	UNDER	3,800	UNDER	4,200	UNDER	4,200	UNDER	--	--	--	--
• North of Santa Clara Ave.	5,000			1,300	UNDER	1,300	UNDER	1,400	UNDER	1,400	UNDER	--	--	--	--
St. of the Golden Lantern															
• North of Selva Rd.		50,600		16,800	UNDER	16,800	UNDER	19,000	UNDER	19,200	UNDER	27,000	UNDER	27,000	UNDER
• North of La Cresta Dr.		50,600		16,400	UNDER	16,500	UNDER	18,700	UNDER	18,800	UNDER	32,900	UNDER	33,000	UNDER
• North of Pacific Coast Hwy.		50,600		15,800	UNDER	16,000	UNDER	18,000	UNDER	18,200	UNDER	35,800	UNDER	36,000	UNDER
• North of Del Prado Ave.	33,800			15,300	UNDER	15,500	UNDER	18,500	UNDER	18,700	UNDER	34,800	**OVER**	35,000	**OVER**
• North of Dana Point Harbor Dr.	33,800			7,400	UNDER	7,600	UNDER	11,000	UNDER	11,200	UNDER	22,800	UNDER	23,000	UNDER
• South of Dana Point Harbor Dr.	33,800			4,700	UNDER	4,800	UNDER	9,500	UNDER	9,600	UNDER	22,800[1]	UNDER	23,000[2]	UNDER
Selva Rd.															
• West of Pacific Coast Hwy.	20,000			3,100	UNDER	4,100	UNDER	3,500	UNDER	4,500	UNDER	3,100	UNDER	4,100	UNDER
• East of Pacific Coast Hwy.	20,000			4,400	UNDER	4,700	UNDER	5,500	UNDER	5,800	UNDER	9,800	UNDER	10,000	UNDER
• West of St. of the Golden Lantern	20,000			4,600	UNDER	4,600	UNDER	5,100	UNDER	5,100	UNDER	8,000	UNDER	8,000	UNDER
• East of St. of the Golden Lantern	20,000			5,700	UNDER	5,800	UNDER	6,600	UNDER	6,700	UNDER	6,900	UNDER	7,000	UNDER
La Cresta Dr.															
• West of St. of the Golden Lantern	10,000			4,700	UNDER	4,700	UNDER	5,300	UNDER	5,300	UNDER	5,000	UNDER	5,000	UNDER
• East of St. of the Golden Lantern	10,000			3,400	UNDER	3,500	UNDER	3,900	UNDER	4,000	UNDER	2,900	UNDER	3,000	UNDER
Del Prado Ave.[1]															
• West of St. of the Amber Lantern			28,100	12,300	UNDER	13,300	UNDER	15,900	UNDER	16,900	UNDER	19,400	UNDER	20,400	UNDER
• West of St. of the Violet Lantern			28,100	17,400	UNDER	18,400	UNDER	21,100	UNDER	22,000	UNDER	18,750[1]	UNDER	18,750[2]	UNDER
• West of St. of the Golden Lantern			28,100	16,300	UNDER	17,200	UNDER	19,900	UNDER	20,800	UNDER	18,100	UNDER	19,000	UNDER
• East of St. of the Golden Lantern			28,100	16,700	UNDER	17,400	UNDER	19,200	UNDER	19,900	UNDER	24,300	UNDER	24,000	UNDER
Dana Point Harbor Dr.															
• West of the Golden Lantern	33,800			7,500	UNDER	7,600	UNDER	8,300	UNDER	8,400	UNDER	19,900	UNDER	20,000	UNDER
• East of the Golden Lantern	33,800			11,100	UNDER	11,200	UNDER	12,200	UNDER	12,300	UNDER	25,900	UNDER	26,000	UNDER
• East of Pacific Coast Hwy.	33,800			12,900	UNDER	13,000	UNDER	12,700	UNDER	12,800	UNDER	25,900	UNDER	26,000	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, daily Level of Service "E" volumes are appropriate for these roadways.

-- Not Available

[2] Volumes are estimated based on the volumes adjacent to the segments.

the capacity of a roadway segment is controlled by the adjacent intersection capacities.

7. The access and circulation system provided by the proposed development is adequate to meet the needs of the development if the recommendations included in this report are implemented. The proposed project will have access to Pacific Coast Highway through Selva Road, Street "A", Street of the Green Lantern, Street of Blue Lantern and Cove Road.

8. A traffic signal is projected to be warranted at the intersection of Pacific Coast Highway and Street "A" for existing plus project traffic conditions (see Appendix "D").

9. The local circulation system with the proposed Master Plan of Arterial Highways (MPAH) amendments are adequate to accommodate the proposed project.

10. The project will have minimal traffic impacts to the street of Green Lantern south of Pacific Coast Highway. The project would contribute 9 vehicles per hour during the AM peak hour and 11 vehicles per hour during the PM peak hour on the one-way link between Pacific Coast Highway and Santa Clara.

11. The project traffic contribution to short-term traffic conditions is shown in Table 7-7.

12. The project traffic contribution to buildout conditions is included in Table 8-5.

Recommendations

1. The project shall construct all internal roadways to their ultimate cross-widths as shown on the HDCP Circulation Plan.

2. The proposed project shall construct Pacific Coast Highway adjacent to the project site at its ultimate half-section width as a Major Arterial (120 foot right-of-way) in conjunction with development as shown on Exhibit 9-A.

3. Prior to obtaining left turn movements into and out of Street "A", a traffic signal will be installed at the PCH/Street "A" intersection subject to Caltrans approval.

4. The traffic signal should be interconnected to the adjacent signalized intersection subject to Caltrans approval.

5. Prior to obtaining left turn movements into Street "A", a northbound 150 feet left turn lane shall be striped at the Pacific Coast Highway/Street "A" for vehicles desiring to turn left into the project site subject to Caltrans approval.

6. Prior to issuance of any grading permit, sight distance at all project access points shall be reviewed with respect to Standard Plan Number 1117 (see Appendix "K") in conjunction with the preparation of precise grading and landscape plans.

7. The proposed project shall contribute fees towards regional roadway improvement programs. The project traffic percentage contribution to intersection improvements is depicted in Table 8-5.

8. Standard Plan Number 1107 (see Appendix "L") requires that entry gates should be set back from the near curb line of any public street to provide a minimum 100 feet or one foot per dwelling unit served, of storage whichever is greater for

entering vehicles to stack without interfering with through traffic. Multiple entrance lanes can be used to meet the storage requirements.

9. The proposed project shall participate in all applicable Road Fee Programs including the San Joaquin Hills Transportation Corridor and CARITS (Coastal Area Road Improvements and Traffic Signal) Fee Programs.

10. The final site design for the Seaside Inn and the Pacific Coast Highway visitor/recreation commercial uses shall be reviewed with respect to access, circulation, parking and sight distance by the City's Traffic Engineer prior to the issuance of any site development permit for those areas.

11. A construction truck routing plan shall be reviewed and approved for the project by the City's Traffic Engineer prior to the issuance of any grading permit.

Based upon the evaluation in this traffic study, the proposed project can be accommodated by the City's General Plan circulation system as amended without adversely affecting traffic in the City.

3.0 EXISTING TRAFFIC CONDITIONS

Study Area Street System

Existing highways in close proximity to the project include Pacific Coast Highway, Crown Valley Parkway, Niguel Road, Selva Road, Street of the Green Lantern, Street of the Blue Lantern, Street of the Amber Lantern, Street of the Violet Lantern, Santa Clara Avenue, Street of the Golden Lantern, and Dana Point Harbor Drive. Other local roads include Dana Strand Road, Scenic Drive, Cove Road, and Marguerita Avenue. The existing number of through travel lanes and intersection controls on these roadways are shown on Exhibit 3-A.

Pacific Coast Highway: This roadway currently is four lanes divided in the vicinity of the site. It is classified as a Major Arterial (120 foot right-of-way) on the City of Dana Point Master Plan Circulation System.

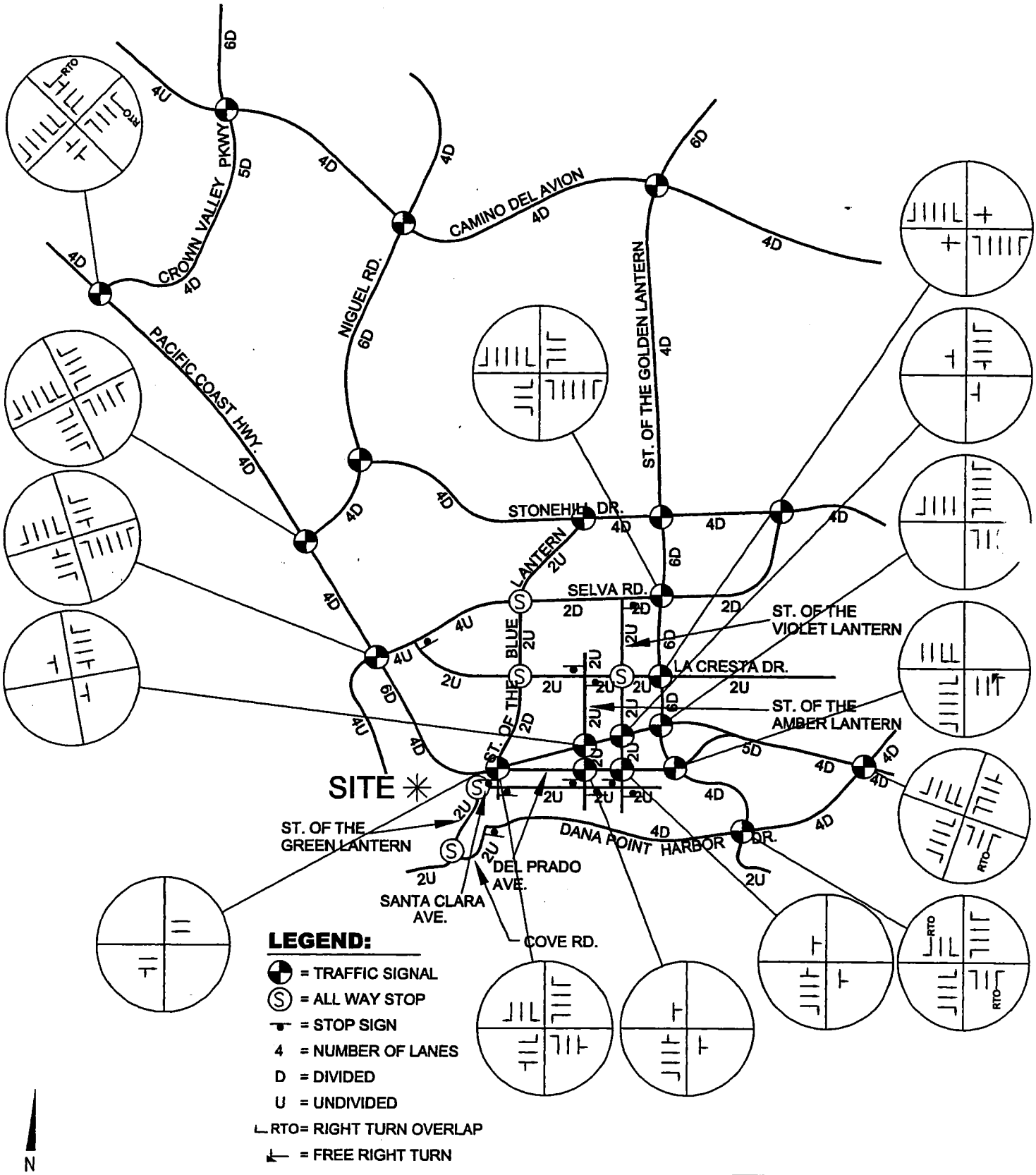
Crown Valley Parkway: This north/south roadway currently is six lanes divided north of Camino Del Avion and is four to five lanes divided south of Camino Del Avion. It is classified as a Major Arterial (120 foot right-of-way) on the City of Dana Point Master Plan Circulation System.

Niguel Road: This north/south roadway currently is six lanes divided between Camino Del Avion and Stonehill Drive and four lanes divided south of Stonehill Drive and north of Camino Del Avion. It is classified as a Major Arterial (120 foot right-of-way) south of Camino Del Avion and as a Primary Arterial (100 foot right-of-way) north of Camino Del Avion on the City of Dana Point Master Plan Circulation System. South of Pacific Coast Highway, Niguel Road turns into Ritz Carlton Drive.

Selva Road: This east/west roadway currently is four lanes undivided west of Street of the Blue Lantern and two lanes divided east of Street of the Blue Lantern. It is

EXHIBIT 3-A

EXISTING NUMBER OF THROUGH LANES AND INTERSECTION CONTROLS



classified as a Secondary Arterial (80 foot right-of-way) on the City of Dana Point Master Plan Circulation System.

Street of the Green Lantern: This north/south roadway currently is two lanes undivided south of Pacific Coast Highway. Street of the Green Lantern is one-way westbound between PCH and Santa Clara Avenue. It is not classified on the City of Dana Point Master Plan Circulation System.

Street of the Blue Lantern: This north/south roadway currently is two lanes undivided in the vicinity of the site. It is not classified on the City of Dana Point Master Plan Circulation System.

Santa Clara Avenue: This east/west roadway currently is two lanes undivided in the vicinity of the site. It has been recently cul-d-saced east of Street of the Blue Lantern. It is not classified on the City of Dana Point Master Plan Circulation System.

Street of the Amber Lantern: This north/south roadway currently is two lanes undivided in the vicinity of the site. It is not classified on the City of Dana Point Master Plan Circulation System.

Street of the Violet Lantern: This north/south roadway currently is two lanes undivided in the vicinity of the site. It is not classified on the City of Dana Point Master Plan Circulation System.

Street of the Golden Lantern: This north/south roadway currently is four lanes divided north of Stonehill Drive, six lanes divided between Stonehill Drive and Pacific Coast Highway, four lanes divided between Pacific Coast Highway and Dana Point Harbor Drive, and two lanes undivided south of Dana Point Harbor Drive. It is classified as a Major Arterial (120 foot right-of-way) north of Pacific Coast Highway and as a Primary Arterial (100 foot right-of-way) south of Pacific Coast Highway on the City of Dana Point Master Plan Circulation System.

Dana Point Harbor Drive: This east/west roadway currently is four lanes divided in the vicinity of the site. It is classified as a Primary Arterial (100 foot right-of-way) on the City of Dana Point Master Plan Circulation System.

City of Dana Point Circulation System Performance Criteria

According to the City of Dana Point Circulation System Performance Criteria in Table 3-1, the average daily link volumes for a major arterial is Level of Service "D" and the maximum volume allows for a major arterials (6 lanes divided) is 50,600. The average daily link volumes for primary arterials, secondary arterials, and collectors is Level of Service "C". The maximum volume allows for a primary arterial (4 lanes divided) is 30,000, and secondary (4 lanes undivided) is 20,000. For CMP (Congestion Management Program) highways, such as Pacific Coast Highway and Del Prado, Level of Service "E" has been utilized for the daily capacity of these roadways consistent with the CMP Program. The City of Dana Point does not provide an average daily link volumes for local streets. As directed by City Traffic Engineer, a maximum volume of 10,000 was used for La Cresta Drive and a maximum volume of 5,000 was used for other local streets. Refer to Exhibit 3-G in later part of the report (City of Dana Point Master Plan Circulation System) for facility type.

For the peak hour intersection volumes, acceptable level of service for primary arterial, secondary arterial, and local street is Level of Service "C". Acceptable level of service for major arterial and State highways is Level of Service "D". Table 3-1 defines the City of Dana Point Circulation System Performance Criteria.

Intersection Capacity Utilization

The technique used to assess the operation of an intersection is known as Intersection Capacity Utilization (ICU). To calculate an ICU, the volume of traffic using the intersection is compared with the capacity of the intersection. ICU is usually expressed as a percent. The percent represents that portion of the hour required to provide sufficient capacity to accommodate all intersection traffic if all approaches operate at capacity.

TABLE 3-1

CITY OF DANA POINT CIRCULATION SYSTEM PERFORMANCE CRITERIA

TABLE A

The following are the performance criteria used for comparing volumes and capacities on the City street and highway system:

I. AVERAGE DAILY TRAFFIC (ADT) LINK VOLUMES

Level of Service C - Primary arterials, secondary arterials and local streets.
Level of Service D - Major arterials and State highways.

Table A below shows ADT volumes corresponding to these levels of service.

II. PEAK HOUR INTERSECTION VOLUMES

Level of Service C - Primary arterials, secondary arterials and local streets.
Level of Service D - Major arterials and State highways.
Level of Service E - Congestion Management Plan (CMP) evaluation (CMP designated roadways only).

Table B below shows how these levels of service are specified.

FACILITY TYPE	MAXIMUM VOLUME		
	LOS C	LOS D	LOS E
Freeway (per lane)	16,500	18,500	20,600
Major (6 lanes divided)	45,000	50,600	56,200
Primary (4 lanes divided)	30,000	33,800	37,500
Secondary (4 lanes undivided)	20,000	22,500	25,000
Collector (2 lanes)	10,000	11,000	12,200

TABLE B

Peak hour intersection Level of Service (LOS) to be based on Intersection Capacity Utilization (ICU) values calculated as follows:

Saturation flow rate	1700 Vehicles Per Hour (VPH)
Clearance Interval	.05 ICU

Levels of Service are as follows:

LEVEL OF SERVICE	MAXIMUM VALUE
LOS A	.60
LOS B	.70
LOS C	.80
LOS D	.90
LOS E	1.00

The calculation method consists of the following:

1. Intersection Capacity Utilization (ICU) for study area intersections;

2. Saturation Flow Rate:

   Saturation flow value of 1,700 vehicles per lane per hour for intersections. No adjustments are used for protection movements with dedicated lanes (including both right and left turns).

3. Lost Time:

   A lost time factor of 5% (.05) is applied to the ICU calculations.

4. Level of Service Ranges:

   The following thresholds are used in assigning a letter value to the resulting LOS:

LOS	CRITICAL VOLUME TO CAPACITY RATIO
A	0.00 - 0.60
B	0.61 - 0.70
C	0.71 - 0.80
D	0.81 - 0.90
E	0.91 - 1.00
F	>1.00

5. Peak-Periods:

Weekday peak-hour analysis periods are defined as follows:

7:00 to 9:00 AM
4:00 to 6:00 PM

All peak hour studies are contained within these periods.

6. Peak-Hour:

The highest one-hour period in both the AM and PM peak periods, as determined by four consecutive 15-minute count periods are used in the ICU calculations. Both AM and PM peak hours are studied.

7. Peak-Hour Data Consistency:

Variations in peak-hour volumes can affect LOS calculations because they vary from day-to-day. To minimize these variations, no counts are taken on Mondays, Fridays, holidays or weekends.

8. Right Turn Movements:

If the distance from the edge of the outside through lane is at least 19 feet and parking is prohibited during the peak period, right turning vehicles may be assumed to utilize this "unofficial" or "defacto" right turn lane. Otherwise, all right turn traffic is assigned to the through lane. If a right turn lane exists, right turn activity is checked for conflicts with other critical movements. It is assumed that right turn movements are accommodated during non-conflicting left turn phases (e.g., northbound right turns during westbound left turn phase), as well as non-

conflicting through flows (e.g., northbound right turns, southbound left turns, and eastbound through flows) represent a sum of vehicle to capacity (V/C) ratios which are greater than the normal through/left turn critical movements. Right turn volumes on these intersection approaches that have a separate lane for a "defacto" right turn lane have been reduced by 15% to account for right turns on red. This reduction was based on personal communication with the City's Traffic Engineer.

Existing Average Daily Traffic

Existing average daily traffic (ADT) on arterial highways throughout the study area are shown on Exhibit 3-B. Existing ADT volumes are based upon ground counts made for RK ENGINEERING GROUP, INC. in February, 2000 and factored up from peak hour counts made for RK ENGINEERING GROUP, INC. in February, 2000.

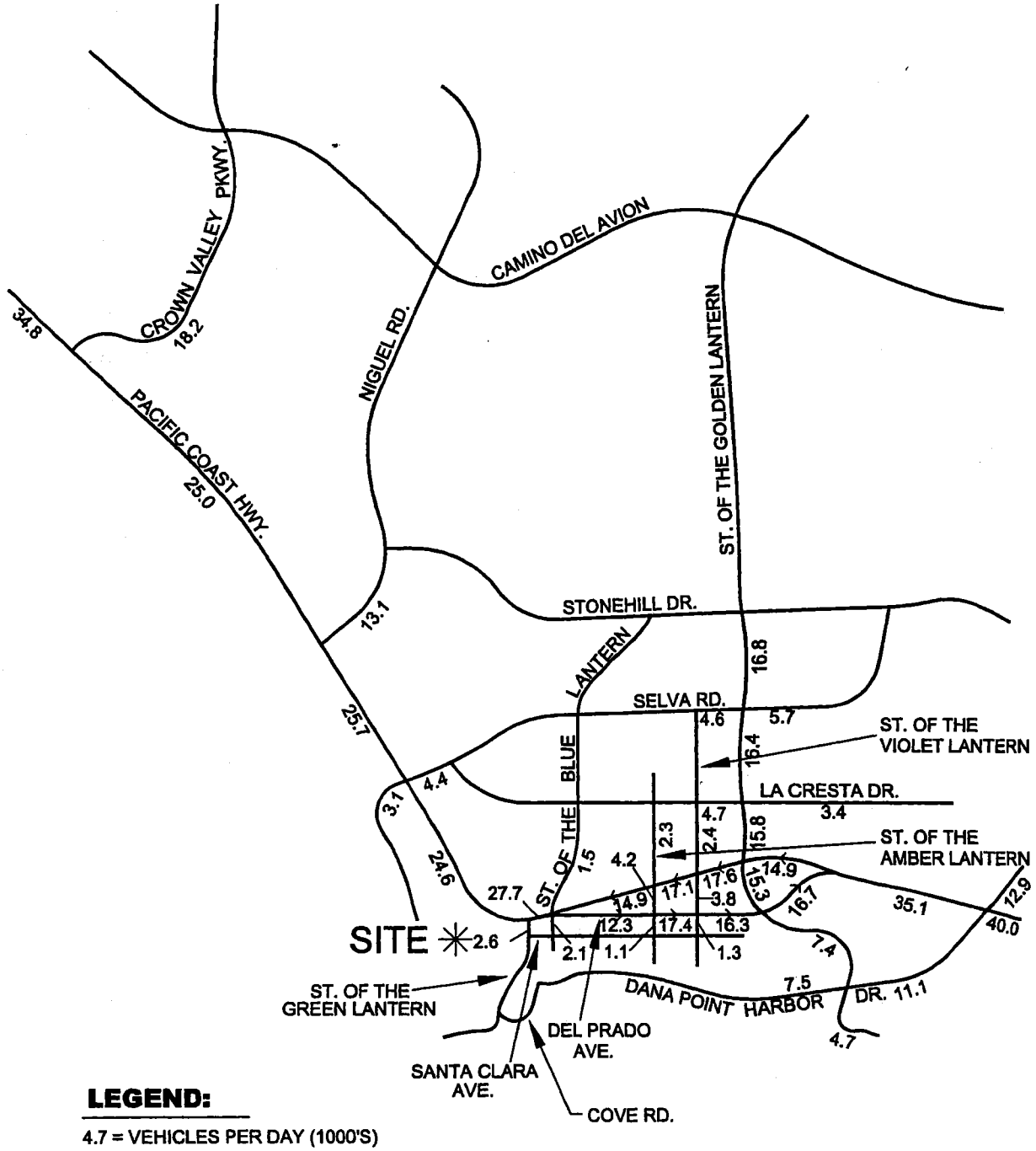
Table 3-2 shows the existing roadway segment analysis. The Pacific Coast Highway roadway segment north of Crown Valley Parkway is currently over the City's link volume threshold by 1,000 ADT. However, the adjacent intersection at Crown Valley Parkway is operating at Level of Service "A" during the AM/PM peak hours. In the case of this segment, the General Plan link capacities are not reflective of the actual capacity of this segment. Furthermore, a capital improvement program to build a median along Pacific Coast Highway in the vicinity is underway. With the median, Pacific Coast Highway in this area would have better access control, because of less cross traffic and left turn traffic along this segment of roadway. This can increase the design capacity of this segment.

Existing Intersection Capacity Utilization

Existing ICU calculations are based upon manual AM and PM peak hour turning movement counts made for RK ENGINEERING GROUP, INC. in January, 2000 (see Exhibits 3-C and 3-D). An explanation of Level of Service is included in Appendix "A".

EXHIBIT 3-B

EXISTING AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

4.7 = VEHICLES PER DAY (1000'S)

N

TABLE 3-2

EXISTING ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	EXISTING VOLUME	EXISTING THRESHOLD
Pacific Coast Hwy.					
• North of Crown Valley Pkwy.			37,500	34,800	UNDER
• South of Crown Valley Pkwy.			56,200	25,000	UNDER
• North of Niguel Rd.			56,200	25,000	UNDER
• North of Selva Rd.			56,200	25,700	UNDER
• South of Selva Rd.			56,200	24,600	UNDER
• West of St. of the Green Lantern			56,200	24,600	UNDER
• West of St. of the Blue Lantern			56,200	27,700	UNDER
• West of St. of the Amber Lantern			28,100	14,900	UNDER
• West of St. of the Violet Lantern			28,100	17,100	UNDER
• West of St. of the Golden Lantern			28,100	17,600	UNDER
• West of Del Prado Ave.			28,100	14,900	UNDER
• East of Del Prado Ave.			56,200	35,100	UNDER
• West of Dana Point Harbor Dr.			56,200	35,100	UNDER
• East of Dana Point Harbor Dr.			56,200	40,000	UNDER
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		18,200	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		13,100	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			2,600	UNDER
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			1,500	UNDER
• North of Santa Clara Ave.	5,000			2,100	UNDER
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			2,300	UNDER
• North of Del Prado Ave.	5,000			4,200	UNDER
• North of Santa Clara Ave.	5,000			1,100	UNDER
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			2,400	UNDER
• North of Del Prado Ave.	5,000			3,800	UNDER
• North of Santa Clara Ave.	5,000			1,300	UNDER
St. of the Golden Lantern					
• North of Selva Rd.		50,600		16,800	UNDER
• North of La Cresta Dr.		50,600		16,400	UNDER
• North of Pacific Coast Hwy.		50,600		15,800	UNDER
• North of Del Prado Ave.	33,800			15,300	UNDER
• North of Dana Point Harbor Dr.	33,800			7,400	UNDER
• South of Dana Point Harbor Dr.	33,800			4,700	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			3,100	UNDER
• East of Pacific Coast Hwy.	20,000			4,400	UNDER
• West of St. of the Golden Lantern	20,000			4,600	UNDER
• East of St. of the Golden Lantern	20,000			5,700	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			4,700	UNDER
• East of St. of the Golden Lantern	10,000			3,400	UNDER
Del Prado Ave.					
• West of St. of the Amber Lantern			28,100	12,300	UNDER
• West of St. of the Violet Lantern			28,100	17,400	UNDER
• West of St. of the Golden Lantern			28,100	16,300	UNDER
• East of St. of the Golden Lantern			28,100	16,700	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			7,500	UNDER
• East of the Golden Lantern	33,800			11,100	UNDER
• East of Pacific Coast Hwy.	33,800			12,900	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

EXHIBIT 3-C

EXISTING AM PEAK HOUR INTERSECTION VOLUMES

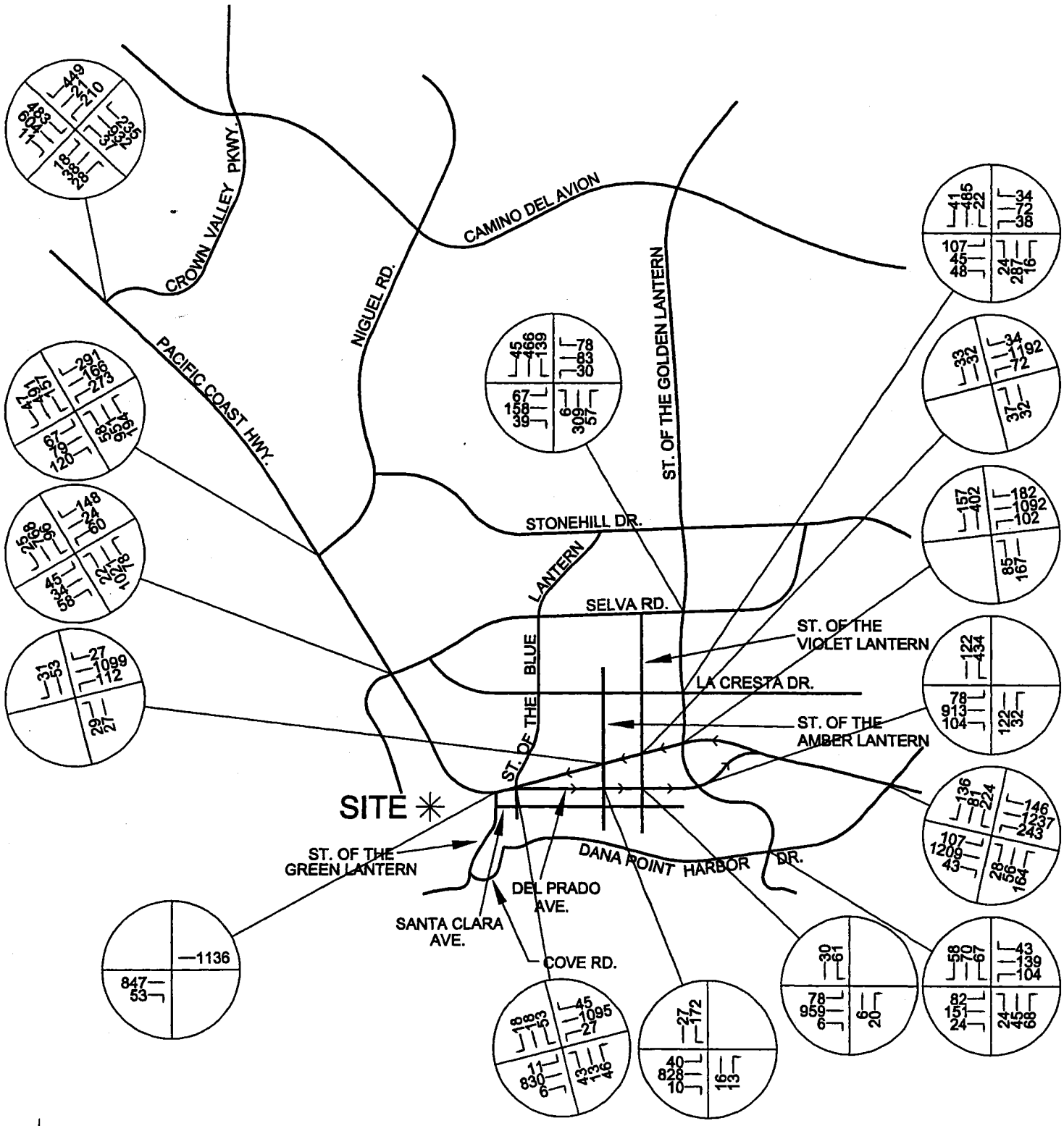
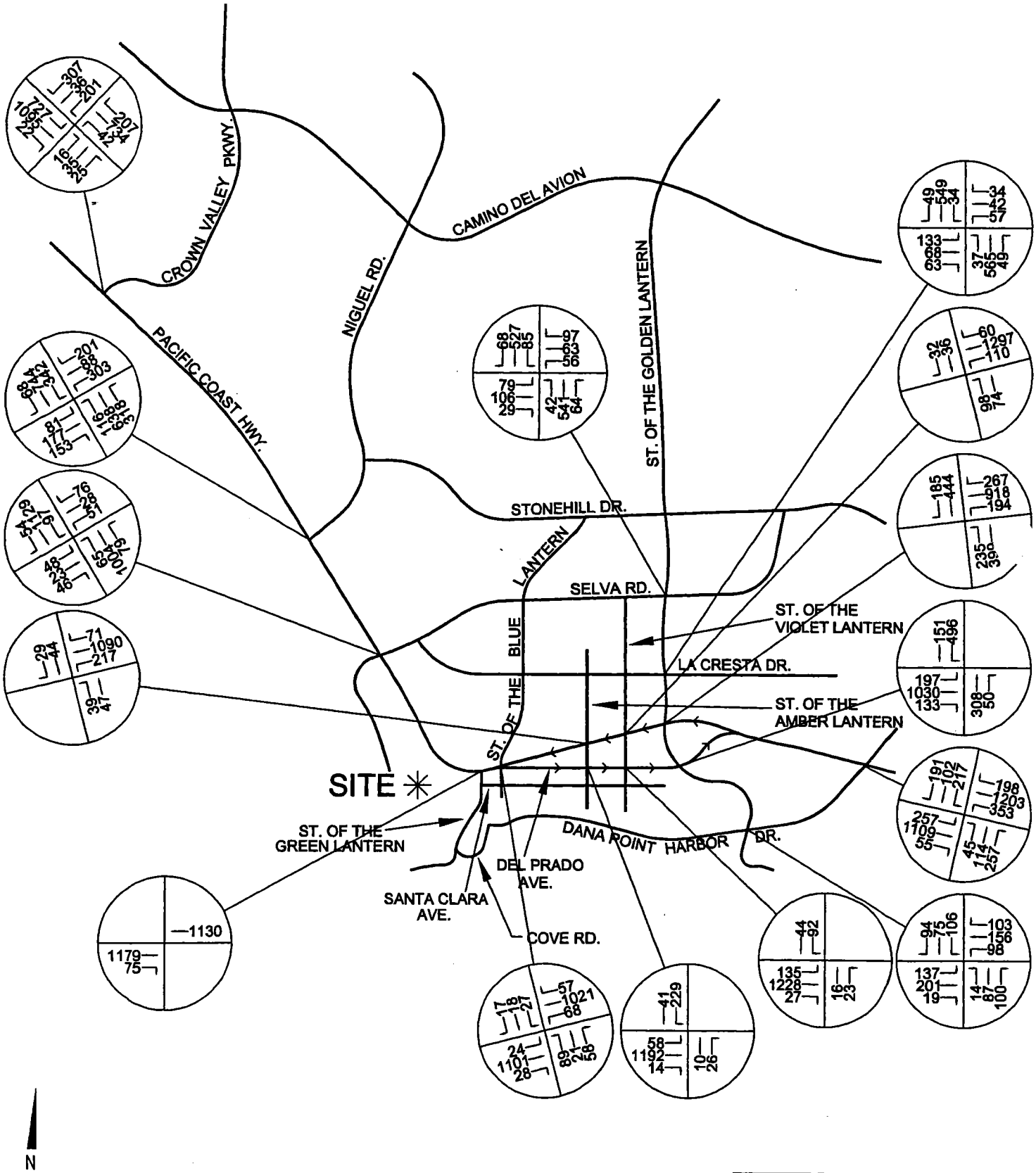


EXHIBIT 3-D

EXISTING PM PEAK HOUR INTERSECTION VOLUMES



Traffic count worksheets are provided in Appendix "B". The ICU's for existing intersections in the study area are shown in Table 3-3.

Based upon the previous traffic study for the Dana Point Headlands project prepared by Austin-Foust Associates, Inc. (July, 1998), the summer peak hour volumes at the intersections along Pacific Coast Highway were 10 percent higher on average than non-summer peak hour volumes. This was based upon comparing summer counts to non-summer counts. At the intersection of Street of the Golden Lantern/Dana Point Harbor Drive, the summer peak hour volumes were 33 percent higher than the non-summer volumes. In order to assess peak summer conditions, a factor of 10 percent was applied to the peak hour volumes at the study area intersection to represent existing summer conditions, with the exception of the intersection of Street of the Golden Lantern/Dana Point Harbor Drive which was increased 33 percent (see Exhibits 3-E and 3-F).

Intersections in the study area are currently operating at acceptable level of service during the peak hours. Existing ICU calculation worksheets are provided in Appendix "C".

Existing Master Plan Circulation Element

Existing and future roadways are included in the City of Dana Point Master Plan Circulation System and is illustrated on Exhibit 3-G. The Orange County Master Plan of Arterial Highways is shown on Exhibit 3-H. This exhibit shows the nature and extent of arterial highways that are needed to adequately serve the ultimate development depicted by the land use element of the General Plan and serves to coordinate future arterials between local jurisdictions. The City of Dana Point typical roadway cross-sections for arterial classifications are provided on Exhibit 3-I.

TABLE 3-3

EXISTING INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific County Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.54	0.56	0.61	0.62	A	A	B	B
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	1	1	2	1	2	2	1	1	2	1	0.60	0.60	0.66	0.66	A	A	B	B
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.42	0.48	0.45	0.53	A	A	A	A
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.38	0.42	0.42	0.46	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.44	0.48	0.47	0.53	A	A	A	A
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.36	0.37	0.38	0.41	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.34	0.46	0.37	0.49	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.36	0.43	0.38	0.46	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.31	0.40	0.33	0.43	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.30	0.31	0.33	0.34	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.30	0.37	0.33	0.40	A	A	A	A
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.39	0.46	0.44	0.50	A	A	A	A
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.40	0.49	0.43	0.53	A	A	A	A
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.22	0.29	0.28	0.38	A	A	A	A
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	1	1>	2	1	1	1	2	1	2	2	0	0.62	0.74	0.68	0.81	A	C	B	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

EXHIBIT 3-E

EXISTING SUMMER AM PEAK HOUR INTERSECTION VOLUMES

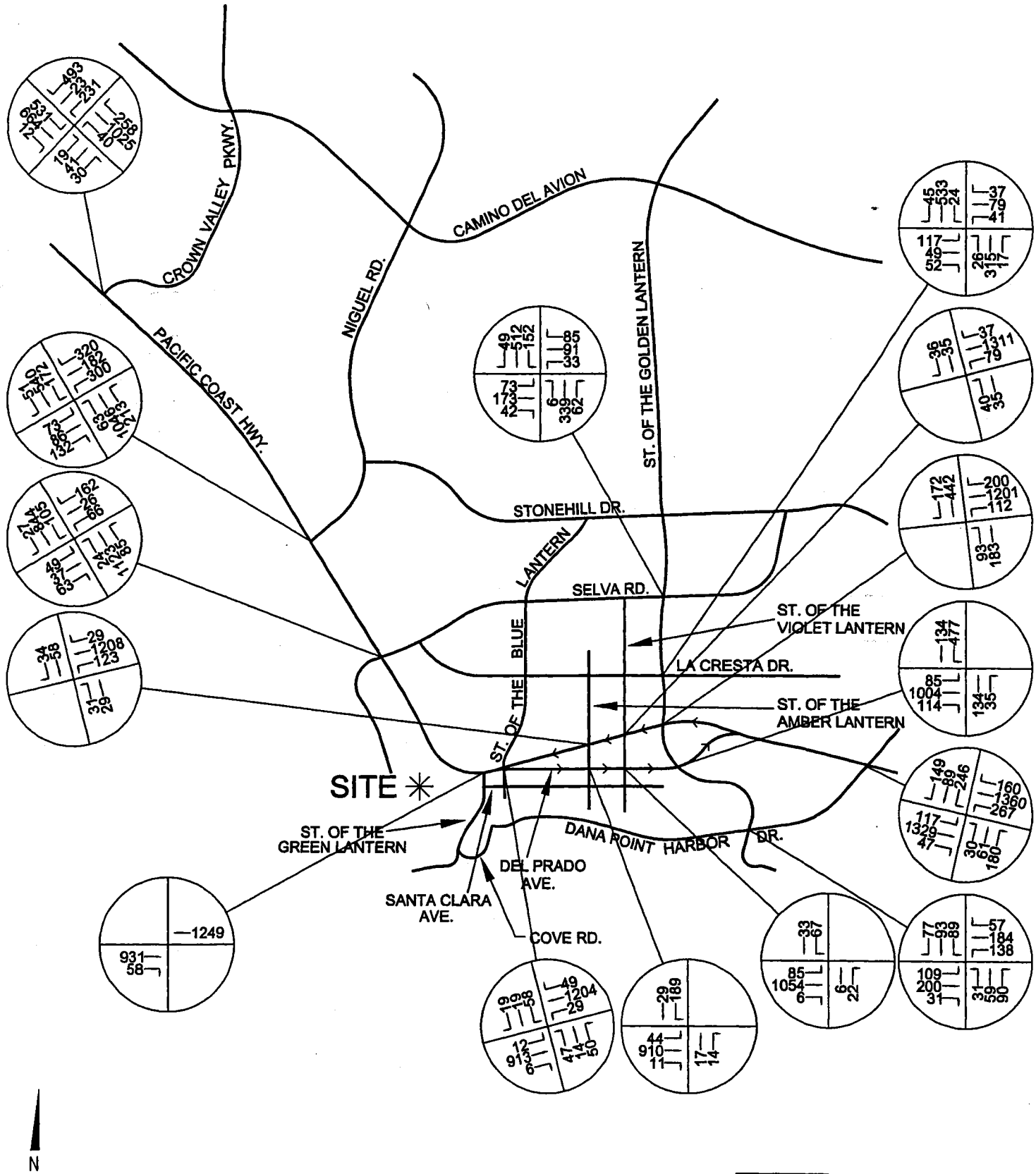


EXHIBIT 3-F

EXISTING SUMMER PM PEAK HOUR INTERSECTION VOLUMES

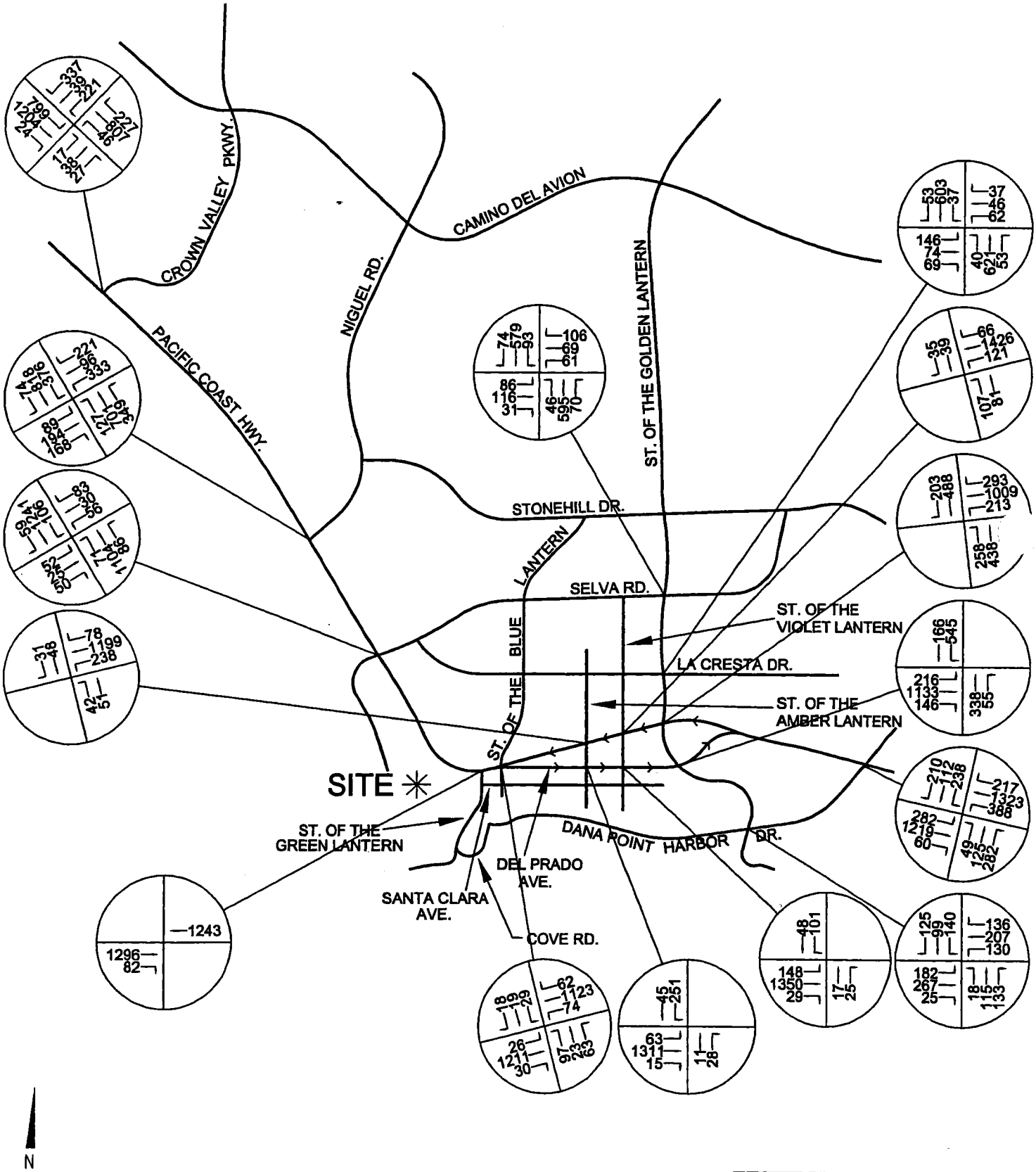
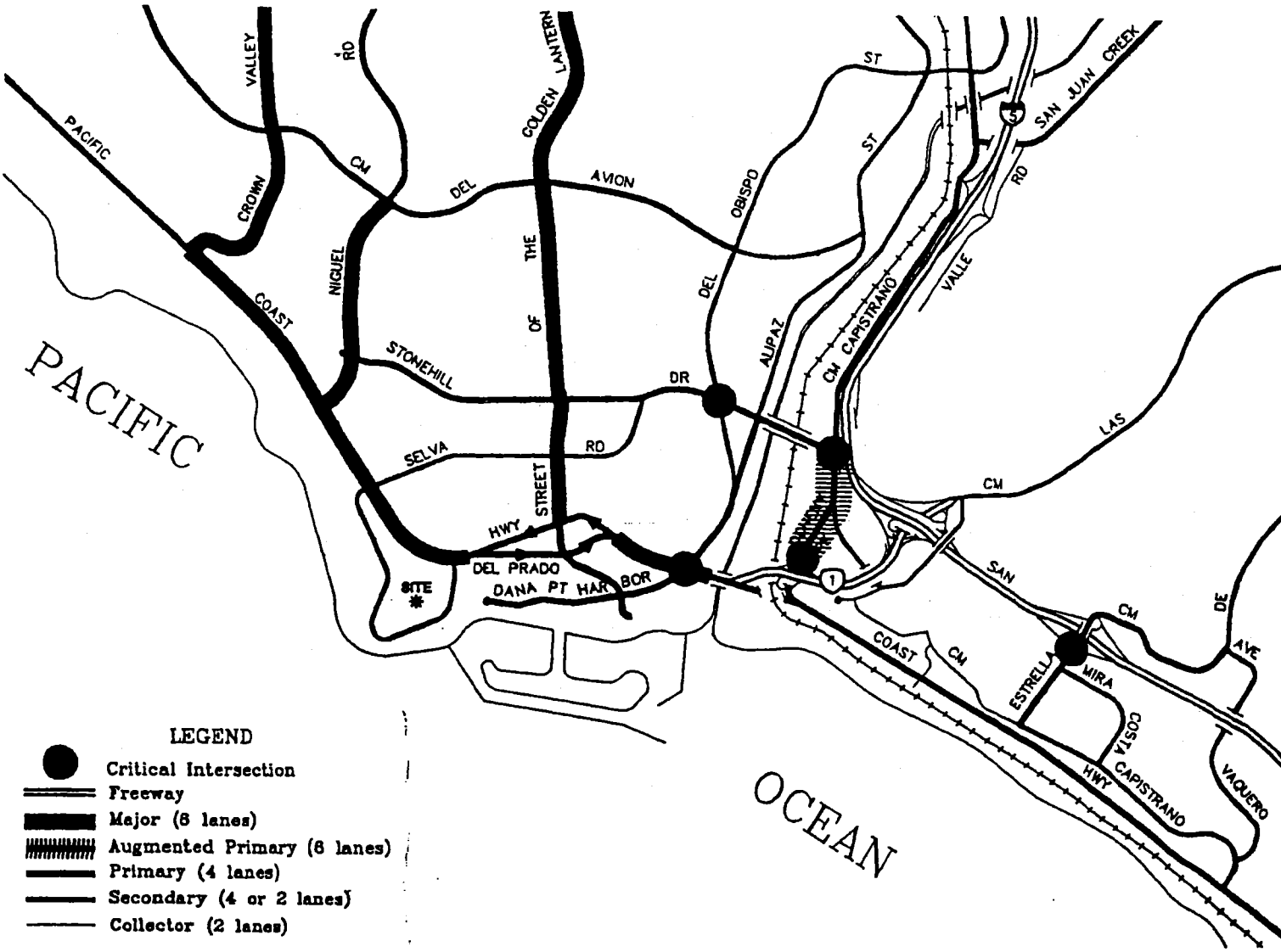


EXHIBIT 3-G

CITY OF DANA POINT
MASTER PLAN CIRCULATION SYSTEM



LEGEND

- Critical Intersection
- Freeway
- Major (6 lanes)
- Augmented Primary (6 lanes)
- Primary (4 lanes)
- Secondary (4 or 2 lanes)
- Collector (2 lanes)

N

SOURCE: CITY OF DANA POINT

EXHIBIT 3-H

ORANGE COUNTY MASTER PLAN OF ARTERIAL HIGHWAYS (MPAH)



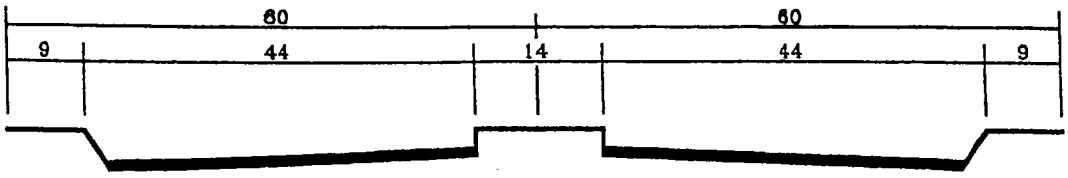
	ESTABLISHED ALIGNMENT	PROPOSED
PRINCIPAL	▬▬▬	▬ ▬ ▬
MAJOR	▬▬▬	▬ ▬ ▬
PRIMARY	———	— — —
SECONDARY	———	— — —
COLLECTOR	———	— — —

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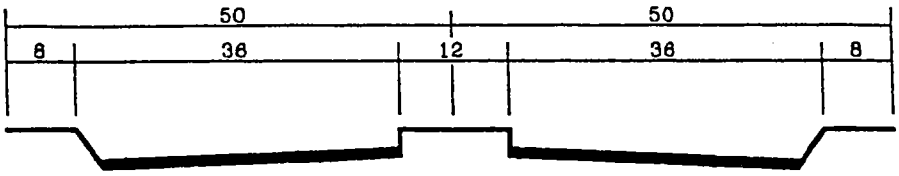
SOURCE: COUNTY OF ORANGE

EXHIBIT 3-I

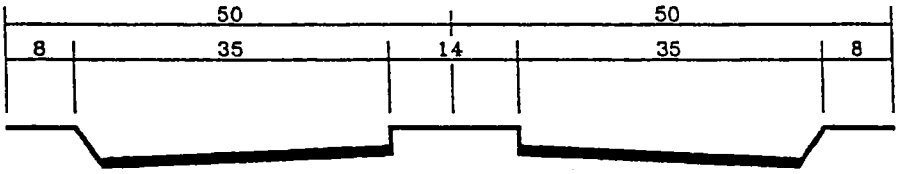
CITY OF DANA POINT
TYPICAL ROADWAY CROSS-SECTIONS



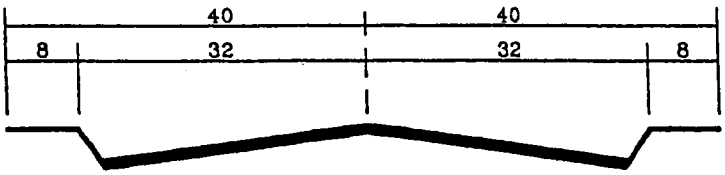
Major Arterial 120' R/W



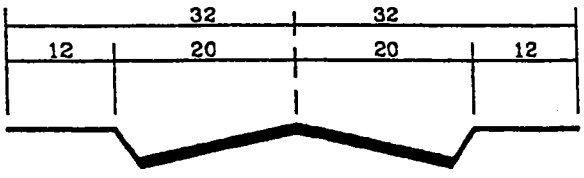
Augmented Primary Arterial 100' R/W



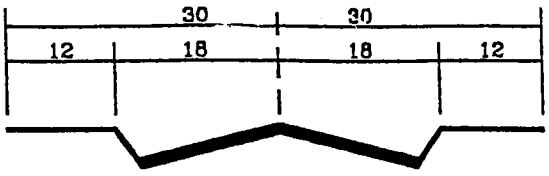
Primary Arterial 100' R/W



Secondary Arterial 80' R/W



Collector Street 64' R/W



Local Street 60' R/W

SOURCE: CITY OF DANA POINT

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4.0 PROJECT DESCRIPTION

Site Location

The proposed project is located in the City of Dana Point, a coastal community located within the southwestern portion of Orange County, California. The project is located west and immediately adjacent to Pacific Coast Highway between Selva Road and Street of the Green Lantern (see Exhibit 1-A). The San Joaquin Hills Transportation Corridor (SR-73) and Santa Ana Freeway (I-5) provide regional access to the proposed project site. Regional access to the project site is provided by Pacific Coast Highway and by the I-5 Freeway via the Camino Las Ramblas exit, which is approximately two miles to the east.

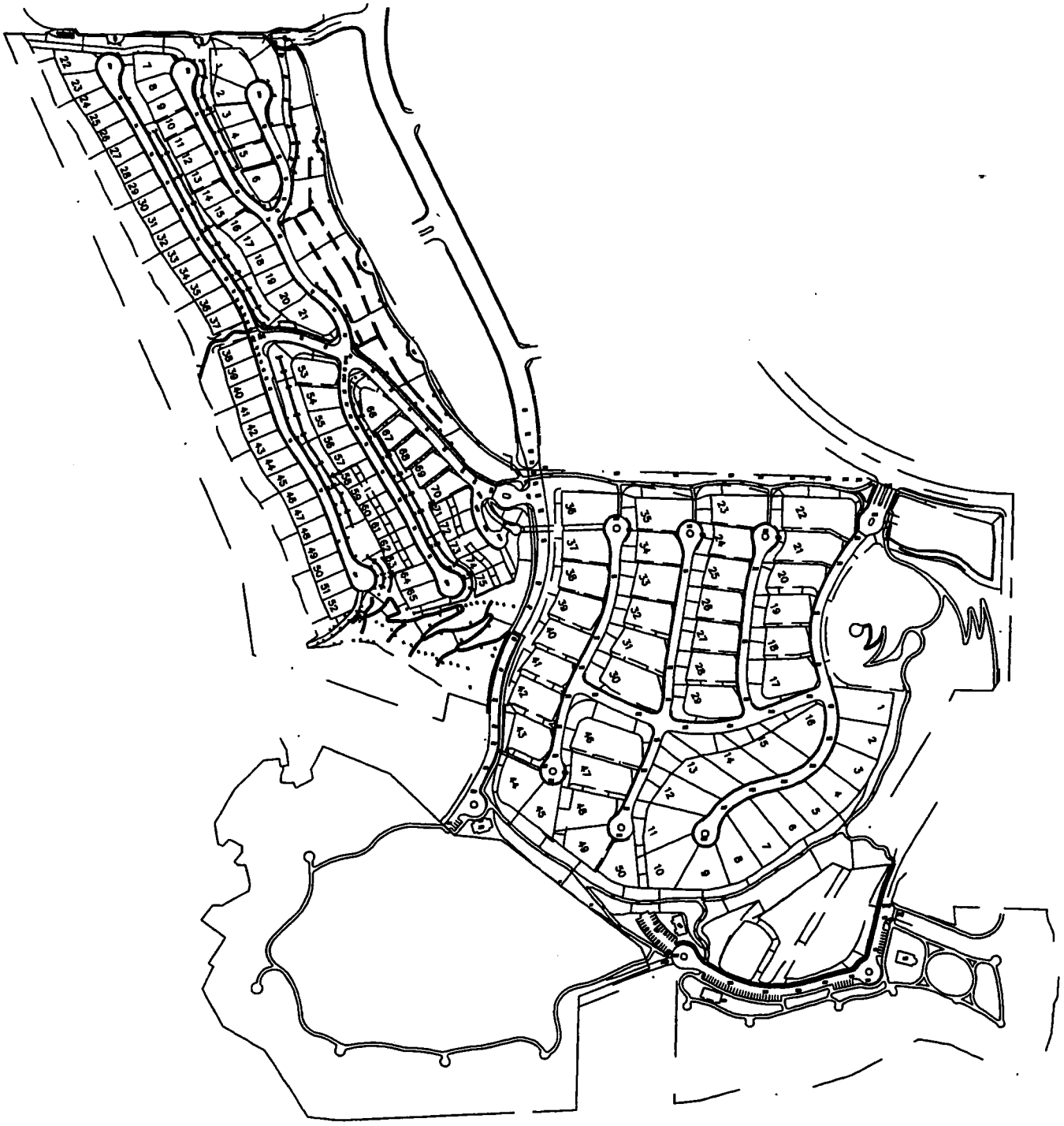
Proposed Project

The proposed project site is approximately 121.3 acres. The proposed project allows for implementation of a development and conservation plan which consists of 125 single-family detached residential dwelling units, a 65 room Seaside Inn that includes meeting/function space, restaurant and lounge, related amenities amounting to 13,000 square feet of visitor/recreation commercial uses, park and recreation areas, visitor recreation (community) facilities, recreation/open space and visitor/recreation commercial area of up to 40,000 square feet at PCH and "A" Street. The proposed project site plan is shown on Exhibit 4-A.

The proposed project will have access to Pacific Coast Highway through Selva Road, Street "A", Street of the Green Lantern, Street of Blue Lantern and Cove Road.

The project proposes to amend the City's General Plan and circulation element by deleting the looping of Selva Road on-site as shown on Exhibit 4-B. In addition, within the project, Selva Road is proposed as a 30 foot right-of-way public street (see Exhibit 4-C).

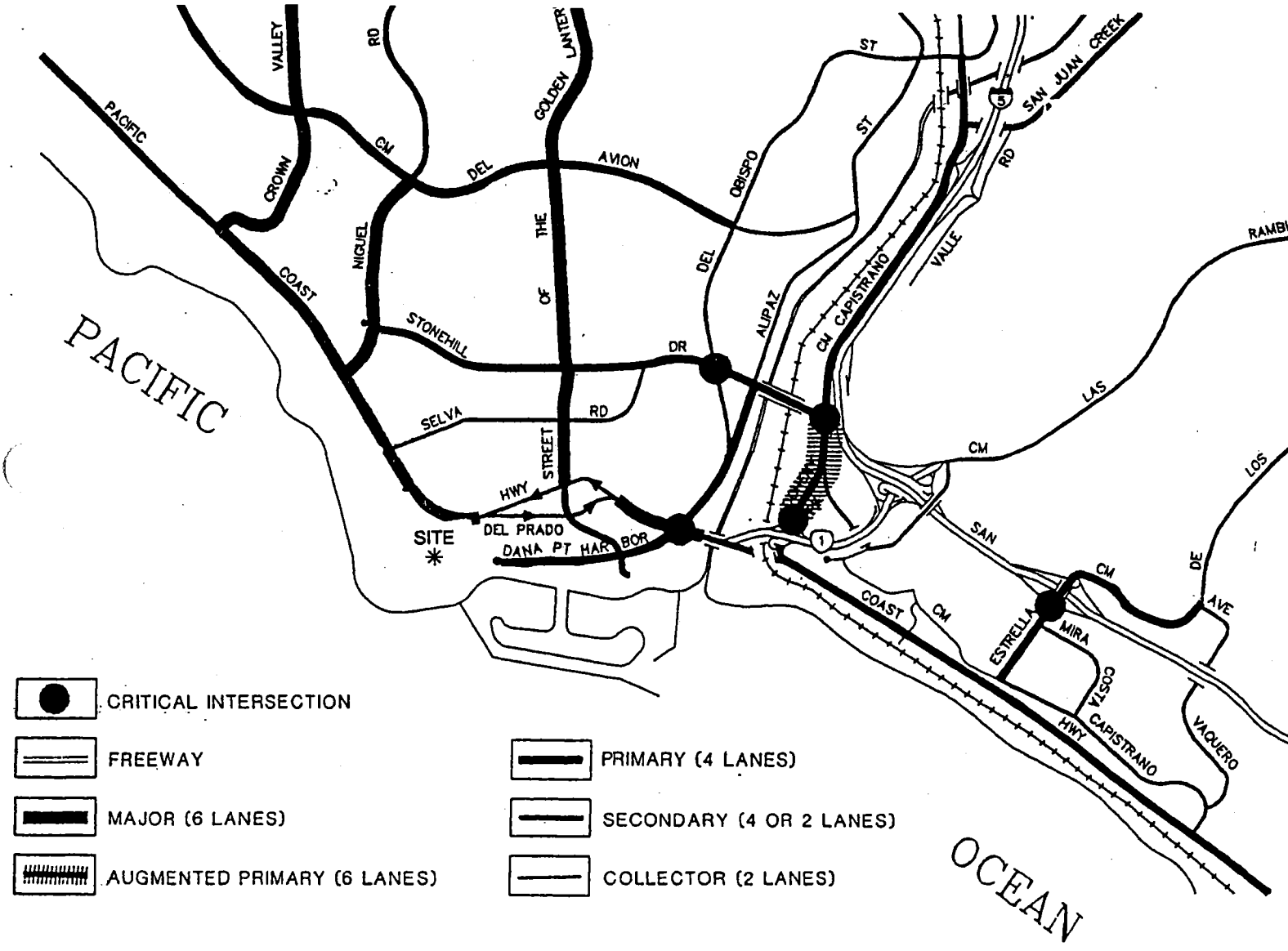
EXHIBIT 4-A
SITE PLAN



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EXHIBIT 4-B

PROPOSED CITY OF DANA POINT MASTER PLAN CIRCULATION SYSTEM W/DELETION OF SELVA RD.

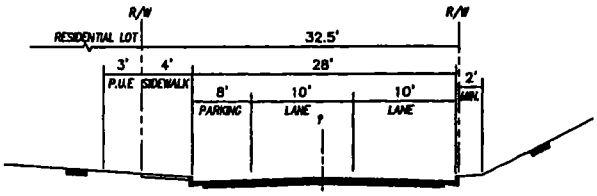


SOURCE: CITY OF DANA POINT

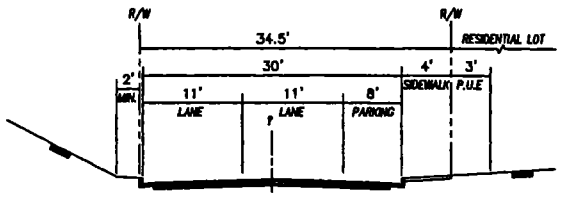
N

EXHIBIT 4-C

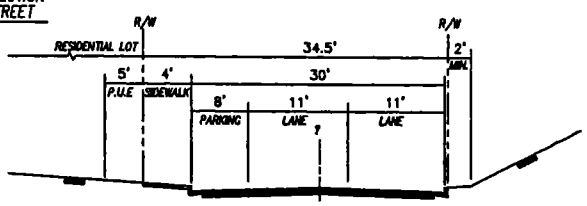
THE HEADLANDS
TYPICAL ROADWAY CROSS-SECTIONS



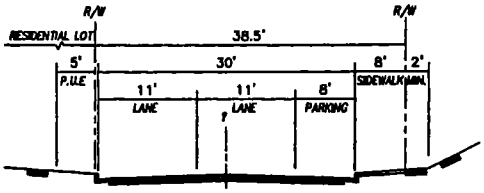
PRIVATE STREET SECTION
SINGLE-LOADED STREET
(A) ≤ 200 ADT
N.T.S



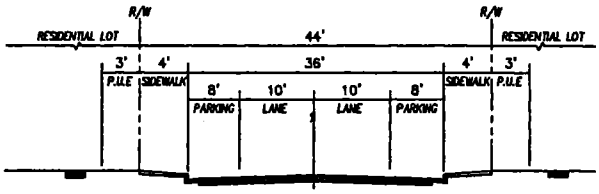
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SINGLE-LOADED STREET
(B) 201–500 ADT
N.T.S



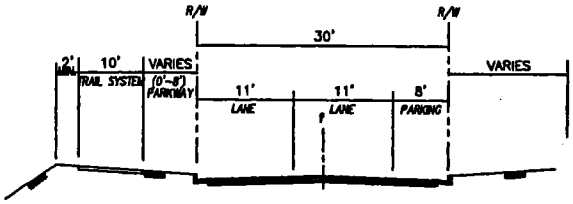
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SINGLE-LOADED STREET
(C) 501–1,200 ADT
N.T.S



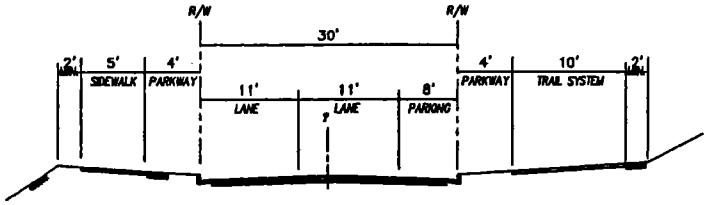
PRIVATE STREET SECTION
SINGLE-LOADED STREET
(C1) 501–1,200 ADT
N.T.S



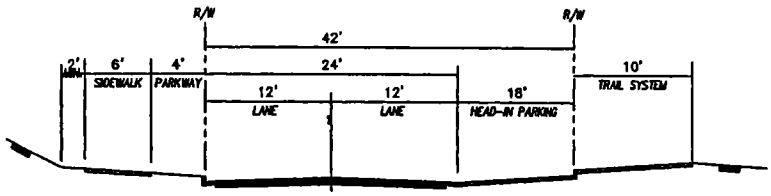
PRIVATE STREET SECTION
DOUBLE-LOADED STREET
(D) ≤ 200 ADT
N.T.S



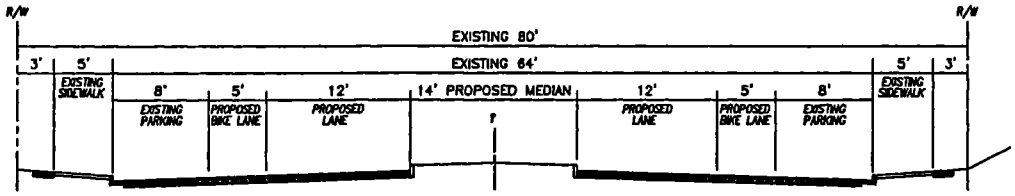
SELVA ROAD EXTENSION
PUBLIC STREET SECTION
PARKING ONE SIDE
(E1)
N.T.S



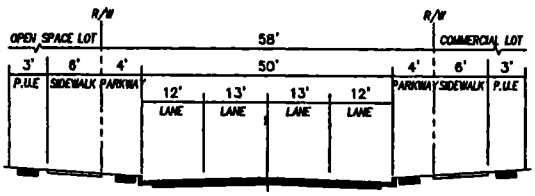
SELVA ROAD EXTENSION
PUBLIC STREET SECTION
PARKING ONE SIDE
(E)
N.T.S



SCENIC DRIVE
PUBLIC STREET SECTION
PARKING ONE SIDE
(F)
N.T.S



EX. SELVA ROAD
PUBLIC STREET SECTION
PARKING TWO SIDES
W/ PROPOSED MEDIAN
(EX)
N.T.S



PUBLIC STREET SECTION
ENTRY STREET
NO PARKING
(G)
N.T.S

Where appropriate, the project proposes a narrower street cross-section as a way to maximize the landscape and natural areas. Selva Road as it is extended into the project site will be narrowed to accommodate just two travel lanes, one side parking, a six-foot sidewalk and a landscaping strip adjoin the roadway.

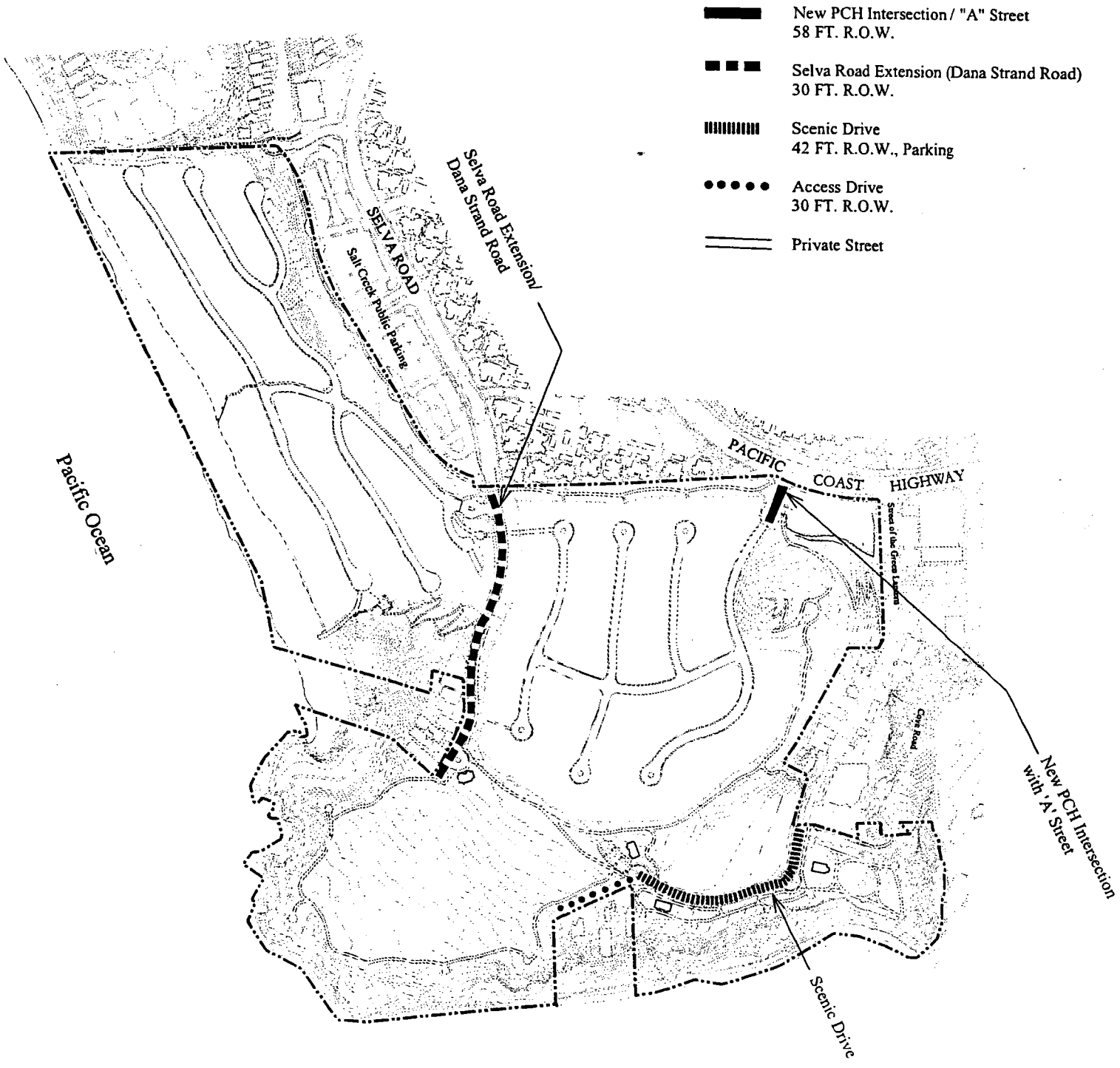
Adjoining the right-of-way on the opposite side of the street will be another landscape strip and the ten foot wide trail alignment which will link all areas of the project site. Selva Road will be aligned and extended to serve the 75-homes in Planning Area 2 and the nature park in Planning Area 7. Selva Road will also connect to existing Dana Strand Road to serve the existing residences in the multi-family enclave (see Exhibit 4-D). Once Selva Road is extended, Marguerita Road, a private easement, will be unnecessary. The project proposes Marguerita Road to be removed and the former alignment utilized as recreation open space.

The 50-homes in Planning Area 6 and the 1.6 acres of visitor/recreation (community) facilities proposed in Planning Area 4 will be accessed via the new signalized intersection of Pacific Coast Highway and Street "A" (Project Entrance).

The Seaside Inn in Planning Area 9, Harbor Point Park in Planning Area 8, and the Headlands Conservation Park in Planning Area 7 will be served by a realignment of Scenic Drive and Street of the Green Lantern onsite. Cove Road will continue to serve as a connection between the proposed project and Dana Point Harbor.

EXHIBIT 4-D

THE HEADLANDS
MASTER PLAN CIRCULATION SYSTEM



5.0 PROJECT DEVELOPMENT

Trip Generation

Trip generation represents the amount of traffic which is attracted and produced by a development. The traffic generation for the proposed project has been estimated based upon the specific land uses planned for the proposed project. Trip generation rates utilized in this analysis are those established by the City of Dana Point General Plan Traffic Analysis (January, 1991).

Trip generation rates utilized in this analysis are those established by the Dana Point General Plan Traffic Analysis (January, 1991). Trip generation rates utilized in this study are shown in Table 5-1.

In order to quantify the proposed project land uses, the proposed project was divided into three (3) traffic analysis zones as shown on Exhibit 5-A. Both daily and peak hour trip generation for the proposed project are shown in Table 5-2. The proposed project is projected to generate approximately 4,599 trip-ends per day with 214 vehicles per hour during the AM peak hour and 397 vehicles per hour during the PM peak hour.

Traffic Assignment

Trip distribution represents the directional orientation of traffic to and from the project site. Trip distribution is influenced by a number of factors, including geographical location of the project site, the type of land use, access to the regional freeway and transportation system, and other planned uses in the area.

The trip distribution pattern for the proposed project has been obtained from the City of Dana Point traffic model. The trip distribution pattern for the proposed project is shown on Exhibit 5-B. Project ADT volumes are calculated based upon the proposed project's trip generation and trip distribution. Exhibit 5-C illustrates the external project ADT

TABLE 5-1

TRIP GENERATION RATES[1]

LAND USE	UNITS[2]	PEAK HOUR				DAILY
		AM		PM		
		IN	OUT	IN	OUT	
Single-Family Residential	DU	0.23	0.63	0.72	0.43	11.57
Inn	RM	0.20	0.10	0.20	0.30	6.00
Visitor Recreation (Community) Facility	TSF	0.79	0.39	0.53	0.56	14.43
Visitor/Recreation Commercial	TSF	1.06	0.49	2.34	2.08	51.78
Recreation/Open Space	AC	0.40	0.40	0.50	0.50	10.00
Park/Recreation	AC	0.00	0.00	0.00	0.00	3.66

[1] Source: Dana Point General Plan Traffic Analysis, AFA, January, 1991

[2] DU = Dwelling Units
RM = Rooms
TSF = Thousand Square Feet
AC = Acres

EXHIBIT 5-A

PROJECT TRAFFIC ANALYSIS ZONE (TAZ) MAP

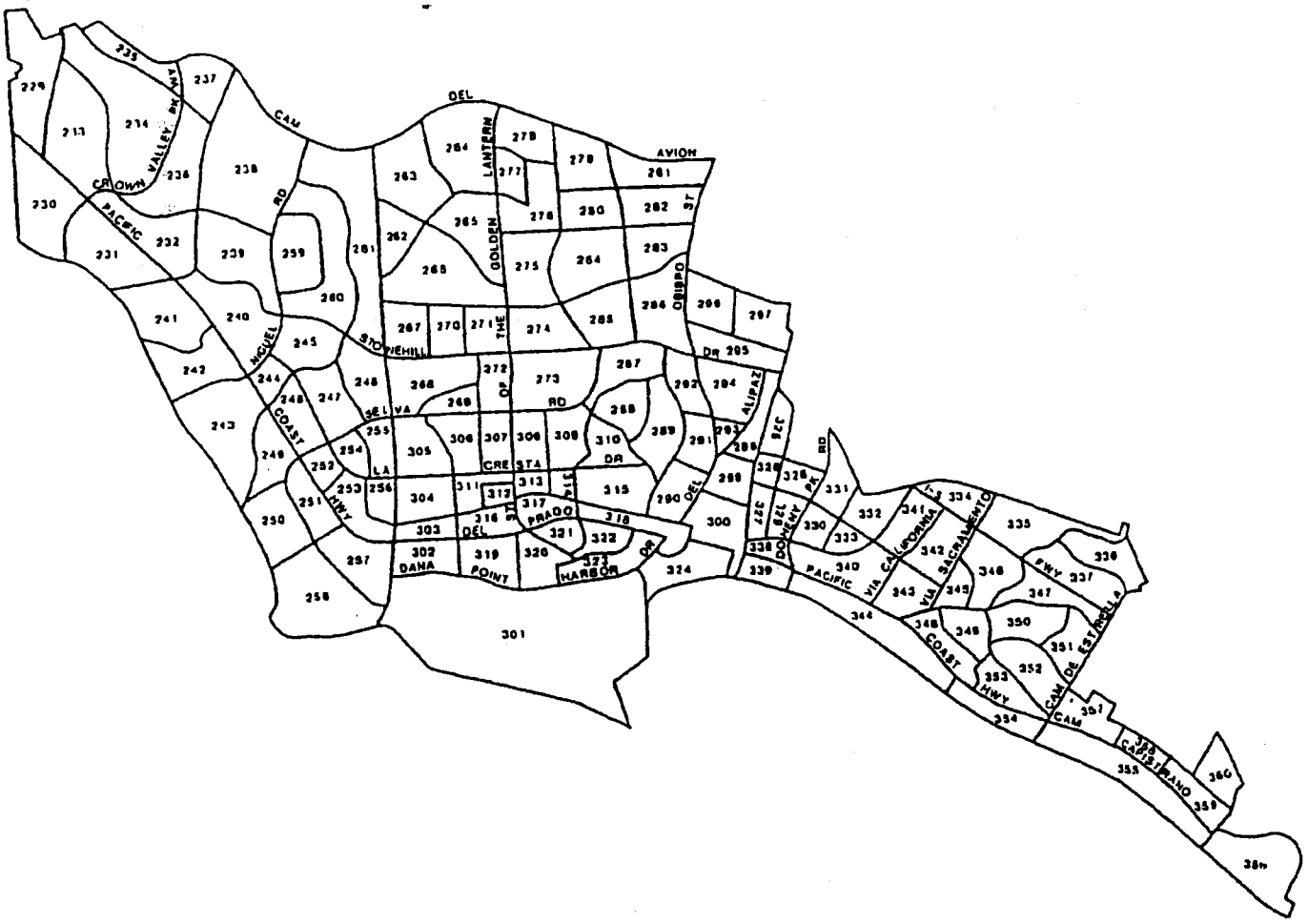


TABLE 5-2

PROPOSED PROJECT TRIP GENERATION

TAZ[1]	LAND USE	QUANTITY	UNITS[2]	PEAK HOUR AM IN	PEAK HOUR AM OUT	PEAK HOUR PM IN	PEAK HOUR PM OUT	DAILY
250	Single-Family Residential	75	DU	17	47	54	32	868
	Park/Recreation	9.9	AC	NOM[3]	NOM	NOM	NOM	36
	Recreation/Open Space	5.2	AC	2	2	3	3	52
	Subtotal			19	49	57	35	956
257	Visitor/Recreation Commercial	40	TSF	42	20	94	83	2,071
	Park/Recreation	12.3	AC	NOM	NOM	NOM	NOM	45
	Visitor Recreation (Community) Facility	2	TSF	2	1	1	1	29
	Single-Family Residential	50	DU	12	32	36	22	579
	Subtotal			56	53	131	106	2,724
258	Park/Recreation	28.6	AC	NOM	NOM	NOM	NOM	105
	Visitor Recreation (Community) Facility	6	TSF	5	2	3	3	87
	Seaside Inn	65	RM	13	7	13	20	390
	Visitor Recreation (Community) Facility[4]	13	TSF	7	3	15	14	337
	Subtotal			25	12	31	37	919
TOTAL				100	114	219	178	4,599

[1] TAZ = Traffic Analysis Zones within the Dana Point Traffic Model.

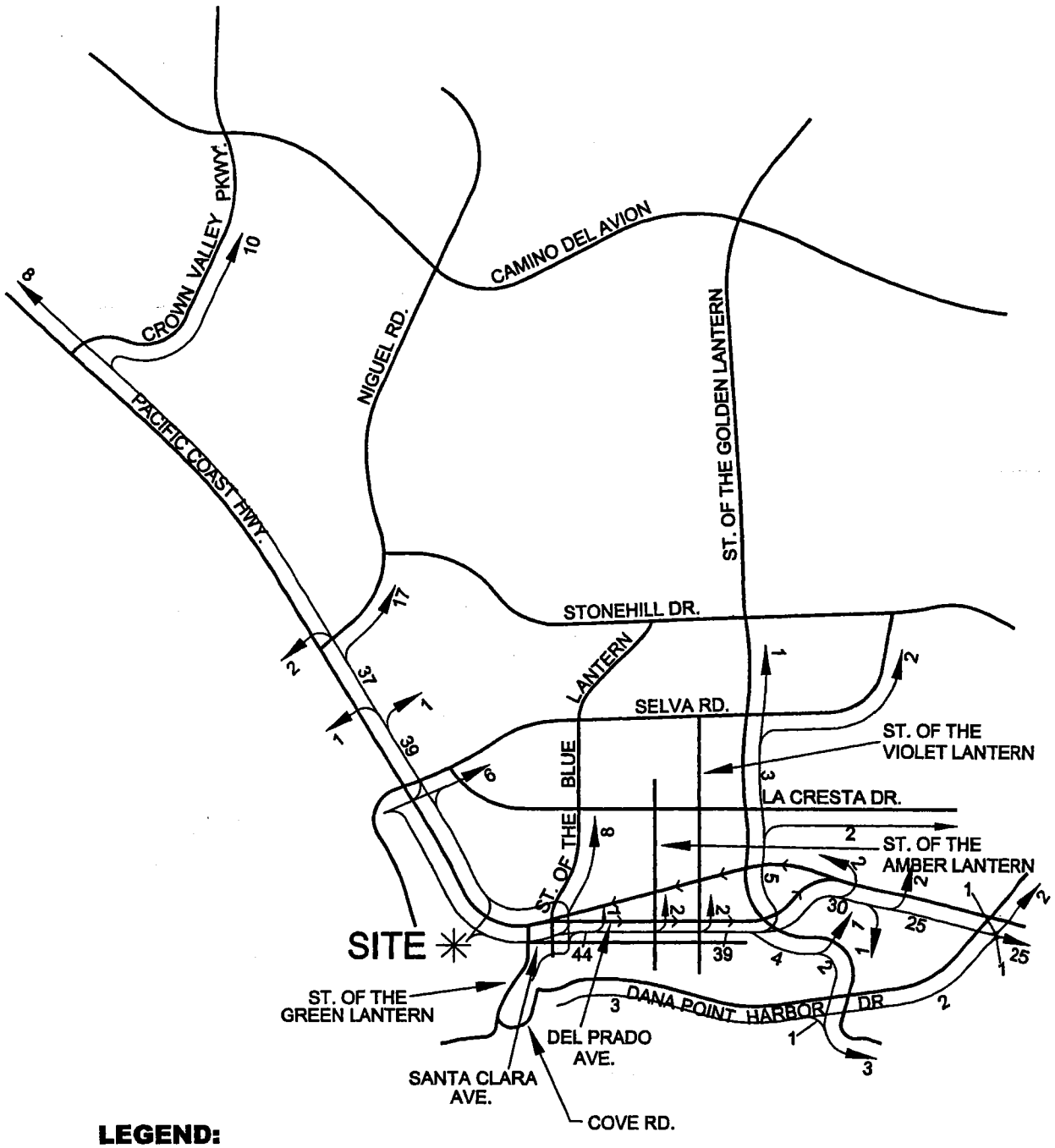
[2] DU = Dwelling Unit
AC = Acres
TSF = Thousand Square Feet
RM = Rooms

[3] NOM = Nominal

[4] Included within the Seaside Inn

EXHIBIT 5-B

PROJECT TRIP DISTRIBUTION



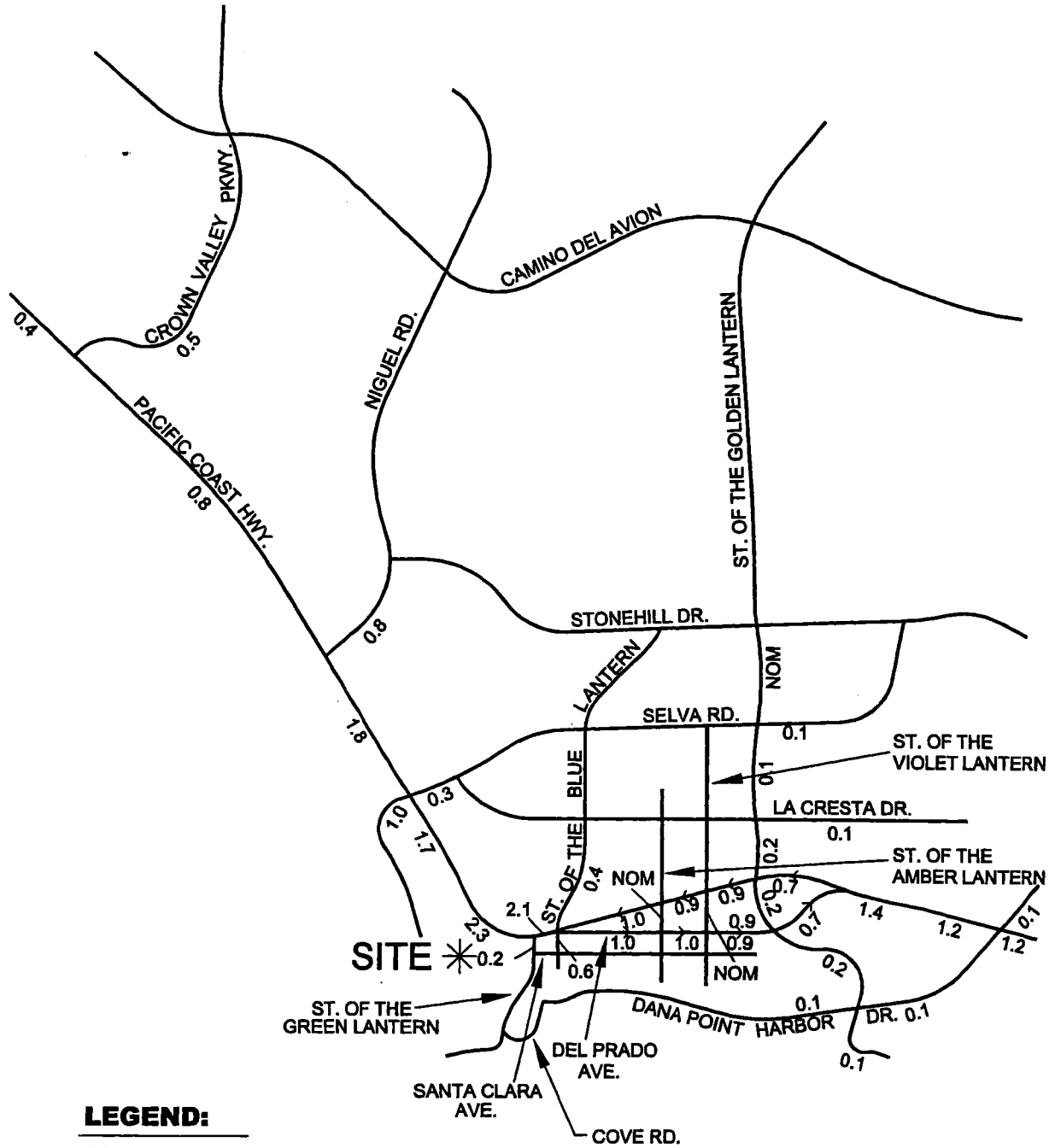
LEGEND:

10 = PERCENT TO/FROM PROJECT

N

EXHIBIT 5-C

PROJECT AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

0.1 = VEHICLES PER DAY (1000'S)

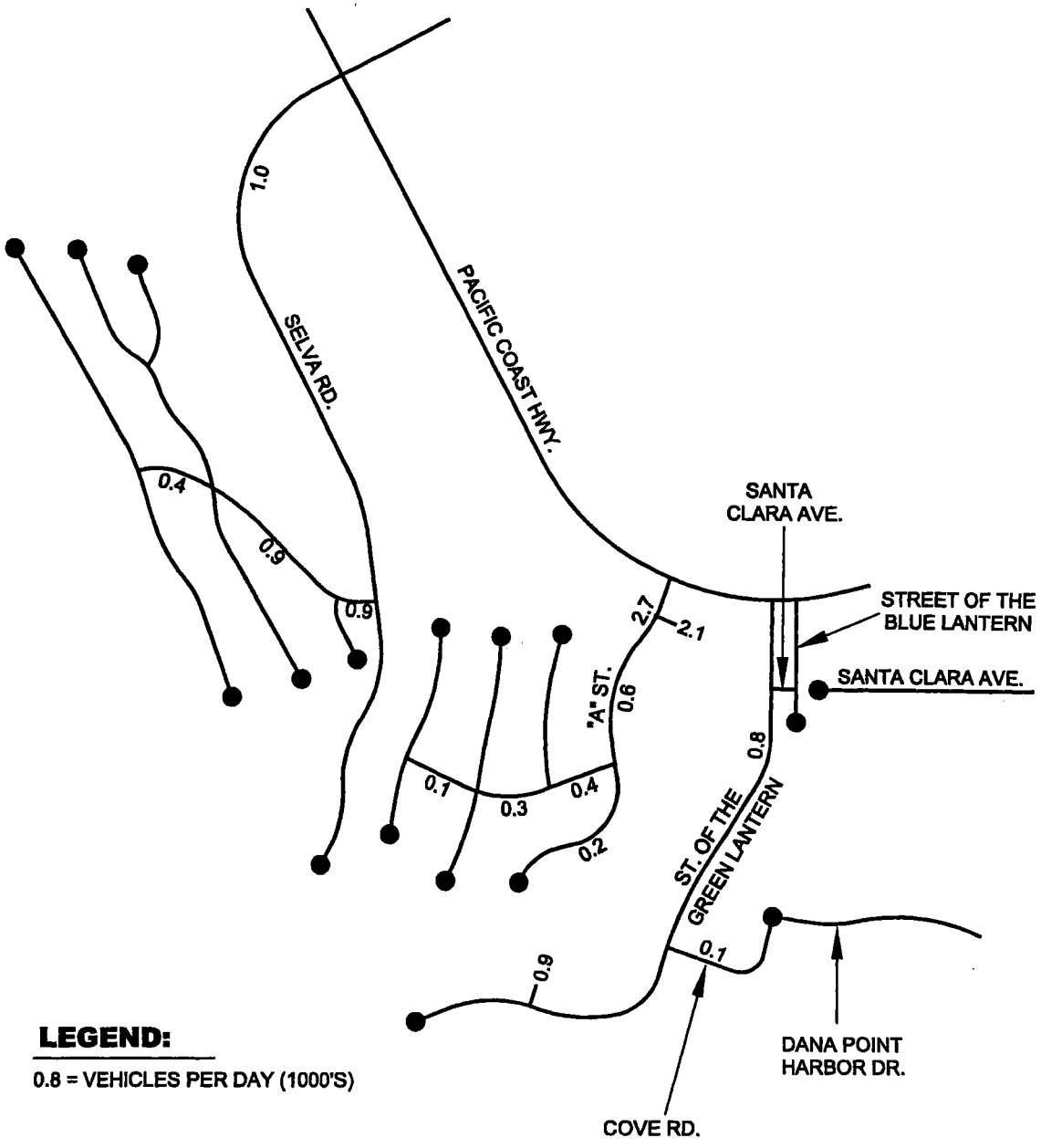
NOM = NOMINAL, LESS THAN 50 VEHICLES PER DAY

N

volumes and Exhibit 5-D shows the local project ADT volumes. Project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 5-E and 5-F, respectively.

EXHIBIT 5-D

LOCAL PROJECT AVERAGE DAILY TRAFFIC (ADT)



N

EXHIBIT 5-E

PROJECT AM PEAK HOUR INTERSECTION VOLUMES

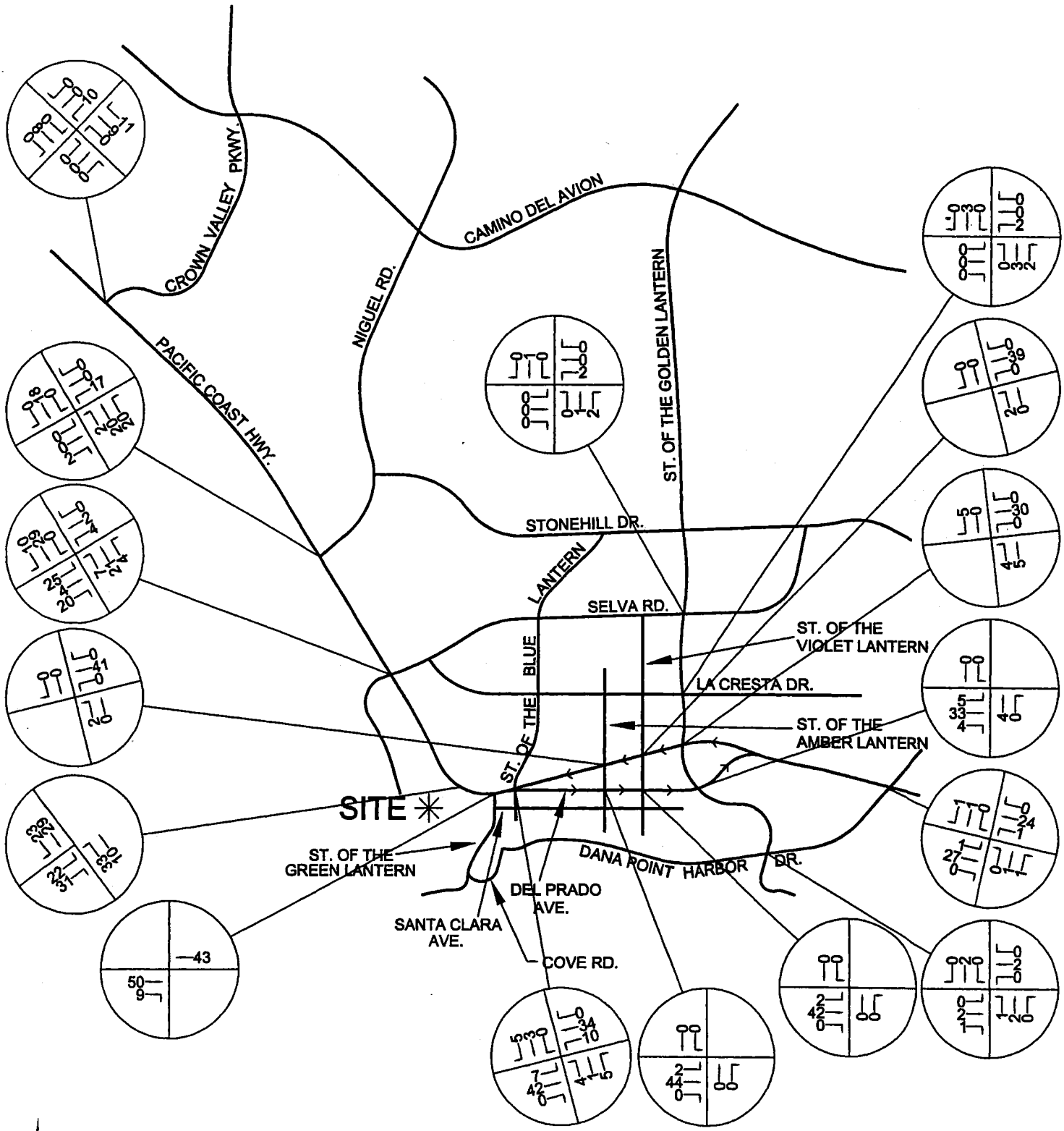
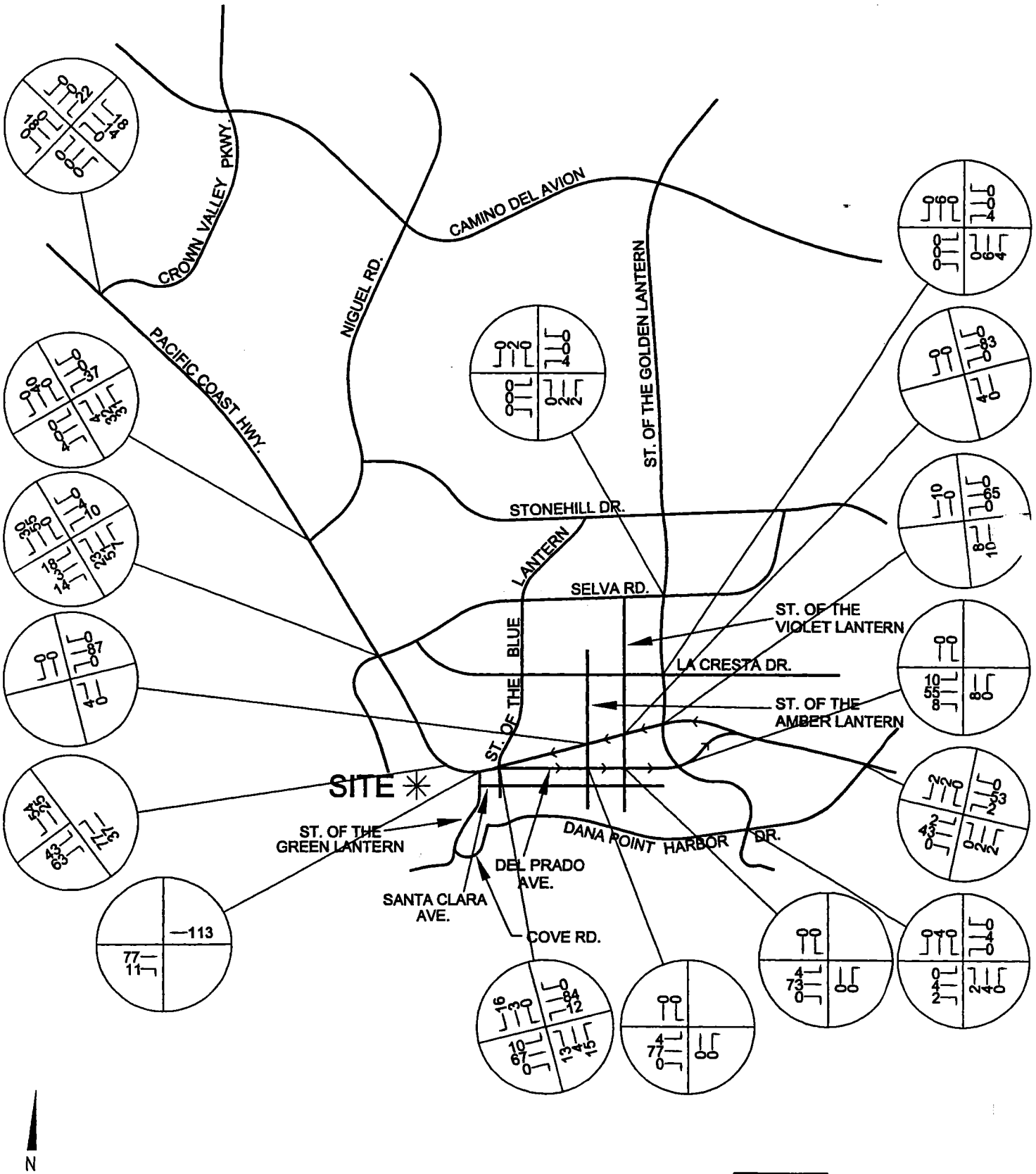


EXHIBIT 5-F

PROJECT PM PEAK HOUR INTERSECTION VOLUMES



6.0 EXISTING PLUS PROJECT TRAFFIC CONDITIONS

Existing Plus Project Average Daily Traffic

Once the project-related traffic is assigned to the street network and added to existing volumes in the study area, the traffic impact of the proposed project can be assessed. Exhibit 6-A shows ADT volumes for existing plus project traffic conditions.

Table 6-1 shows the Existing Plus Project roadway segment analysis. As can be seen on Table 6-1, the Pacific Coast Highway roadway segment north of Crown Valley Parkway is currently over the City's link volume threshold by 1,400 ADT. However, the adjacent intersection at Crown Valley Parkway is operating at Level of Service "A" during the AM/PM peak hours. In the case of this segment, the General Plan link capacities are not reflective of the actual capacity of this segment. Furthermore, a capital improvement program to build a median along Pacific Coast Highway in the vicinity is underway. With the median, Pacific Coast Highway in this area would have better access control, because of less cross traffic and left turn traffic along this segment of roadway. This can increase the design capacity of this segment.

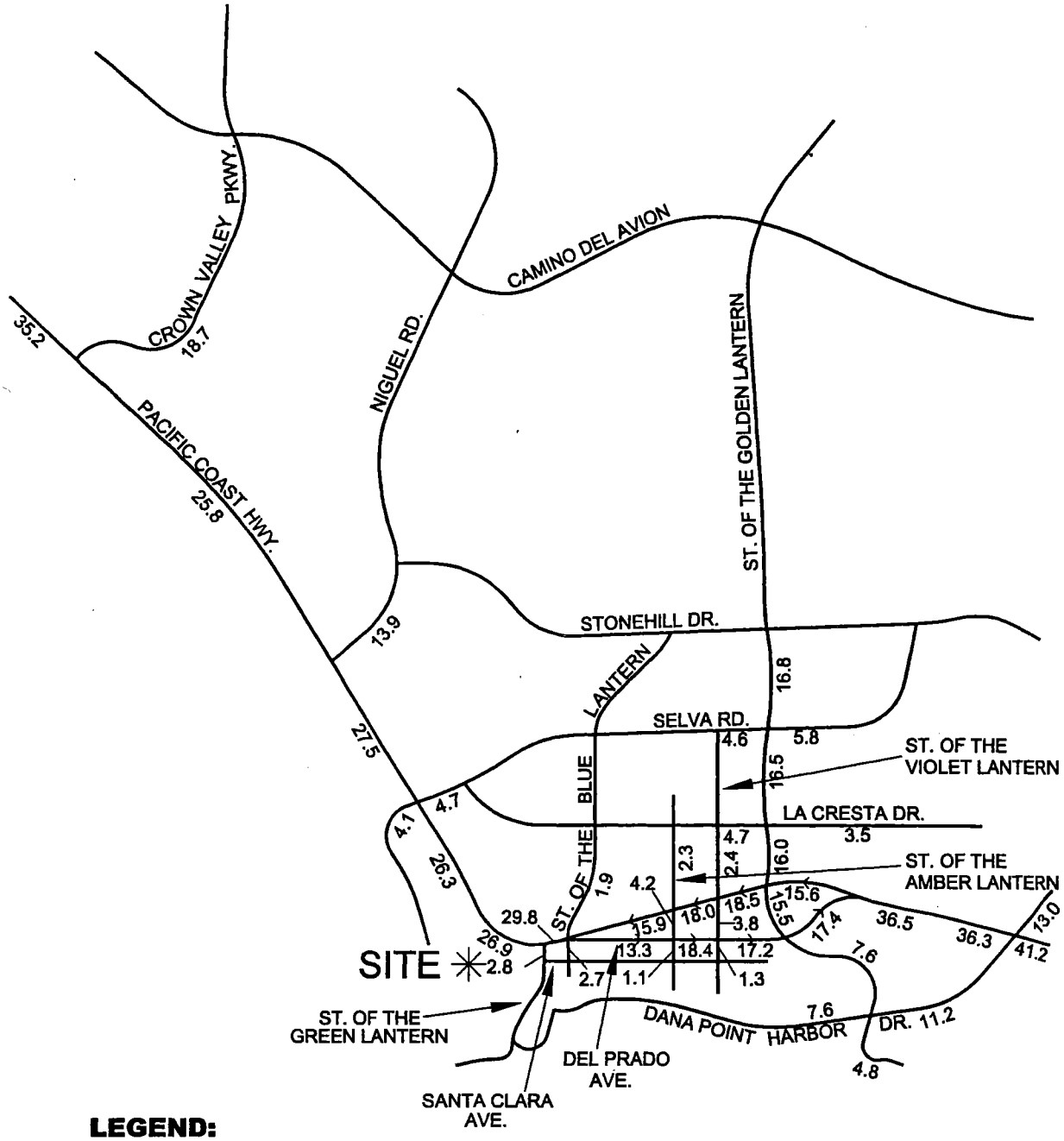
A traffic signal is projected to be warranted at the intersection of Pacific Coast Highway/ Street "A" (Project Entrance) for existing plus project traffic conditions (see Appendix "D").

Existing Plus Project Intersection Capacity Utilization

Intersection Capacity Utilization (ICU) for existing plus project traffic conditions have been calculated and are shown in Table 6-2. As shown in Table 6-2, the study area intersections are projected to continue to operate at acceptable level of service during the peak hours with the existing geometrics. Existing plus project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 6-B and 6-C, respectively. Existing plus project summer AM and PM peak hour intersection turning movement

EXHIBIT 6-A

EXISTING PLUS PROJECT AVERAGE DAILY TRAFFIC (ADT'



LEGEND:

4.8 = VEHICLES PER DAY (1000'S)

N

TABLE 6-1

EXISTING PLUS PROJECT ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	EXISTING PLUS PROJECT VOLUME	EXISTING PLUS PROJECT THRESHOLD
Pacific Coast Hwy.[1]					
• North of Crown Valley Pkwy.			37,500	35,200	UNDER
• South of Crown Valley Pkwy.			56,200	25,800	UNDER
• North of Niguel Rd.			56,200	25,800	UNDER
• North of Selva Rd.			56,200	27,500	UNDER
• South of Selva Rd.			56,200	26,300	UNDER
• West of St. of the Green Lantern			56,200	26,900	UNDER
• West of St. of the Blue Lantern			56,200	29,800	UNDER
• West of St. of the Amber Lantern			28,100	15,900	UNDER
• West of St. of the Violet Lantern			28,100	18,000	UNDER
• West of St. of the Golden Lantern			28,100	18,500	UNDER
• West of Del Prado Ave.			28,100	15,600	UNDER
• East of Del Prado Ave.			56,200	36,500	UNDER
• West of Dana Point Harbor Dr.			56,200	36,300	UNDER
• East of Dana Point Harbor Dr.			56,200	41,200	UNDER
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		18,700	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		13,900	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			2,800	UNDER
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			1,900	UNDER
• North of Santa Clara Ave.	5,000			2,700	UNDER
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			2,300	UNDER
• North of Del Prado Ave.	5,000			4,200	UNDER
• North of Santa Clara Ave.	5,000			1,100	UNDER
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			2,400	UNDER
• North of Del Prado Ave.	5,000			3,800	UNDER
• North of Santa Clara Ave.	5,000			1,300	UNDER
St. of the Golden Lantern					
• North of Selva Rd.		50,600		16,800	UNDER
• North of La Cresta Dr.		50,600		16,500	UNDER
• North of Pacific Coast Hwy.		50,600		16,000	UNDER
• North of Del Prado Ave.	33,800			15,500	UNDER
• North of Dana Point Harbor Dr.	33,800			7,600	UNDER
• South of Dana Point Harbor Dr.	33,800			4,800	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			4,100	UNDER
• East of Pacific Coast Hwy.	20,000			4,700	UNDER
• West of St. of the Golden Lantern	20,000			4,600	UNDER
• East of St. of the Golden Lantern	20,000			5,800	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			4,700	UNDER
• East of St. of the Golden Lantern	10,000			3,500	UNDER
Del Prado Ave.[1]					
• West of St. of the Amber Lantern			28,100	13,300	UNDER
• West of St. of the Violet Lantern			28,100	18,400	UNDER
• West of St. of the Golden Lantern			28,100	17,200	UNDER
• East of St. of the Golden Lantern			28,100	17,400	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			7,600	UNDER
• East of the Golden Lantern	33,800			11,200	UNDER
• East of Pacific Coast Hwy.	33,800			13,000	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

TABLE 6-2

EXISTING PLUS PROJECT INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific Coast Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.55	0.57	0.61	0.62	A	A	B	B
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	1	1	2	1	2	2	1	1	2	1	0.62	0.63	0.67	0.69	B	B	B	B
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.43	0.52	0.46	0.57	A	A	A	A
• Project Entrance (EW)	1	2	0	0	2	1	1	0	1	0	0	0	0.41	0.51	0.44	0.54	A	A	A	A
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.40	0.44	0.43	0.48	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.48	0.60	0.53	0.64	A	A	A	B
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.37	0.39	0.39	0.43	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.35	0.47	0.38	0.51	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.37	0.44	0.40	0.48	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.32	0.41	0.34	0.45	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.30	0.31	0.33	0.34	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.31	0.38	0.34	0.40	A	A	A	A
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.41	0.47	0.44	0.53	A	A	A	A
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.41	0.50	0.43	0.54	A	A	A	A
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.23	0.29	0.24	0.33	A	A	A	A
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	1	1>	2	1	1	1	2	1	2	2	0	0.62	0.76	0.68	0.83	B	C	B	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap; 1 = Improvement

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

EXHIBIT 6-B

EXISTING PLUS PROJECT AM PEAK HOUR INTERSECTION VOLUMES

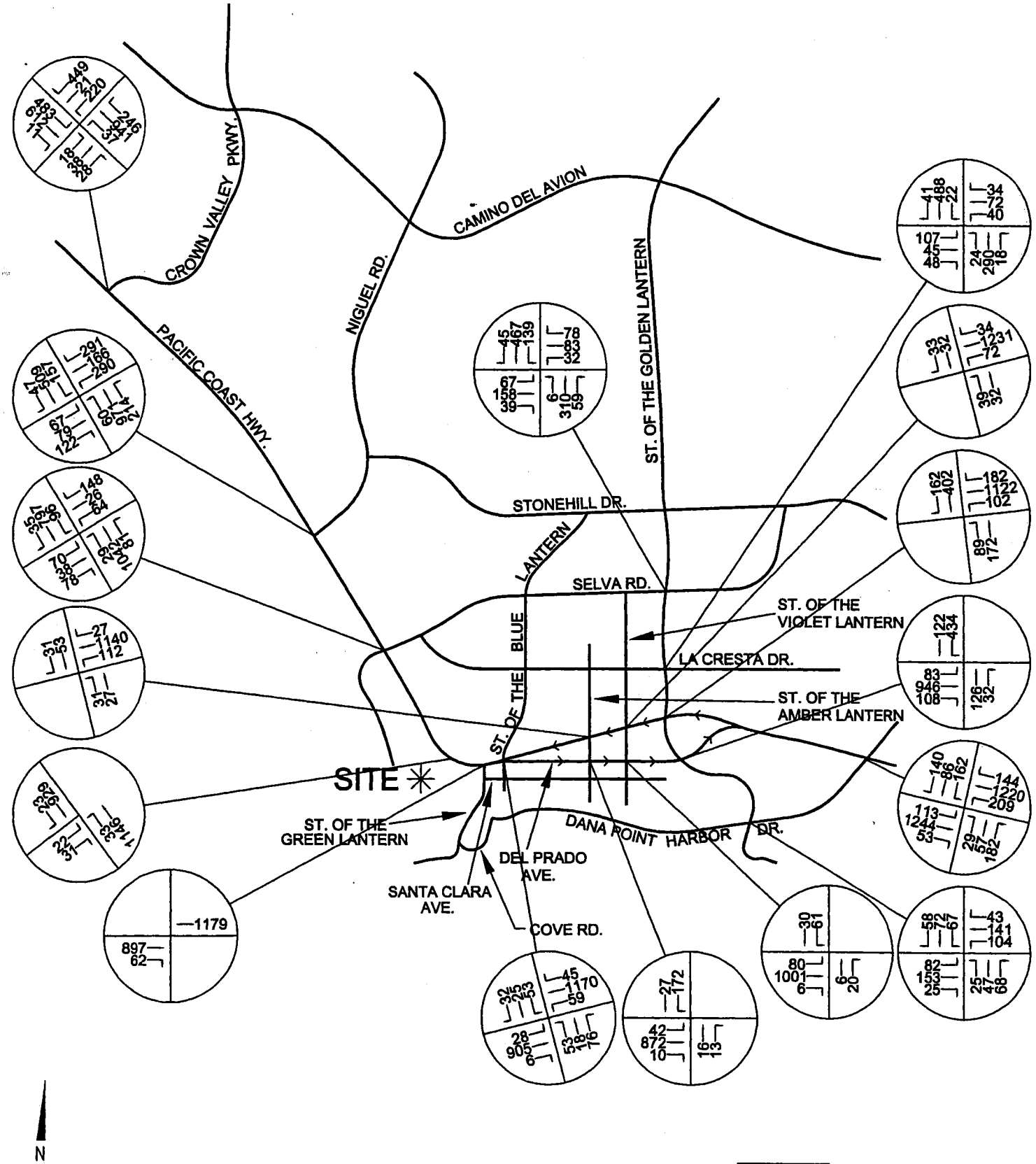
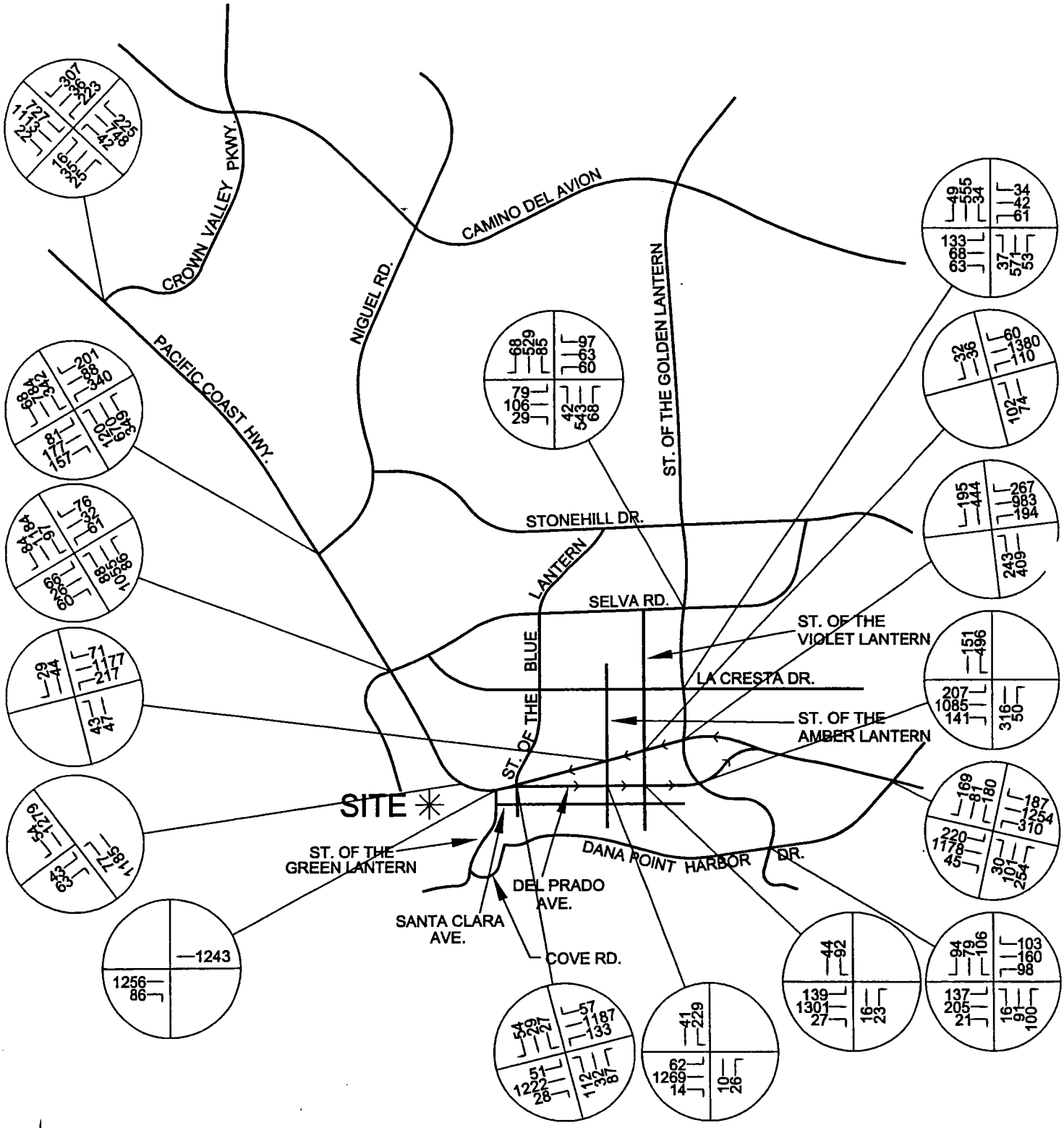


EXHIBIT 6-C

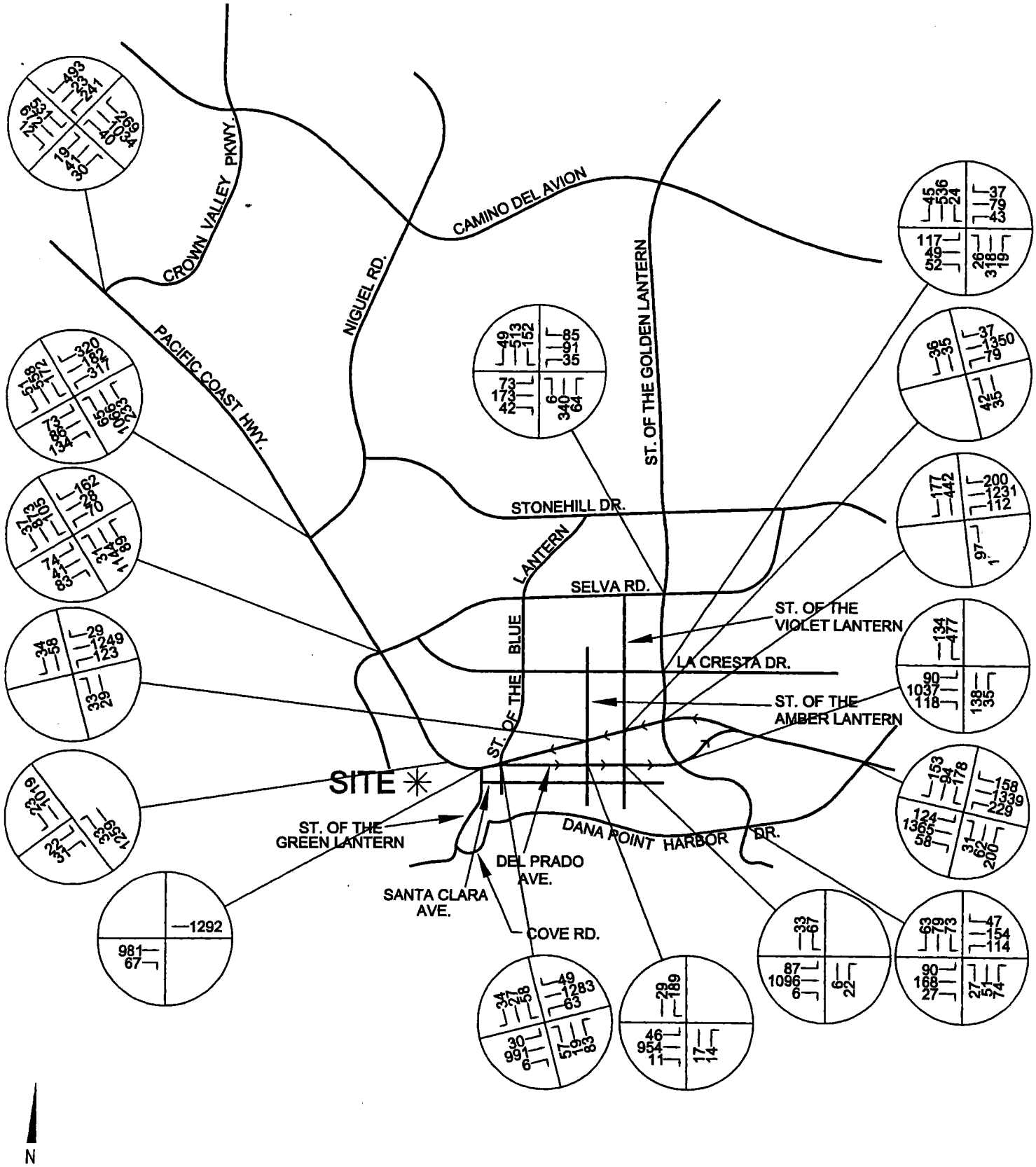
EXISTING PLUS PROJECT PM PEAK HOUR INTERSECTION VOLUMES



volumes are shown on Exhibits 6-D and 6-E, respectively. Existing plus project ICU calculation worksheets are included in Appendix "E".

EXHIBIT 6-D

EXISTING PLUS PROJECT SUMMER AM PEAK HOUR INTERSECTION VOLUME

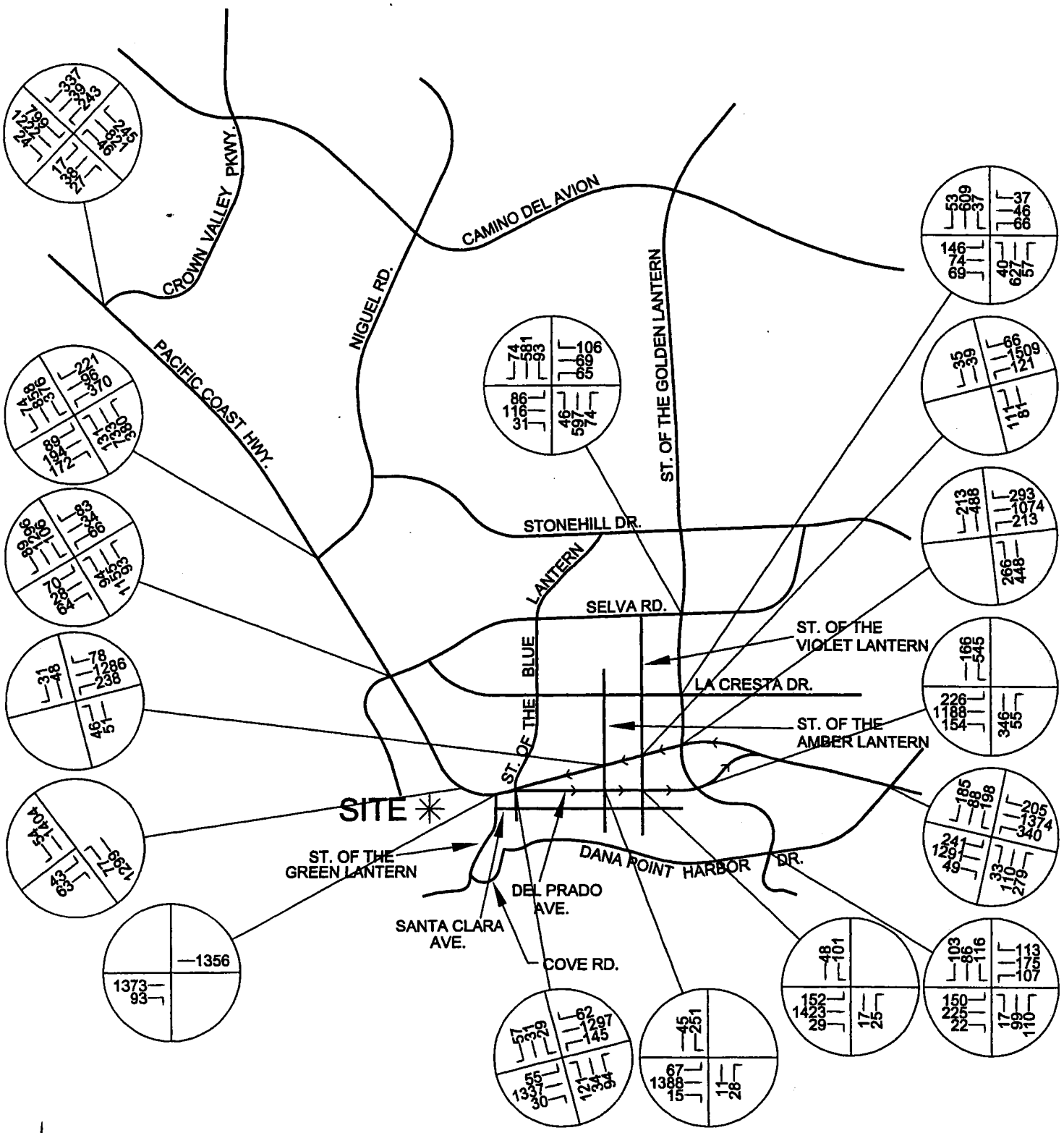


1110-99-01:19A
HEADLANDS, Dana Point, California

RK engineering group, inc.

EXHIBIT 6-E

EXISTING PLUS PROJECT
SUMMER PM PEAK HOUR INTERSECTION VOLUMES



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HEADLANDS, Dana Point, California

RK engineering group, inc.

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7.0 SHORT-RANGE TRAFFIC CONDITIONS

Other Development

Table 7-1 lists the other development projects provided by the City of Dana Point staff. Table 7-2 shows the daily and peak hour vehicle trips generated by the surrounding development in the vicinity of the project site.

The other development ADT volumes are shown on Exhibit 7-A. Other development AM and PM peak hour intersection turning movement volumes are shown on Exhibits 7-B and 7-C, respectively.

Areawide Growth

To account for areawide growth on roadways, short-range traffic volumes have been calculated based on a 1.0 percent annual growth rate of existing traffic volumes over the next 10 years. This annual growth rate is based upon a previous traffic study for the study area. This growth rate has been confirmed by reviewing historical traffic volumes in the vicinity of the project site. For short-range traffic conditions, areawide growth has been added to daily and peak hour traffic volumes on surrounding roadways, in addition to traffic generated by the proposed project and other development as identified on Tables 7-1 and 7-2.

Santa Clara Avenue Improvement

The City of Dana Point has moved forward with the construction of Santa Clara Avenue into a cul-de-sac east of Street of the Blue Lantern. As a result, the Short-range analysis has been updated to reflect this improvement. RK ENGINEERING GROUP, INC. has reviewed the Neighborhood Traffic Management Traffic Evaluation prepared for Santa Clara Avenue by Wildan Engineers and Planners. From the study,

TABLE 7-1

OTHER DEVELOPMENT LAND USE

DEVELOPMENT	LAND USE	QUANTITY	UNITS[1]
Dana Point Harbor Expansion	Commercial	28.05	TSF
	Hotel	42	RM
	Dry Boat Storage	471	UNITS
	Maintenance Bldg.	4.50	TSF
	Marina Slips	18	SLIPS
	Marine Institute	32.0	TSF
Monarch Beach Resort	Resort Hotel	400	RM
	Residential	238	DU
	Golf Course	18	Holes
	Beach House	3,900	SF
	Community Park	21.50	Acres
Ritz Pointe	Single-Family Detached Residential	70	DU
Capo By The Sea	Single-Family Detached Residential	50	DU
St. Edward's Church	School Expansion	28	TSF
Bade Property	Single-Family Detached Residential	3	DU

[1] TSF = Thousand Square Feet
RM = Rooms
DU = Dwelling Units

TABLE 7-2

OTHER DEVELOPMENT TRIP GENERATION

DEVELOPMENT	LAND USE	PEAK HOUR AM IN	PEAK HOUR AM OUT	PEAK HOUR PM IN	PEAK HOUR PM OUT	DAILY
Dana Point Harbor Expansion	Commercial	30	14	66	58	1,452
	Hotel	19	10	15	13	365
	Dry Boat Storage	5	5	9	5	132
	Mainenance Bldg.	8	3	8	13	197
	Marina Slips	NOM [1]	NOM	1	1	18
	Marine Institute	24	10	122	118	1,728
	Subtotal	86	42	221	208	3,892
Monarch Beach Resort[4]	Resort Hotel	80	50	75	120	4,060
	Residential	45	125	155	80	2,290
	Golf Course	40	10	30	30	650
	Beach House	0	0	0	0	0
	Community Park	5	0	5	5	80
	Subtotal	170	185	265	235	7,080
Ritz Pointe	Single-Family Detached Residential	14	38	44	26	704
Capo By The Sea	Single-Family Detached Residential	10	28	32	18	503
St. Edward Church	Private School	117 [2]	104 [2]	0	0	716 [3]
Bade Property	Single-Family Detached Residential	1	2	2	1	35
TOTAL		398	399	564	488	12,930

[1] NOM = Nominal

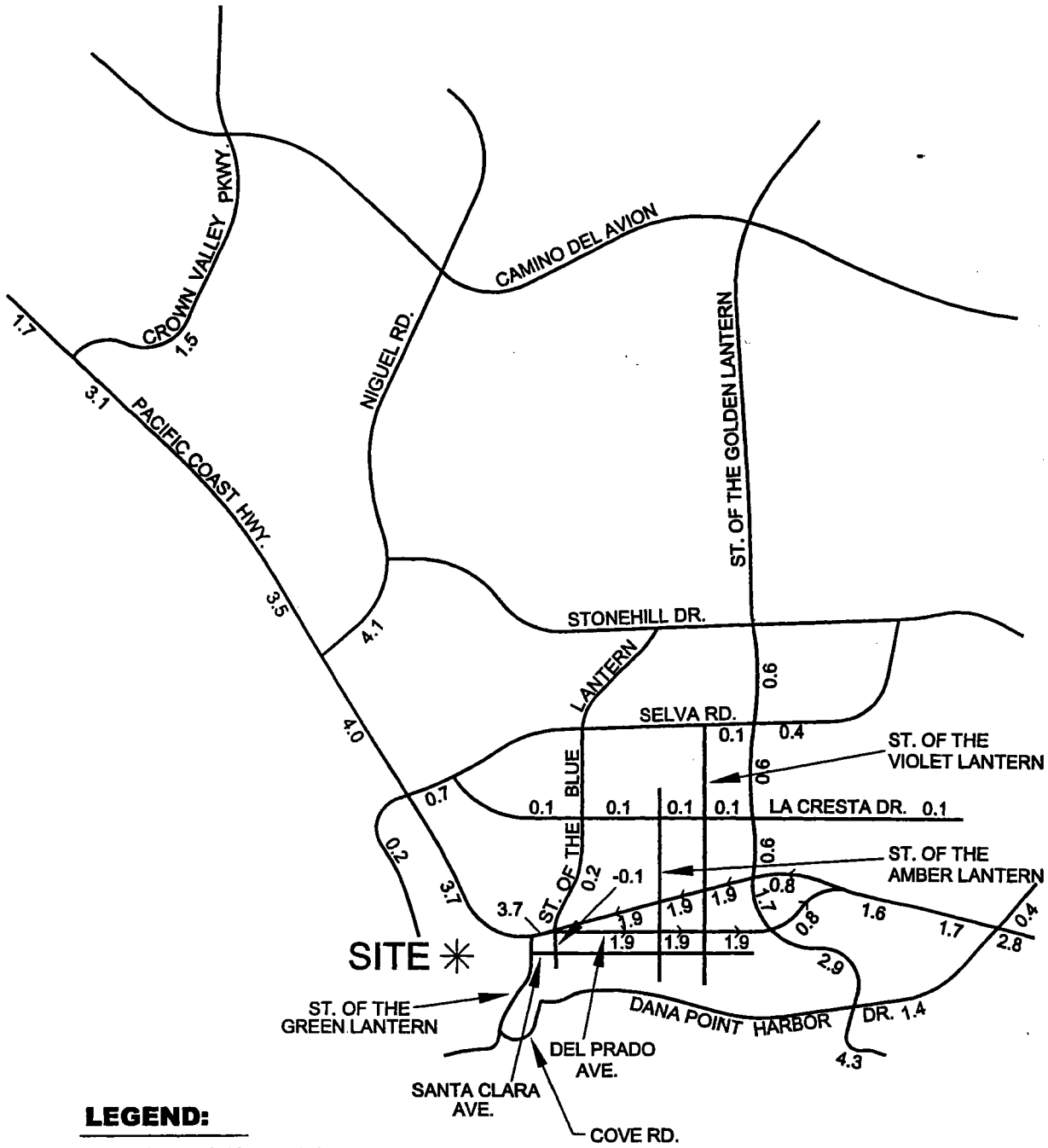
[2] Trip generation data were taken from study prepared by Austin-Foust Associates, Inc.

[3] Daily trips were derived by proportioning the private school peak hour trips with elementary school peak hour trips.

[4] Trip generation was obtained from Capistrano by the Sea project prepared by WPA Traffic Engineering, Inc., January, 1999.

EXHIBIT 7-A

OTHER DEVELOPMENT AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

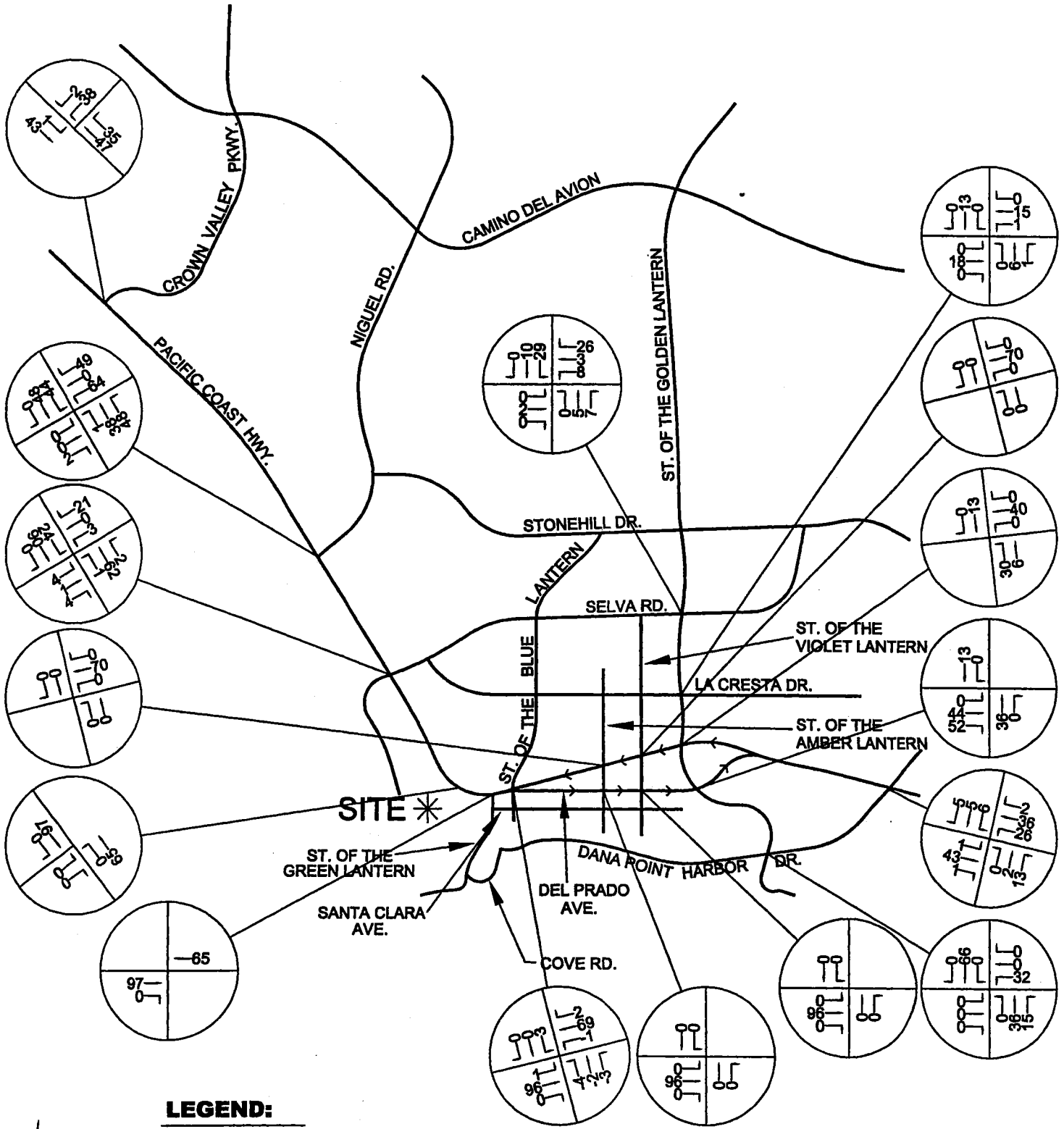
9.9 = VEHICLES PER DAY (1000'S)

-0.1 = TRIPS GENERATED BY EXISTING MULTI-FAMILY RESIDENTIAL ARE DIVERTED FROM STREET OF THE GREEN LANTERN TO SELVA ROAD.

N

EXHIBIT 7-B

OTHER DEVELOPMENT AM PEAK HOUR INTERSECTION VOLUMES



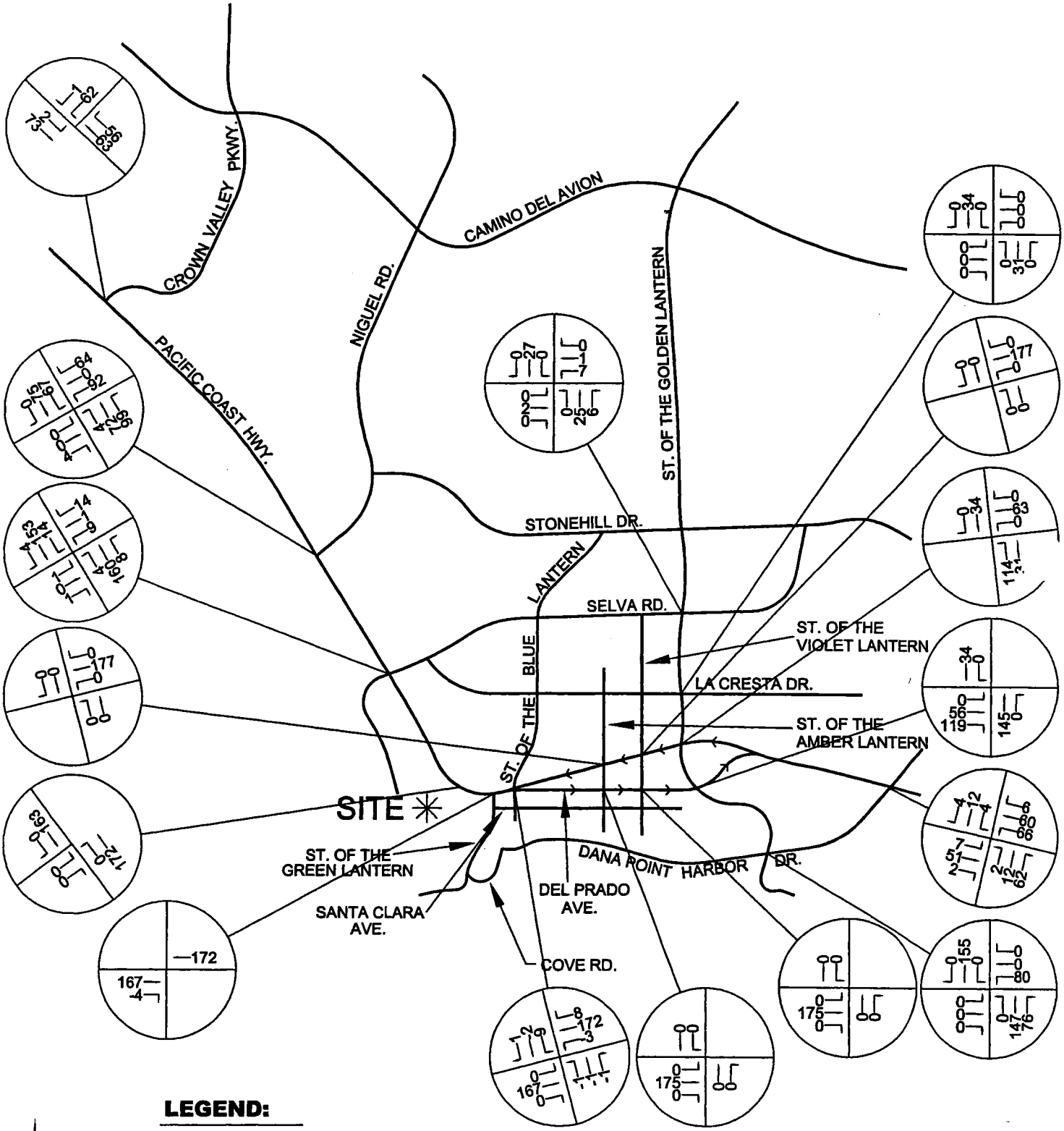
LEGEND:

-4 = TRIPS GENERATED BY EXISTING MULTI-FAMILY RESIDENTIAL ARE DIVERTED FROM STREET OF THE GREEN LATERN TO SELVA ROAD.

N

EXHIBIT 7-C

OTHER DEVELOPMENT PM PEAK HOUR INTERSECTION VOLUMES



LEGEND:

-4 = TRIPS GENERATED BY EXISTING MULTI-FAMILY RESIDENTIAL ARE DIVERTED FROM STREET OF THE GREEN LATERN TO SELVA ROAD.

N

RK ENGINEERING GROUP, INC. was able to determine the amount of traffic that would be redistributed for the future conditions in the study. It was determined that the rerouted traffic shown in the Wildan study only affects the intersection of Street of the Blue Lantern at Pacific Coast Highway.

The detoured traffic for the Future Conditions in the Wildan study was applied to the Short-Range Without and With Project Conditions (normal and summer).

Short-Range Average Daily Traffic (ADT)

Once the project, other development and areawide growth related traffic is assigned to the street network and added to existing volumes in the study area, the traffic impact can be assessed. Exhibit 7-D shows ADT volumes for Short-Range Without Project traffic conditions and Exhibit 7-E shows ADT volumes for Short-Range With Project traffic conditions.

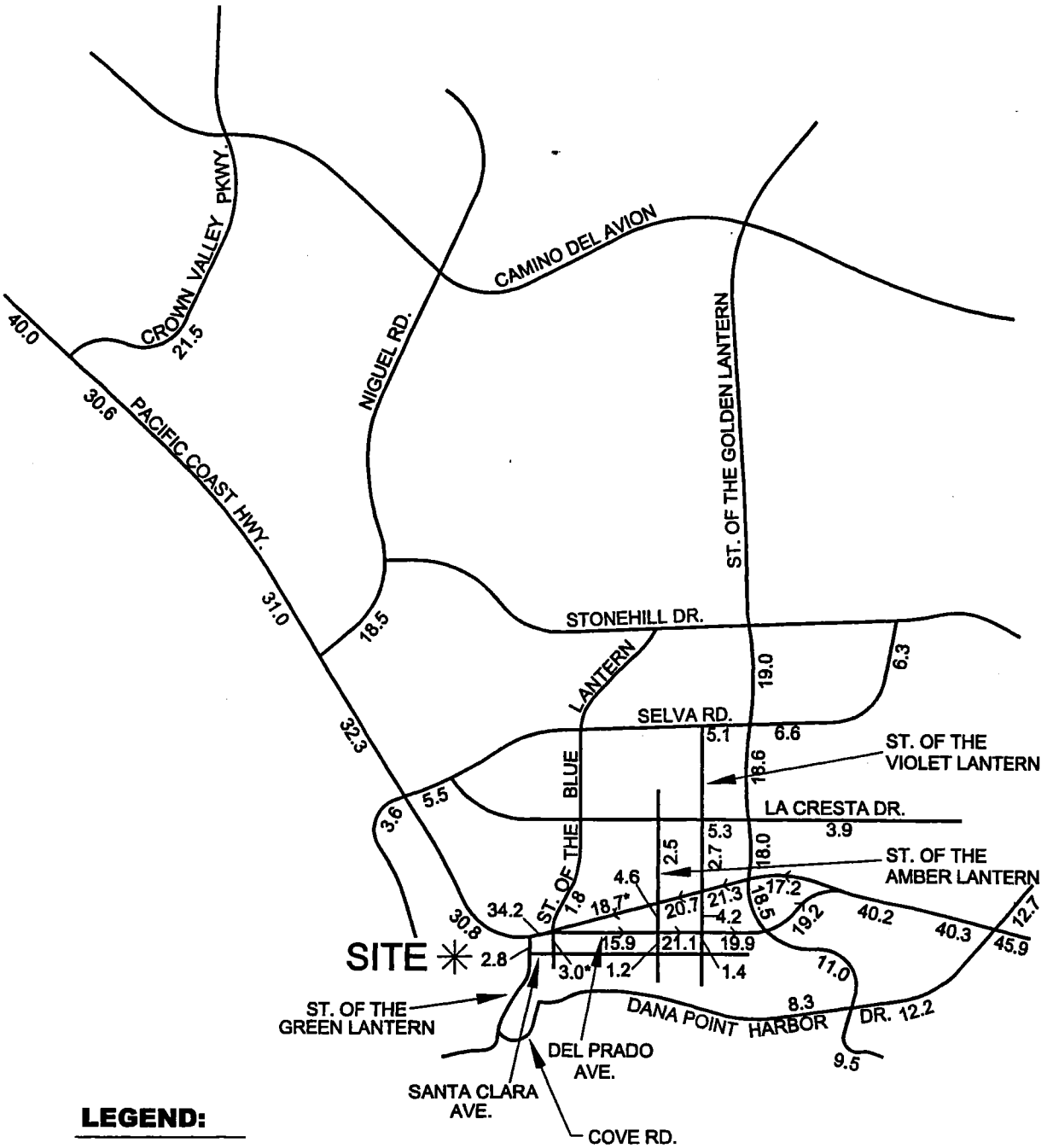
Tables 7-3 and 7-4 show the Short-Range With and Without Project roadway segment analysis. As can be seen on both tables, the traffic volume on Pacific Coast Highway north of Crown Valley Parkway and Pacific Coast Highway east of Dana Point Harbor Drive are projected to be over the City's link volume threshold. This is mitigated by the fact that all of the adjacent intersections will be within the City's Level of Service standards with planned improvements. As indicated earlier, a capital improvement program to build a median along Pacific Coast Highway in the vicinity is underway. With the median, Pacific Coast Highway in this highway would have better access control, because of less cross traffic and left turn traffic along this segment of roadway. This can increase the design capacity of this segment.

Short-Range Intersection Capacity Utilization

Intersection Capacity Utilization (ICU) for Short-Range traffic conditions have been calculated and are shown in Tables 7-5 and 7-6. Table 7-5 shows ICU calculations at

EXHIBIT 7-D

SHORT-RANGE WITHOUT PROJECT AVERAGE DAILY TRAFFIC (ADT'



LEGEND:

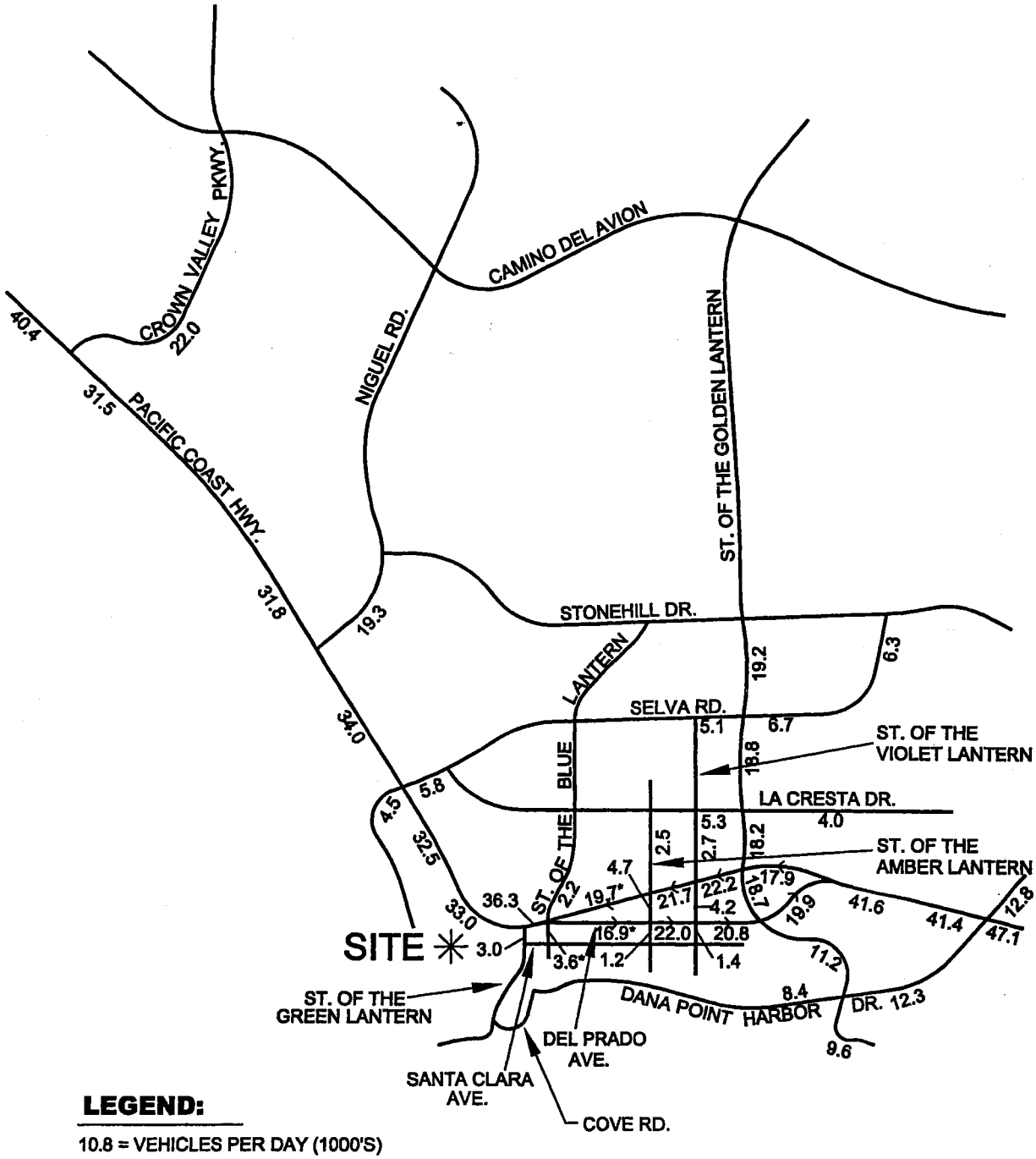
10.7 = VEHICLES PER DAY (1000'S)

* = INCLUDES TRAFFIC DIVERTED FROM SANTA CLARA AVENUE

N

EXHIBIT 7-E

SHORT-RANGE WITH PROJECT AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

10.8 = VEHICLES PER DAY (1000'S)

* = INCLUDES TRAFFIC DIVERTED FROM SANTA CLARA AVENUE

N

TABLE 7-3

SHORT-RANGE WITHOUT PROJECT ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	SHORT-RANGE WITHOUT PROJECT	
				VOLUME	THRESHOLD
Pacific Coast Hwy.[1]					
• North of Crown Valley Pkwy.			37,500	40,000	**OVER**
• South of Crown Valley Pkwy.			56,200	30,600	UNDER
• North of Niguel Rd.			56,200	31,000	UNDER
• North of Selva Rd.			56,200	32,300	UNDER
• South of Selva Rd.			56,200	30,800	UNDER
• West of St. of the Green Lantern			56,200	30,800	UNDER
• West of St. of the Blue Lantern			56,200	34,200	UNDER
• West of St. of the Amber Lantern			28,100	18,700	UNDER
• West of St. of the Violet Lantern			28,100	20,700	UNDER
• West of St. of the Golden Lantern			28,100	21,300	UNDER
• West of Del Prado Ave.			28,100	17,200	UNDER
• East of Del Prado Ave.			56,200	40,200	UNDER
• West of Dana Point Harbor Dr.			56,200	40,300	UNDER
• East of Dana Point Harbor Dr.			56,200	45,900	UNDER
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		21,500	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		18,500	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			2,800	UNDER
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			1,800	UNDER
• North of Santa Clara Ave.	5,000			3,000	UNDER
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			2,500	UNDER
• North of Del Prado Ave.	5,000			4,600	UNDER
• North of Santa Clara Ave.	5,000			1,200	UNDER
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			2,700	UNDER
• North of Del Prado Ave.	5,000			4,200	UNDER
• North of Santa Clara Ave.	5,000			1,400	UNDER
St. of the Golden Lantern					
• North of Selva Rd.		50,600		19,000	UNDER
• North of La Cresta Dr.		50,600		18,700	UNDER
• North of Pacific Coast Hwy.		50,600		18,000	UNDER
• North of Del Prado Ave.	33,800			18,500	UNDER
• North of Dana Point Harbor Dr.	33,800			11,000	UNDER
• South of Dana Point Harbor Dr.	33,800			9,500	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			3,500	UNDER
• East of Pacific Coast Hwy.	20,000			5,500	UNDER
• West of St. of the Golden Lantern	20,000			5,100	UNDER
• East of St. of the Golden Lantern	20,000			6,600	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			5,300	UNDER
• East of St. of the Golden Lantern	10,000			3,900	UNDER
Del Prado Ave.[1]					
• West of St. of the Amber Lantern			28,100	15,900	UNDER
• West of St. of the Violet Lantern			28,100	21,100	UNDER
• West of St. of the Golden Lantern			28,100	19,900	UNDER
• East of St. of the Golden Lantern			28,100	19,200	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			8,300	UNDER
• East of the Golden Lantern	33,800			12,200	UNDER
• East of Pacific Coast Hwy.	33,800			12,700	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

TABLE 7-4

SHORT-RANGE WITH PROJECT ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	SHORT-RANGE WITH PROJECT	
				VOLUME	THRESHOLD
Pacific Coast Hwy.[1]					
• North of Crown Valley Pkwy.			37,500	40,400	**OVER**
• South of Crown Valley Pkwy.			56,200	31,500	UNDER
• North of Niguel Rd.			56,200	31,800	UNDER
• North of Selva Rd.			56,200	34,000	UNDER
• South of Selva Rd.			56,200	32,500	UNDER
• West of St. of the Green Lantern			56,200	33,000	UNDER
• West of St. of the Blue Lantern			56,200	36,300	UNDER
• West of St. of the Amber Lantern			28,100	19,700	UNDER
• West of St. of the Violet Lantern			28,100	21,700	UNDER
• West of St. of the Golden Lantern			28,100	22,200	UNDER
• West of Del Prado Ave.			28,100	17,900	UNDER
• East of Del Prado Ave.			56,200	41,600	UNDER
• West of Dana Point Harbor Dr.			56,200	41,400	UNDER
• East of Dana Point Harbor Dr.			56,200	47,100	UNDER
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		22,000	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		19,300	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			3,000	UNDER
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			2,200	UNDER
• North of Santa Clara Ave.	5,000			3,600	UNDER
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			2,500	UNDER
• North of Del Prado Ave.	5,000			4,700	UNDER
• North of Santa Clara Ave.	5,000			1,200	UNDER
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			2,700	UNDER
• North of Del Prado Ave.	5,000			4,200	UNDER
• North of Santa Clara Ave.	5,000			1,400	UNDER
St. of the Golden Lantern					
• North of Selva Rd.		50,600		19,200	UNDER
• North of La Cresta Dr.		50,600		18,800	UNDER
• North of Pacific Coast Hwy.		50,600		18,200	UNDER
• North of Del Prado Ave.	33,800			18,700	UNDER
• North of Dana Point Harbor Dr.	33,800			11,200	UNDER
• South of Dana Point Harbor Dr.	33,800			9,600	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			4,500	UNDER
• East of Pacific Coast Hwy.	20,000			5,800	UNDER
• West of St. of the Golden Lantern	20,000			5,100	UNDER
• East of St. of the Golden Lantern	20,000			6,700	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			5,300	UNDER
• East of St. of the Golden Lantern	10,000			4,000	UNDER
Del Prado Ave.[1]					
• West of St. of the Amber Lantern			28,100	16,900	UNDER
• West of St. of the Violet Lantern			28,100	22,000	UNDER
• West of St. of the Golden Lantern			28,100	20,800	UNDER
• East of St. of the Golden Lantern			28,100	19,900	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			8,400	UNDER
• East of the Golden Lantern	33,800			12,300	UNDER
• East of Pacific Coast Hwy.	33,800			12,800	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

TABLE 7-5

SHORT-RANGE WITHOUT PROJECT INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific Coast Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.64	0.65	0.69	0.71	B	B	B	C
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	1	1	2	1	2	2	1	1	2	1	0.71	0.75	0.78	0.80	C	C	C	C
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.48	0.58	0.51	0.63	A	A	A	B
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.44	0.50	0.47	0.54	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.52	0.61	0.55	0.65	A	B	A	B
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.39	0.45	0.43	0.47	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.39	0.52	0.41	0.57	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.40	0.50	0.44	0.54	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.35	0.47	0.37	0.51	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.35	0.34	0.38	0.36	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.35	0.41	0.38	0.45	A	A	A	A
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.45	0.58	0.50	0.62	A	A	A	B
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.45	0.58	0.48	0.64	A	A	A	B
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.29	0.44	0.30	0.47	A	A	A	A
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	1	1>	2	1	1	1	2	1	2	2	0	0.69	0.84	0.75	0.93	B	D	C	E
-w/ Improvements	1	2	1>	2	2	0	1	2	1	2	2	1>	0.65	0.79	0.70	0.86	B	C	B	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap; 1 = Improvement

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

TABLE 7-6

SHORT-RANGE WITH PROJECT INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific Coast Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.64	0.66	0.69	0.72	B	B	B	C
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	1	1	2	1	2	2	1	1	2	1	0.72	0.78	0.80	0.83	C	C	C	D
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.51	0.63	0.54	0.67	A	B	A	B
• Street "A" (EW)	1	2	0	0	2	1	1	0	1	0	0	0	0.46	0.59	0.50	0.63	A	A	A	B
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.45	0.53	0.49	0.57	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.53	0.64	0.56	0.69	A	B	A	B
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.40	0.46	0.44	0.49	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.40	0.54	0.42	0.59	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.41	0.51	0.45	0.55	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.36	0.48	0.38	0.52	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.36	0.34	0.38	0.37	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.35	0.41	0.38	0.45	A	A	A	A
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.47	0.60	0.50	0.65	A	A	A	B
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.45	0.59	0.49	0.65	A	A	A	B
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.30	0.45	0.30	0.47	A	A	A	A
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	1	1>	2	1	1	1	2	1	2	2	0	0.70	0.86	0.76	0.94	B	D	C	E
-w/ Improvements	1	2	1>	2	2	0	1	2	1	2	2	1>	0.66	0.80	0.71	0.87	B	C	C	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap; 1 = Improvement

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

the study area intersections for Short-Range Without Project traffic conditions. As shown in Table 7-5, the study area intersections are projected to operate at acceptable level of service during the peak hours, with improvements. Short-Range Without Project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 7-F and 7-G, respectively. Short-Range Without Project summer AM and PM peak hour intersection turning movement volumes are shown on Exhibits 7-H and 7-I, respectively. Short-Range Without Project ICU calculation worksheets are included in Appendix "F".

Table 7-6 shows ICU calculations at the study area intersections for Short-Range With Project conditions. As shown in Table 7-6, the study area intersections are projected to operate at acceptable level of service during the peak hours, with improvements. Short-Range With Project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 7-J and 7-K, respectively. Short-Range With Project summer AM and PM peak hour intersection turning movement volumes are shown on Exhibits 7-L and 7-M, respectively. Short-Range With Project ICU calculation worksheets are included in Appendix "G".

Short-Range Project Traffic Contribution

The Short-Range lane requirements with the project are included in Table 7-6. The project traffic contribution to intersection improvements is included in Table7-7.

EXHIBIT 7-F

SHORT-RANGE WITHOUT PROJECT AM PEAK HOUR INTERSECTION VOLUMES

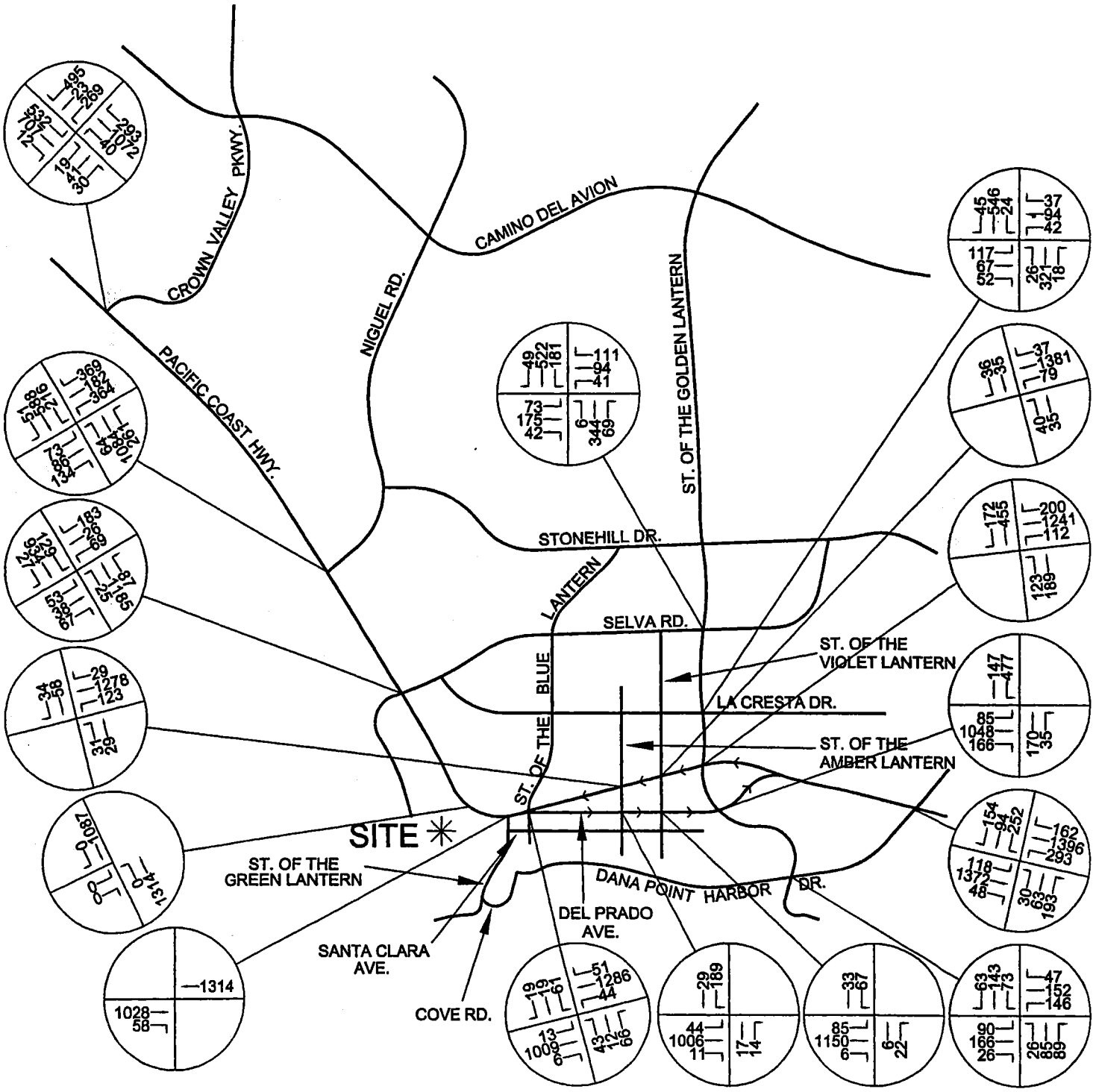


EXHIBIT 7-G

SHORT-RANGE WITHOUT PROJECT PM PEAK HOUR INTERSECTION VOLUMES

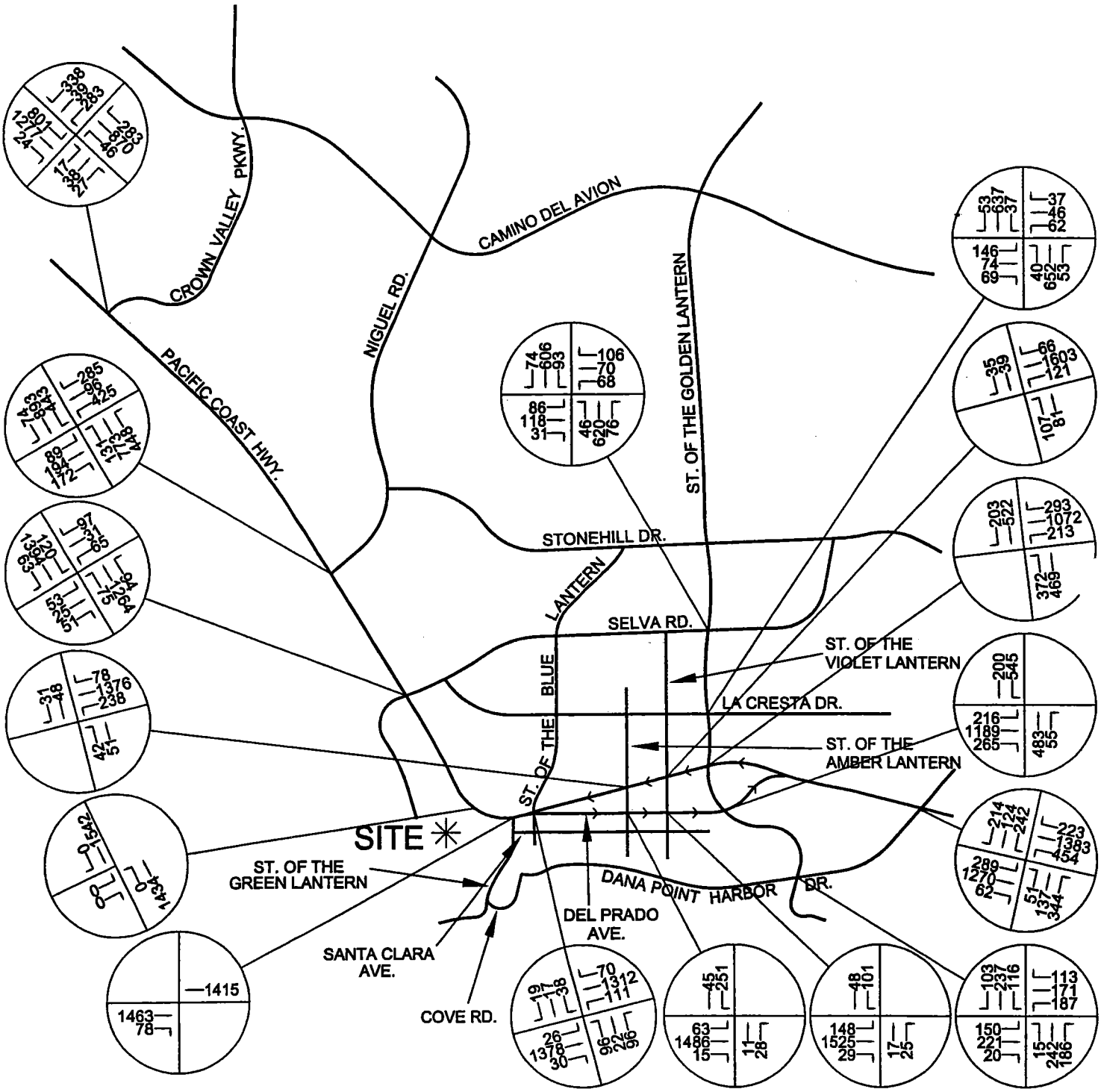


EXHIBIT 7-H

SHORT-RANGE WITHOUT PROJECT
SUMMER AM PEAK HOUR INTERSECTION VOLUMES

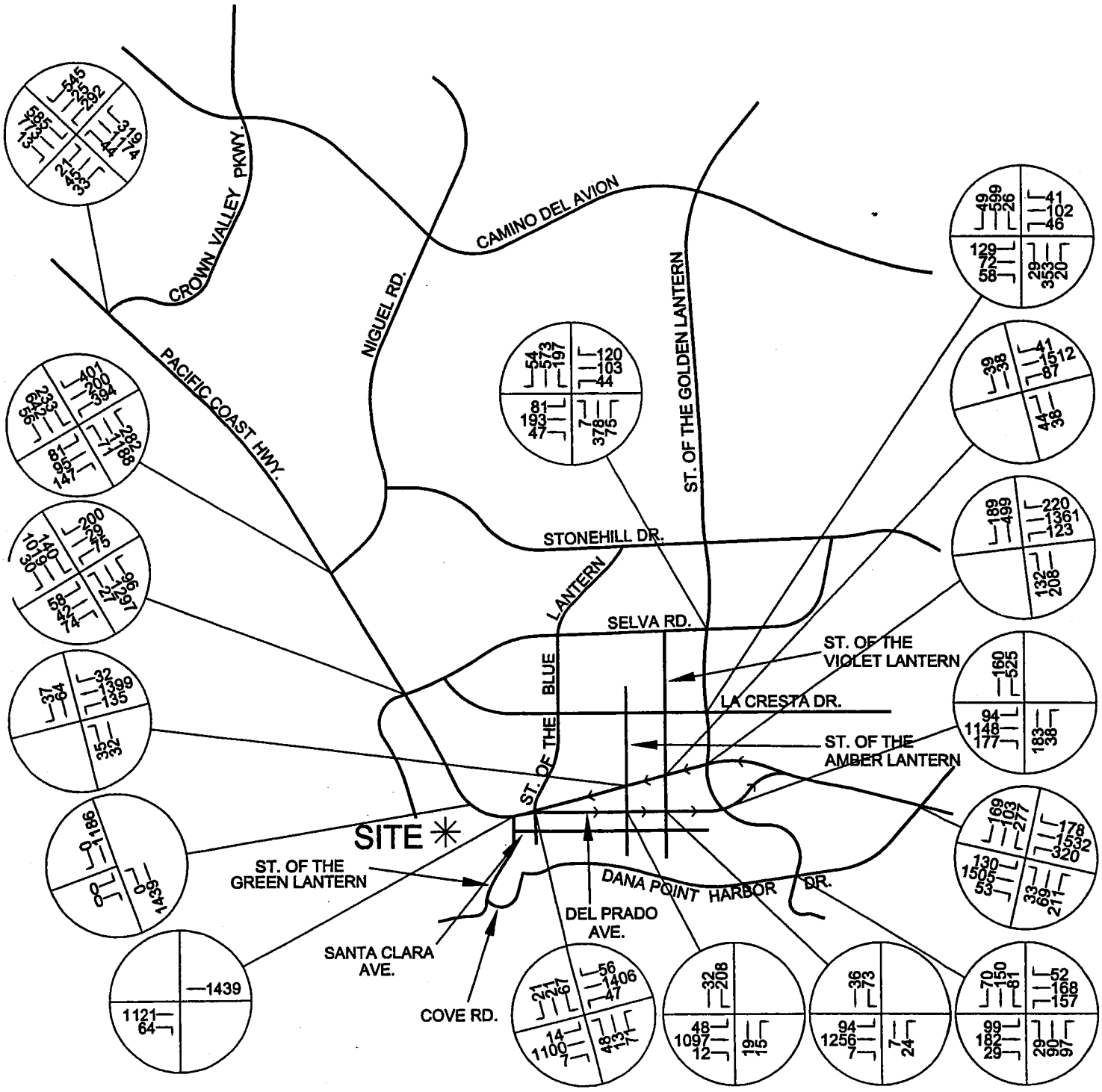


EXHIBIT 7-I

SHORT-RANGE WITHOUT PROJECT
SUMMER PM PEAK HOUR INTERSECTION VOLUMES

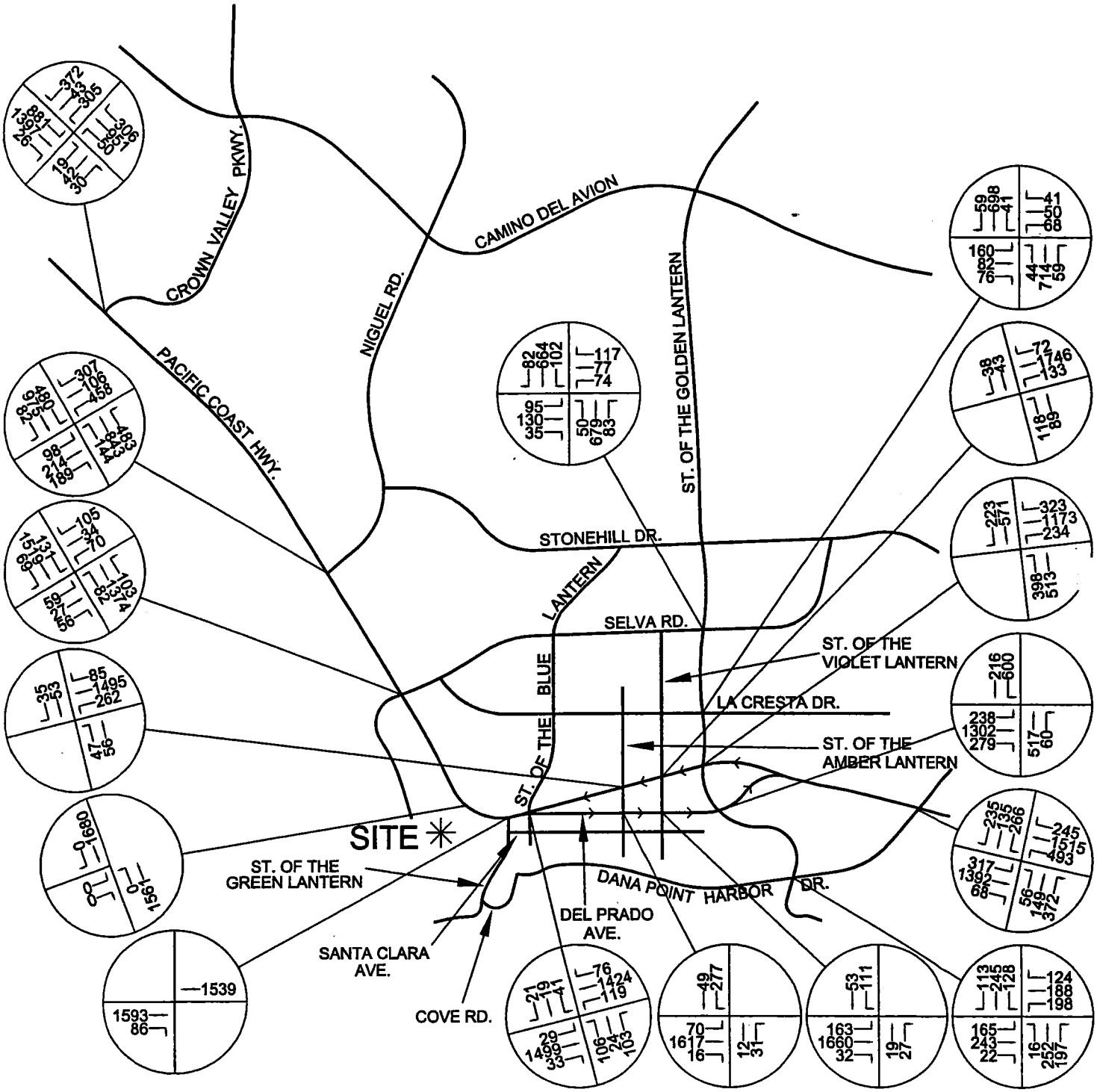


EXHIBIT 7-J

SHORT-RANGE WITH PROJECT AM PEAK HOUR INTERSECTION VOLUMES

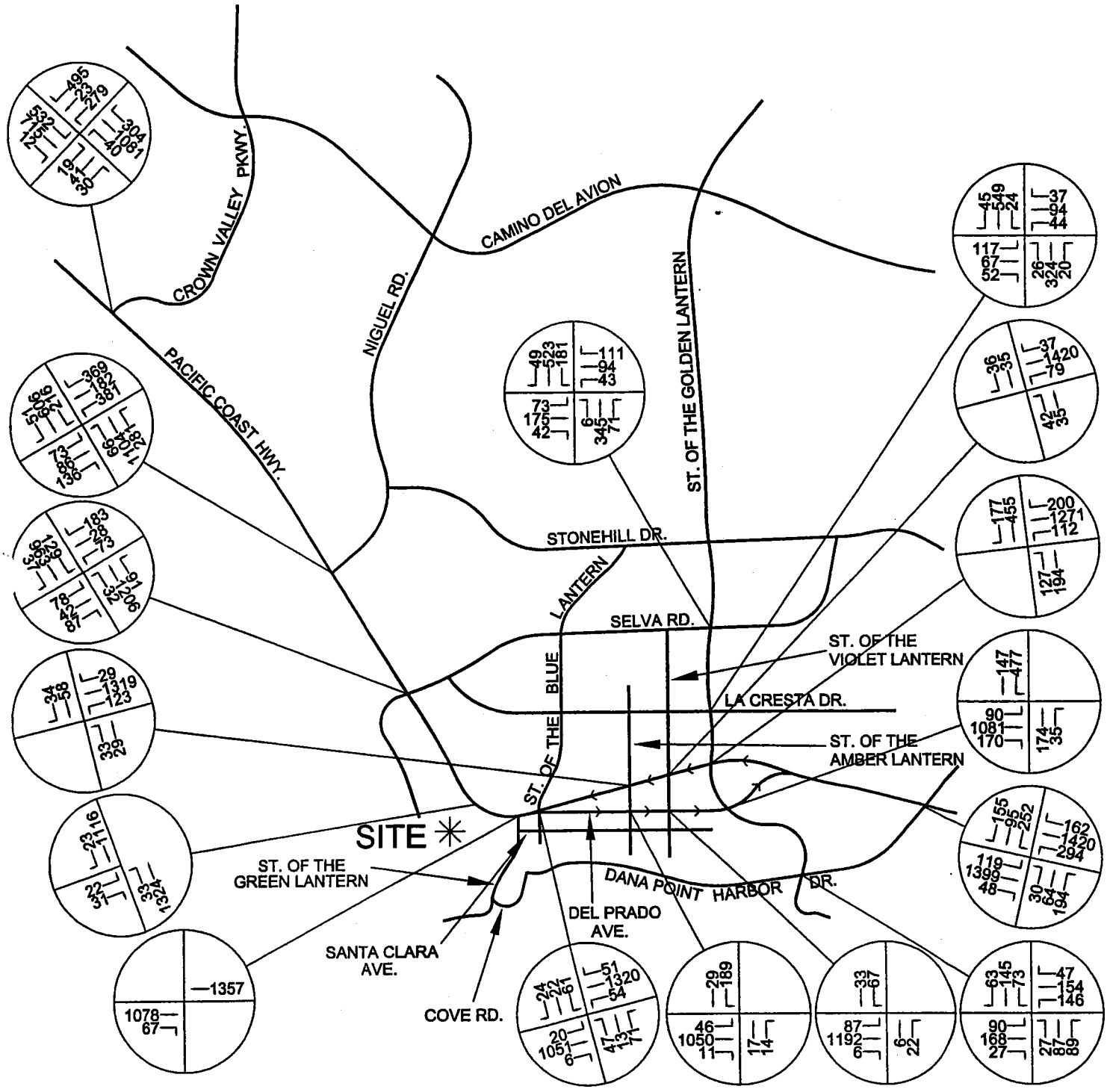


EXHIBIT 7-K

SHORT-RANGE WITH PROJECT PM PEAK HOUR INTERSECTION VOLUMES

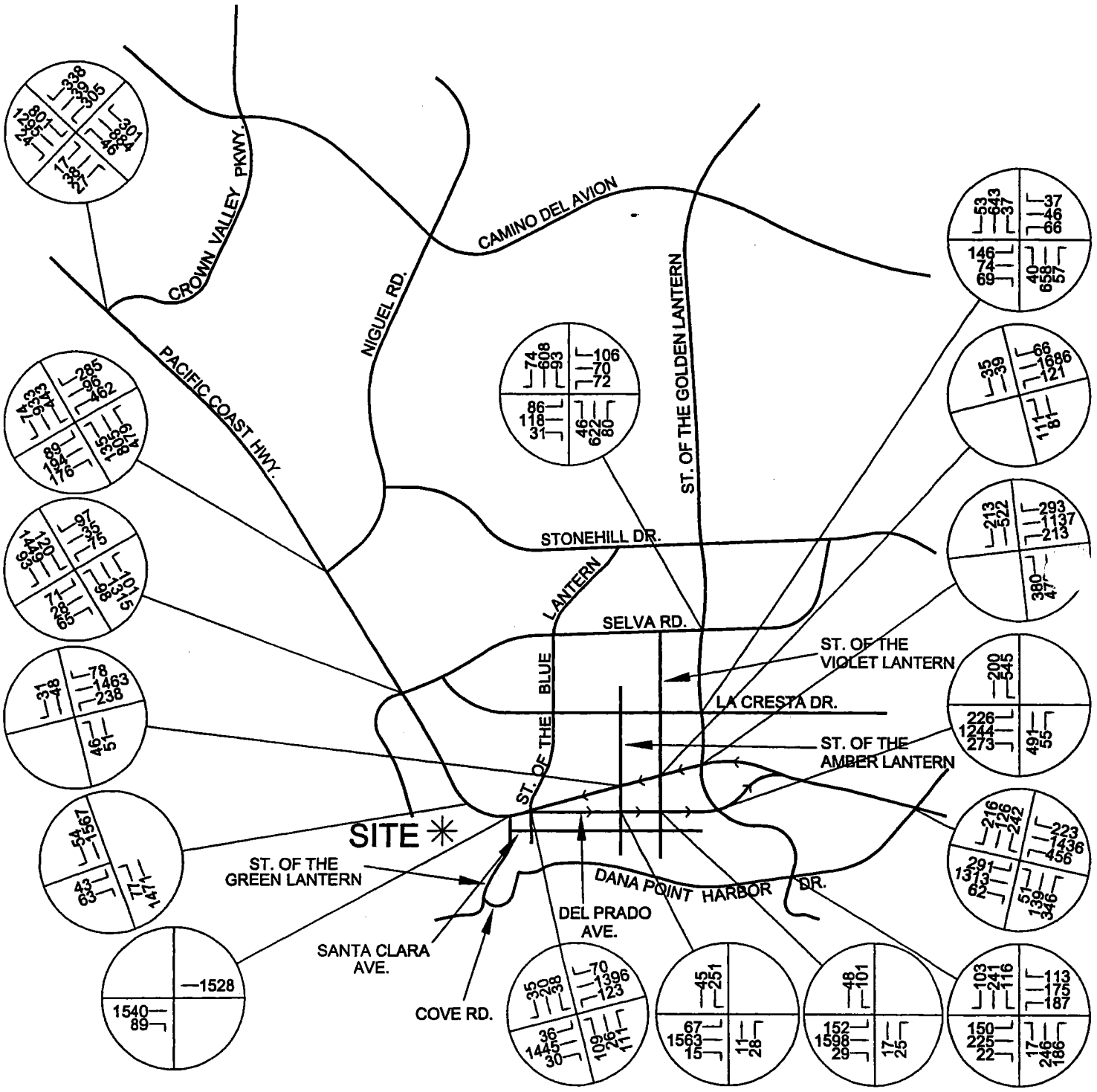


EXHIBIT 7-L

SHORT-RANGE WITH PROJECT SUMMER AM PEAK HOUR INTERSECTION VOLUMES

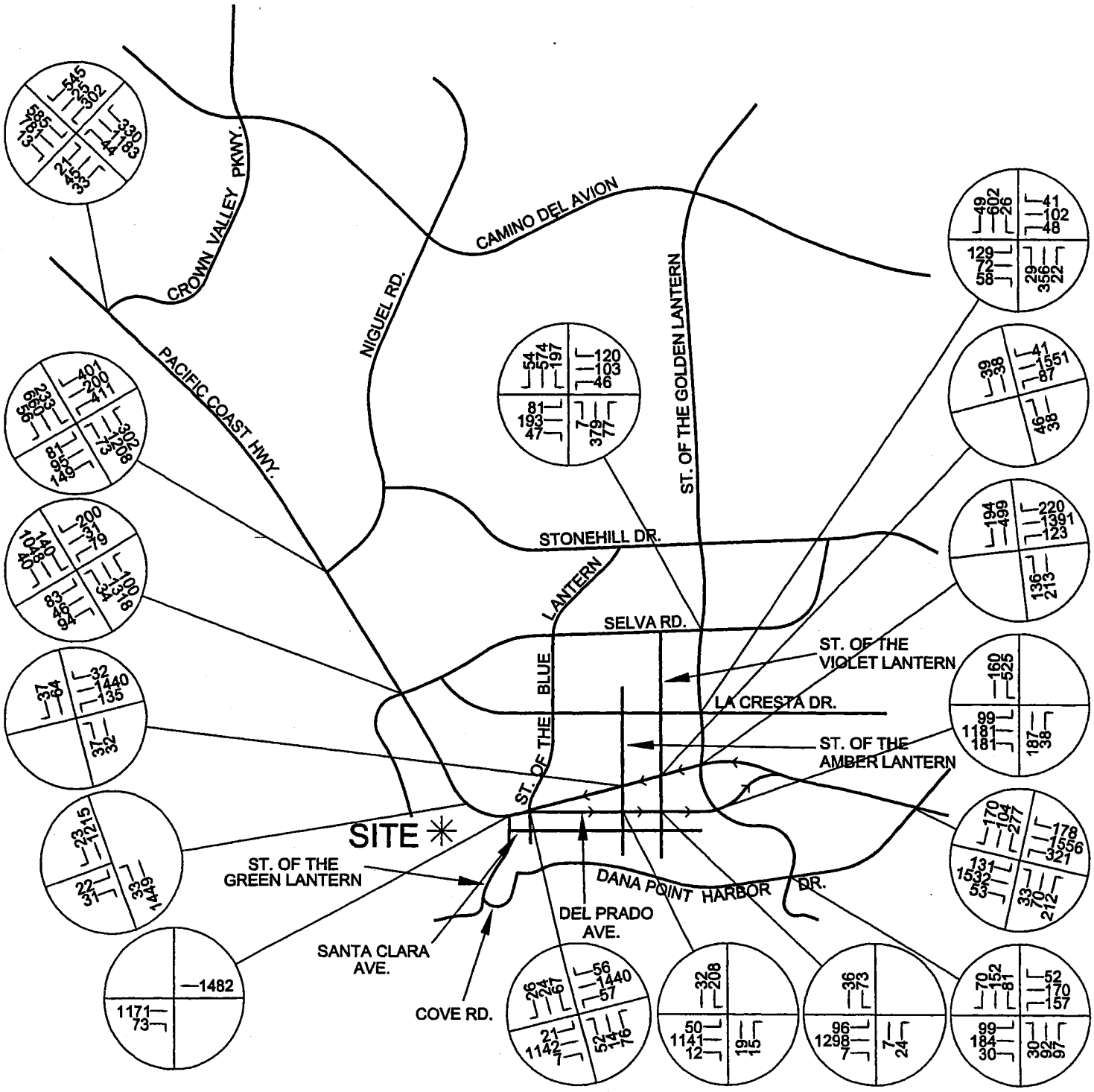


EXHIBIT 7-M

SHORT-RANGE WITH PROJECT SUMMER PM PEAK HOUR INTERSECTION VOLUMES

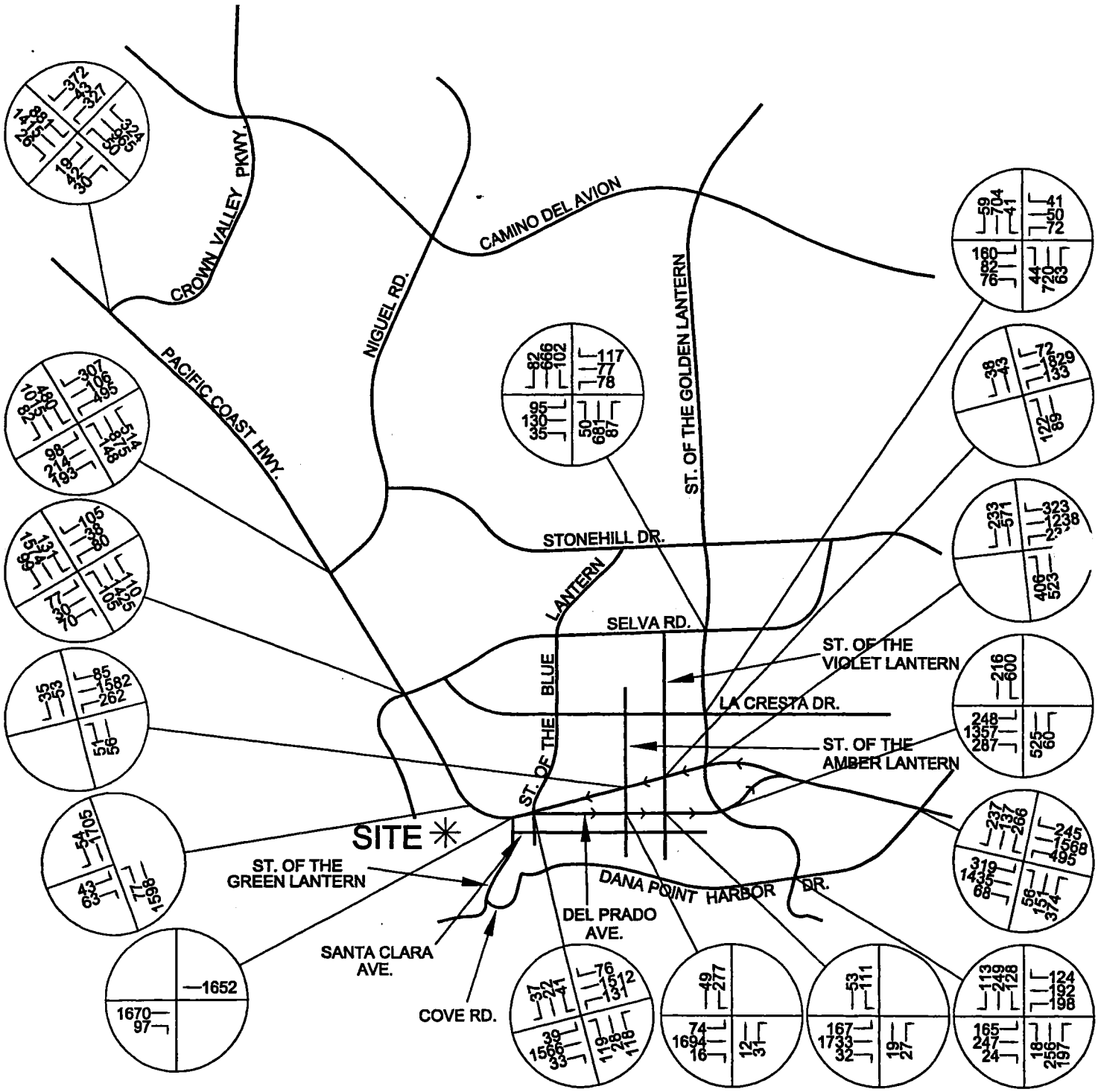


TABLE 7-7

PROJECT SHORT-RANGE TRAFFIC CONTRIBUTION

INTERSECTION	PROJECT TRAFFIC	SHORT-RANGE WITH PROJECT TRAFFIC	PERCENT OF PROJECT TRAFFIC CONTRIBUTION
Crown Valley Pkwy. (NS) at:			
• Pacific Coast Hwy. (EW)	38	3,571	1.1%
	72	4,115	1.7%
Niguel Rd. (NS) at:			
• Pacific Coast Hwy. (EW)	79	3,551	2.2%
	148	4,171	3.5%
Pacific Coast Hwy. (NS) at:			
• Selva Rd. (EW)	10	2,949	0.3%
	18	3,547	0.5%
Street of the Green Lantern (NS) at:			
• Pacific Coast Hwy. (EW)	92	2,502	3.7%
	180	3,157	5.7%
Street of the Blue Lantern (NS) at:			
• Pacific Coast Hwy. (EW)	111	2,740	4.1%
	213	3,439	6.2%
Street of the Amber Lantern (NS) at:			
• Pacific Coast Hwy. (EW)	43	1,625	2.6%
	91	1,955	4.7%
• Del Prado (EW)	46	1,356	3.4%
	81	1,980	4.1%
Street of the Violet Lantern (NS) at:			
• Pacific Coast Hwy. (EW)	41	1,684	2.4%
	87	2,139	4.1%
• Del Prado (EW)	44	1,413	3.1%
	77	1,970	3.9%
Street of the Golden Lantern (NS) at:			
• Selva Rd. (EW)	6	1,713	0.4%
	12	2,006	0.6%
• La Cresta Dr. (EW)	10	1,399	0.7%
	20	1,926	1.0%
• Pacific Coast Hwy. (EW)	44	2,536	1.7%
	93	3,237	2.9%
• Del Prado (EW)	46	2,174	2.1%
	81	3,034	2.7%
• Dana Point Harbor Dr. (EW)	10	1,116	0.9%
	20	1,781	1.1%
Dana Point Harbor Dr. (NS) at:			
• Pacific Coast Hwy. (EW)	57	4,232	1.3%
	108	4,901	2.2%

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8.0 BUILDOUT TRAFFIC CONDITIONS

Santa Clara Avenue Improvement

As mentioned in the Short-Range analysis, the City of Dana Point has moved forward with the construction of Santa Clara Avenue into a cul-de-sac east of Street of the Blue Lantern. As a result, the Buildout analysis also has been updated to reflect this improvement. The redistributed traffic for the Future Conditions in the Wildan study was applied to the Buildout Without and With Project conditions (normal and summer).

Buildout Average Daily Traffic

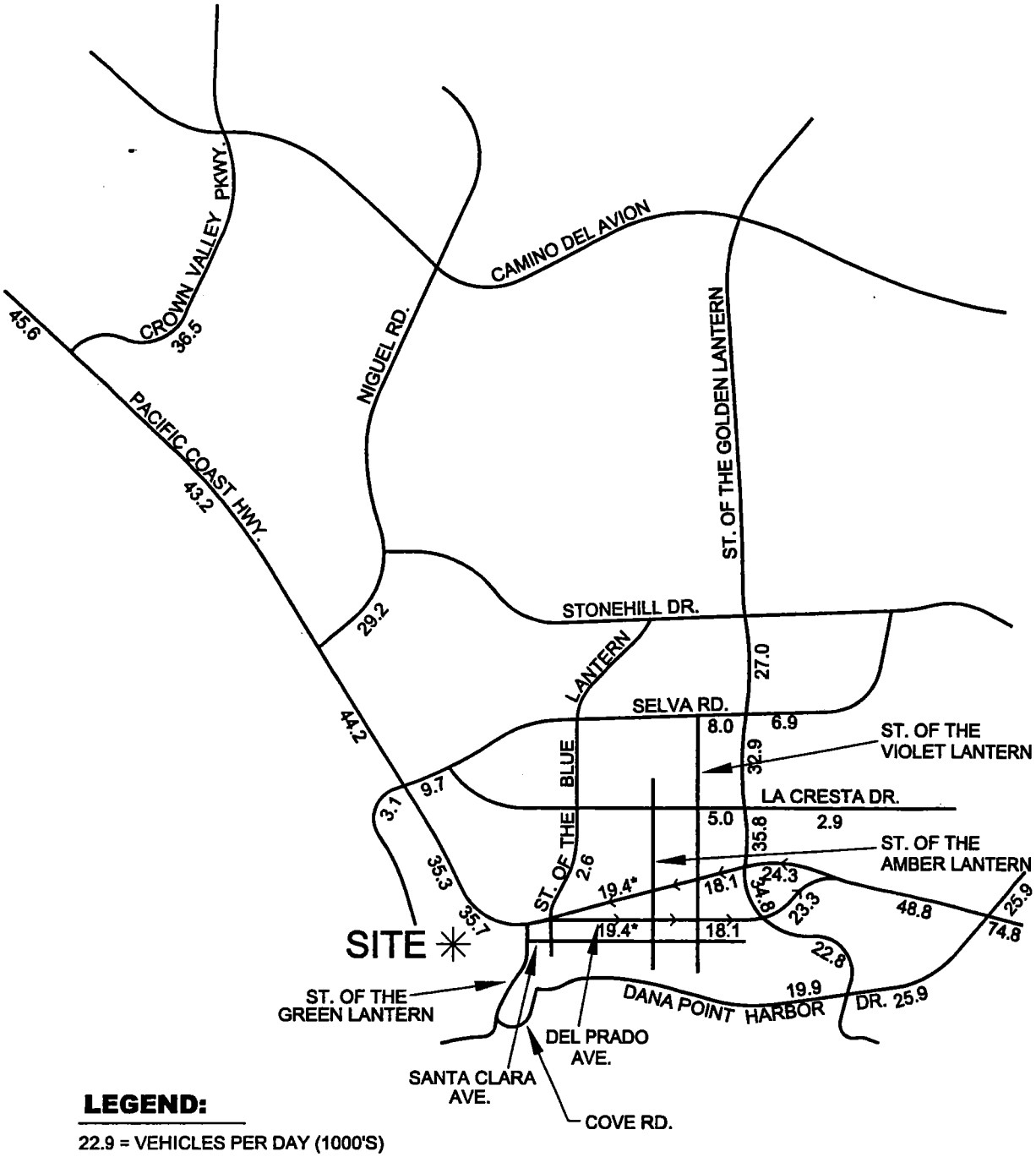
Buildout traffic volumes have been obtained from the Dana Point Traffic Model. According to the City's Generla Plan Traffic Model, the buildout year is 2010. Exhibit 8-A shows ADT volumes for Buildout Without Project traffic conditions and Exhibit 8-B shows ADT volumes for Buildout With Project traffic conditions.

Tables 8-1 and 8-2 illustrate the Buildout With and Without Project roadway segment Analysis. The City of Dana Point Traffic Model does not provide all the roadway segments included in this report. As a result, RK ENGINEERING GROUP, INC. has estimated some of the traffic volumes where possible. Again, Pacific Coast Highway north of Crown Valley is estimated to be over the City's link volume threshold. However, the adjacent intersections are projected to operate at acceptable levels of service with the recommended improvements. As mentioned earlier, a capital improvement program to build a median along Pacific Coast Highway in the vicinity is underway. With the median, Pacific Coast Highway in this area would have better access control, because of less cross traffic and left turn traffic along this segment of roadway. This can increase the design capacity of this setment.

Street of the Golden Lantern north of Del Prado Avenue and Pacific Coast Highway east of Dana Point Harbor are projected to be over the City's link volume threshold.

EXHIBIT 8-A

BUILD-OUT WITHOUT PROJECT AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

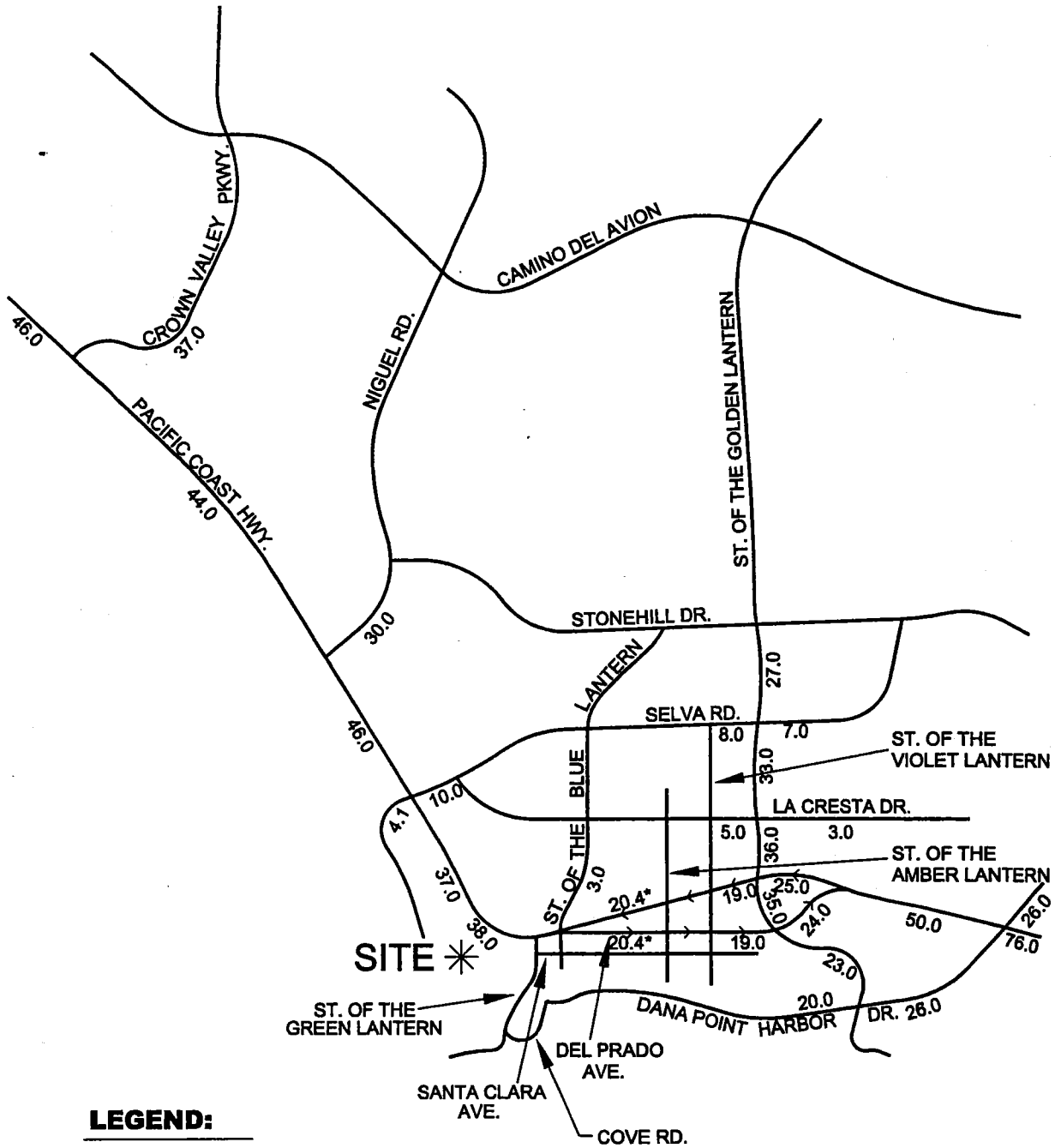
22.9 = VEHICLES PER DAY (1000'S)

* = INCLUDES TRAFFIC DIVERTED FROM SANTA CLARA AVENUE.

N

EXHIBIT 8-B

BUILD-OUT WITH PROJECT AVERAGE DAILY TRAFFIC (ADT)



LEGEND:

23.0 = VEHICLES PER DAY (1000'S)

* = INCLUDES TRAFFIC DIVERTED FROM SANTA CLARA AVENUE.

N

TABLE 8-1

BUILDOUT WITHOUT PROJECT ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	BUILDOUT WITHOUT PROJECT	
				VOLUME	THRESHOLD
Pacific Coast Hwy.[1]					
• North of Crown Valley Pkwy.			37,500	45,600	**OVER**
• South of Crown Valley Pkwy.			56,200	43,200	UNDER
• North of Niguel Rd.			56,200	43,200	UNDER
• North of Selva Rd.			56,200	44,200	UNDER
• South of Selva Rd.			56,200	35,300	UNDER
• West of St. of the Green Lantern			56,200	35,700	UNDER
• West of St. of the Blue Lantern			56,200	37,250[2]	UNDER
• West of St. of the Amber Lantern			28,100	19,400	UNDER
• West of St. of the Violet Lantern			28,100	18,750[2]	UNDER
• West of St. of the Golden Lantern			28,100	18,100	UNDER
• West of Del Prado Ave.			28,100	24,300	UNDER
• East of Del Prado Ave.			56,200	48,800	UNDER
• West of Dana Point Harbor Dr.			56,200	48,800	UNDER
• East of Dana Point Harbor Dr.			56,200	74,800	**OVER**
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		36,500	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		29,200	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			--	--
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			2,600	UNDER
• North of Santa Clara Ave.	5,000			--	--
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			--	--
• North of Del Prado Ave.	5,000			--	--
• North of Santa Clara Ave.	5,000			--	--
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			--	--
• North of Del Prado Ave.	5,000			--	--
• North of Santa Clara Ave.	5,000			--	--
St. of the Golden Lantern					
• North of Selva Rd.		50,600		27,000	UNDER
• North of La Cresta Dr.		50,600		32,900	UNDER
• North of Pacific Coast Hwy.		50,600		35,800	UNDER
• North of Del Prado Ave.	33,800			34,800	**OVER**
• North of Dana Point Harbor Dr.	33,800			22,800	UNDER
• South of Dana Point Harbor Dr.	33,800			22,800[2]	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			3,100	UNDER
• East of Pacific Coast Hwy.	20,000			9,800	UNDER
• West of St. of the Golden Lantern	20,000			8,000	UNDER
• East of St. of the Golden Lantern	20,000			6,900	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			5,000	UNDER
• East of St. of the Golden Lantern	10,000			2,900	UNDER
Del Prado Ave.[1]					
• West of St. of the Amber Lantern			28,100	19,400	UNDER
• West of St. of the Violet Lantern			28,100	18,750[2]	UNDER
• West of St. of the Golden Lantern			28,100	18,100	UNDER
• East of St. of the Golden Lantern			28,100	24,300	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			19,900	UNDER
• East of the Golden Lantern	33,800			25,900	UNDER
• East of Pacific Coast Hwy.	33,800			25,900	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

[2] Volumes are estimated based on the volumes adjacent to the segments.

-- Not Available

TABLE 8-2

BUILDOUT WITH PROJECT ROADWAY SEGMENT ANALYSIS

ROADWAY SEGMENT	LOS C VOLUME	LOS D VOLUME	LOS E VOLUME	BUILDOUT WITH PROJECT VOLUME	BUILDOUT WITH PROJECT THRESHOLD
Pacific Coast Hwy.[1]					
• North of Crown Valley Pkwy.			37,500	46,000	**OVER**
• South of Crown Valley Pkwy.			56,200	44,000	UNDER
• North of Niguel Rd.			56,200	44,000	UNDER
• North of Selva Rd.			56,200	46,000	UNDER
• South of Selva Rd.			56,200	37,000	UNDER
• West of St. of the Green Lantern			56,200	38,000	UNDER
• West of St. of the Blue Lantern			56,200	39,400[2]	UNDER
• West of St. of the Amber Lantern			28,100	20,400	UNDER
• West of St. of the Violet Lantern			28,100	19,700[2]	UNDER
• West of St. of the Golden Lantern			28,100	19,000	UNDER
• West of Del Prado Ave.			28,100	25,000	UNDER
• East of Del Prado Ave.			56,200	50,000	UNDER
• West of Dana Point Harbor Dr.			56,200	50,000	UNDER
• East of Dana Point Harbor Dr.			56,200	76,000	**OVER**
Crown Valley Pkwy					
• East of Pacific Coast Hwy.		50,600		37,000	UNDER
Niguel Rd.					
• East of Pacific Coast Hwy.		50,600		30,000	UNDER
St. of the Green Lantern					
• South of Pacific Coast Hwy.	5,000			--	--
St. of the Blue Lantern					
• North of Pacific Coast Hwy.	5,000			3,000	UNDER
• North of Santa Clara Ave.	5,000			--	--
St. of the Amber Lantern					
• North of Pacific Coast Hwy.	5,000			--	--
• North of Del Prado Ave.	5,000			--	--
• North of Santa Clara Ave.	5,000			--	--
St. of the Violet Lantern					
• North of Pacific Coast Hwy.	5,000			--	--
• North of Del Prado Ave.	5,000			--	--
• North of Santa Clara Ave.	5,000			--	--
St. of the Golden Lantern					
• North of Selva Rd.		50,600		27,000	UNDER
• North of La Cresta Dr.		50,600		33,000	UNDER
• North of Pacific Coast Hwy.		50,600		36,000	UNDER
• North of Del Prado Ave.	33,800			35,000	**OVER**
• North of Dana Point Harbor Dr.	33,800			23,000	UNDER
• South of Dana Point Harbor Dr.	33,800			23,000[2]	UNDER
Selva Rd.					
• West of Pacific Coast Hwy.	20,000			4,100	UNDER
• East of Pacific Coast Hwy.	20,000			10,000	UNDER
• West of St. of the Golden Lantern	20,000			8,000	UNDER
• East of St. of the Golden Lantern	20,000			7,000	UNDER
La Cresta Dr.					
• West of St. of the Golden Lantern	10,000			5,000	UNDER
• East of St. of the Golden Lantern	10,000			3,000	UNDER
Del Prado Ave.[1]					
• West of St. of the Amber Lantern			28,100	20,400	UNDER
• West of St. of the Violet Lantern			28,100	18,750[2]	UNDER
• West of St. of the Golden Lantern			28,100	19,000	UNDER
• East of St. of the Golden Lantern			28,100	24,000	UNDER
Dana Point Harbor Dr.					
• West of the Golden Lantern	33,800			20,000	UNDER
• East of the Golden Lantern	33,800			26,000	UNDER
• East of Pacific Coast Hwy.	33,800			26,000	UNDER

[1] Pacific Coast Highway and Del Prado are CMP (Congestion Management Program) highways, therefore, Level of Service "E" daily volumes are appropriate for these roadways.

[2] Volumes are estimated based on the volumes adjacent to the segments.

-- Not Available

However, based on further analysis at the adjacent intersections (see section below), the intersections are projected to operate at acceptable level of service.

Buildout Intersection Capacity Utilization

Intersection Capacity Utilization (ICU) for Buildout traffic conditions have been calculated and are shown in Tables 8-3 and 8-4. Table 8-3 shows ICU calculations at the study area intersections for Buildout Without Project traffic conditions. As shown in Table 8-3, the study area intersections are projected to operate at acceptable level of service during the peak hours, with improvements. Buildout Without Project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 8-C and 8-D, respectively. Buildout Without Project summer AM and PM peak hour intersection turning movement volumes are shown on Exhibits 8-E and 8-F, respectively. Buildout Without Project ICU calculation worksheets are included in Appendix "H".

Table 8-4 shows ICU calculations at the study area intersections for Buildout With Project traffic conditions. As shown in Table 8-4, the study area intersections are projected to operate at acceptable level of service during the peak hours, with improvements. Buildout With Project AM and PM peak hour intersection turning movement volumes are shown on Exhibits 8-G and 8-H, respectively. Buildout With Project Summer AM and PM peak hour intersection turning movement volumes are shown on Exhibits 8-I and 8-J, respectively. Buildout With Project ICU calculation worksheets are included in Appendix "I".

Project Traffic Contribution

The buildout lane requirements are illustrated on Exhibit 8-K. The project traffic contribution to intersection improvements is depicted in Table 8-5.

TABLE 8-3

BUILDOUT WITHOUT PROJECT INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific Coast Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.72	0.77	0.80	0.84	C	C	C	D
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	2	1	1	2	1	2	2	1	1	2	1	0.68	0.84	0.74	0.93	B	D	C	E
-w/ Improvements	1.5	1.5	1	1.5	1.5	1	2	2	1	1	2	1	0.62	0.79	0.67	0.87	B	C	B	D
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.54	0.62	0.59	0.68	A	B	A	B
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.45	0.50	0.49	0.55	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.53	0.63	0.57	0.67	A	B	A	B
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.36	0.40	0.40	0.43	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.43	0.51	0.46	0.56	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.35	0.43	0.40	0.47	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.37	0.46	0.40	0.51	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.42	0.45	0.45	0.50	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.41	0.63	0.45	0.69	A	B	A	B
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.58	0.75	0.65	0.81	A	C	B	D
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.48	0.75	0.52	0.82	A	C	A	D
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.27	0.83	0.29	0.90	A	D	A	D
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	1	1>	2	1	1	1	2	1	2	2	0	1.00	1.31	1.10	1.44	E	F	F	F
-w/ Improvements	1	1	2>	2	1	1	1	3	0	2	3	1	0.61	0.79	0.61	0.79	B	C	B	C

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap; 1 = Improvement

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

TABLE 8-4

BUILDOUT WITH PROJECT INTERSECTION CAPACITY UTILIZATION

INTERSECTION	INTERSECTION APPROACH LANES[1]												PEAK HOUR ICU[2]				PEAK HOUR LOS[3]			
	NORTH-BOUND			SOUTH-BOUND			EAST-BOUND			WEST-BOUND					SUMMER				SUMMER	
	L	T	R	L	T	R	L	T	R	L	T	R	AM	PM	AM	PM	AM	PM	AM	PM
Crown Valley Pkwy. (NS) at:																				
• Pacific Coast Hwy. (EW)	0	2	0	2	0.5	1.5>	2	2	1	1	2	1>	0.74	0.78	0.80	0.84	C	C	C	D
Niguel Rd. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	2	1	1	2	1	2	2	1	1	2	1	0.70	0.86	0.77	0.94	B	D	C	E
-w/ Improvements	1.5	1.5	1	1.5	1.5	1	2	2	1	1	2	1	0.63	0.80	0.69	0.88	B	C	B	D
Pacific Coast Hwy. (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	2	1	0	2	1	0	2	1	0.57	0.67	0.61	0.72	A	B	B	C
• Street "A" (EW)	1	2	0	0	2	1	1	0	1	0	0	0	0.50	0.58	0.54	0.63	A	A	A	B
Street of the Green Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	0	0	0	0	0	0	2	0	0	2	0	0.47	0.53	0.51	0.57	A	A	A	A
Street of the Blue Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	1	2	0	1	1	1	1	2	0	1	2	1	0.54	0.66	0.61	0.71	A	B	B	C
Street of the Amber Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.37	0.42	0.40	0.45	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.44	0.52	0.47	0.57	A	A	A	A
Street of the Violet Lantern (NS) at:																				
• Pacific Coast Hwy. (EW)	0	1	0	0	1	0	0	0	0	0	3	1	0.37	0.45	0.40	0.49	A	A	A	A
• Del Prado (EW)	0	1	0	0	1	0	0	3	1	0	0	0	0.38	0.48	0.41	0.52	A	A	A	A
Street of the Golden Lantern (NS) at:																				
• Selva Rd. (EW)	1	3	1	1	3	1	1	1	1	1	1	1	0.42	0.46	0.46	0.50	A	A	A	A
• La Cresta Dr. (EW)	1	3	1	1	3	1	0	1	0	0	1	0	0.42	0.63	0.45	0.70	A	B	A	B
• Pacific Coast Hwy. (EW)	1	2	0	0	3	1	0	0	0	1	3	1	0.58	0.75	0.65	0.82	A	C	B	D
• Del Prado (EW)	0	2	1>>	2	2	0	1	3	1	0	0	0	0.50	0.76	0.53	0.83	A	C	A	D
• Dana Point Harbor Dr. (EW)	1	1	1>	1	1	1>	1	2	1	1	2	1	0.27	0.84	0.29	0.90	A	D	A	D
Dana Point Harbor Dr. (NS) at:																				
• Pacific Coast Hwy. (EW)																				
-w/o Improvements	1	1	1>	2	1	1	1	2	1	2	2	0	1.01	1.33	1.11	1.46	F	F	F	F
-w/ Improvements	1	1	2>	2	1	1	1	3	0	2	3	1	0.62	0.81	0.68	0.87	B	D	B	D

[1] When a right turn is designated, the lane can either be striped or unstriped. To function as a right turn lane there must be sufficient width for right turning vehicles to travel outside the through lanes.
L = Left; T = Through; R = Right; >> = Free Right Turn; > = Right Turn Overlap; 1 = Improvement

[2] Intersection Capacity Utilization (ICU)

[3] Level of Service (LOS)

EXHIBIT 8-C

BUILD-OUT WITHOUT PROJECT
AM PEAK HOUR INTERSECTION VOLUMES

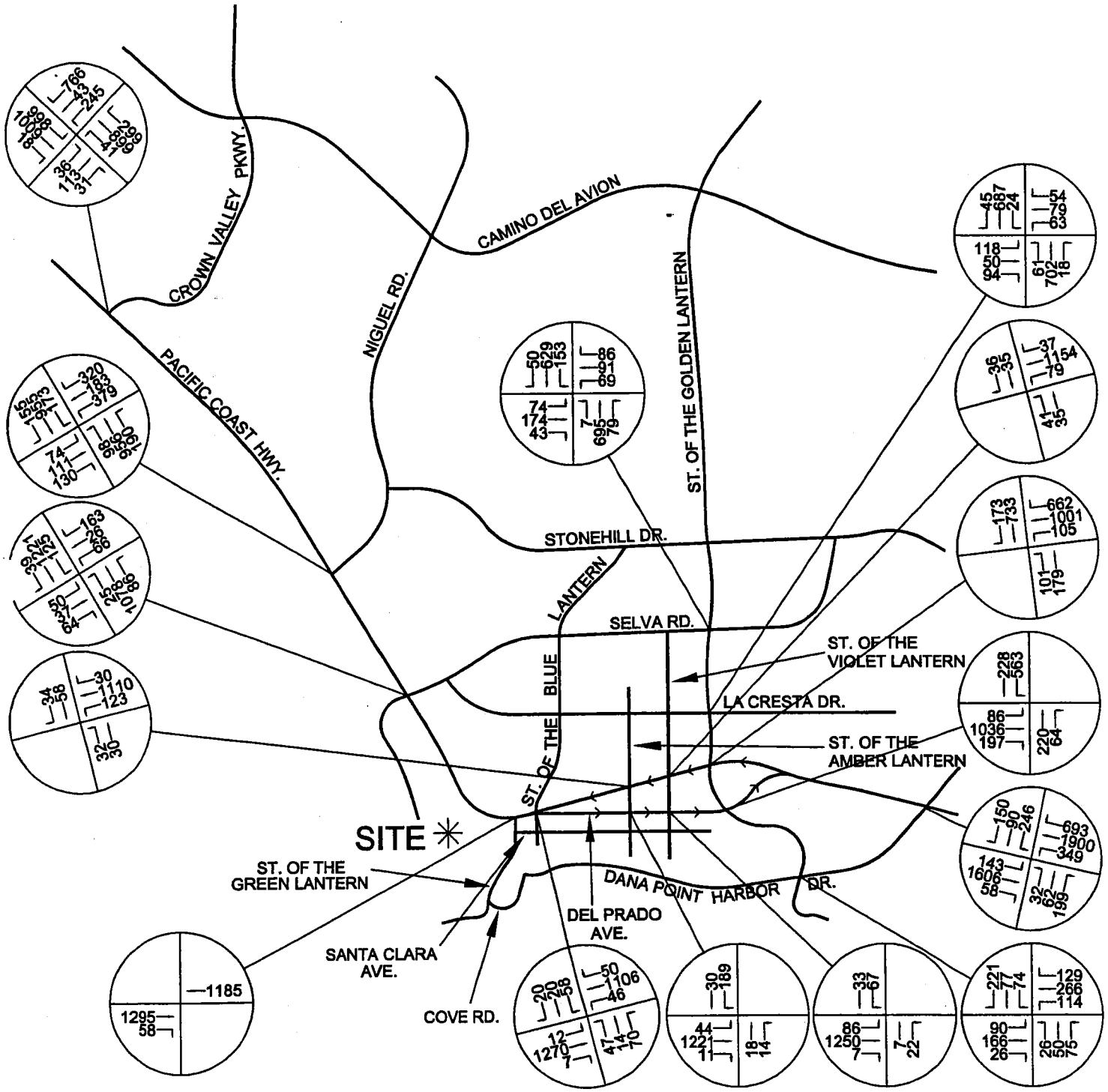


EXHIBIT 8-D

BUILD-OUT WITHOUT PROJECT
PM PEAK HOUR INTERSECTION VOLUMES

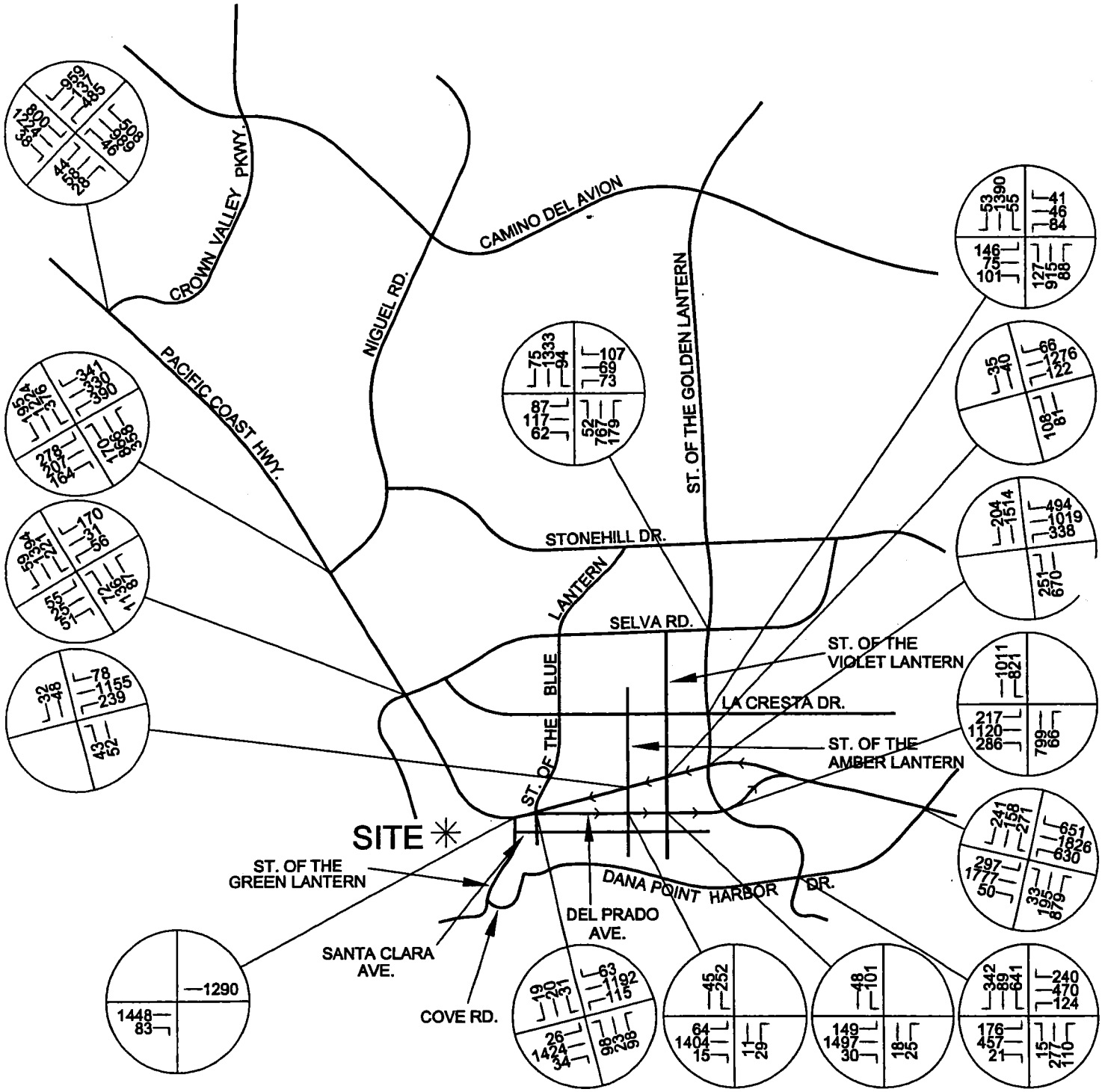


EXHIBIT 8-E

BUILD-OUT WITHOUT PROJECT
SUMMER AM PEAK HOUR INTERSECTION VOLUMES

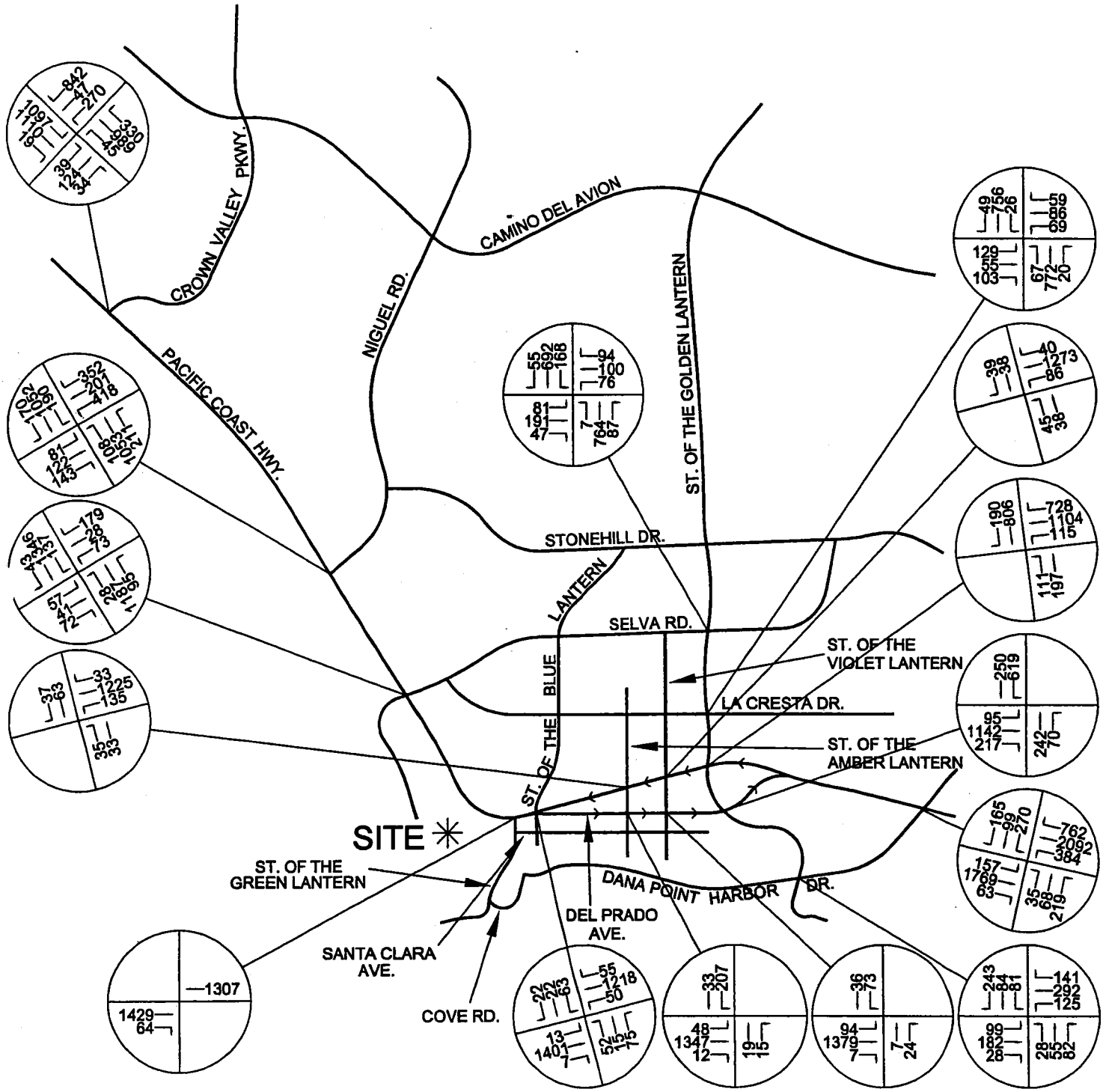


EXHIBIT 8-F

BUILD-OUT WITHOUT PROJECT
SUMMER PM PEAK HOUR INTERSECTION VOLUMES

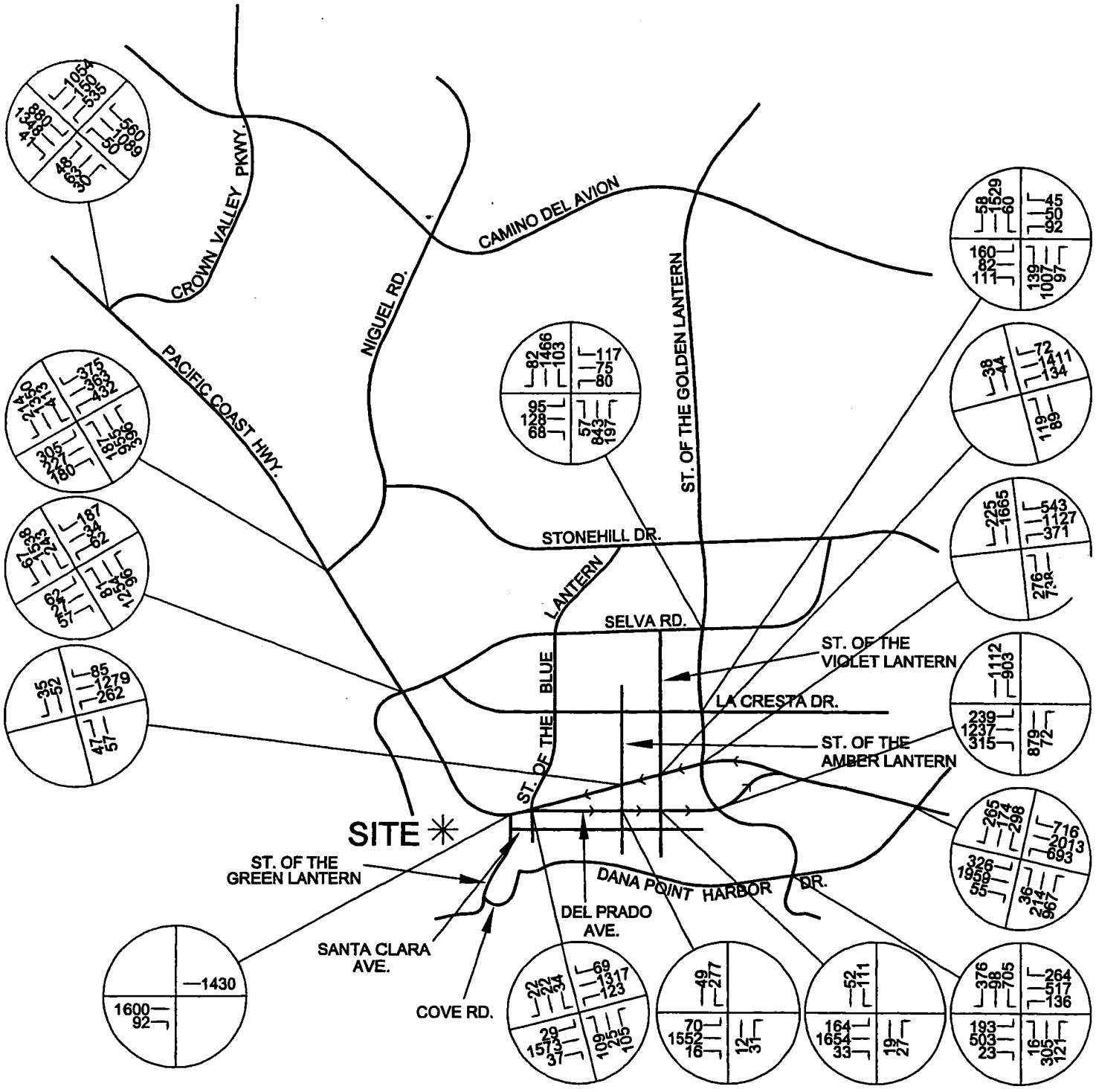


EXHIBIT 8-G

BUILD-OUT WITH PROJECT AM PEAK HOUR INTERSECTION VOLUMES

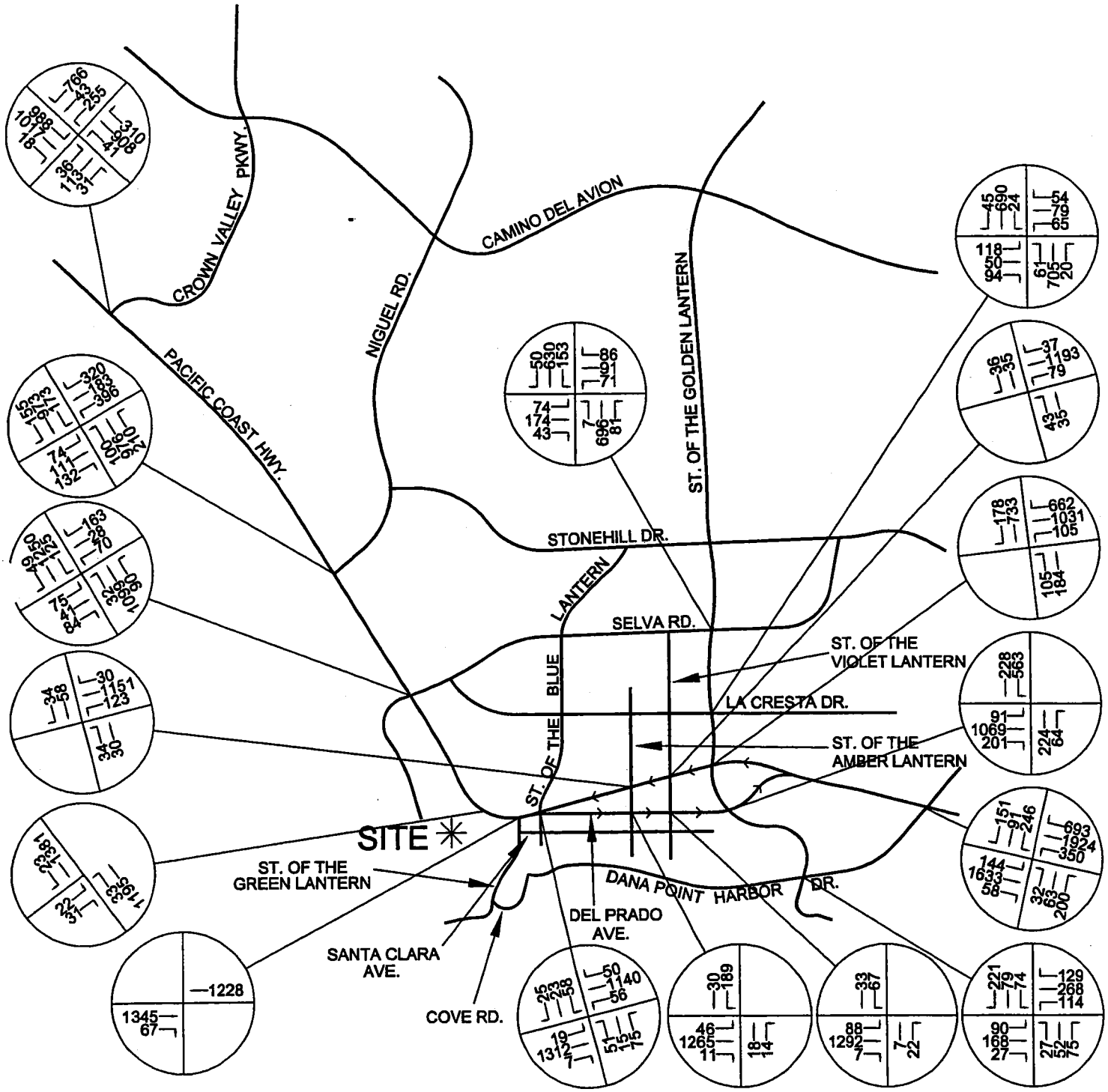


EXHIBIT 8-H

BUILD-OUT WITH PROJECT
PM PEAK HOUR INTERSECTION VOLUMES

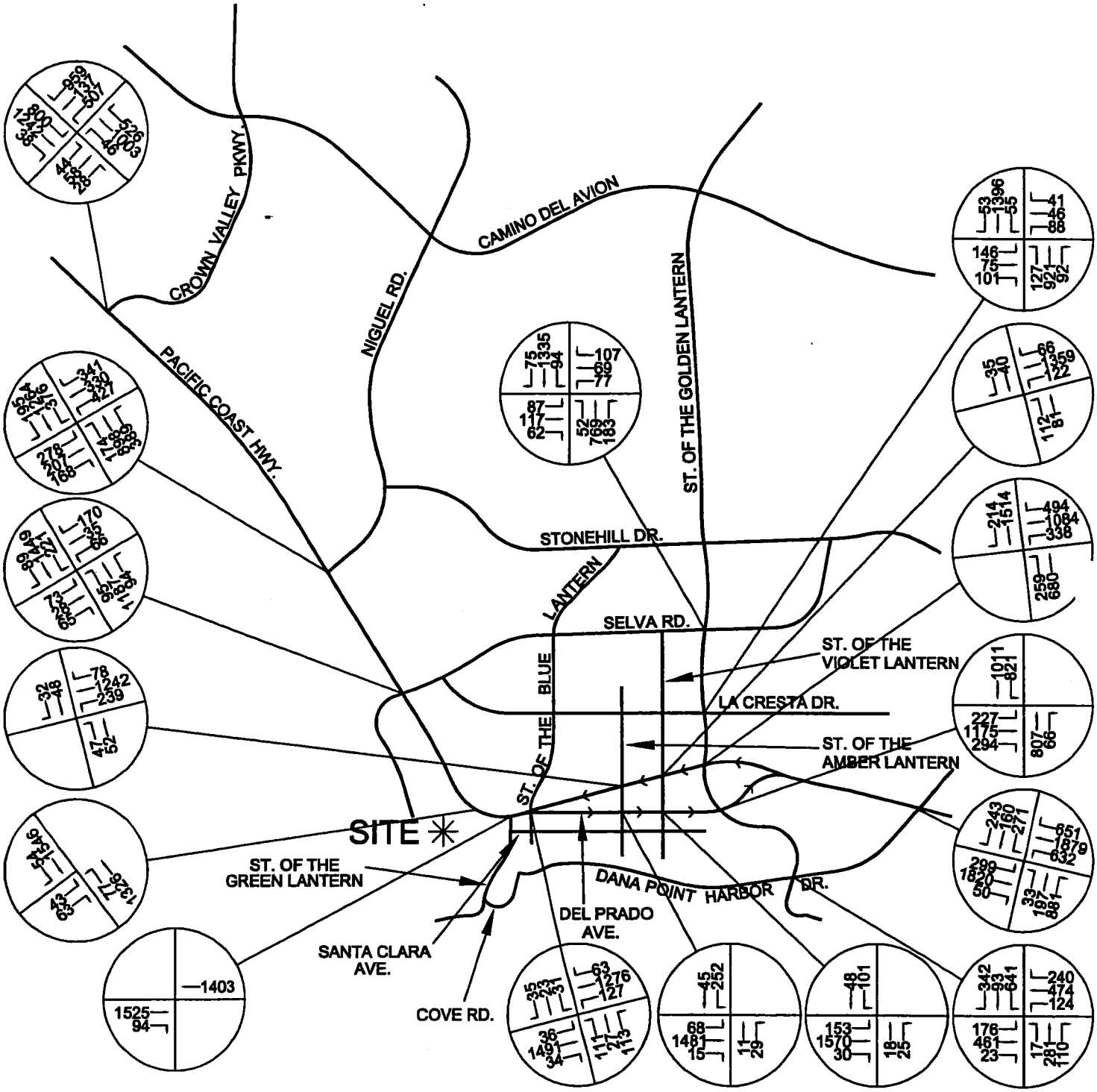


EXHIBIT 8-I

BUILD-OUT WITH PROJECT
SUMMER AM PEAK HOUR INTERSECTION VOLUMES

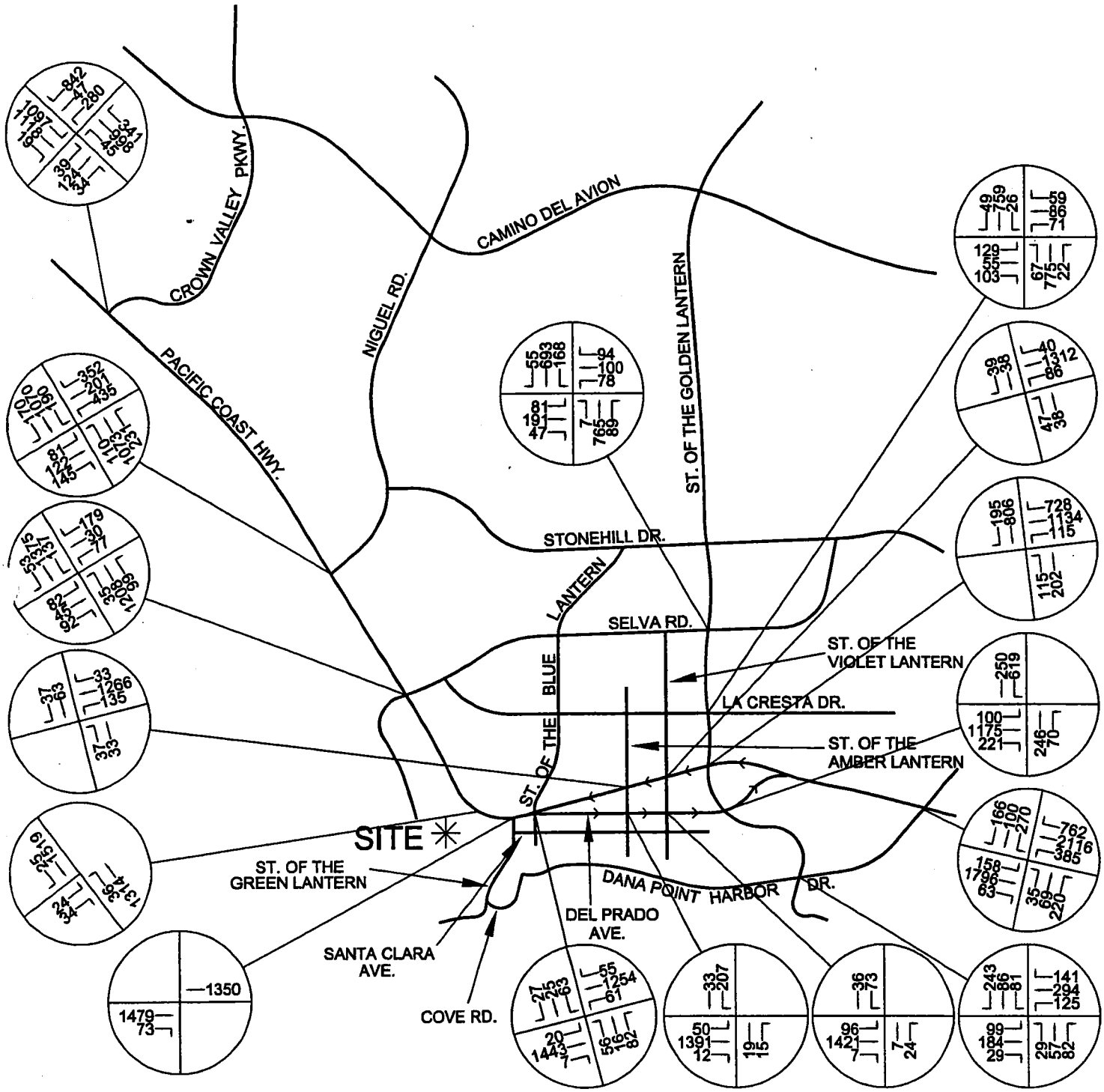


EXHIBIT 8-J

BUILD-OUT WITH PROJECT
SUMMER PM PEAK HOUR INTERSECTION VOLUMES

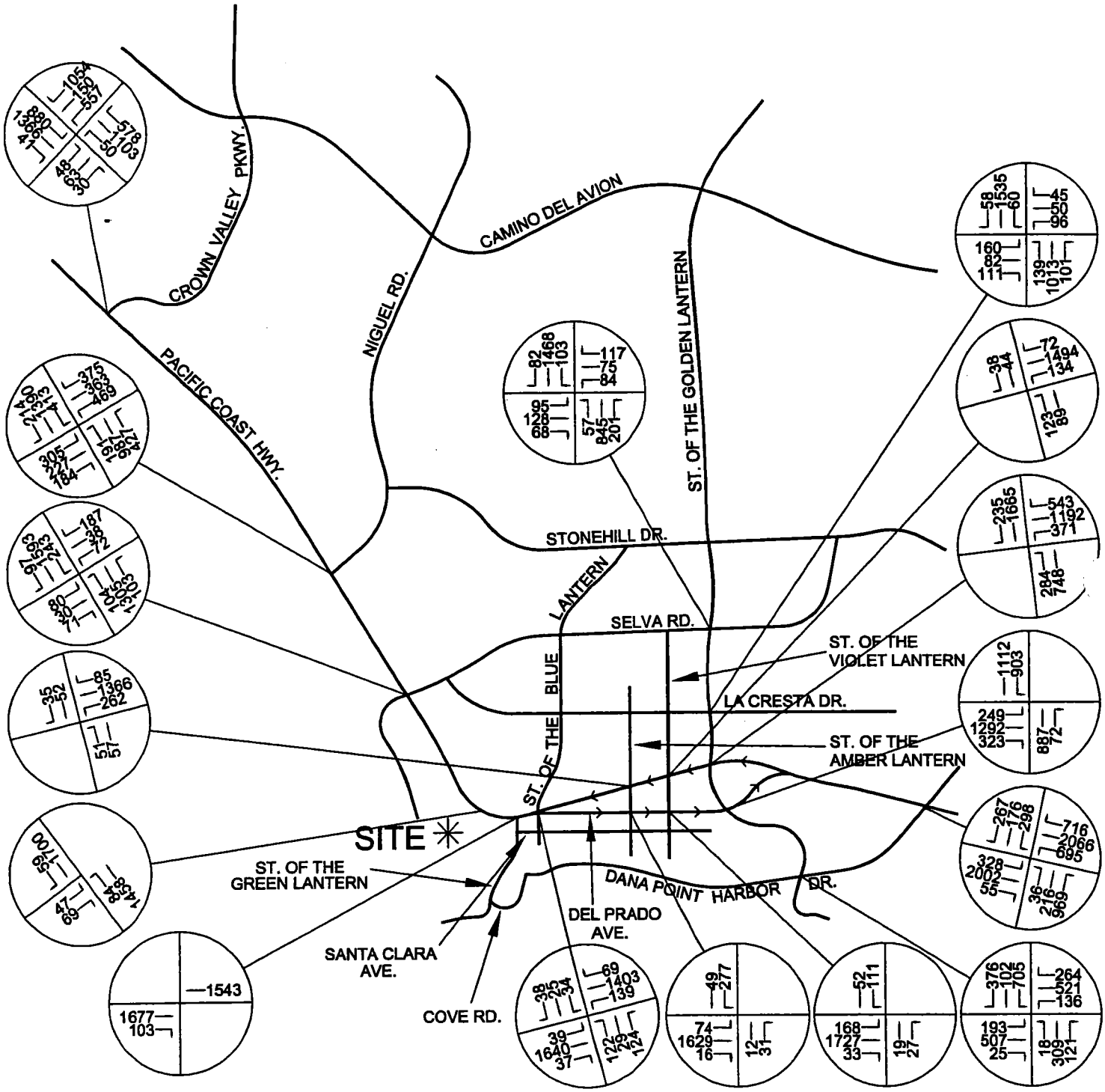


EXHIBIT 8-K

BUILD-OUT LANE REQUIREMENTS

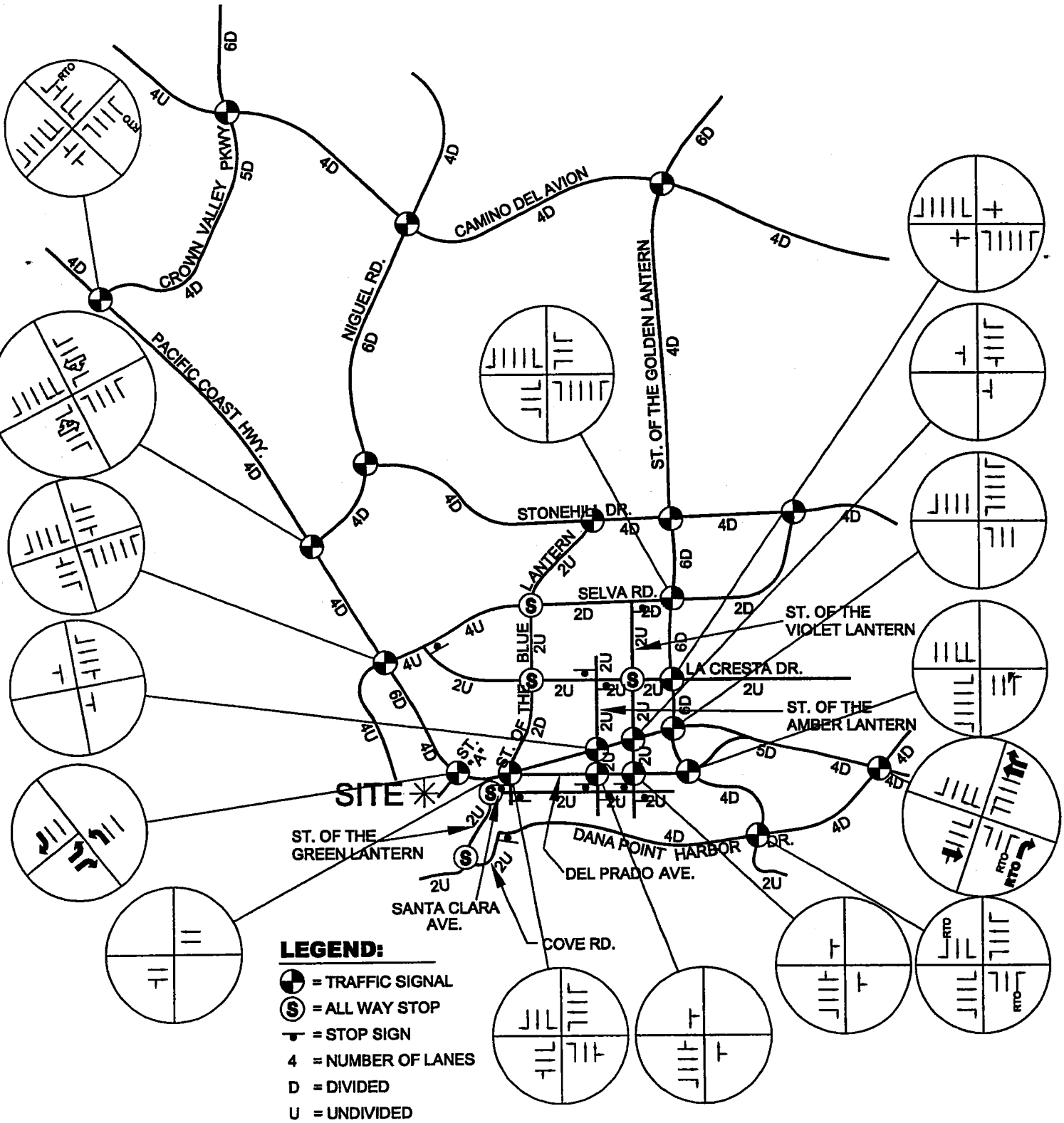


TABLE 8-5

PROJECT TRAFFIC CONTRIBUTION

INTERSECTION	PEAK HOUR	PROJECT TRAFFIC	BUILDOUT WITH PROJECT TRAFFIC	PERCENT OF PROJECT TRAFFIC CONTRIBUTION
Crown Valley Pkwy. (NS) at:				
• Pacific Coast Hwy. (EW)	AM	38	4,536	0.8%
	PM	72	5,388	1.3%
Niguel Rd. (NS) at:				
• Pacific Coast Hwy. (EW)	AM	79	3,803	2.1%
	PM	148	5,047	2.9%
Pacific Coast Hwy. (NS) at:				
• Selva Rd. (EW)	AM	10	3,106	0.3%
	PM	18	3,572	0.5%
Street of the Green Lantern (NS) at:				
• Pacific Coast Hwy. (EW)	AM	92	2,640	3.5%
	PM	180	3,022	6.0%
Street of the Blue Lantern (NS) at:				
• Pacific Coast Hwy. (EW)	AM	111	2,831	3.9%
	PM	213	3,367	6.3%
Street of the Amber Lantern (NS) at:				
• Pacific Coast Hwy. (EW)	AM	43	1,460	2.9%
	PM	91	1,738	5.2%
• Del Prado (EW)	AM	46	1,573	2.9%
	PM	81	1,901	4.3%
Street of the Violet Lantern (NS) at:				
• Pacific Coast Hwy. (EW)	AM	41	1,458	2.8%
	PM	87	1,815	4.8%
• Del Prado (EW)	AM	44	1,516	2.9%
	PM	77	1,945	4.0%
Street of the Golden Lantern (NS) at:				
• Selva Rd. (EW)	AM	6	2,156	0.3%
	PM	12	3,027	0.4%
• La Cresta Dr. (EW)	AM	10	2,005	0.5%
	PM	20	3,141	0.6%
• Pacific Coast Hwy. (EW)	AM	44	2,998	1.5%
	PM	93	4,583	2.0%
• Del Prado (EW)	AM	46	2,440	1.9%
	PM	81	4,401	1.8%
• Dana Point Harbor Dr. (EW)	AM	10	1,324	0.8%
	PM	20	2,982	0.7%
Dana Point Harbor Dr. (NS) at:				
• Pacific Coast Hwy. (EW)	AM	57	5,585	1.0%
	PM	108	7,116	1.5%

9.0 ON-SITE CONSIDERATIONS

RK ENGINEERING GROUP, INC. has reviewed the overall access and circulation for the project. The specific project recommendations are included in Exhibit 9-A. These improvements should be implemented with the phased development of the project.

1. The project shall construct all internal roadways to their ultimate cross-widths as shown on the HDCP Circulation Plan.

2. The proposed project shall construct Pacific Coast Highway adjacent to the project site at its ultimate half-section width as a Major Arterial (120 foot right-of-way) in conjunction with development as shown on Exhibit 9-A.

3. Prior to obtaining left turn movements into and out of Street "A", a traffic signal will be installed at the PCH/Street "A" intersection subject to Caltrans approval.

4. The traffic signal should be interconnected to the adjoining intersection subject to Caltrans approval.

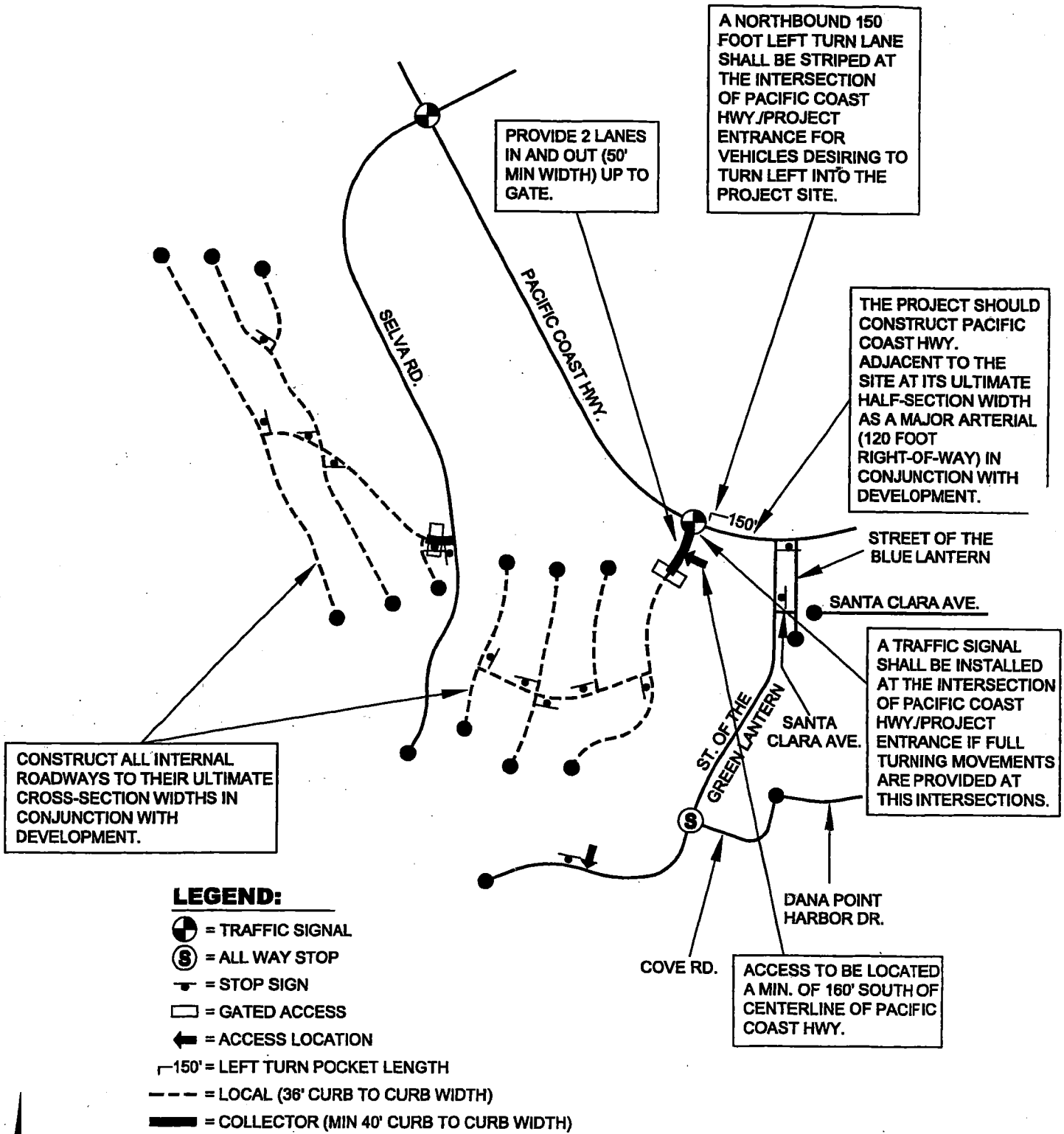
5. Prior to obtaining left turn movements into Street "A", a northbound 150 feet left turn lane shall be striped at the Pacific Coast Highway/Street "A" for vehicles desiring to turn left into the project site subject to Caltrans approval.

6. Prior to issuance of any grading permit, sight distance at all project access points shall be reviewed with respect to Standard Plan Number 1117 (see Appendix "K") in conjunction with the preparation of precise grading and landscape plans.

7. The proposed project shall contribute fees towards regional roadway improvement programs. The project traffic percentage contribution to intersection improvements is depicted in Table 8-5.

EXHIBIT 9-A

CIRCULATION RECOMMENDATIONS



8. Standard Plan Number 1107 (see Appendix "L") requires that entry gates should be set back from the near curb line of any public street to provide a minimum 100 feet or one foot per dwelling unit served, of storage whichever is greater for entering vehicles to stack without interfering with through traffic. Multiple entrance lanes can be used to meet the storage requirements.

9. The proposed project shall participate in all applicable Road Fee Programs including the San Joaquin Hills Transportation Corridor and CARITS (Coastal Area Road Improvements and Traffic Signal) Fee Programs.

10. The final site design for the Seaside Inn and Pacific Coast Highway creation/commercial uses shall be reviewed with respect to access, circulation, parking and sight distance by the City's Traffic Engineer prior to the issuance of any site development permit for those areas.

11. A construction truck routing plan shall be reviewed and approved for the project by the City's traffic engineer prior to the issuance of any grading permit.

PARKING

The parking to be provided for the visitor/recreation commercial and residential uses will be in accordance with Chapter 9.35 Zoning Code of the City of Dana Point, or as otherwise set forth in the Headlands Development and Conservation Plan (HDCP).

The City of Dana Point Zoning Code does not provide a specific parking standard for recreation or related open space uses. Through its General Plan EIR traffic model, the City does provide trip generation rates for parks and open space. Utilizing those rates for the proposed parks and open space in the project results in a total of 354 average daily trips (177 in/177 out). This includes the projected trip generation for the visitor recreation facilities which are located in the parks.

The parks and open space provide for a wide variety of recreational activities that will occur throughout the day, including running, biking, beach activities, nature tours, sunset walks, etc. Highest use will typically occur on weekends in the middle of the day. Assuming an average visit to the site is three hours, the estimated maximum amount of visitors occurring at any one time is assumed to be 60 percent of the daily total. Applying the 60 percent peak demand to the 177 inbound trips results in a projected parking demand for the parks and recreational open space of 106 spaces.

Recreational opportunities in the Headlands project are concentrated on the coastal edge of the project from Harbor Point to Strand Beach. The project proposes open space related parking dispersed relatively evenly and in close proximity to the coastal recreational opportunities. This includes approximately 62 parking spaces on-site along the Street of the Green Lantern, Scenic Drive, and in the parking lot adjacent to the Nature Interpretive Center. This will serve the uses in Harbor Point Park, the trails in the Conservation Park and Hilltop Park.

Also, approximately 60 spaces are proposed on-site along the extension of Selva Road. These spaces will serve as secondary parking for the Conservation Park, a portion of the trail system, overflow parking for the multi-family enclave and for Strand Beach.

In addition to these 122 spaces, the County owned Salt Creek parking lot (Selva Road) immediately adjoins the proposed Strand Vista Park. Current and historic data indicate that the Salt Creek parking lot, despite providing free parking, has extensive excess capacity. The County parking lot and the west side of Selva Road fronting the parking lot can accommodate approximately 593 vehicles, including approximately 10 handicap spaces. Three pedestrian access ways to Strand Beach will be accessible from Strand Vista Park and the adjoining parking lot.

A parking survey was undertaken mid-day, in 1993 on four consecutive weekends in August, including Labor Day. Occupied parking spaces ranged from 125 (21 percent) to 463 (78 percent). An updated survey was conducted for the final two weekends in

August and Labor Day weekend, 2001. A total of seven days were surveyed. The survey was completed between the hours of 11:00 AM and 2:30 PM on those days. Occupied parking spaces on those days ranged from 196 (33 percent) and 277 (47 percent). The parking survey results are included in Appendix "L".

Besides Niguel Shores Beach, the Salt Creek parking lot above Strand Beach was sized in the anticipation that, one day, it would also serve the recreational activities associated with Strand Beach.

The proposed park and open space parking lot for the Headlands has been dispersed into coastal fronting locations that will meet the requirements and serve the needs of the recreational activities proposed on-site. Extensive additional parking is readily available at no charge at the Salt Creek parking lot. Excess capacity at this location will also serve the enhanced coastal access opportunities provided by the project. No impacts associated with parking are foreseen.

TRAFFIC SIGNAL – PACIFIC COAST HIGHWAY AND STREET "A"

The intersection of Pacific Coast Highway and Street "A" has been planned as a full service signalized intersection. Based upon the projected traffic volumes from the residential and commercial development and the traffic volumes on Pacific Coast Highway, the traffic signal has been projected to be warranted at this intersection. The traffic analysis for the project has been based upon the assumption of full turning movements at Street "A" and Pacific Coast Highway.

The Advantages of the Traffic Signal at the intersection of Street "A" and Pacific Coast Highway are as follows:

1. Provides direct, safe, signal controlled access to the commercial (Planning Area 4) and residential (Planning Area 6) areas of the Headlands project at a single point on PCH.

2. The proposed signalized intersection meets or exceeds Caltrans standard sight distances.

3. The projected traffic counts meet Caltrans warrants for a traffic signal. (See attached warrant sheet).

4. Provides a point of vehicular access to PCH as identified in the adopted Dana Point Local Coastal Program and the City's general plan.

5. Accommodate access as shown on Caltrans R.O.W. Map No. P_2 9376-1 and on Tract Map No. 697, circa 1924, which preceded conveyance of the right-of-way easements to the State of California for PCH in 1925 and 1930, and avoids creation of land locked parcels.

6. Eliminates the need for driveways along PCH to serve the proposed commercial site.

7. Provides controlled access and crossing of PCH for pedestrians and bicycles directly to the proposed Headlands Trail system, providing coastal access.

8. Provides an intermediate observable traffic signal between Selva Road and Blue Lantern which will transition the 50 mph speed limit zone north of the Headlands, to the 35 mph speed limit zone that now begins just south of the Green Lantern/PCH intersection.

9. Serves the project in a manner which will not physically bisect the proposed public Hilltop Park (Planning Area 5) and will not result in extensive grading of the visually significant Hilltop landform and its public view point.

10. Avoids loading traffic onto Green Lantern, a restricted access roadway.

11. Allows a customer driving on PCH to make a visual connection between the Headlands commercial site and the physical point of access.

12. Eliminates unnecessary "u-turns" on Pacific Coast Highway at the Street of the Blue Lantern and Selva Road.

In the event that a traffic signal is not provided at Street "A" and Pacific Coast Highway, this access would be limited to right turns in/out only. RK ENGINEERING GROUP, INC. has reviewed the traffic impacts to the study area intersections as a result of this restriction. If Street "A" is limited to right turns in/out only, then traffic desiring to travel to the north of the site would first have to make a right turn, and then make a "U-turn" at Street of the Blue Lantern and Pacific Coast Highway and return to the north along Pacific Coast Highway. Likewise, vehicles desiring to enter the site at Street "A" from the south would have to continue northbound beyond the site approximately 0.45 miles and make a "U-turn" at Selva Road and Pacific Coast Highway and then travel southbound another 0.45 miles to Street "A" at Pacific Coast Highway. This type of "out of the way travel" for the typical customer of the commercial uses, creates commercial accessibility concerns and, therefore, economic liability issues which are beyond the scope of a traffic analysis.

This access restriction would increase U-turning movements at Street of the Blue Lantern at Pacific Coast Highway and Selva Road at Pacific Coast Highway. RK ENGINEERING GROUP, INC. has reviewed the intersection capacity analysis with the right turn only access at Street "A" and Pacific Coast Highway. For the short range with project conditions, the ICU values would change, however, no change in level of service would be anticipated at either of the two adjacent intersections. For buildout conditions, the intersection of Selva Road at Pacific Coast Highway the Level of Service would change from "B" to "C" during the PM peak hour with no level of service change occurring during the AM peak hour. At the intersection of Street of the Blue Lantern and Pacific Coast Highway, no change in ICU or level of service would be anticipated with this restriction.

As previously mentioned, limiting Street "A" right turn in/out only access would require additional turning movements at Street of the Blue Lantern at Pacific Coast Highway and Pacific Coast Highway at Selva Road. This additional traffic would increase the storage length requirements for left turn pockets at both of these intersections, as a result of additional traffic desiring to make the "U-turn" movements. The most critical increase would be to the northbound left turn movement at Pacific Coast Highway at Selva Road. The turning movements at this intersection during the PM peak hour would increase from approximately 95 vehicles per hour to 172 vehicles per hour during the peak. However, the existing storage length at this location is 300 feet, which could accommodate the increased traffic demand.

The traffic at the southbound left turn pocket on Pacific Coast Highway at Blue Lantern would increase from 36 to 79 vehicles per hour as a result of the right turn in/out restriction at Street "A" and Pacific Coast Highway. However, the existing storage length at this location is 150 feet, which could accommodate this traffic demand.

This restriction would also require traffic desiring to travel to the north on Pacific Coast Highway to travel southbound and weave across all of the southbound lanes of Pacific Coast Highway to make the "U-turn" at Street of the Blue Lantern. There is a relatively short distance to make this weaving movement. Furthermore, the additional "U-turn" movements at these two adjacent intersections could introduce additional traffic conflicts at these locations.

Another problem that is caused by this access restriction is the increased travel required, since vehicles could not directly enter or exit Street "A" at Pacific Coast Highway to the proposed development. Vehicles traveling northbound on Pacific Coast Highway would have to travel up to Selva Road and then return to the site traveling southbound on Pacific Coast Highway, an additional 0.91 miles. Similarly, vehicles leaving the site desiring to travel to the north would have to first travel southbound to Street of the Blue Lantern and then return northbound on Pacific

southbound to Street of the Blue Lantern and then return northbound on Pacific Coast Highway an additional 0.27 miles. This would result in increased vehicle miles traveled as a result of the access restriction.

In conclusion, while the Street "A" access could function as a right turn in/out only access, there would be several undesirable aspects, which would not otherwise occur with the signalization of this intersection. These include a slightly worse level of service for buildout conditions at the intersection of Pacific Coast Highway and Selva Road, shorter distances for weaving movements on Pacific Coast Highway from Street "A" to Street of the Blue Lantern and additional "U-turn" movements at the two adjacent intersections. The right turn only restriction would increase vehicle miles traveled from the project as a result of the out-of-the-way travel required with this restriction and may affect the economic viability of the proposed commercial use. Without a signalized intersection, the opportunity for a protected crosswalk on PCH for pedestrians and bikes would be lost. Finally, there would not be an intermediate observable traffic signal between Selva Road and Blue Lantern which could transition the 50 mph speed limit zone north of the Headlands, to the 35 mph speed limit zone that now begins just south of the Green Lantern/PCH intersection.

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10.0 CONSTRUCTION IMPACTS

Construction activities associated with the development of the project will be clearing and grubbing, demolition, excavation/grading, construction of drainage systems, roadways and structures within the project. The construction impacts that will result from these activities will include temporary increases in traffic during construction. Construction impacts will be incremental over time based upon the phasing of construction throughout the site.

During demolition activities, it is estimated that approximately nine pieces of heavy equipment may be expected to operate any one time on the site. The equipment may include two loaders, three tractors, two water trucks and two miscellaneous pieces of equipment. This equipment is anticipated to operate approximately eight hours per day during the demolition phase of construction.

During the grading phase of the development, it is estimated that approximately 17 pieces of heavy equipment may be expected to operate any one time at the project site. The equipment may include eight scrapers, two tractor dozers, four wheel dozers, two water trucks and three miscellaneous trucks.

There will be additional temporary traffic generated by construction workers as they travel to/from the job site and from haul trucks associated with delivery of material and demolition removal. Estimates of the number of construction workers and haul trucks for the proposed project were estimated by the applicant. As many as 100 trips per day (50 in and 50 out) are assumed for construction activities. Construction impacts are temporary during the period of construction and the number of construction workers will vary depending on the specific construction activities over time. Prior to the start of construction, an appropriate construction management routing program will be established to minimize traffic impacts upon the local circulation system in the area.

In terms of traffic impacts during construction, the analysis of project impacts for short-range traffic projections more than covers the traffic generated by the project during construction. The traffic impacts and improvements for short-term conditions is discussed in Section 7 of this report.

APPENDIX H

TRAFFIC STUDY

Appendices A – L of the Traffic Study are contained in Volume IIA, Additional Appendices.

APPENDIX I

PUBLIC SERVICE AND UTILITY CORRESPONDENCE

Capistrano Unified School District

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32972 Calle Perfecto, San Juan Capistrano, California 92675 Telephone (949) 489-7000/FAX 248-8546

August 13, 2001

Ms. Andrea Zullo
LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, California 92614

SUBJECT: SCHOOL INFORMATION FOR HEADLANDS DEVELOPMENT AND CONSERVATION PLAN EIR, CITY OF DANA POINT, CA

Dear Ms. Zullo:

Thank you for your "Notice of Preparation" (NOP) letter for the proposed Headlands Development and Conservation Plan project in the City of Dana Point, California. The proposed development is within the jurisdictional boundaries of Capistrano Unified School District (CUSD), and the District is committed to providing educational facilities for all future students generated by new developments.

As indicated in the NOP, the proposed development includes 125 residential housing units, and 150,750 square feet of commercial facilities (i.e., hotel and commercial use). Based upon current student generation data for the District, the residential units are projected to generate 62 students (i.e., 37 elementary school students, 13 middle school students, and 12 high school students). The proposed commercial facilities are projected to generate 32 students (i.e., 19 elementary school students, 5 middle school students, and 8 high school students). Therefore, the total number of students that may be generated by the Headlands project is 94 students (i.e., 56 elementary school students, 18 middle school students, and 20 high school students).

These additional students will impact the existing schools within this region, and CUSD will require full mitigation of this impact, either through an executed mitigation agreement providing for 100% of the costs associated with housing new students generated from this development. All CUSD schools have enrollments that exceed the original design capacities of the permanent building construction, and most schools now include relocatable classrooms to accommodate students beyond these original capacities. CUSD hereby requests that building permits for the development not be issued until such time a mitigation agreement between the developer and the District can be resolved.

This letter supports my prior correspondence for previous proposals for this property, indicating a requirement for full mitigation to accommodate new students generated by the development. We appreciate the opportunity to review and comment on the NOP and look forward to responding to the Draft EIR for the Headlands project. If you have any questions or concerns regarding this letter, please do not hesitate to contact me at (949) 489-7094.

Sincerely,

Cary D. Brockman
Director, Facilities Planning

File: L-Headlands-CP NOP Response.doc

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CR&R

31641 ORTEGA HIGHWAY

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SAN JUAN CAPISTRANO, CA

949-728-0446

FAX 949-728-3444

HEADLANDS DEVELOPMENT AND CONSERVATION PLAN EIR
QUESTIONNAIRE & RESPONSE SHEET

Solid Waste and Recyclable Collection Information
Solag Disposal Company

RECEIVED

JUL 1 9 2001

1 The curbside program for residential service consists of two automated containers, one for solid waste and one for recyclable materials. Green waste if requested by an association is picked up at curbside in bundles or containers provided by the customer. Informational material pertaining to the program will be provided to customer upon request of service.

Solid waste and recycling service is also provided with the use of three-yard containers at designated enclosed areas with sufficient room for solid waste and recycling containers.

2 Do to the different variables such as weather, seasonal fluctuations and occupancy, the following are approximate estimates:

Curbside residential solid waste	23 to 40 pounds per week
Inn (without meals served)	.020 Loose Cubic Yards
Inn (with meals served)	.026 Loose Cubic Yards
General commercial (Mall)	.018 Loose Cubic Yards

3 There should not be any changes in the services to accommodate the present solid waste and recycling program needed to service the Headlands project.

4 The present solid waste and recycling program for the City of Dana Point is conducive to general city street standards. There is a concern with Planning Area #6 with cul-de-sac islands. This is the turn around area at the end of a closed street. The type and size of the island may have a severe effect on operations and street surface damage. Other problems for the proposed project can not be determined until a site plan, set to scale is provided.

5 CR&R/Solag has the capability and capacity to handle all additional recycling and solid waste material. A major concern is the bin location and access when servicing the solid waste and recycling containers. A site plan of the location and access of each enclosure is needed for final evaluation.

Prepared by: Jim Koutroulis

Title: Director of Governmental Affairs

Date: July 16, 2001

Phone: (949) 728-0446

RECYCLED PAPER

RECEIVED
BY LSA, INC.
JUL 23 2001

July 18, 2001

Ms. Andrea Zullo
LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, CA 92614

Dear Ms. Zullo,

I received your request for information regarding the proposed development of the Dana Point Headlands. I hope the following responses will assist you in the preparation of the Environmental Impact Report.

1. The Orange County Sheriff's Department provides law enforcement services, under contract, for the entire City of Dana Point. The Dana Point Police Services group, a unit of the Orange County Sheriff's Department, currently provides all law enforcement services to the project site and adjacent areas. This includes, but is not limited to, handling all calls for service, investigating criminal matters, apprehending criminal offenders, handling non-criminal matters, enforcing traffic and parking regulations, and investigating traffic accidents.

2. The Aliso Viejo Sheriff's Station serves the City of Dana Point, as well as, the cities of San Juan Capistrano, Laguna Niguel, Mission Viejo, Laguna Hills, Laguna Woods, Lake Forest, Aliso Viejo, and Rancho Santa Margarita. These cities all contract for service from the Orange County Sheriff's Department. The Station is located at 11 Journey in Aliso Viejo, which is approximately eight miles from Dana Point.

   All primary units assigned to Dana Point and all secondary or backup units would work out of that station, but would not be responding to calls from that location. The Dana Point units would be responding to calls from within the city limits of Dana Point and the secondary units would be responding first from adjacent cities and next from more distant areas depending on the scale of the situation.

   The Aliso Viejo Sheriff's Station has approximately 350 sworn officers assigned to it. A total of 39 positions are dedicated solely to the City of Dana Point, assigned as follows:
   (1) Lieutenant – serving as the Chief of Police Services
   (4) Sergeants – serving as field supervisors
   (2) Investigators
   (27) Deputies

33282 Golden Lantern, Ste. 209, Dana Point, CA 92629 • (949) 248-3580 • FAX (949) 248-3543
Internet: www.danapoint.org

(2) Investigative Aides – civilian assistants
(3) Community Service Officers – civilian parking enforcement officers

All deputies responding to calls for service operate standard Black and White patrol cars. The number of deputies assigned to handle any given situation is dependant on the type of problem anticipated.

Dana Point Police Services has not set any specific "response time goals" for our patrol units. The Sheriff's Department defines response times as the period from when our dispatcher answers the phone call until the patrol deputy arrives at the scene. Our current response times are approximately six (6) minutes for priority 1 calls (life threatening emergencies) and approximately twelve (12) minutes for priority 2 calls (crime recent, potential to escalate to an emergency). We view these times as acceptable and they are comparable with the response times of the surrounding cities. The actual response times will vary depending on the type of call and the location the unit is responding from.

3. The Countywide Mutual Aid Agreement is the only formal, reciprocal agreement in place regarding law enforcement services. This agreement applies to all law enforcement agencies in the County of Orange and governs the response of outside assistance to major law enforcement events such as natural disasters, civil unrest, etc.

   As a practical matter, Dana Point Police Services would be providing service to the project site and adjacent area. If the scope of the situation exceeds our ability to adequately handle the problem we would call for additional assistance in the following order:

   - Orange County Sheriff units assigned to the adjacent contract cities (San Clemente, San Juan Capistrano, and Laguna Niguel)
   - Orange County Sheriff units assigned to more distant areas
   - Outside agency units pursuant to the Mutual Aid Agreement

   The Orange County Sheriff's Department fields over 100 patrol cars per shift on the average shift.

4. There are no plans for any expansion of Sheriff's Department facilities affecting the project site or adjacent area.

5. The Orange County Sheriff's Department reports Part I crime rates to the United States Department of Justice (DOJ) per the DOJ guidelines. Part I crimes include: homicide, rape, robbery, assault, burglary, larceny, and motor vehicle theft. The City of Dana Point had 737 Part I crimes citywide during calendar year 1999. The Part I crimes dropped to 707 or 4% during calendar year 2000. This drop is the latest in a ten-year pattern of dropping crime rates both citywide and

region-wide. Our crime rate and calls for service are similar to the other jurisdictions in the region.

The Sheriff's Department does not break down crime rate information by neighborhood, only by city. The most common offenses currently encountered in the project area are: vehicular trespassing, possession of narcotics, alcohol violations, and possession of weapons.

I do not believe the proposed development would negatively impact our operation from a traffic safety standpoint.

6. I do not believe the proposed land use will adversely impact the current service levels.

7. The proposed project will not create the need to expand facilities or add staff. The project will generate calls for service once completed. Our experience with similar areas would dictate that these calls would be primarily alarm calls, etc. The area currently generates a high level of self-initiated law enforcement activity in its undeveloped state. The deputies routinely check on occupied vehicles parked during darkness and these checks often result in arrests for alcohol, narcotics, or weapons violations. We also experience a high level of vehicular trespassing activity. The development of this area will probably reduce the overall level of law enforcement activity.

8. Not applicable.

9. I do not foresee any problems serving the proposed project area, nor do I have any specific concerns.

10. I have no mitigation measures to recommend at this point.

If you have questions, or need additional information, please do not hesitate to contact me at rkennedy@danapoint.org or (949) 248-3580.

Prepared by,

Ron Kennedy
Community Support Deputy

HEADLANDS DEVELOPMENT AND CONSERVATION PLAN EIR QUESTIONAIRE & RESPONSE SHEET

Public Services – Recreation Information
City of Dana Point Recreation Department

1. **What type of services and facilities do you provide?**

   a. The City provides general recreation and leisure service programs for families and guests to Dana Point. These services include structured and non-structured programs for participants ranging in age from 1 through 99. The Recreation Division provides various amenities that include a Community Center, lighted ballfields, tennis courts, basketball courts (indoor & outdoor), handball courts and seasonal swimming pool.

2. **Please list the names and location of recreational facilities that would serve the project.**

   a. Del Obispo Community Center – City of Dana Point
      34052 Del Obispo Road
   b. Dana Hills High School – City of Dana Point
      33333 Street of the Golden Lantern
   c. Community Garden - City of Dana Point
      Corner Stonehill & Golden Lantern
   d. Youth & Group Facility – County of Orange
   e. Doheny State Beach – State Park

3. **What are the current plans for expansion of your facilities (include use, location, capacities, and completion dates)? Identify any of these that may specifically serve the project site.**

   a. No current plans for expansion of the facilities are planned at the present time.

4. **Currently, what level of service, if any do you provide to the project site and adjacent area.**

   a. The services provided are citywide and would include all areas within the proposed project site.

5. **Will the proposed project adversely impact the level of service you presently provide?**

   a. With the additional families and guests that will come to Dana Point as a result of the development many of the facilities may be impacted in relationship to available use (i.e. tennis courts, active ballfields & multi-

purpose fields, park areas, and community center rentals) on a regular basis. This impact will be felt in the scheduling and maintenance of the facilities.

6. **Will the proposed project create a need for the expansion or re-location of recreational facilities or the addition of staff? If so, describe the anticipated needs. Please explain how you determine service demands (i.e. park acreage/population ratios, playgrounds/population, etc.).**

   a. Based on the standards set by the National Recreation and Park Association and the Facility Needs Analysis of the Park and Recreation Master Plan for the City of Dana Point the following facilities will be needed to meet the growing demands for the project. (See attached).
      i. Diamond sports fields
      ii. Multi-purpose fields
      iii. Basketball courts
      iv. Tennis courts.

7. **If an expansion is required to serve the proposed project, is revenue budgeted? If not, what methods will be used to secure revenue? What are these and how are they determined (e.g. fee per housing unit)?**

   a. Expansion is not required in order to serve the approximately 375 additional residents based on the proposed 125 residential lots.

8. **What problems do you foresee in serving the proposed project? Identify any particular concerns.**

   a. I don't foresee any problems in serving the proposed project area.

9. **If implementation of the proposed project results in a significant effect on the provision of recreational services, what measures can you recommend for mitigating project impacts identified above.**

   a. Any impact on service levels attributed to the proposed project will be addressed on a case-by-case basis by the City Council.

Prepared by: Kevin Evans
Recreation Manager
August 2, 2001
(949) 248-3530

Received Aug-02-01 09:36am from CCITT G3 → LSA FAX THREE page 4
Aug-02-01 09:35A P.04

TABLE 6 - FACILITY NEEDS ANALYSIS

FACILITY	STANDARD	REQUIRED *	EXISTING	SURPLUS DEFICIT	ADJUSTED (D.POINT)	COMMENTS
Adult Softball	1/3,000	13 (11)	4	-9	-2	Lighted fields desired
Amphitheater/Stage Gazebo	1/20,000	2 (2)	5	+3	-1	
Archery	1/50,000	1 (1)	0	-1	-1	Site for class only
Basketball Court	1/1,500	26 (21)	19	-7	-1 -6	At residents' request
Community Center	1/25,000	2 (1)	1	-1	0	
Elementary Play	1/5,000	8 (6)	9	+1	+1	
Football Stadium	1/25,000	2 (1)	1	-1	0	
Football/Soccer	1/15,000	3 (2)	6	+3	-2	
Gymnasium	1/25,000	2 (1)	2	0	0	
Handball Court (3 - wall)	1/20,000	2 (2)	8	+6	-2	Association with tennis desired
Handball Court (4 - wall)	1/20,000	2 (2)	0	-2	-2	For racquetball
Horseshoes	1/40,000	1 (1)	1	0	-1	In association with Senior Center
Youth Baseball LEAGUE	1/5,000	8 (6)	3	-5	-3	Lighted fields desired, need fields of differing sizes, grouped

** NOTE: FACILITY REQUIREMENT FOR THE 1990 POPULATION OF 31,896 IS SHOWN IN PARENTHESIS*

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Aug-02-01 09:36A P.05

FACILITY	STANDARD	REQUIRED *	EXISTING	SURPLUS DEFICIT	ADJUST (D. POINT)	COMMENTS
Multipurpose Room	1/3,000	13 (11)	3	-10	-1	Flexible, dividable space desired, crafts, clubs, events
Community Pool	1/20,000	2 (2)	1	-1	0	
Roller Hockey	NONE	NA	0	NA	-1	At Sea Canyon due to residents' request
Senior's Center	1/40,000	1 (1)	0	-1	-1	Location near residential and commercial desired - location near public transit desired
Shuffleboard	1/10,000	4 (3)	0	-4	-4	In association with Senior Center
Skateboard Area	N/A	N/A	0	N/A	-1	
Tennis Court	1/2,500	16 (13)	14	-2	-2	Capistrano Beach location
Tot-lot	1/5,000	8 (6)	8	0	-3	Central Dana Point location
Track/Jogging Course	1/20,000	2 (2)	3	+1	-1 -2	
Volleyball	1/5,000	8 (6)	11	+3	0	

** NOTE: FACILITY REQUIREMENT FOR THE 1990 POPULATION OF 31,896 IS SHOWN IN PARENTHESIS*

Received Aug-02-01 09:36am
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from CCITT G3 → LSA FAX THREE
page 6
P.06

SUPPORT FACILITIES

FACILITY	STANDARD	REQUIRED *	EXISTING	SURPLUS DEFICIT	ADJUSTED (D.POINT)	COMMENTS
BARBECUE (GROUP)	1/1,500	26 (21)				WILL CONSTRUCT IN NEW PARKS
CONCESSION STAND	N/A	N/A	2	N/A	0	
MAINTENANCE STRUCTURE	N/A	N/A	1	N/A	-1	
PICNIC SHELTERS	1/5,000	8 (6)	6	-2	-2	WILL CONSTRUCT IN NEW PARKS
PICNIC TABLES	1/1,000	39 (31)	74	+35		WILL INSTALL IN NEW PARKS
RESTROOMS	N/A	N/A	15	N/A		

* *NOTE:* *FACILITY REQUIREMENT FOR THE 1990 POPULATION OF 31,896 IS SHOWN IN PARENTHESIS*

LSA

LSA ASSOCIATES, INC.
ONE PARK PLAZA, SUITE 500
IRVINE, CALIFORNIA 92614

949.553.0666 TEL
949.553.8076 FAX

OTHER OFFICES: FT. COLLINS
BERKELEY RIVERSIDE
PT. RICHMOND ROCKLIN

July 24, 2001

Mr. Glen Kau
Principal Engineer
South Coast Water District
P.O. Box 30205
Laguna Niguel, CA 92607-0205

Subject: Proposed Headlands Development and Conservation Plan Project - Request to Assess Water Demand from Proposed Project

Dear Mr. Kau:

This letter is to inform you of the proposed Headlands Development and Conservation Plan in the City of Dana Point, and to request that your agency assess whether available water supplies will meet projected water demands associated with the proposed project. LSA Associates, Inc. (LSA) has been retained to prepare the Environmental Impact Report (EIR) for the proposed project. Please direct your response to LSA separate from any other response to questionnaire or Notice of Preparation that you may have received.

Pursuant to Sections 10910-10915 of the State Water Code, all affected water purveyors must be notified of the proposed project and asked whether water demand associated with the proposed project has been included and assessed in the water purveyors' "urban water management plans." According to Section 10910(f), water purveyors are given 30 days to provide a written response to this request. If a water purveyor fails to provide a response within 30 days, it shall be assumed, without a specific request for a time extension, that the water purveyor has no information to submit. Once LSA has received this information, it will be incorporated into the EIR.

Please consider this letter a formal request for your consideration in assessing the water demands of the proposed Headlands project. If possible, please respond by ***August 6, 2001***.

Please direct your written response to:

Mr. Rob Balen
LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, CA 92614
Fax: (949) 553-8076

7/24/01«P:\HLR130\Communication-faxes-memos\Water.wpd»

Please contact me or Andrea Zullo at (714) 553-0666 if you have any questions or require further information. Thank you for your cooperation.

Sincerely,

LSA ASSOCIATES, INC.

Rob Balen
Principal

cc: Ed Knight, Director of Community Development

OCTA

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JUL 26 2001

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Ex-Officio Member

July 23, 2001

Ms. Andrea Zullo
LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, CA 92614

Subject: Request for Public Transit Information for the Headlands Development and Conservation Plan EIR, City of Dana Point

Dear Ms. Zullo:

Thank you for contacting the Orange County Transportation Authority (OCTA) for information regarding public transit as it relates to the above referenced project. OCTA responses to the questionnaire are as follows:

1. What type of public transit services do you provide to the project site and adjacent areas?

   Public Bus Service

2. Please list the names and locations of the facilities/transit lines that would serve the project site, their capacity, and the level at which they are currently operating.

   - *Route 1 Long Beach to San Clemente via Pacific Coast Highway (PCH)*
   - *Route 85 Mission Viejo to Dana Point via Crown Valley Parkway/PCH*
   - *Bus stop on the northbound side of PCH and Street of the Ruby Lantern*
   - *Bus stop on the southbound side of PCH and Street of the Ruby Lantern*

3. Will the proposed project adversely impact the level of service you presently provide?

   No

4. Are there current plans for expansion of your facilities? If so, please provide the location, capacities, and completion dates. Identify any of these that may specifically serve the project site.

   There are no current plans for expansion of our facilities in the project area

5. Would the proposed project create a need for the expansion of public transit routes/facilities or the addition of staff? If so, give a brief description of anticipated needs and explain how the increase need for service is determined (i.e., buses/population ratios).

   There will be no need for expansion of public transit routes in the project area. However, if the entrance to the project site requires installation of a signal, a bus turnout is recommended south on OCH, farside of the intersection.

6. If an expansion is required to serve the proposed project, is revenue budgeted? If not, what methods will be used to secure capital revenue?

   Not applicable

7. What problems do you foresee in serving the proposed project? Identify any particular concerns.

   The proposed area is currently served along PCH. There are no concerns foreseen at this time.

8. If implementation of the proposed project results in a significant effect on the provision of transit services, what measures can you recommend for mitigating project impacts identified above?

   No significant impact is expected.

Prepared by: Christine Dolan
Title: Assistant Transportation Analyst
Date: July 23, 2001
Phone: 714-560-5751

Thank you for the opportunity to comment on this project. Please contact me at the number above with questions or comments.

Sincerely,

Christine Dolan

Christine Dolan
Assistant Transportation Analyst

ORANGE COUNTY FIRE AUTHORITY
P. O. Box 86, Orange, CA 92856-9086 • 180 South Water Street, Orange, CA 92866-2123
Chip Prather, Fire Chief (714) 289-3712 www.ocfa.org

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DEPARTMENT
Jul 16 12 29 PM '01

July 13, 2001

Mr. Edward M. Knight
City of Dana Point
33282 Golden Lantern.
Dana Point, CA 92629

Re: Dana Point Headlands

Dear Mr. Knight

Thank you for the opportunity to comment on the Dana Point Headlands Notice of Preparation for a draft EIR. The Orange County Fire Authority (OCFA) has considered the potential impacts associated with this proposal and would like to offer some preliminary comment.

The OCFA has identified that the proposed project may present significant impacts to existing fire and rescue services. Currently, the OCFA is responsible for provision of these services to the project area. To mitigate these impacts, the applicant may be required to enter into a secured fire protection agreement with the OCFA as a condition of development.

The project will be subject to standard conditions of development. flows for the proposed project will be determined at the time of plans submittal.

We look forward to continued participation in the environmental review process for this project. Should you have any additional questions at this time please contact me at (714)744-0484.

Sincerely.

Michael S. Rohde
Battalion Chief. Advance Planning

Orange County Public Library

1501 E. ST. ANDREW PLACE, SANTA ANA, CA 92705 (714) 566-3000

JOHN M. ADAMS
COUNTY LIBRARIAN

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August 13, 2001

Ms. Andrea Zullo, Environmental Analyst
LSA Associates, Inc.
One Park Plaza
Irvine, CA 92614

Dear Ms. Zullo;

The following is provided in response to your request for information regarding Headlands Development EIR for the City of Dana Point.

1. The Orange County Public Library (OCPL) provides the full range of contemporary public library services to the community, including loan of materials, reference assistance, children's and adult programming, and electronic database and internet access.
2. The Dana Point Branch Library, 33841 Niguel Road, an 11,600 square foot facility, currently serves the community and is open six days per week.
3. Discussions are underway with the City of Dana Point regarding a possible expansion of the library.
4. (See #1, above).
5. Service level for OCPL is based upon the population to be served. The addition of 125 residences will increase that population, and increase the overall demand for service at the facility.
6. The impact of the project will depend on the built-out population. Current OCPL standards require 0.2 square feet of library space per capita and 1.5 volumes per capita.
7. No revenues are currently budgeted for building expansion.
8. We do not identify any particular service delivery problems caused by this project.
9. The primary mitigation we would recommend would be provision of sufficient funds to add 1.5 volumes per capita to the library collection.

Sincerely,

John M. Adams
County Librarian

SOUTH COAST WATER DISTRICT

Providing Quality Water and Wastewater Services to the Coastal Communities

April 5, 2001

Mr. Edward Knight
Director of Community Development
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

RE: HEADLANDS PROJECT DRY SEASON RUNOFF

Dear Mr. Knight:

The District has had discussions with Kevin Darnall of Headlands Reserve LLC concerning its acceptance of dry season diversions from the Headlands into the sewer collection system. There is sufficient capacity available in both the sewer collection system and at the treatment plant. The District can accept an estimated 10,000 gallons per day of dry weather diversion from the Headlands. As you may be aware, the District recently made a similar accommodation for the Treasure Island project in Laguna Beach.

As you know, the District has been very proactive in addressing water quality issues. We look forward to cooperating with the City of Dana Point on these important matters.

Very truly yours,

SOUTH COAST WATER DISTRICT

Michael P. Dunbar
General Manager

MPD:rb

cc: Mr. Kevin Darnall, Headlands Reserve LLC

Mailing Address: P.O. Box 30205, Laguna Niguel, CA 92607-0205
Street Address: 31592 West Street, Laguna Beach, CA 92651
Fax: (949) 499-4256 Phone: (949) 499-4555

APPENDIX J

COASTAL PROCESSES ASSESSMENT AND RELATED DOCUMENTS

Coastal Processes Assessment
For
Headlands Development And Conservation Plan

Prepared for:

LSA Associates, Inc.
One Park Plaza, Suite 500
Irvine, CA 92614

Prepared by:

Noble Consultants Inc.
2201 Dupont Drive, Suite 620
Irvine, CA 92612

September 2001

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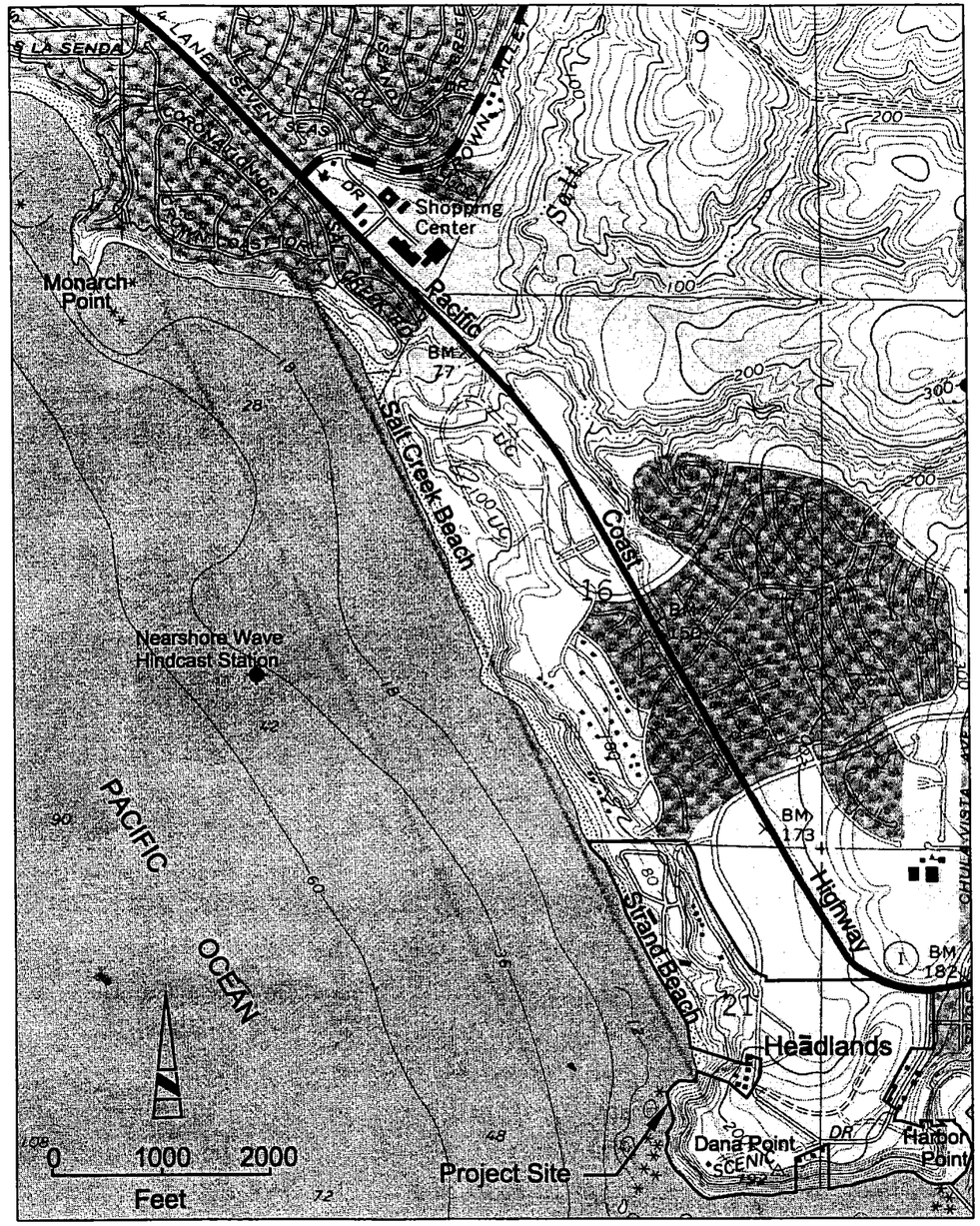
1.0 INTRODUCTION

The property is located within the west-center portion of the City of Dana Point, see **Figure 1**. The project site, encompassing 121.3 acres, consists of four distinct landforms: 1) the coastal bluffs associated with the "Headlands" portion of the property, 2) the two geographic points-Dana Point and Harbor Point, 3) the white sandy Strand Beach, and, 4) the hilltop near Pacific Coast Highway. The white sandy Strand Beach area from the slope toe seaward to the Mean High Tide (MHT) is currently privately owned.

The terrace area above the Strand Beach formerly was developed as a 90-lot mobile home park, with attendant facilities and amenities, such as tennis courts, community recreation centers, a gate guard house, private beach access ramp, cabana buildings, garages etc. All structures associated with the mobile home park, including the buildings, fencing, storm drain systems and outlets, septic systems, streets and pavement, waterlines, and utility facilities including electrical transformers remain in place but are in a dilapidated condition. These structures and the supporting, graded terraces where they are constructed are currently protected by an existing 2,240-foot riprap revetment against coastal erosion and storm attack.

The proposed project establishes a combination of recreation and conservation open space, visitor/recreation commercial areas, and residential land uses. The project includes 62 acres of parks and open space, with five public parks, five visitor recreation public facilities, an integrated public trail system, and coastal beach access facilities. The Strand Beach will be dedicated to the County of Orange as a public park and designated as recreational open space.

This coastal engineering assessment report describes the environmental setting and evaluates the impacts of the proposed project to the coastal processes. The site contains approximately 1.25 miles of ocean frontage. Approximately seventy percent of the proposed land uses adjacent to the beach, ocean and Dana Point Harbor are designated as recreation and conservation open space. Except for public coastal access paths and amenities no development or any site modification is proposed in these open space areas. The coastal process assessment presented in this report focuses primarily on Strand Beach, a portion of the overall project boundary.



PROJECT SITE

Source: USGS Quadrangle Map

NOBLE CONSULTANTS, INC.

Figure 1

2.0 OCEANOGRAPHY/COASTAL PROCESSES

2.1 Water Levels

Variations in water levels along the southern California shoreline are due principally to astronomical tides, storm surge driven by spatial variation in barometric pressure and wind, wave setup occurring where wave energy is dissipated as surf, and inter-annual large scale oscillations in the water circulation and ocean temperature distribution.

Tides within the Orange County coastal water area are of the mixed semi-diurnal type. Typically, a lunar day (about 24 hours) consists of two high and two low tides, each of different magnitude. The lower-low normally follows the higher-high by seven to eight hours, the next higher-high (after the lower-high and higher-low waters) follows in about 17 hours. The project site tide characteristics are referenced to the Newport Bay tide gauge as shown in **Table 1**. It should be noted that within the open water of southern California, the highest water level of +7.94 feet, MLLW was recorded at Scripps Pier on November 17, 1997.

Storm surge is relatively small (less than 1 foot) along the Southern California Coast when compared with the astronomical tidal fluctuations. For example, the winter storm of January 17 and 18, 1988, which produced the all-time record low barometer pressure generated a water level anomaly only 0.7 feet above predicted astronomical levels, as measured at the Los Angeles Harbor gage (National Ocean Service, 1988). Excluding the effects of waves, storm surges rarely exceed three feet in amplitude, with average heights below one foot for two to six days (Corps of Engineers, 1993). Wave setups, caused by breaking waves that elevate water surface, vary along the beach profile from a minimum near the wave breaker location to a maximum of a few feet at the shoreline.

2.2 Sea Level Rise

The ocean level has never remained constant over geologic time, but has risen and fallen relative to the land surface. Along the Southern California coast, average sea level rise is approximately six to eight inches per century. A review of yearly Mean Sea Level (MSL) data recorded at San Diego indicates that a rise of eight inches per century has occurred. Positive departures from the annual mean occur during strong El Nino episodes. The added probability of experiencing more severe winter storms during El Nino periods increases the likelihood of coincident storm waves and higher storm surge. The record water level of 8.35 ft, MLLW,

observed at San Diego in January 1983 includes an estimated 0.7 ft of surge and seasonal sea level rise (Flick and Cayan, 1984).

Table 1 Tidal Characteristics at Newport Bay Entrance

Datum or Level	Elevation	
	(ft, MLLW)	(ft, NGVD)
Highest Measures Water Level (28 Jan 1983)	7.86	5.14
Mean Higher High Water (MHHW)	5.40	2.68
Mean High Water (MHW)	4.65	1.93
Mean Tide Level (MTL)	2.79	0.07
Mean Sea Level (MSL)	2.76	0.04
Mean Low Water (MLW)	0.93	-1.79
Mean Lower Low Water (MLLW)	0.00	-2.72
Lowest Measured Water Level (20 Jan 1988)	-2.16	-4.88
National Geodetic Vertical Datum- 1929 (NGVD)	2.72	0.00
North America Vertical Datum- 1988 (NAVD88)	0.42	-2.30

Source: Corps of Engineers, 1995a

2.3 Currents

Based on limited current measurement data collected at Huntington Beach, Newport Beach, and San Clemente nearshore coastal areas, the cross-shore currents are generally slower than those in the alongshore direction. The maximum measured current speeds for onshore and offshore flows were less than one knot (1.69 ft/sec), while the maximum alongshore current speeds were measured at approximately 1.3 knots (2.2 ft/sec) (Corps of Engineers, 1993).

2.4 Wave Climate

2.4.1 Meteorological Patterns

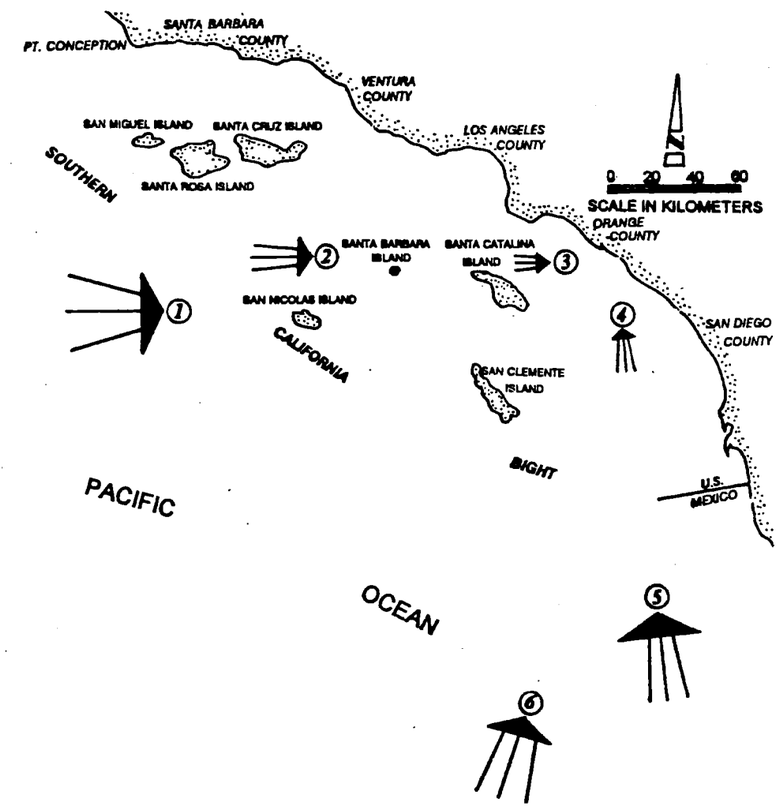
Wind waves and swells within the Strand coast area are produced primarily by six basic meteorological patterns: extratropical storm swells in the northern hemisphere (north or northwest swell); wind swells generated by northwest winds in the outer coastal waters (wind

swell); westerly (west sea) and southeasterly (southeast sea) local seas; storm swells of tropical storms or hurricanes off the Mexican coast; and southerly swells originating in the southern hemisphere (southerly swell). **Figure 2** illustrates these identified weather patterns and generated wave propagating directions.

Extratropical Cyclone of the Northern Hemisphere (North or Northwest Swell): Low pressure centers which develop along the polar front are the source of the predominant wave action along the entire coast during the winter half of the year. Storm swell is generated at some distance from the Strand Beach coastline in the North Pacific. Most commonly these storms will traverse the mid-Pacific before turning northeastward toward the Gulf of Alaska with swell decaying on the average of 1,500 miles to the coast of Southern California. However, under some meteorological conditions, storms can move in much closer to the coast; and on rare occasion these storms may move directly across Southern California, following either a northeast, east or southeast trajectory.

In general, the modal deep water approach direction of these waves to Southern California is between 275° and 285°. However, these North Pacific low pressure systems exhibit great variations from year to year such that wave approach directions and amplitudes will show a corresponding degree of variation. Years when the storm centers follow a more northerly route in the eastern Pacific will result in extremely quiet conditions at Strand Beach, whereas more southerly storm tracks through the mid and/or eastern Pacific will result in frequent periods of high wave conditions.

Northwest Winds in the Outer Coastal Waters (Wind Swell): Annually, the predominant wave action along the Strand Beach coast is due to the prevailing northwest winds north and west of the Southern California Coastal Waters. This is particularly true during the spring and summer months. Wave heights are usually low, less than 3 feet; but on occasion, with superposition of a strong surface high and an upper level trough, the north westerlies increase, becoming strong from about Point Sal to San Nicolas Island. The wave height is defined as the vertical height between the trough and the crest within a wave cycle. The inner waters of Southern California often remain unaffected under the influence of the Catalina eddy circulation. Waves traveling at a variance to the mean wind direction reach Strand Beach with periods on the order of 6 to 10 seconds. Moderate northwesters will produce breaker heights of 4 to 6 feet, while strong events can generate 6 to 9 foot waves along the shoreline.



○ **Approx. Locations of Deep Water Wave Hindcast**

Notes:

1. ***Extratropical Cyclones of the Northern Hemisphere***
2. ***Northwest Winds in the Outer Coastal Waters***
3. ***West to Northwest Local Sea***
4. ***Pre-Frontal Local Sea***
5. ***Tropical Storm Swell***
6. ***Extratropical Cyclones of the Southern Hemisphere***

Source: Corps of Engineers, 1996a

METEOROLOGICAL PATTERNS

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Figure 2

West to Northwest Local Sea (West Sea): Westerly winds can be divided into two types: 1) temperature-induced sea breezes, and 2) gradient winds. The former exhibits a pronounced seasonal and diurnal variation. The strongest sea breezes occur during the late spring and summer months, while the lightest winds are during December and January. The summer sea breeze usually sets in during the late morning and peaks in the mid-afternoon. In winter months, sea breeze conditions are limited to a few hours during early afternoon with wind speed on the order of 10 knots. The summer sea breezes, on the other hand, will average about 15 knots and occasionally reach 20 knots or more.

Gradient winds are confined largely to the months of November through May with the peak in March and early April. They typically occur following a frontal passage or with the development of a cold low pressure area over the southwestern United States. The latter produces the strongest winds with duration of up to three days. Under such conditions, locally generated wind waves combine with components of the northwest swell generated off the California coast.

Pre-Frontal Local Sea (Southeast Sea): The Strand coastline may be vulnerable under storm conditions prior to frontal passage winds blowing strongly from the southeast to southwest along the coast, but turning toward the south-southeast to south a short distance offshore. Wind waves, with peak energy averaging between 6 and 8 seconds, reach shore with minimal loss due to island sheltering or refraction. Significant wave heights are generally in the range of 4 to 8 feet. The significant wave height is defined as the average height of the one-third highest waves within a wave train. Extreme wave heights are rare, because the fetch and often the duration of these wind waves are short. The fetch is defined as a region in which the wind speed and direction are reasonably constant.

Tropical Storm Swell: Tropical cyclones form regularly along the intertropical convergence zone west of Mexico from early July to early October. On the average, about 15 to 20 hurricanes are to be expected each year, and most take a westerly track. Swells generated by these storms will have little or no effect on Southern California, however; those that take a northwest track thereby lengthen the effective fetch over which swells traveling toward Southern California can be generated resulting in larger waves at Strand Beach.

Extratropical Cyclone of the Southern Hemisphere (Southerly Swell): From the months of April through October, and to a lesser extent the remainder of the year, large South Pacific storm

systems traversing the ocean between south latitude 40° and 60° from Australia to South America send swells northward to the west coast of Central and North America. Great circle approach directions to Southern California range from about 215° for storms near New Zealand to 170° for South American storm systems. The decay distance ranges from about 4,500 to 7,000 miles. Wave heights in deep water are usually low, on the order of one to three feet. However, since these waves are nearly monochromatic, their capacity for shoaling that increases the wave heights is enhanced. Nevertheless, since this wave pattern occurs mostly during the summer months when Strand Beach is the widest, its potential storm damage impact is in general insignificant.

2.4.2 Deepwater Wave Characteristics

Numerous storms have impacted the Southern California Coast in the past. These storms are mainly extratropical winter events that, when combined with spring high tides, can cause severe beach erosion and structure damages. For example, the sequential El Nino extreme storms occurring in January 25th, February 11th and March 1st of 1983 (Corps of Engineers, 1996a) damaged the existing revetment along Strand Beach, and resulted in subsequent repairs. Another El Nino storm coincident with extreme high tides destroyed one outer section of the Huntington Pier on January 18 1998. **Table 2** presents 30 severe extratropical storm wave characteristics hindcasted from past storms in the offshore deep-water area between 1931 and 1994 (Corps of Engineers, 1996a). It should be noted there were no severe extratropical storms between 1931 and 1937. The tropical storms, which possess different meteorological characteristics, are also hindcasted and tabulated in **Table 3.**

2.4.3 Nearshore Water Wave Characteristics

Deep water waves that can enter within the Strand Beach nearshore coastal area are altered by offshore island sheltering refraction, diffraction, and shoaling effects as they propagate toward shoreline. Transformation of deep ocean waves to the nearshore water area near the project site can be performed using a spectral back-refraction model (O'Reilly and Goza, 1991). The numerical model accounts for island blocking, wave refraction and wave shoaling.

Nearshore storm wave characteristics within the project coastal area were calculated in the Coast of California Storm and Tidal Wave Study (Corps of Engineers, 1996a). The selected

Table 2 Deep Water Extratropical Extreme Storm Events

Date of Storm	Wave Height (ft)	Wave Period (sec)	Azimuth (deg)
Dec. 11, 1937	17.6	16 - 17	261
Mar. 1, 1938	16.6	15 - 16	276
Jan. 5, 1939	25.9	18 - 19	288
Jan. 23, 1940	14.2	15 - 16	270
Dec. 23 1940	24.2	17 - 18	274
Jan. 22 1943	23.3	13 - 14	160
Jan. 4 1953	16.5	17 - 18	275
Nov. 12 1953	18.8	16 - 17	277
Jan. 26, 1958	18.1	13 - 14	282
Feb. 2 1958	24.0	11 - 13	254
Apr. 2 1958	25.1	16 - 17	295
Feb. 9 1963	22.4	15 - 17	270
Dec. 4 1969	16.2	21 - 22	276
Jan. 15 1978	18.6	16 - 17	284
Dec. 29,1979	13.7	17 - 18	277
Feb. 16, 1980	15.6	14 - 15	250
Jan. 20, 1981	15.4	16 - 17	265
Jan. 28, 1981	22.5	15 - 17	265
Nov. 30, 1982	19.5	14 - 15	290
Jan. 25, 1983	20.6	19 - 21	285
Feb. 11, 1983	18.7	16 - 17	278
Mar. 1, 1983	33.5	15 -18	271
Dec. 1, 1985	20.3	18 - 19	271
Jan. 31, 1986	23.9	17 - 20	276
Feb. 14, 1986	24.1	16 - 18	273
Dec. 16, 1987	17.0	12 - 13	160
Jan. 17, 1988	33.1	16 - 17	269
Jan. 12, 1993	15.6	13 - 14	260
Jan. 17, 1993	11.5	11 - 12	265
Feb. 7, 1994	13.6	10 - 11	180

Source: Corps of Engineers, 1996a

Table 3 Deep Water Tropical Extreme Storm Events

Name of Storm	Date of Storm	Wave Height (ft)	Wave period (sec)	Azimuth (deg)
Joanne	Aug. 26, 1968	6.0	10.5	195
Doreen	Aug. 6, 1969	11.0	11.5	153
Norma	Sept. 4, 1970	5.8	9.5	155
Monica	Sept. 1, 1971	7.1	9.5	166
Estelle	Aug. 18, 1972	7.7	8.5	178
Fernanda	Aug. 22, 1972	7.4	12.5	160
Gwen	Aug. 28, 1972	11.4	14.5	160
Hyacinth	Sept. 3, 1972	7.9	10.5	194
Emily	July 25, 1973	8.6	11.5	156
Francesca	July 18, 1974	5.6	9.5	159
Carlotta	July 4, 1975	7.2	11.5	153
Hyacinth	Aug. 9, 1976	6.1	11.5	153
Heather	Oct. 5, 1977	5.5	8.5	153
Hector	Aug. 25, 1978	7.9	12.5	156
Norman	Sept. 3, 1978	8.7	12.5	155
Dolores	July 20, 1979	7.0	10.5	167
Howard	Aug. 3, 1980	6.2	9.5	167
Beatriz	July 2, 1981	6.6	10.5	167
Olivia	Sept. 22, 1982	10.8	12.5	158
Manuel	Sept. 17, 1983	5.7	11.5	158
Iselle	Aug. 8, 1984	9.3	12.5	161
Marie	Sept. 8, 1984	8.1	11.5	155
Olat	Aug. 26, 1985	6.9	10.5	160
Javier	Aug. 25, 1986	7.9	11.5	153

Source: Corps of Engineers, 1996a

nearshore station (33°28'21"N, 117°43'37.3"W) shown on **Figure 1** is located at a depth of 39.2 feet, MLLW. The computed nearshore wave heights, periods and approach directions for the hindcasted 30 extratropical storms and 24 tropical storm swells are presented in **Tables 4** and **5**, respectively. Nearshore extreme storm return intervals were also estimated by approximating the selected storm wave characteristics to a probability distribution curve (Corps of Engineers, 1996a). **Table 6** tabulates the 5, 10, 25, 50, and 100 -year return wave heights for the extratropical and tropical storms, respectively.

2.5 Tsunamis

Tsunamis are long period waves caused by an underwater disturbance such as volcanic eruptions or earthquakes. Tsunamis cross the deep ocean as very long waves of low amplitude. A wavelength in excess of 100 miles and amplitude of 3 feet or more is possible. The tsunamis waves can be significantly amplified by shoaling, diffraction, refraction, convergence, and resonance when they reach coastal areas.

No tsunami has ever significantly affected the Orange County Coast. It is believed that local earthquake events will not produce underwater disturbances capable of generating tsunamis within this coastal region. Although historically tsunamis were originated from coasts of Chile and Alaska, the propagation impacts to Orange County have been negligible. Therefore, the threat of coastal flooding resulting from tsunamis along the Strand Beach area is considered low (Corps of Engineers, 1993).

2.6 Coastal Processes

The proposed project site lies within the Laguna Beach Mini Littoral Cells which extends from the Newport Harbor Entrance to Dana Point. In general, the shoreline reach between Newport Bay and Dana Point is the seaward extension of the San Joaquin Hills, which consists of a rugged coast that contains a series of small pocket beaches. These pocket beaches are bounded by headlands of varying length which extend below sea level and act as partial or complete barriers to the alongshore sediment movement into or out of the pocket beaches. The project site is located within a shoreline reach bounded by Monarch Point to the northwest and Dana Point to the southeast. This coastal reach encompasses both Salt Creek Beach and Strand Beach as previously noted in **Figure 1**.

Table 4 Nearshore Wave Characteristics For Extreme Extratropical Storm Swells

Date of Storm	Peak of Storm		Wave Height (ft)	Wave Period (sec)	Azimuth (deg)
	Date	Time			
Dec. 11, 1937	Dec. 12, 1937	4	9.1	12.5	239.5
Mar. 1, 1938	Mar. 2, 1938	19	10.2	11.5	214.5
Jan. 5, 1939	Jan. 6, 1939	7	9.2	17.5	249.5
Jan. 23, 1940	Jan. 23, 1940	22	7.0	17.5	249.5
Dec. 23, 1940	Dec. 25, 1940	10	10.5	17.5	249.5
Jan. 22, 1943	Jan. 23, 1943	22	14.7	14.5	209.5
Jan. 4, 1953	Jan. 7, 1953	16	5.0	16.5	250.5
Nov. 12, 1953	Nov. 14, 1953	22	8.0	15.5	251.5
Jan. 26, 1958	Jan. 26, 1958	22	9.4	12.5	239.5
Feb. 2, 1958	Feb. 4, 1958	16	15.4	12.5	205.5
Apr. 2, 1958	Apr. 4, 1958	19	10.6	17.5	249.5
Feb. 9, 1963	Feb. 10, 1963	13	12.3	15.5	251.5
Dec. 4, 1969	Dec. 6, 1969	19	5.4	19.5	246.5
Jan. 15, 1978	Jan. 15, 1978	22	8.8	16.5	250.5
Dec. 29, 1979	Dec. 31, 1979	1	6.8	16.5	250.5
Feb. 16, 1980	Feb. 16, 1980	22	11.4	10.5	220.5
Jan. 20, 1981	Jan. 22, 1981	10	6.2	17.5	249.5
Jan. 28, 1981	Jan. 28, 1981	16	11.6	15.5	251.5
Nov. 30, 1982	Nov. 30, 1982	13	8.8	10.5	242.5
Jan. 25, 1983	Jan. 27, 1983	10	6.9	19.5	246.5
Feb. 11, 1983	Feb. 13, 1983	10	7.8	16.5	250.5
Mar. 1, 1983	Mar. 2, 1983	1	21.2	15.5	223.5
Dec. 1, 1985	Dec. 3, 1985	4	9.0	18.5	237.5
Jan. 31, 1986	Feb. 1, 1986	7	9.7	18.5	247.5
Feb. 14, 1986	Feb. 15, 1986	22	12.1	16.5	238.5
Dec. 16, 1987	Dec. 16, 1987	13	10.0	12.5	205.5
Jan. 17, 1988	Jan. 17, 1988	22	21.5	15.5	251.5
Jan. 12, 1993	Jan. 13, 1993	22	9.5	13.5	239.5
Jan. 17, 1993	Jan. 18, 1993	7	6.3	12.5	240.5
Feb. 7, 1994	Feb. 7, 1994	13	9.1	11.5	214.5

Notes: All times listed are Pacific Standard Time (PST).
Nearshore station at 33° 28' 21" N, 117° 43' 37.3"W
Source: Corps of Engineers, 1996a

Table 5 Nearshore Wave Characteristics For Extreme Tropical Storm Swells

Date of Storm	Peak of Storm		Wave Height (ft)	Wave Period (sec)	Azimuth (deg)
	Date	Time			
Aug. 26, 1968	Aug. 28, 1968	19	5.7	10.5	215.5
Aug. 6, 1969	Aug. 9, 1969	1	2.8	11.5	199.5
Sept. 4, 1970	Sept. 6, 1970	4	2.4	9.5	196.5
Sept. 1, 1971	Sept. 4, 1971	7	5.0	9.5	198.5
Aug. 18, 1972	Aug. 21, 1972	19	6.2	8.5	199.5
Aug. 22, 1972	Aug. 24, 1972	22	2.9	12.5	201.5
Aug. 28, 1972	Aug. 29, 1972	16	1.6	14.5	204.5
Sept. 3, 1972	Sept. 5, 1972	7	7.5	10.5	216.5
July 25, 1973	July 27, 1973	16	3.6	11.5	200.5
July 18, 1974	July 20, 1974	19	3.0	9.5	196.5
July 4, 1975	July 7, 1975	4	2.0	11.5	200.5
Aug. 9, 1976	Aug. 12, 1976	1	1.6	11.5	199.5
Oct. 5, 1977	Oct. 8, 1977	10	1.8	8.5	192.5
July 25, 1978	July 27, 1978	13	1.3	12.5	201.5
Sept. 3, 1978	Sept. 5, 1978	1	1.6	12.5	201.5
July 20, 1979	July 23, 1979	4	6.4	10.5	202.5
Aug. 3, 1980	Aug. 7, 1980	1	4.6	9.5	198.5
July 2, 1981	July 5, 1981	1	4.9	10.5	200.5
Sept. 22, 1982	Sept. 25, 1982	1	5.6	12.5	202.5
Sept. 17, 1983	Sept. 19, 1983	10	3.4	11.5	200.5
Aug. 8, 1984	Aug. 11, 1984	4	5.3	12.5	202.5
Sept. 8, 1984	Sept. 10, 1984	4	4.5	12.5	202.5
Aug. 26, 1985	Aug. 29, 1985	4	3.9	10.5	199.5
Aug. 25, 1986	Aug. 27, 1986	22	4.2	11.5	200.5

Notes: All times listed are Pacific Standard Time (PST).
Nearshore Station at 33°28'21" N, 117°43'37.3" W
Source: Corps of Engineers, 1996a

Table 6 Estimated Extreme Return Wave Heights

Return Probability	Extratropical Storms (ft)	Tropical Storms (ft)
5-yr	9.9	6.1
10-yr	12.6	7.2
25-yr	16.1	8.7
50-yr	18.6	9.7
100-yr	21.1	10.7

Note: At nearshore station 33°28'21" N, 117°43'37.3" W
Source: Corps of Engineers, 1996a

The shoreline within the project site experiences seasonal changes in beach width as winter sand profiles are typically more depleted than summer profiles. In general, sands are carried offshore beyond the surf zone in the winter starting in December and stored in a bar formation. During the summer months beginning in June, the beach widens and reforms as sands from the offshore bar return. This phenomenon is the consequence of seasonal wave climate. The offshore sand movements are induced by the stormy high waves in the winter, while the reverse trend results from the low longer-period swells commonly observed in the summer months. The beach profiles surveyed in April 1986 (winter profile) and September 1987 (summer profile) on Strand Beach demonstrate the above-stated seasonal variation in beach width (EIP, 1999).

It is believed that the sediment supply to the Laguna Beach mini littoral cells is mostly limited to contributions from cliff erosion within the littoral cells and episodic delivery of sediment from the streams and creeks that discharge along the coastal reaches. The Salt Creek with its discharge point located northwest of the Salt Creek Beach delivers fluvial sediment episodically in response to sustained periods of winter rainfall.

Alongshore sediment transport is almost unidirectional from northwest to southeast in response to the prevailing westerly wave climate within the Orange County coastal area. The net littoral transport rate within the Laguna Beach mini littoral cells is not definitely determined as the pocket beaches are separated from one another by the headland reefs. In general, the pocket beaches within the littoral cell are considered to be mostly isolated from neighboring pocket beaches with the majority of beach sands confined within each individual pocket beach. A comprehensive tracer study (Corps of Engineers, 1995b) within the Crescent Bay pocket beach

showed that the tracer sands placed on the beach were widely dispersed and confined within the nearshore zone of Crescent Bay, and no tracer sand was found at adjacent coves.

Shoreline Changes

Strand Beach has been relatively stable during the past 50 years (Corps of Engineers, 1997). Within the Laguna Beach pocket beaches, it was identified (County of Orange, 1985) that the shoreline seasonally fluctuates in an alongshore direction, typically with an advance along the southeast reach due to west or northwest swell in winter months. The shift in the opposite direction occurs in the summer months during which the prevailing southerly swell moving sediment toward northwest. Due to the Dana Point blocking effect on the southerly swell, the southeast end of Strand Beach is always wider than the northwest end.

Slope and Bluff Erosion

The project site contains terraced slopes on Strand Beach and coastal bluffs at Dana Point. The coastal bluffs create the landform commonly referred to as the Headlands, and range in height from 140 to 215 feet. Adjacent to the coastal bluffs lie rocky outcrops extending into the intertidal zone. The coastal bluffs are primarily composed of San Onofre Breccia that is highly resistant to erosion. In contrast, the gentle terraced slopes at Strand Beach, consisting of Monterey formation topped with Terrace deposits, are more susceptible to erosion.

The long-term mean bluff and slope retreat rate over a geologic time (8,000 years before present to the present time) from Monarch Point to Dana Point was estimated at 0.19 foot per year (Corps of Engineers, 1995c). Based upon this mean erosion rate, the cliff sediment contribution, primarily from terrace deposits, between Monarch Point and Dana Point was approximated to be 1,800 cubic yards per year (Corps of Engineers, 1997). However, studies of bluff erosion for the San Onofre Breccia formation similar to the Headlands within the Laguna Beach mini littoral cells indicate that the retreat rate, ranging from 0.003 to 0.1 foot per year, is considerably slower than the estimated average value of 0.19 foot per year (AGRA, 2001). Additionally, slope erosion along Strand Beach resulting from wave attack has been reduced because of the existing revetment that was constructed in the 1950s. Therefore, the overall sediment contribution from Monarch Point to Dana Point is expected to be smaller than the estimated average value of 1,800 cubic yards per year.

Fluvial Contribution

The Salt Creek watershed, with a channel slope ranging from 0.1 percent in the upstream area to 0.02 percent in the downstream reach, encompasses 9 square miles of hilly coastal terrain and extends nearly 5 miles inland. Sediment yield is estimated to be 900 to 1,200 cubic yards per year (Corps of Engineers, 1996a).

Drainage Sediment Yield

The existing, project area watershed includes approximately 27 acres of off-site, developed property adjacent to the project site. When added to the 121-acre project site, the total drainage area consists of approximately 148 acres. The project area watershed can be divided into nine separate drainage basins, as illustrated in **Figure 3**.

Each existing drainage basin can be classified according to watershed type, and contains developed and undeveloped terraces, that result in varying sediment yields as depicted in **Table 7**. These findings result in an estimated 20.4 cubic yards/year of sediment yield for the existing area watershed (TKC, 2001a). It should be noted that runoff flows within Basin A are drained to Dana Point Harbor. Thus, only 16.4 cubic yards per year of sediment yield are contributed to Strand Beach.

The Keith Companies, 2001a study was based on average sediment yields that were estimated for the Laguna Beach drainage watersheds (City of Laguna Beach, 1988; and Corps of Engineers, 1993). The estimated sediment yield rates within the Laguna Beach terraces are 100 cubic yards/square mile/year for undeveloped terrace, and 60 cubic yards/square mile/year for developed terrace. These estimates were empirically computed from the entrapment rates measured in debris basins and reservoirs of small streams and terrace watersheds. Thus, the sediment delivery from the existing project drainage basin is insignificant when compared to the annual estimated sediment contribution of about 1,800 cubic yards from erosion (see Slope and Bluff Erosion section).

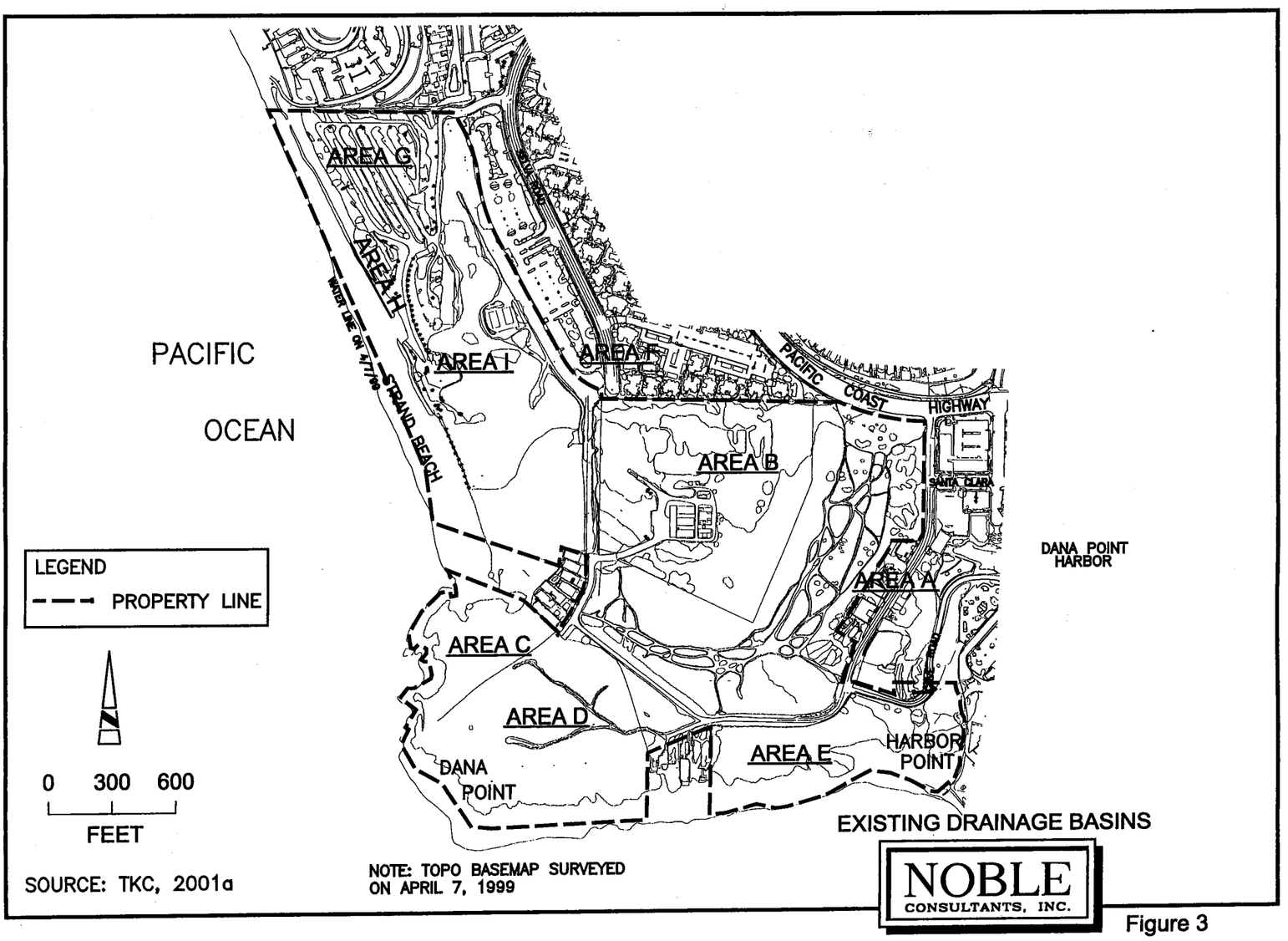

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EXISTING DRAINAGE BASINS
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Figure 3

Table 7 Estimated Drainage Sediment Yield under Existing Condition

Drainage Basin	Area		Watershed Type	Sediment Yield
	(Acres)	(Sq. Mi.)		(cy/yr)
A	12.42	0.0194	Developed Terrace	1.2
	18.15	0.0284	Undeveloped Terrace	2.8
B	2.97	0.0046	Developed Terrace	0.3
	33.89	0.0530	Undeveloped Terrace	5.3
C	1.07	0.0017	Developed Terrace	0.1
	9.54	0.0149	Undeveloped Terrace	1.5
D	0.47	0.0007	Developed Terrace	0.0
	18.19	0.0284	Undeveloped Terrace	2.8
E	1.14	0.0018	Developed Terrace	0.1
	10.03	0.0157	Undeveloped Terrace	1.6
F	13.11	0.0205	Developed Terrace	1.2
	5.97	0.0093	Undeveloped Terrace	0.9
G	6.96	0.0109	Developed Terrace	0.7
	1.12	0.0018	Undeveloped Terrace	0.2
H	0.97	0.0015	Developed Terrace	0.1
	1.27	0.0020	Undeveloped Terrace	0.2
I	3.05	0.0048	Developed Terrace	0.3
	7.28	0.0114	Undeveloped Terrace	1.1
Total	147.6	0.2306		20.4

Source: TKC, 2001a

Sediment Budget

Within the shoreline reach bounded by Dana Point and Monarch Point, a mini-littoral cell containing sediment sources, transport paths and sediment sinks can be defined. The sediment budget can then be quantified by examining each littoral component within the cell.

Although Dana Point, acting as a partial barrier, would block most of the alongshore sediment transport down to the Dana Point Harbor, sediment bypassing Dana Point is still evident. A shoal, consistently observed inside the Dana Point Harbor along the west breakwater, results from sediment being transported around the Headlands, seeping through the placed rocks, and depositing along the harbor side of the breakwater. The average sediment deposition rate was estimated to range from 15,000 to 17,200 cubic yards per year (Corps of Engineers, 1996b &1997). This estimate was based upon the shoaling rate along the harbor side of the west

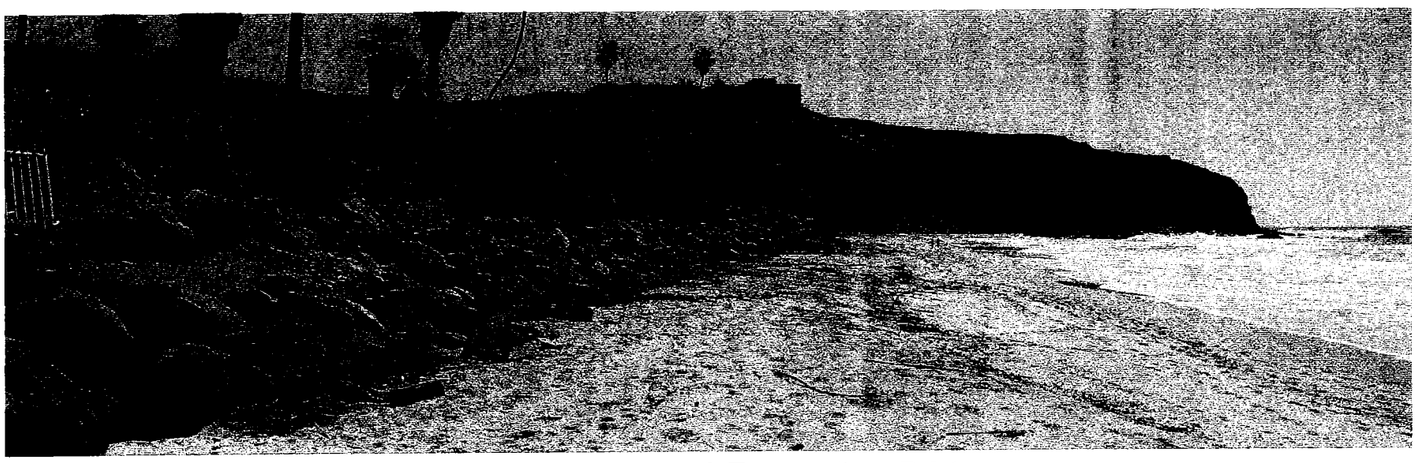
breakwater and a comparison of the 1965 and 1988 surveys within both sides of the breakwater. Since the subject beaches within this coastal reach are relatively stable, the net alongshore littoral transport toward Dana Point Harbor would be between 15,000 and 17,200 cubic yards annually. In addition to the sediment contribution from the bluff and slope erosion and fluvial supply from the Salt Creek, the estimated net downcoast sediment transported from Three Arch Bay is on the order of 15,000 cubic yards per year (Corps of Engineers, 1997). This would account for the required volume of littoral sediment that is transported downcoast and around the Dana Point.

3.0 PROJECT IMPACT ASSESSMENT

3.1 Existing Coastal Structures

The existing coastal structures within the Strand Beach area include five storm drainage outlets, a private access ramp, and a riprap revetment that runs approximately 2,240 feet. **Figure 4** shows the location of the drainage outlets, the access ramp, and the approximate footprint of the revetment, while **Exhibits 1** to **4** illustrate several site photographs that were taken on March 14, 2000 and May 15, 2001, respectively. The drainage outlets, typically sized between 12 to 18 inches in diameter with the exception of a 42-inch pipe and not equipped with any energy dissipators, were constructed in the 1950's. The asphalt/concrete access ramp is located in the approximate center of Strand Beach. The ramp landing runs parallel to Strand Beach and includes a 26-foot offset that separates the structural revetment system (see **Figure 4**). In addition, an off-site, coastal access path, located adjacent to and immediately north of the project site, provides beach access to Salt Creek Beach and Strand Beach. The path also provides a transition to the adjacent Niguel Shores revetment system.

The project site revetment structure extends from the northern property line to the southern end of Strand Beach, an approximate distance of 2,240 feet. The most southerly 140-foot revetment segment is almost entirely buried in beach sand. The revetment structure is founded on bedrock at an approximate elevation of +0 feet, NGVD (approximately at the Mean Sea Level) and rises 14 to 16 feet above the sand. The amount of revetment visible above the sand varies seasonally. The revetment structure varies in height, front slope, and rock size. A recent site inspection indicates that the under-engineered riprap structure was not designed under current

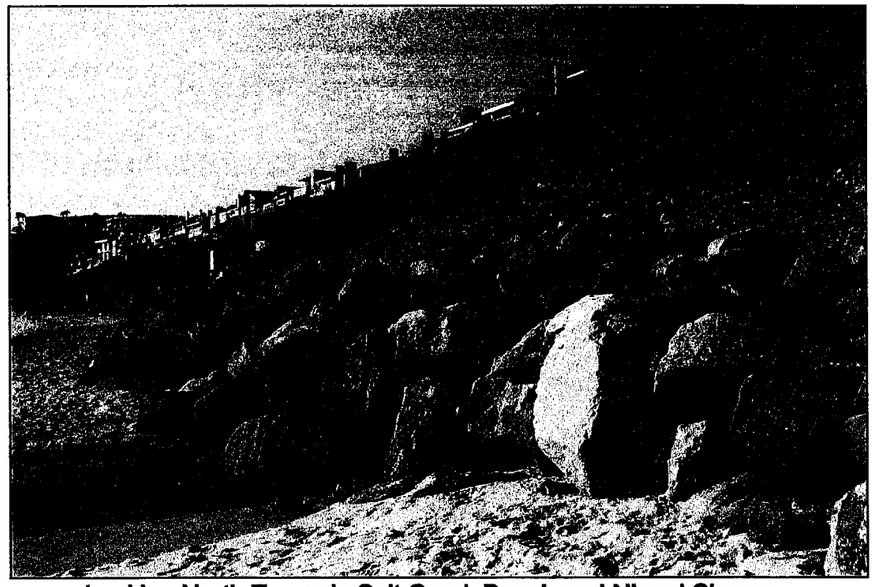


Looking South Towards Dana Point

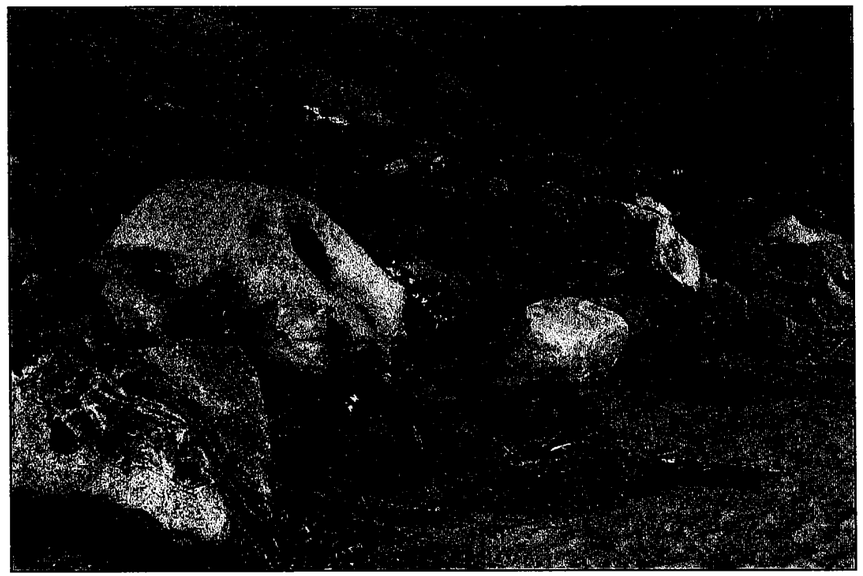
Note: Photo taken on March 14, 2000

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Exhibit 1

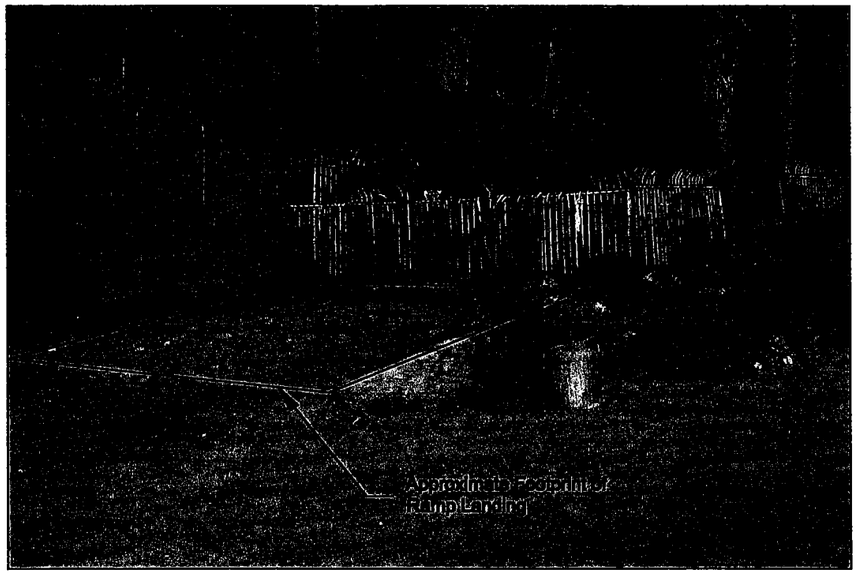


Looking North Towards Salt Creek Beach and Niguel Shores



Storm Drain Outlet At North Strand Beach

Note: Photos taken on May 15, 2001



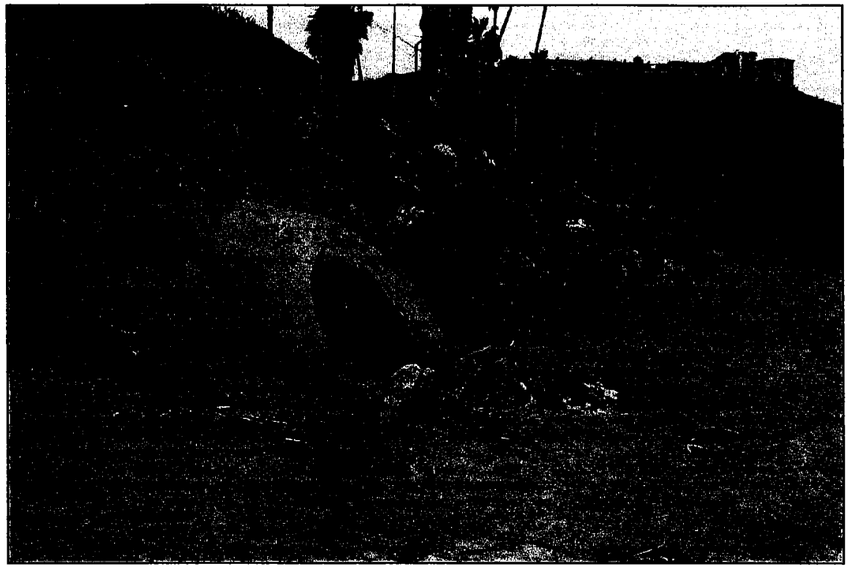
Private Access Ramp And Landing



Revetment And Fencing Adjacent To The Private Access Ramp

Note: Photos taken on May 15, 2001

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Storm Drain Outlet Just South Of The Private Access Ramp



Revetment at South Strand Beach

Note: Photos taken on May 15, 2001

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engineering standards that are based on the most updated nearshore wave climate and a design cross section comprised of various layers of bed material and armor stones.

3.2 Proposed Coastal Structures

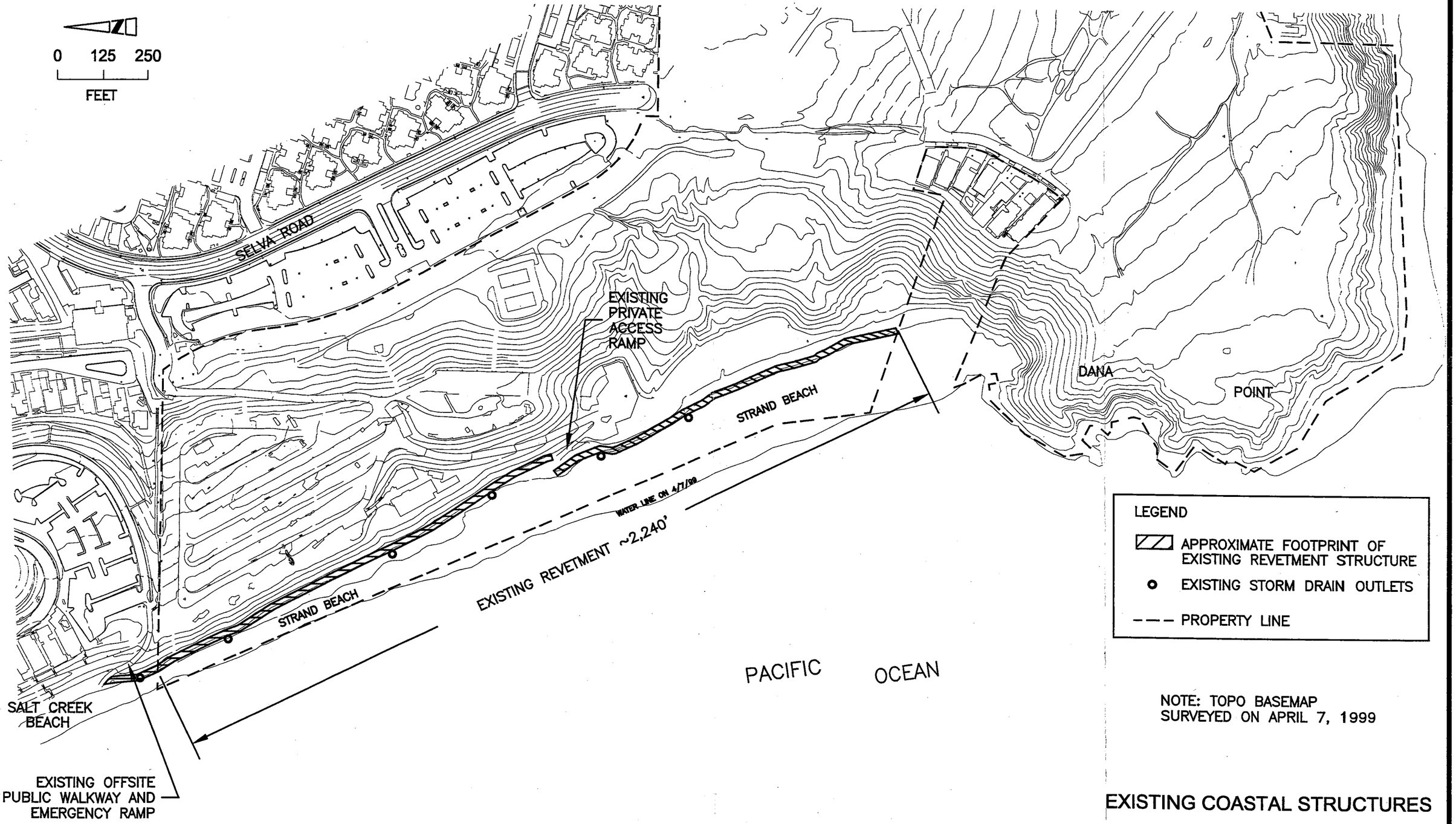
Proposed coastal structures along Strand Beach consist of three 42-inch storm drain outlets, a public pedestrian path, a public pedestrian and emergency vehicle access ramp, and reconstruction of the existing riprap revetment. **Figure 5** illustrates the proposed street and trail layout for the project, and the two proposed public beach access paths.

3.2.1 Drainage Outlets

The project proposes a new drainage system designed to incorporate best management practices, with discharge outlets equipped with energy dissipaters. The drainage system also includes sand filtration elements that act as detention basins for first flush water runoff, and filtering devices for potential pollutants. The three new storm drain outlets replace the five existing outlets on Strand Beach. **Figure 6** illustrates the locations of these storm drain outlets, while **Figure 7** shows the outlet details. The preliminary design is based upon a 10-year return peak runoff (TKC, 2001a). Internal, vertical drop energy dissipation structures, or ring energy dissipators within the drainage pipes, will be installed and combined with riprap aprons to reduce the flow velocity of the drainage runnoff. This design minimizes beach scouring, which is assessed later in this report. **Table 8** presents the pipe sizes of the storm drains, the size of the drainage basins, and estimated peak discharge flow rates at the outlets. An individual sediment filtering and floating debris collection system located upstream of each outlet will be designed to ensure that floating debris and polluted solid particles will be removed prior to the discharge of storm flows.

3.2.2 Public Pedestrian Walkway and Public Access Ramp

To provide public beach access, two new paths are planned, as shown in **Figure 5**. In addition, the existing public access path that lies immediately north of the property line will be improved and partially reconstructed. The two new public paths terminate at Strand Beach, in a 6-foot wide stair/walkway and a 15-foot wide ramp/walkway. The 6-foot walkway is located near the



NOTE: TOPO BASEMAP SURVEYED ON APRIL 7, 1999

EXISTING COASTAL STRUCTURES

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Figure 4

0 175 350

FEET

LEGEND

--- PROPERTY LINE

DANA POINT HARBOR

PACIFIC COAST HIGHWAY

HARBOR POINT

SELVA ROAD

STRAND BEACH

WATER LINE ON 4/7/99

SALT CREEK BEACH

EXISTING PUBLIC WALKWAY/RAMP (TO BE IMPROVED)

PROPOSED PUBLIC WALKWAY

PROPOSED PUBLIC RAMP/WALKWAY

DANA POINT

PACIFIC OCEAN

NOTE: TOPO BASEMAP SURVEYED ON APRIL, 7, 1999

SOURCE: TKC, 2001b

PROPOSED BEACH ACCESS POINTS

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Figure 5

LEGEND

PROPOSED STORM DRAIN

CATCHBASIN

OUTLET

BMP FILTER

PROPERTY LINE

DANA POINT HARBOR

PACIFIC COAST HIGHWAY

HARBOR POINT

SELVA ROAD

CENTRAL DRAIN

STRAND

BEACH

SOUTH DRAIN

WATER LINE ON 4/7/00

SALT CREEK BEACH

NORTH DRAIN

PROPOSED 42" RCP OUTLETS

0 175 350

FEET

DANA POINT

PACIFIC OCEAN

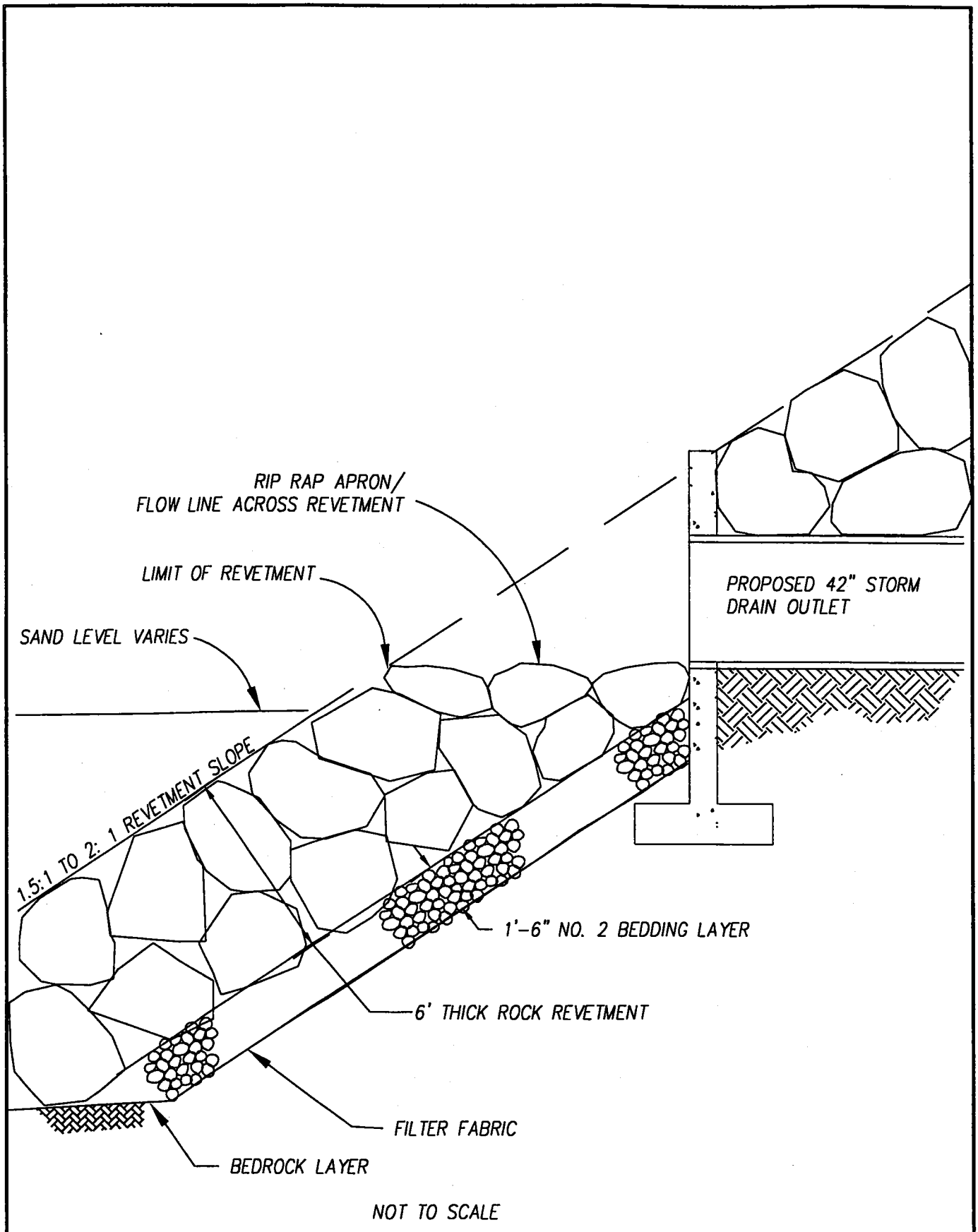
NOTE: TOPO BASEMAP SURVEYED ON APRIL 7, 1999

SOURCE: TKC, 2001a

PROPOSED DRAINAGE SYSTEM ON STRAND BEACH

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Figure 6



OUTLET DETAILS

Source: TKC, 2001a

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Figure 7

Table 8 Proposed Storm Drains on Strand Beach

Drainage Outlet	Pipe Diameter (inches)	Drainage Area (Acres)	Q_{10} (cfs)
South Drain	42	28.76	44.9
Central Drain	42	24.86	43.6
North Drain	42	22.33	51.3

Source: TKC, 2001a

center of Strand beach and replaces the existing, private, mobile home ramp. The 15-foot ramp is positioned near the south end of Strand Beach and accommodates pedestrian and emergency vehicle access. Both public paths enter through the proposed Strand Vista Park, descend the terraced slope above Strand Beach, and terminate at beach level. **Figures 8** and **9** show detailed views of the walkway and ramp landing areas, respectively.

The public walkway and ramp landing areas encroach slightly into the existing beach to enhance accessibility and provide proper slope gradients. Since the sand level varies seasonally, a portion of the landings may be buried. The alignment and layout of the landing extensions are designed to minimize the cross-shore encroachment. The walkway landing encroachment area encompasses approximately 1,770 square feet, with a maximum cross-shore distance of 30 feet (see **Figure 8**). The ramp landing encroachment extends approximately 40 feet across the shore and occupies 1,065 square feet (see **Figure 9**).

3.2.3 Revetment Reconstruction

At Strand Beach, the existing under-designed riprap revetment may be damaged and stones could be dislodged onto the beach during a moderate to severe storm event. To provide adequate protection against wave attack, minimize terrace slope erosion, enhance public safety, maintain public lateral beach access, and protect site improvements, 2,100 feet of the existing riprap revetment will be reconstructed. Potential alternatives other than reconstruction of the existing revetment structure include 1) no action; 2) removal of existing revetment; 3) beach fill; 4) nearshore submerged breakwater; and 5) seawall. These alternatives are further delineated as follows.

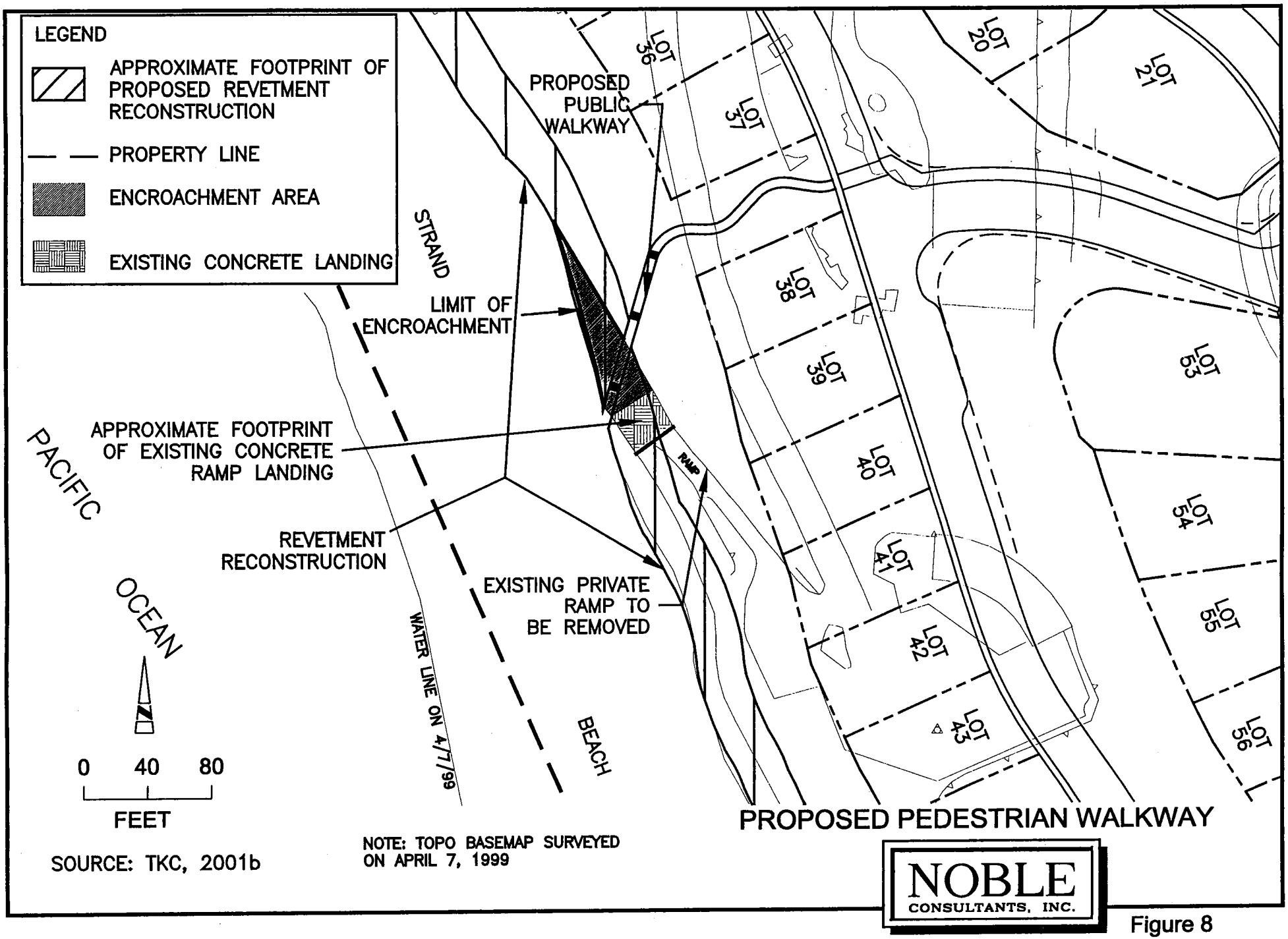

LEGEND
APPROXIMATE FOOTPRINT OF PROPOSED REVETMENT RECONSTRUCTION
PROPERTY LINE
ENCROACHMENT AREA
EXISTING CONCRETE LANDING
PROPOSED PUBLIC WALKWAY
LIMIT OF ENCROACHMENT
APPROXIMATE FOOTPRINT OF EXISTING CONCRETE RAMP LANDING
REVETMENT RECONSTRUCTION
EXISTING PRIVATE RAMP TO BE REMOVED
STRAND
PACIFIC OCEAN
BEACH
WATER LINE ON 4/7/99
RAMP
LOT 36
LOT 37
LOT 38
LOT 39
LOT 40
LOT A1
LOT 42
LOT 43
LOT 20
LOT 21
LOT 63
LOT 54
LOT 55
LOT 56
PROPOSED PEDESTRIAN WALKWAY
0 40 80
FEET
SOURCE: TKC, 2001b
NOTE: TOPO BASEMAP SURVEYED ON APRIL 7, 1999
NOBLE CONSULTANTS, INC.

Figure 8

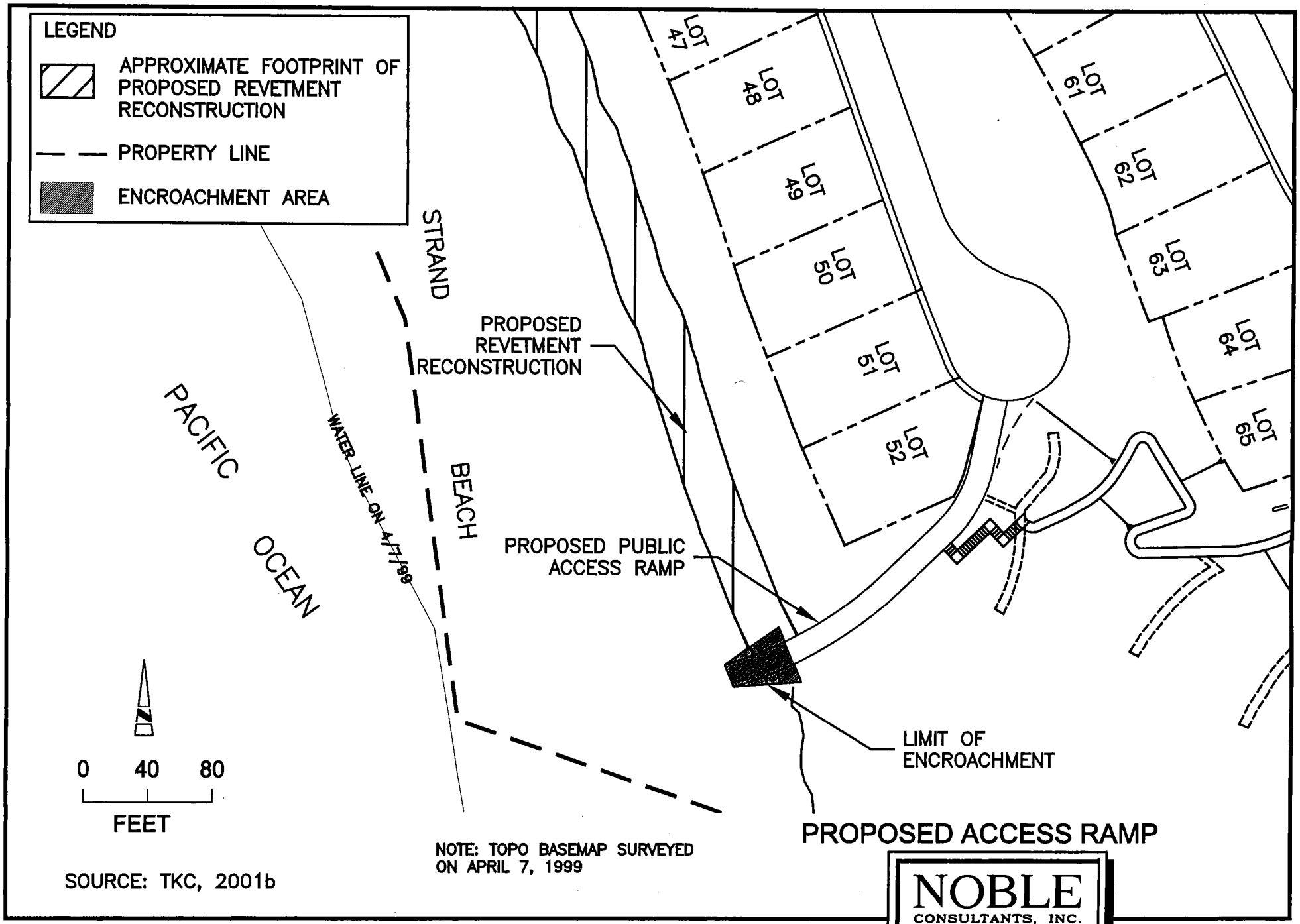

LEGEND
APPROXIMATE FOOTPRINT OF PROPOSED REVETMENT RECONSTRUCTION
PROPERTY LINE
ENCROACHMENT AREA
LOT 47
LOT 48
LOT 49
LOT 50
LOT 51
LOT 52
LOT 61
LOT 62
LOT 63
LOT 64
LOT 65
STRAND
BEACH
PACIFIC
OCEAN
WATER LINE ON 4/7/99
PROPOSED REVETMENT RECONSTRUCTION
PROPOSED PUBLIC ACCESS RAMP
LIMIT OF ENCROACHMENT
PROPOSED ACCESS RAMP
0 40 80
FEET
NOTE: TOPO BASEMAP SURVEYED ON APRIL 7, 1999
SOURCE: TKC, 2001b
NOBLE CONSULTANTS, INC.

Figure 9

No Action

Geologic stability modeling of the site's current condition conducted by AMEC (2001) indicates some areas of the landslide complex are in a marginally stable condition (i.e. the factor of safety is near a value of one). The factor of safety is defined to be the ratio between the forces resisting landslide movement and the forces tending to drive it. In the Strand project area, the lower terrace, including the slope fronted by the beach, serves as a counter-balance to the higher rear segment of the landslide complex. Significant toe erosion of the lower terrace slope would result in a higher potential for geologic instability of the landslide complex which makes up the majority of the Strand area. Bottom-up wasting of the lower slope and terrace, associated with wave induced erosion, may upset the current general landslide equilibrium present onsite.

The original improvements of the mobile park, which include several buildings, pavement, septic systems, storm drain systems, utilities, waterlines, etc., as previously described in Section 1.0, remain on the site. If no action is taken to remedy the existing revetment condition, the terrace material slopes will be susceptible to slope erosion, as the existing under-designed revetment cannot provide adequate protection against wave attack. Consequently, the existing dilapidated infrastructure and improvements on site as well as those immediately to the north, including the existing public walkway/ramp and county storm drain outlet, may be undermined and damaged, and the loose debris and riprap stone would end up on the beach/ocean. This can create a hazardous beach condition for the public and can have a detrimental impact to nearshore water quality. It may also create potential geologic instability within the Strand area.

Removal of Existing Revetment

If the on-site revetment structure is completely removed, the existing narrow backbeach berm at the north end of the project site will provide essentially no buffer for storm protection. The undercut and erosion of the unprotected terrace slope described above in the "no action" alternative would be accelerated and may create a worse hazardous beach condition and a more severe impact to nearshore water quality, as compared to the "no action" alternative.

The present on-site revetment and an approximately 155-foot off-site revetment segment north of the project boundary form a continuous shore protective device to protect the existing public

walkway, emergency ramp and county storm drain outlet (see Figure 4). In fact, the riprap shore protective device continues upcoast (northwest) for approximately 5,000 feet. The slope erosion resulting from the removal of the revetment would extend to the off-site revetment, exposing the public walkway/ramp and county storm drain to structure damage. The effectiveness of the existing off-site revetment would be substantially compromised. Consequently, the public walkway/ramp and the county storm drain may be damaged, and the provision of public coastal access and safety would be impacted. Therefore, permanent removal of the revetment would result in a high probability for geologic instability and accelerate the adverse impacts identified in the "no action" alternative.

Beach Fill Alternative

A beach fill consists of an extensive placement of sand to widen the Strand Beach area for storm-damage protection and recreational activity. A periodic replacement of sand may be required to maintain a design beach width. It is a rule of thumb that within the Orange County shoreline a minimum winter beach width required for storm wave protection is about 200 feet (Rossmiller, 2001). The mean winter beach width averaged over five separate locations from historical aerial photographs was about 65 feet (Corps of Engineers, 1997). Thus, to protect the terraced slope against storm wave attack, a beach fill of 135 feet in berm width would be necessary. An Orange County shoreline study indicates that a one-foot cross-shore beach position movement would equal 1.0 to 2.5 cubic yards of volumetric change per linear foot of shoreline, an average of 1.75 cubic yards per linear foot (Corps of Engineers, 1998). Due to the thin littoral sediment lens observed within the Laguna Beach Mini Cells, the volumetric conversion value would be on the lower end. Applying the equivalent value of one cubic yard for a one-foot change, a sand volume of 337,500 cubic yards would be required to accomplish a beach fill of 135 feet wide and 2,500 feet long on Strand Beach. The sand sources would be from the terrace deposit on site, if available, or an offshore borrow area.

Since the littoral transport regime within Strand Beach is in a general equilibrium, such a large sand placement would induce a number of coastal processes and environmental impacts. As delineated in Section 2.6, a shoal located on the harbor side of the west breakwater of Dana Point Harbor requires regular harbor dredging to maintain a navigable channel. The beach fill will increase the volume of sand passing around Dana Point and depositing along both sides of the breakwater. As a result, after completion of each dredging cycle the shoal will develop and

expand within a shorter period as compared to the present condition. The current maintenance dredging practice to remove the shoal would need to be conducted more frequent if the beach fill alternative is implemented on Strand Beach.

Immediately offshore of Strand Beach is the Niguel Marine Refuge. Farther downcoast, the Dana Point Marine Life Refuge continues to Dana Point Harbor. Both refuge areas contain sensitive marine species such as surfgrass that are dependent on the support of the intertidal and subtidal rocky environments (Applied Ecological Research, 2000). With the beach fill alternative, more available sands will be moved offshore to form sand bars during the winter months as a consequence of seasonal wave climate, as previously noted in Section 2.6. This would alter the nearshore rocky environments and would have a significant impact to these two marine refuge areas.

Nearshore Submerged Breakwater Alternative

A nearshore submerged breakwater is an offshore structure consisting of a mound of riprap stone placed parallel to the shoreline. The breakwater would be designed to dissipate incident waves and protect the Strand Beach shore area. In addition, the lack of wave energy which drives the littoral transport system would result in a deposition of sediment behind the breakwater. This sand trapping effect will reduce the amount of sediment that is transported around Dana Point. Thus, the regional littoral transport regime would be disrupted. In addition, the loss of the footprint area required for the breakwater construction within the Niguel Marine Refuge will be detrimental to the existing marine habitats.

Seawall Alternative

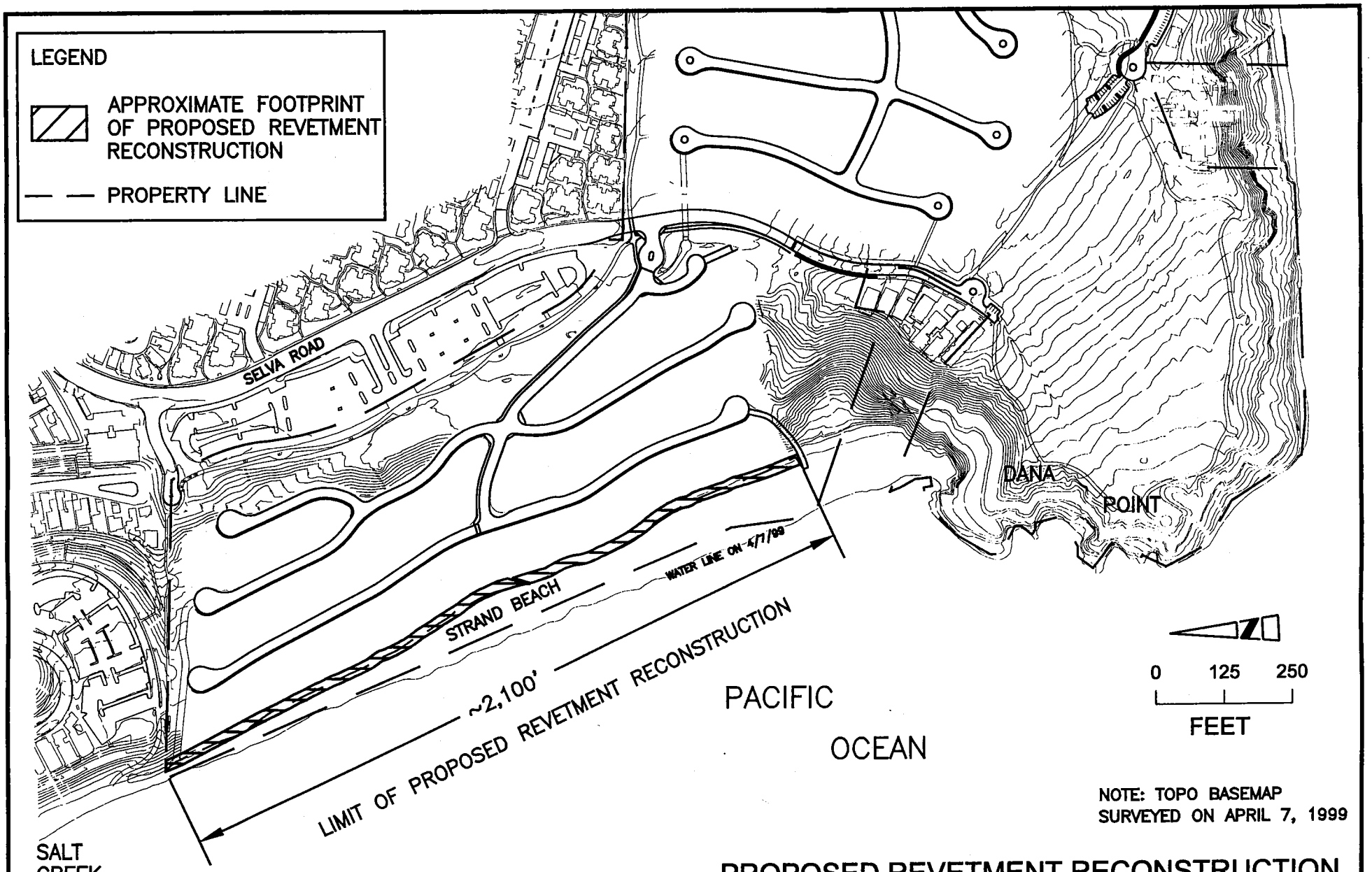
A vertical seawall is constructed of poured in-place concrete with internal steel rebar reinforcement and is typically founded in bedrock. The seawall structure placed along Strand Beach would be massive since it must be built to resist the full force of incident waves. Unlike the proposed riprap revetment which is porous absorbing and dissipating incident wave energy, the seawall structure reflects and amplifies the incident wave energy. This would have an effect on Strand Beach in that scour can be anticipated at the toe of the structure. In addition, as the temporary short-term scouring occurs, the magnitude of wave forces acting on the seawall structure during a storm event will increase. Depending on the nature of the wave attack and

the depth of bedrock, beach scour may form a trough in the front of the seawall. At either end of the seawall structure, a localized scouring effect due to the reflection of wave energy would be more severe as compared to the riprap revetment.

Preferred Alternative

Compared to the above-identified alternatives, reconstruction of the existing revetment appears to be the most suitable since this proposed measure would induce the least coastal processes and environmental impacts. The reconstruction, complying with the current engineering standards as previously noted in Section 3.1, will only extend to the most northerly 2,100-foot segment as compared to the existing length of 2,240 feet. The remaining 140-foot segment to the south is presently buried almost entirely in beach sand. Rather than disturb the beach area to remove the buried riprap stone, the 140-foot revetment structure would be left in its current condition. **Figure 10** delineates the limits of the reconstructed revetment. Except for the above noted public walkway encroachment, the entire reconstructed revetment is designed not to extend seaward of existing revetment footprint.

A wave runup analysis was conducted to determine the height of the to-be-reconstructed revetment. Wave runups were computed from a depleted beach profile that is eroded to the bedrock level. The estimated return wave heights presented in Section 2.4.3 and breaking wave scenarios under various water levels from +3.3 to +5.8 feet, NGVD were used as the oceanographic conditions. The assumed highest water level at +5.8 feet, NGVD is about 0.6 foot higher than the recorded highest water level at Scripps Pier (see Section 2.1). The top of the revetment at +20 feet, NGVD would prevent wave overtopping under most storm events. Minor wave overtopping (slightly over a foot) may occur only under an extremely rare occasion during which waves break near the toe of the revetment coincident with the selected highest water level at +5.8 feet, NGVD. Occurrence of such an event, simultaneously including the eroded profile to the bedrock, breaking waves and the selected highest water level, would be similar to or even rarer than those storm events observed in the 1983 El Nino year. It is noted that the return intervals for the 1983 El Nino storms and the selected highest water level of +5.8 feet, NGVD are approximately 50 and 100 years, respectively.



PROPOSED REVETMENT RECONSTRUCTION

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Figure 10

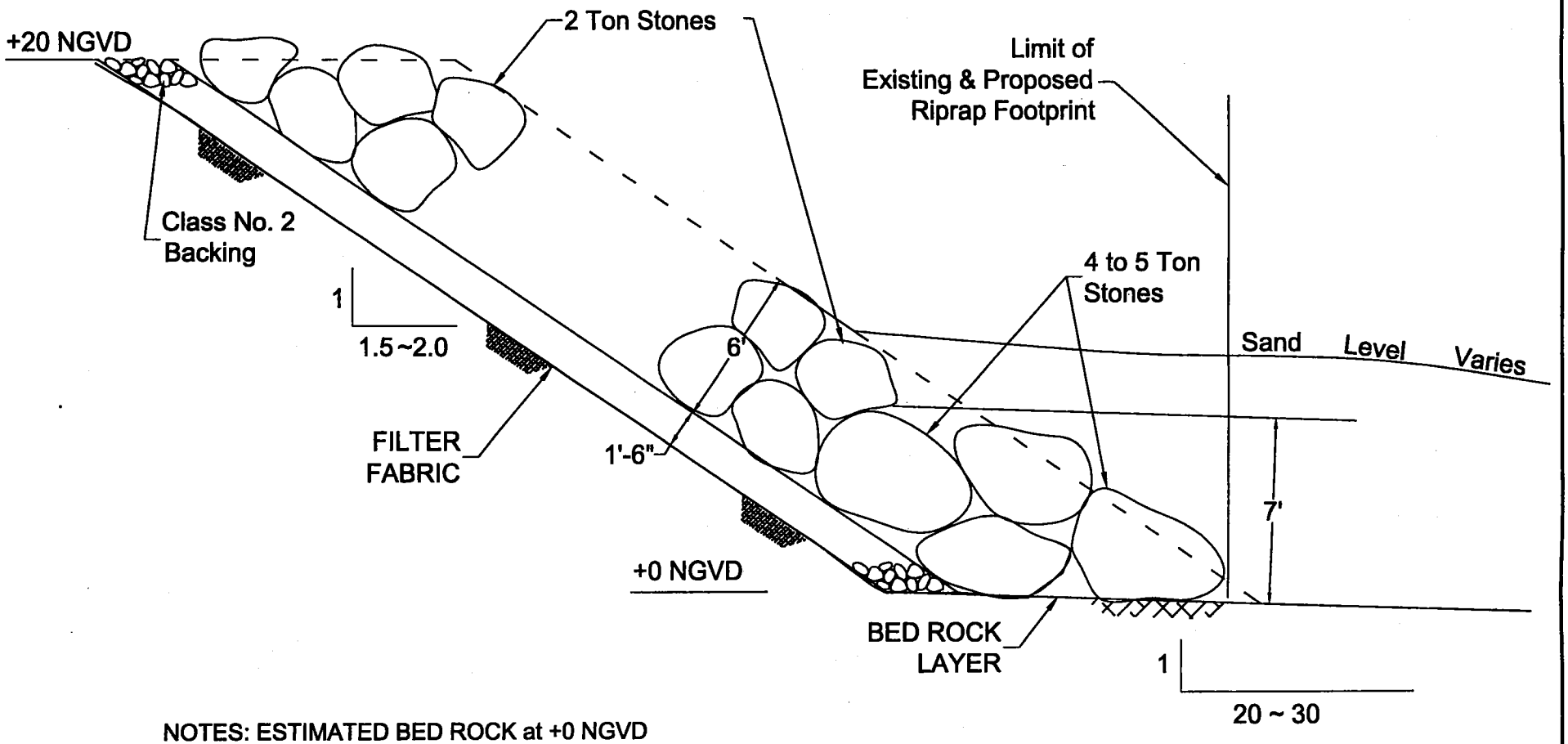
Figure 11 illustrates the typical cross section of the proposed revetment structure. A class No. 2 bedding layer with filter fabric will be placed between the slope face and two layers of riprap stones. The revetment begins at elevation +0 feet, NGVD and ends at +20 feet, NGVD for a total height of 20 feet. A riprap toe is not necessary since the bedrock where armor stones are directly placed on is not erodible. The revetment will be approximately 6-feet thick with 4- to 5-ton stones used for the two base levels to provide more resistance to wave attack. The upper levels to the height of +20 feet, NGVD will be tapered down to 2-ton stones. Allowing for seasonal variance, approximately 40 percent of the revetment structure will be buried by sand, based upon an average sand elevation at +8 feet, NGVD.

The proposed revetment reconstruction mitigates the existing 26-foot linear offset associated with the mobile home park ramp near the center of Strand Beach. The existing ramp creates a significant streamline break in as much as the access runs parallel to the beach, and the discontinuous revetment structures were not constructed along a consistent alignment. This creates an eddy effect with attendant beach scouring. The reconstructed revetment incorporates a public access path and a realignment of the resulting revetment structures that eliminate the eddy effect by forming a continuous structure system.

3.3 Thresholds of Significance

The proposed coastal structures are evaluated in later sections for potential impacts to the oceanographic environment and littoral system, on the basis of alterations to the existing conditions. This section establishes the significant impact thresholds and provides a delineation as to how these criteria were arrived at.

Three coastal processes components--beach width, littoral transport rate, and nearshore wave characteristics--are the primary indicators that characterize the beach conditions of a shoreline reach. Any alteration of these three parameters will potentially induce changes in the beach conditions, whether the shoreline reach becomes erosional, accretional, or remains stable. Therefore, these three parameters are selected to assess the project-induced coastal processes impacts. Beach loss implies a reduction in the beach berm that acts as a buffer to prevent the shore structure from direct exposure to storm wave attack. When beach loss occurs, the storm-induced damage may increase. Beach loss also reduces the recreational area available to the public. Decrease or increase in the littoral transport rate may result in insufficient sediment



NOTES: ESTIMATED BED ROCK at +0 NGVD
SLOPE VARIES FROM 1.5:1 TO 2: 1
NGVD =+2.30' NAVD88 = +2.72' MLLW

NOT TO SCALE

TYPICAL REVETMENT SECTION

NOBLE CONSULTANTS, INC.

Figure 11

supply to a subject site and beach erosion may occur to compensate for the sediment supply deficiency. A change in nearshore wave characteristics may alter the alongshore sediment transport rate that can, in turn, induce beach loss within a subject site or adjacent beaches. Therefore, the degree of impact must be assessed by comparing predicted physical changes in beach width, disruption to the littoral transport regime, or alteration of nearshore wave characteristics against a set of defined limits. **Table 9** summarizes the specific criteria that were established to assess the significance of project impacts. These criteria were developed in correspondence with the natural variation of coastal process at Strand Beach.

Table 9 Criteria for Determining Coastal Processes Significant Impacts

Beach Loss
Permanent decreases in beach width caused by the proposed project shall be designated a significant impact if the beach reduces in width by > 20 percent of the seasonal beach width variation, and the reduction extends more than 500 feet of shoreline length.
Littoral Transport Rate
Any increase or decrease in littoral transport rates caused by the proposed project that are greater than or equal to 15 percent of the naturally occurring value shall be deemed a significant impact.
Nearshore Wave Heights
Any increase or decrease in wave heights caused by the proposed project shall be considered a significant impact to recreational uses if a long-term change of 10 percent or greater occurs.

A discussion of the criteria for each parameter and its inter-correlation with the other two is provided as follows:

Beach Loss

The mean beach widths averaged over five separate locations range from 120 feet for the summer condition to 65 feet for the winter conditions (Corps of Engineers, 1997). Thus, the average seasonal beach width change at Strand Beach is estimated to be 55 feet. Applying this finding to the above defined significant impact criteria, a proposed project impact will be deemed significant if its induced beach loss is greater than 11 feet in width (55 x 0.2 = 11) and 500 feet in shoreline length. It should be noted that the winter beach width fluctuates from one year to another. (i.e. the winter beach width can be greater or less than the average value of 65 feet for a given year). The 11-foot threshold value is within the natural variation of winter beach

width. The 500-foot shoreline extension criteria equals approximately 20 percent of the 2,500-foot Stand Beach shoreline reach. As shown in Section 3.4, the project impact falls significantly below the 11-foot threshold value.

Littoral Transport Rate

Potential beach loss can also result from the interruption of alongshore littoral transport rates and the alteration of nearshore wave heights. For Strand Beach, the net alongshore transport rate is approximately 15,000 cubic yards per year (Corps of Engineers, 1997). Applied to the above-defined criteria, a project impact will be deemed significant if the induced change of the net alongshore transport rate is greater than 2,250 cubic yards per year (15000 x 0.15 = 2250). It is stated in Section 3.2.3 that a one-foot cross-shore beach position movement would equal an average of 1.75 cubic yards per linear alongshore foot. Over a 25-year period, the net result would equate to a change in beach width of approximately 13 feet[1], which compares proportionally to the 11-foot beach loss criterion discussed above. As shown in Section 3.4, the project impact falls significantly below the 13-foot threshold value.

Nearshore Wave Heights

Nearshore wave heights vary in accordance with different meteorological patterns that occur within each season. Typically, the prevailing southerly swell observed in the summer months has a longer wave period and lower wave height, as compared to the west or northwest swell generated from the extratropical cyclone, more fully described in Section 2.4.1. A coastal structure such as a nearshore breakwater can attenuate incoming waves and reduce the height on the lee of the structure. Consequently, beach gains occur since the alongshore littoral transport rate toward downcoast is reduced, which results in sediment deposition within the beach located directly on the lee side of the breakwater. As shown in Section 3.4.4, the project has no impact on nearshore wave heights.

For the nearshore wave heights, an impact is deemed significant if the proposed structure alters a 10-foot incoming wave by 1-foot (i.e., 10%). Since the wave energy flux is proportional to the

[1] 2250 cy per year / (2500 ft x 1.75 cy/ft per linear foot) x 25 yr = 12.86 ft ≈ 13 ft.

second power of wave height, a 10 percent reduction or increase in wave height translates into an approximate 20-percent change (0.9 x 0.9 = 0.81 ≈ 0.8, or 1.1 x 1.1 = 1.21 ≈ 1.2) in wave energy flux, which is directly related to the littoral transport rate. The resulting 20 percent reduction in the alongshore littoral transport rate is proportional to the littoral transport regime criteria.

3.4 Impact Analysis

This section analyzes the potential coastal impacts associated with the proposed project including, 1) sediment yield reduction, 2) installation of new storm outlets, 3) construction of two public beach access paths, and, 4) reconstruction of the revetment structure.

3.4.1 Sediment Yield Reduction

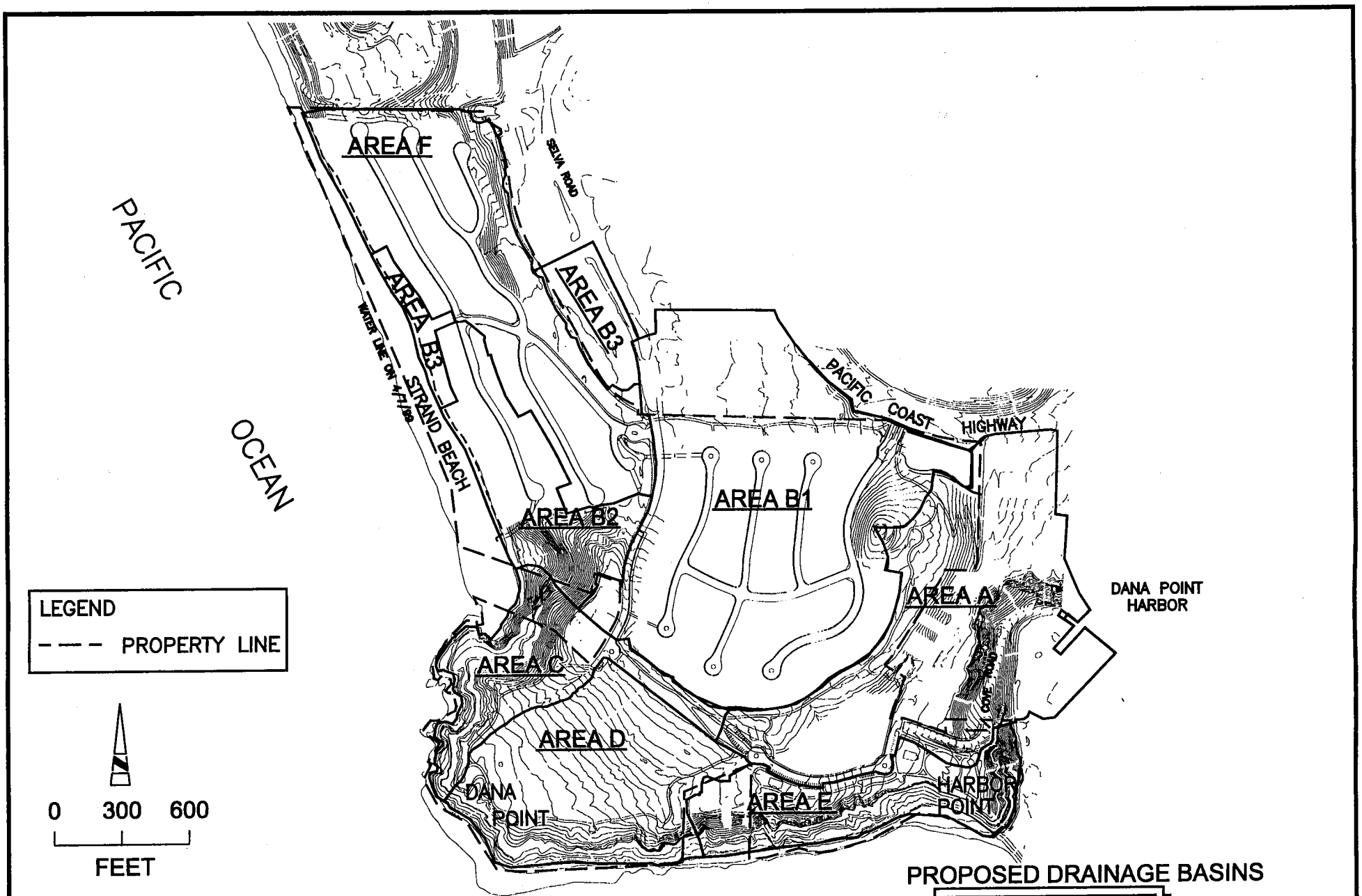
Under the proposed project, the drainage conditions, as well as the existing watershed types, vary from the existing conditions found in **Figure 3**. A number of existing drainage areas are reconfigured to minimize impacts by dispersing flows and improving water run-off quality. **Figure 12** illustrates the reconfigured drainage basins. **Table 10** lists the re-configured drainage basins and revised sediment yields, as compared to the existing conditions identified in **Table 7**.

Table 10 Estimated Drainage Sediment Yield under Proposed Condition

Drainage Basin	Area		Watershed Type	Sediment Yield
	(Acres)	(Sq. Mi)		(cy/yr)
A	17.14	0.0268	Developed Terrace	1.6
	12.16	0.0190	Undeveloped Terrace	1.9
B	56.84	0.0888	Developed Terrace	5.0
	4.82	0.0075	Undeveloped Terrace	0.7
C	1.10	0.0017	Developed Terrace	0.1
	8.76	0.0137	Undeveloped Terrace	1.4
D	0.24	0.0004	Developed Terrace	0.0
	17.12	0.0268	Undeveloped Terrace	2.7
E	1.14	0.0018	Developed Terrace	0.1
	9.04	0.0141	Undeveloped Terrace	1.4
F	5.3	0.0083	Developed Terrace	2.2
Total	148.08	0.2314		17.1

Note: Area B includes Areas B1, B2, and B3 as illustrated in Figure 12

Source: TKC, 2001a



PROPOSED DRAINAGE BASINS

NOBLE CONSULTANTS, INC.

Figure 12

Total sediment delivery to Strand Beach from the proposed drainage basins is estimated at 13.6 cubic yards per year since runoff flows within Basin A are drained to the harbor. The difference in the sediment yield rate to Strand Beach between the existing and proposed conditions equals 2.8 cubic yards per year (16.4-13.6=2.8), or an amount significantly less than one percent as compared to the total bluff sediment contribution of 1,800 cubic yards per year (see Section Slope and Bluff Erosion) generated from Monarch Point to Dana Point (2.8/1800 ≈ 0.002).

In addition, the total beach sand volume on Strand Beach extending from the riprap revetment to the approximate MHW line was estimated to be about 48,300 cubic yards[2], based upon a Ground Penetrating Radar (GPR) test, conducted on February 28, 2000, at two profile locations (Kerwin, 2001). The sediment yield reduction of 2.8 cubic yards per year would be a negligible quantity compared to the estimated average sand volume, even after a 25-year period (25x2.8/48300 = 0.0015). Using the ratio of one cubic yard to a one-foot cross-shore beach as stated in Section 3.2.3, the equivalent beach loss over a 2,500-foot shoreline segment is virtually inconsequential[3]. Therefore, the impact due to the sediment yield reduction is considered insignificant.

3.4.2 Installation of Storm Drain Outlets

The proposed drainage system at Stand Beach consists of three new storm drains, each sized as a 42-inch pipeline, to accommodate portions of the surface runoff for the proposed project. Each storm drain will be equipped with an internal vertical drop or ring energy dissipator, along with a first-flush desiltation, filtering and floating-debris-collection system located upstream of the outlet. The estimated peak flow velocities range from 5.3 to 6.1 feet per second (TKC, 2001a) as compared to the existing 42-inch drainage outlet that has a flow discharge rate of 8.7 feet per second (TKC, 2001a). Flow velocities are further reduced as they disperse through the revetment structure onto the beach. It should be noted that without as-built plans of the other four drainage outlets, the flow rate in each drainage system cannot be estimated.

Although the energy dissipating system will substantially reduce the peak flow velocities at the outlets, potential scouring may occur as the flows meander through the beach. This could

[2] 522 cf/lf x 2500 ft / (27 cf/cy) = 48333 cy ≈ 48300 cy.
522 sf is the average sand cross section area of the GPR profiles.
[3] 2.8 cy/yr x 25 yr / 2500 lf x 1 ft-lf/cy =0.03 ft.

conceivably occur during severe rainfalls (e.g., 25- or 50-year return frequency), where peak flow discharges are larger than the 10-year return frequency flow rates. The resultant higher velocity residual flows may create a temporary scouring ditch, extending from the outlets to the ocean. The alongshore width of the scour may potentially exceed 42-inches, the diameter of the three proposed drainage outlets located along Strand Beach.

Because of the sand trapping effect of the Dana Point, the resulting configuration of Strand Beach creates a beach berm that is typically wider toward the Dana Point than at the northwestern shore reach. As a result, storm waves during high tides run up across the shore and reach the revetment within the northwestern shore reach where the north and central drains are located (see **Figure 6**). Therefore, the onshore-offshore sediment transport mechanism will recover the temporary and localized scouring induced by infrequent high flows discharged onto Strand Beach.

In the southern drainage outlet, located within the southeastern shore reach where the beach berm is moderate to wide, the horizontal excursion of wave runups may not reach the revetment structure. Thus, the cross-shore sediment movement would not be expected to fill the entire scoured area, particularly immediately adjacent to the outlet location. In the event of the 25- or 50-year return frequency rainfall, localized beach scouring impact may result near the southern outlet. This impact is not considered significant since the localized scouring will not disrupt regional littoral transport regime within Strand Beach. Furthermore, the proposed system represents a material design improvement to the existing conditions associated with the existing Strand Beach storm drains.

The proposed drainage system also diverts dry season nuisance flows resulting from irrigation and other domestic uses into the sewage treatment system operated by the South Coast Water District. Thus, nuisance flows during the dry season, at least seven months each year (from April to October), will not be discharged into the ocean through the proposed drainage outlets. Importantly, no nuisance water will be discharged onto Strand Beach during peak periods of public usage, such as the prime summer months. Again, the existing, antiquated drainage system makes no provision for diversion of nuisance water, including run-off that currently flows onto Strand Beach from adjoining off-site areas.

3.4.3 Construction of Access Walkway and Ramp Landings

The proposed public walkway encroachment triangular in shape, extends a shore length of 120 feet with a maximum cross-shore width of 30 feet, and covers an area of approximately 1,770 square feet (see **Figure 8**). Although the maximum seaward beach encroachment of 30 feet exceeds one component of the significant impact criteria (the threshold value of 14 feet), the encroached shore length is shorter than the criterion of 500 feet. The total area of 1,770 square feet is considerably less than 7,000 square feet (14 x 500 = 7000).

As was earlier noted, the beach encroachment analysis focuses on the storm-protection and recreational impacts (see section 3.3). Based on the measured mean beach widths provided in Section 3.3, the total recreational beach area of Strand Beach at the water line, has been calculated to range from 162,500 square feet (65 x 2500 = 162500 - winter conditions) to 300,000 square feet (120 x 2500 = 300000 - summer conditions) . Potential loss of recreational beach area due to the walkway encroachment equals 0.6 percent (summer beach conditions) to 1.1 percent (winter beach conditions) of the total beach area. As a result, the impact on the available recreational area is considered insignificant. Additionally, the potential impact on coastal processes is not significant since the seaward extent of the proposed beach encroachment remains landward of the existing revetment segment, located immediately southeast of the proposed walkway.

The proposed public access ramp landing, located about 1,000 feet southeast of the proposed walkway, encroaches approximately 1,064 square feet into the Strand Beach. The landing accommodates pedestrians and emergency vehicles, and its footprint extends an average shore length of 27.5 feet (ranging from 15 to 40 feet), with a cross-shore width of 40 feet (see **Figure 9**). This ramp is located in the wide, southern section of Strand Beach approximately 170-feet from the water line surveyed on April 7, 1999, a spring beach condition. So, typically most of the encroachment will be buried beneath the sand.

The 1,064 square feet of impacted area equates to a 0.4 percent (summer conditions) to 0.6 percent (winter conditions) reduction of the Strand Beach recreational area. This impact is insignificant. The landing extension may result in localized scouring to the immediate adjoining upcoast and downcoast areas due to a gyration effect as wave runups encounter the trapezoidal configuration of the landing. However, the impact induced by the proposed access

landing is considered local, and will not alter the regional coastal processes within Strand Beach. Its coastal processes impact is deemed adverse but insignificant.

3.4.4 Reconstruction of Revetment Structure

The proposed reconstructed revetment remains within the existing structure's seaward footprint, but will be 140 feet shorter. The revetment structure will not alter waves propagating from deep water into the nearshore zone at Strand Beach, since it is located landward of the backshore. No impact to nearshore wave heights would result. The revetment replacement does not encroach upon any beach area, except for the public coastal access walkway improvement. Furthermore, the seaward extent of the transition revetment associated with the walkway facility remains landward of the existing revetment section located immediately south of the proposed walkway landing.

Presently, during a winter storm a gyration effect that induces localized beach scouring adjacent to the existing revetments at the existing private access ramp can occur. The proposed 120-foot section of riprap revetment, streamlining the two existing out-of-alignment structures into a continuous one, will improve the identified scouring condition and provide for the construction of a pedestrian access way to the beach. Also, the re-engineered revetment incorporates updated engineering standards that reduce potential public safety issues associated with the existing revetment. As a result, the reconstruction revetment impact to potential local coastal processes is not considered significant.

The revetment stones will be placed directly on bedrock to prevent any subsidence or slumping that may otherwise occur, during which sands could be temporarily scoured out and deposited offshore in a storm event. As is the case with the placement of the existing revetment, any short-term beach erosion will be restored by the benign waves afterward. Since the proposed revetment will be engineered to current design standards, the potential for dislodgement of the proposed revetment structure will be greatly reduced as compared to the existing system.

The revetment reconstruction is scheduled to occur concurrent with the proposed project's remedial grading operation. This schedule reduces the duration of the reconstruction, and allows for coordination and job site efficiencies, thereby reducing potential short-term construction impacts. No unusual circumstances are associated with the revetment reconstruction process; it will be very similar to the revetment reconstruction activities that

occurred in the adjacent Niguel Shores and Ritz Cove projects. In fact, the existing revetment structure and the proposed revetment reconstruction is a direct extension of these two revetment systems. Therefore, the resulting regional coastal process impacts are expected to be minimal, if any.

Long-term structure maintenance may be required if riprap rocks on the upper layer are unseated during a severe storm event. This impact is not considered to be significant for the following reasons: (1) structural maintenance has historically been required for the existing revetment and it is anticipated that the maintenance may be required in the future, but on a less frequent basis; (2) the new revetment will be designed to meet current engineering standards, thus minimizing the existing and future potential for slumping, subsidence or displacement.

3.5 Mitigation Measures

At Strand Beach, the construction of the two new beach access paths, removal of the five existing storm drain outlets, construction of three new storm drain outlets, and the revetment reconstruction will create coastal processes and recreational impacts. The induced local scouring effect near the proposed public access landing areas and the potential dislodgement of the placed revetment stones during a severe storm are localized impacts. No significant coastal processes impacts result from the proposed coastal structures. Nevertheless, a mitigation measure should be provided to further minimize the development impacts. This measure would be a comprehensive maintenance program that includes 1) pre-winter drainage swale cutting, 2) post-winter beach re-contouring, and 3) post-storm reposition of dislodged stones.

Elements 1 and 2 of the suggested maintenance program will mitigate the previously identified potential impact near the south drain outlet. The practice typically consists of: 1) excavating a shallow swale across the beach before the winter season to direct the storm runoff flows and to minimize the meandering flow path; 2) re-contouring the swale back to its normal form after the winter season ends. This pre-winter channel cutting and post-winter beach re-contouring practice can apply, if necessary, to the north and central drain outlets as well. The County of Orange implements this common beach maintenance for its beaches where storm drains, creeks, or streams are present within the beach limits (Rossmiller, 2001).

3.6 Level of Significance

The level of significance can be classified according to the following criteria:

Class I: A significant adverse impact that cannot be mitigated to insignificance

Class II: A significant adverse impact that can be mitigated to insignificance

Class III: An impact that is adverse but insignificant

Class IV: An existing impact is improved

Based upon the impact assessment described in Section 3.4, the level of impact significance induced by the proposed coastal structures is presented in **Table 11**. An overall reduction of 2.8 cubic yards per year in drainage sediment yield that supplies the Strand Beach littoral system is considered insignificant.

Table 11 Level of Impact Significance

Proposed Coastal Structure	Impact Category
Reduction of Sediment Yield	Class III
Storm Drain Outlets at Strand Beach	Class IV
Pedestrian Walkway & Access Ramp Construction	Class III
Reconstruction of Revetment Structure	Class IV

At Strand Beach, an internal energy dissipation system is proposed for each of three new storm drain outlets. As previously noted in Section 3.4.2, the flow discharge velocities will be substantially reduced, relieving the existing localized beach-scouring that results from the existing unregulated high-velocity drainage flows. The routine maintenance program described in Section 3.5 will further mitigate any potential scouring conditions that may result from the proposed drain and outlet design. In addition, the proposed diversion of summer nuisance flows prevents water from running on the beach during peak usage, and improves water quality within the surf zone for bathing activity.

Construction of the public walkway and emergency access ramp for improved beach access, as detailed in Section 3.4.3, requires landing sections that reduce a total 1.0 percent (summer conditions) to 1.7 percent (winter conditions) of the available area within Strand Beach. This beach encroachment is also required to re-align two existing revetment segments offset by the existing asphalt/concrete ramp. The realignment will mitigate the previously identified existing scouring condition. The localized impact of the public access improvements is deemed adverse

but insignificant, since no alteration of regional coastal processes results from these project components.

The proposed revetment reconstruction significantly improves the protective deficiencies inherent to the existing structure. The potential for future storm damage, rock dislodgement and local scouring will be substantially improved by the reconstruction of the existing revetment, as previously addressed in Section 3.4.4. Since the reconstruction occurs within the footprint of the existing revetment, the proposed revetment structure, with the application of current engineering standards, will result in reduction of localized beach scouring, improved public safety and beach lateral access, minimal littoral sand displacement, and negligible beach encroachment.

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19 September 2001

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Rob,

The following is a technical review of the report entitled,"Coastal Processes Assessment Headlands Development and Conservation Plan," by Noble Consultants dated September 2001. The report shall be referred to herein by the abbreviated reference, "The Noble Report." This review is my professional opinion and does not represent an institutional opinion of the Scripps Institution of Oceanography.

A) General Comments:

The 121.3 acre project site is located along one of the most heavily studied sections of coastlines in the world. A very extensive body of coastal processes data and technical literature exists for this region, and The Noble Report has drawn thoroughly from that information base in the preparation of their study.

The decisive coastal processes issue which the report addresses is whether or not the project will result in significant adverse changes to the beach and shoreline stability relative to the pre-project condition. This issue breaks down into three fundamental questions: 1) Does the project create a significant reduction in the supply rate of beach grade sand relative to the pre-project condition;

2) Does the project create a significant increase in the rate of loss of beach grade sand relative to the pre-project condition; and 3) Does the project create encroachments which did not exist in the pre-project condition. Because these three fundamental questions are relative to pre-project conditions, The Noble Report builds an historic baseline for each from the existing data, supplemented by additional site specific analysis.

The Noble Report evaluates the first question above through analysis of sediment yield due to watershed and bluff sources for the pre- and post-project conditions. The second question required analysis of wave climate, wave shoaling, and reflection, extreme water levels, and longshore transport rates for pre- and post-project conditions. The Noble Report balances sand supply and loss rates in their analysis of the first two questions to determine the sediment budget for the beach in both the pre- and post project conditions. The natural variability of the pre-project sediment budget is compared against historic beach width changes to establish levels of significance for post-project changes. Analysis of the third question, (encroachment), was based on detailed pre-project surveys and post project changes were held to minimal deviations from pre-project footprints.

B) Analysis of Beach Sand Supply Rates

The Noble Report estimates project impacts on watershed yield of beach grade sand by means of the rational method, whereby erosion rates are estimated based on generic categories of slope, soil composition, vegetation, and land use. This is approach was taken because the project site contains no well defined streams or fluvial systems. The analysis determined that the project would reduce beach sediment yield from the watershed by 2.8 cubic yards per year. The analysis also determined that the project would reduce coarse grained sediment runoff into Dana Pt. Harbor by 0.5 cubic yards per year, representing a project benefit.

The yield of beach sediment from bluff retreat was found to not be impacted by the project because a revetment already exists along the erodible sections of bluff, while the remaining unprotected bluffs within the project boundaries are comprised of erosion resistant geologic formations. The proposed reconstruction of the revetment is for the purpose of increasing mechanical strength and remains inside the footprint of the existing structure.

C) Analysis of Beach Sand Loss Rates

The proposed reconstruction of the revetment does not alter the slope of the existing structure, nor significantly change its permeability. Therefore, it does not change the reflection coefficient from the pre- project condition, and thereby does not change local beach slopes, wave heights, or longshore and cross shore transport rates. Consequently, The Noble Report conclusion of no significant project impacts to beach sand loss rates due to wave shoaling and reflection is sensible. The improved strength of the proposed revetment reconstruction will reduce the possibility of beach scour associated with the likelihood of rock dislodgement in the existing structure.

The project will reduce the numbers of storm drains discharging across the beach from 5 to 3, and will equip each of the outlets with energy dissipators.. Because the outlets will reduce the peak flow velocities, they will reduce the volume of sand scoured from runoff channels across the beach face, and thereby reduce the local beach erosion that otherwise occurs in the neighborhood of those channels. Hence, I believe the beach sand loss rates are likely to be diminished somewhat in the post-project condition.

D) Encroachment

The access walkway and ramp landings are found to encroach upon 1,770 square feet of back beach area. Much of this encroachment area will be below the sand elevation during the summer recreational period when the beach sand volumes are maximized by the summer equilibrium profile. I believe a portion of this encroachment is self mitigating by two factors: 1) the proposed reconstruction of the revetment occupies fewer linear feet of beach length than the existing revetment, and 2) the improvements in the storm drain system will probably increase back beach sand volume and dry beach area. The Noble Report does not address the degree of beach scour that occurs for the higher peak flow velocities of the pre-project storm water discharges, and makes no attempt to offset calculations of encroachment impacts with estimates of benefits derived from reducing those peak flow velocities. The report also indicates that the project will eliminate dry weather nuisance flows but does not factor recreational benefits arising from the increase in dry beach area by eliminating those nuisance flows. Presumably, The Noble Report has not attempted to credit the project with such benefits because

they are difficult to quantify, but nonetheless are probably real. (On the other hand the report does emphasize project improvements in the quality of storm water due to proposed installations of first-flush desiltation, filtering and floating debris collection systems).

E) Sediment Budget Analysis and Levels of Significance

The Noble Report concludes that the beach within the project boundaries is primarily sustained by littoral drift from updrift sources, including watersheds and bluffs as far north as Monarch Point. This conclusion is supported by virtually every known previous study of this region. The project impact of reducing sediment yield to the beach by 2.8 cubic yards per year is miniscule in relation to the annual littoral drift rate along the Strand Beach (15,000 -17,200 cubic yards per year), or in relation to the beach volume along the project boundary (48,300 cubic yards). If the project impacts were accumulated over 25 years, The Noble Report finds that the local beach width would be reduced by less than 0.03 ft. That amount of beach retreat can not be measured by present beach survey methods. Average seasonal variability in beach widths along the Strand Beach were found to be typically 55 ft. Therefore, project impacts on beach and shoreline stability are less than significant by any conceivable measure.

F) Project Alternatives

The Noble Report finds that the Beach Fill Alternative would require 337,500 cubic yards of supplemental nourishment volume to achieve shoreline protection comparable to the preferred project. That amount of nourishment would have to be replaced periodically. There are no known borrow sites for that quantity of beach compatible sand within the region. Moreover, when placed, that quantity of sand would likely bury low relief hard bottom habitat near the fill area. For these reasons, I concur with the findings of The Noble Report that the Beach Fill Alternative is not as viable as the preferred project.

The Seawall Alternative would likely increase the shoreline reflectivity during high water level events. This would likely increase the local beach slopes and set off a chain reaction of unpredictable effects in the shoaling wave patterns during high energy events. Changes in reflection coefficient due to the seawall

could alter rip current strength and location, thereby changing loss rates of beach sand. The breaking wave characteristics could also be altered due to increased shoreline reflectivity, thereby effecting local surfing. The numbers of uncertainties surrounding the potential impacts of this alternative do not seem to be worth a deviation from the preferred alternative.

Removal of the existing revetment would be a high risk project alternative that offers benefits of little consequence. There is no doubt of The Noble Report conclusion that removal of the existing revetment would result in wave-induced undercutting of the lower terrace slopes in the Strand project area. Geotechnical analysis by AMEC (2001) indicates that these slopes are part of an ancient landslide complex, and that such undercutting by waves would lead to bottom up wasting of the slopes and terrace above the beach. Such an outcome would endanger people on the beach as well as upset private and public infrastructure in areas both inside and outside the project boundaries. The Strand Beach is not a sand-starved beach and consequently there is no apparent need to provide additional sediment to this beach by way of slope/terrace retreat. Furthermore, because the landslide deposits will be eventually rendered unstable by removal of the revetment, it does not seem possible to manage that slope/terrace retreat in a safe manner. This outcome would be essentially the same for the no-action alternative, except it would probably take longer to occur depending upon the frequency of recurrence of the extreme wave events that would progressively dismantle the existing revetment over time.

G) Conclusions

The Noble Report draws thoroughly from the body of existing data on the coastal processes of this region, and employs contemporary analysis techniques in evaluating the fundamental questions surrounding this project's potential impacts. I believe the report was written using conservative engineering judgement, avoiding emphasis of certain project benefits which are apparent but difficult to quantify. I believe the findings of The Noble Report are correct. The project was found to have benign impact on coastal processes because of three attributes of the physical setting: 1) there is no well defined fluvial system within the project boundary, and consequently the watershed yield of beach sand from the project site is negligible, 2) shoreline fortification is a pre-project condition, and consequently the project does not change sediment yield from bluff retreat, and

3) the beach fronting the project boundary is at the downdrift (receiving) end of a littoral cell where sand supply is primarily derived from distant (updrift) sources. The encroachment impacts of the project are small, and are partially offset by increases in dry beach area achieved by storm drain improvements.

Respectfully submitted,

Scott A. Jenkins, PhD
Senior Engineer

SAJ:saj

APPENDIX K

WATER QUALITY ASSESSMENTS AND RELATED DOCUMENTS

HEADLANDS WATER QUALITY TECHNICAL REPORT

PART 1: WATER QUALITY EVALUATION

PART 2: WATER QUALITY MODELING RESULTS

PART 1

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HEADLANDS WATER QUALITY TECHNICAL REPORT

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EXECUTIVE SUMMARY

The purpose of this report is to provide an evaluation of water quality issues for the Project. It is directly associated with the accompanying document included as Part 2 of this volume, entitled Water Quality Modeling Results.

Headlands Reserve LLC proposes to develop a 121.3-acre coastal property located within the City of Dana Point and west of Dana Point Harbor, known as the Headlands. The Project site is bounded by commercial and residential land uses to the north and west, residential and commercial development along Street of the Green Lantern, and Dana Pont Harbor to the east. Immediately adjacent to and offshore of the Project site are the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge, with their varied intertidal and subtidal marine habitats. Because of the ecological importance of these marine habitats and their designation as marine life refuges by the State of California, water quality issues are of particular importance for the Project. In addition, because Dana Point Harbor is considered as an impaired water body, water quality in runoff from the Project draining to the Harbor is of special concern.

The report discusses existing water quality conditions at the Project site, including watershed drainages within and directly adjacent to the site, the quality of groundwater resources, and conditions in Dana Point Harbor. As part of this discussion, a summary is presented concerning the results of a baseline water quality study at the Project site conducted during 1999-2000. A full description of this study also is provided in the Appendix. The primary purpose of this study is to provide baseline water quality data on 46 constituents of storm water runoff, against which data obtained in future water quality monitoring during the construction and post-construction phases of the Project can be compared. The results indicate that these constituents of storm runoff at the site were typical of those in other, similar coastal watersheds elsewhere in Orange County and southern California.

The report discusses water quality plans and policies applicable to the Project. Of primary importance are the San Diego Basin Plan, the California Ocean Plan and the NPDES Program of the Federal Clean Water Act.

The report also provides detailed evaluations and discussions of potential Project impacts on water quality, as well as associated control measures. These include drainage and runoff management, water quality effects related to construction, and water quality effects following construction. For the latter two topics, specific Best Management Practices (BMPs) and other Project design features are suggested and their effects evaluated.

Of particular importance are the widely spaced outlets carrying relatively low runoff flows to the receiving water, the use of sand filters and their associated detention capabilities and high removal efficiencies for many runoff constituents, and diversion of first flush runoff away from the ecologically sensitive marine habitats and marine refuge areas close to the Headlands Promontory. In addition, the proposed diversion of non-storm runoff ("nuisance water") and its associated bacterial and chemical constituents into the sanitary sewer is a key Project feature. These Project BMPs also will act to control the concentrations of constituents

in runoff from the 34 acres of adjoining urbanized development off site that are within the same watersheds.

Finally, based on the forgoing information, a baseline water quality study, and the results of flow-based modeling to predict concentrations of 12 runoff constituents, evaluations are made to compare those concentrations with agency water quality objectives and guidelines and to consider the related effectiveness of the proposed primary structural BMPs and other Project design features. Due to the limited information available on removal efficiencies for the other proposed BMPs, the predicted effluent concentrations include only the constituent removal effects associated with sand filters and street sweeping.

The results of these evaluations show that under developed conditions, with the street and parking lot sweeping and sand filters employed, all of the 12 physical and chemical constituents for which modeling predictions were made, have concentrations that are well below the specific guidance values provided in appropriate agency water quality guidelines. This indicates very clearly that these runoff concentrations would have no adverse ecological effects, either in the Project watersheds or in the adjacent receiving waters of Dana Point Harbor and Strand Beach. It further indicates that these constituents would have no adverse effects on other beneficial uses in the receiving waters, as those are specified in the San Diego Basin Plan and the California Ocean Plan.

The results from the modeling show that, with the exception of dissolved phosphorus and nitrate (and of TDS and COD in one instance), the predicted concentrations of these constituents in the developed condition will be very substantially reduced by the combination of frequent street and parking lot sweeping and the removal effects of the sand filters. These predicted reductions are: 85-87% for TSS, 19% for TDS, 68-72% for BOD, 13% for COD, 43-53% for TKN, 35-39% for total phosphorus, 19-37% for total cadmium, 46-59% for total copper, 82-87% for total zinc and 83-88% for total lead. Although bacteria were not included in the modeling, removal efficiencies of bacteria by sand filters reported in the literature have a range of 37 – 78%. This indicates that there will be a substantial reduction in the numbers of pathogen indicator bacteria by sand filtration during storm runoff at the Project site. The use of additional proposed structural and non-structural BMPs and other design features described in this technical report, but for which specific efficiencies are not available, will further reduce the concentrations of these constituents. This evidence indicates that the combination of proposed Project design features will be very effective in maintaining the concentrations of these constituents within fully acceptable ranges from an environmental and regulatory standpoint.

Concentrations of dissolved phosphorus and nitrate (as N) are predicted to increase by 15-38% and 24-53%, respectively, as the result of the sand filtration process. These predicted increases would most likely be due to the disassociation of organic or particulate-bound nutrients as the runoff water passes through the filters. However, the modeling does not take into account the fact that increases in dissolved phosphorus and nitrate during sand filtration are a function of the total phosphorus and TKN concentrations present. As a result, the series of additional proposed non-structural BMPs and other Project design features that remove total phosphorus, particulate-bound nutrients and TKN from the watershed upstream of the filters would have the end result of reducing dissolved phosphorus and nitrate concentrations

below the levels predicted. In one instance each, under developed conditions with BMPs, the levels of TDS and COD are predicted to increase in the Strand Beach watershed by 26% and 21%, respectively. These predicted increases probably are simply artifacts of the modeling process, because no removal efficiencies for TDS and COD by sand filters are available. It should be noted that BOD and COD are interrelated; as BOD levels decrease, there is a corresponding decrease in COD.

Despite these predicted increases for dissolved phosphorus, nitrate, TDS and COD, all of the resulting predicted values are very far below the applicable agency water quality guidelines. This indicates clearly that the levels of these runoff constituents will have no adverse ecological effects or adverse effects on other beneficial uses in the watershed or receiving waters.

It is important to recognize that regulatory standards for indicator bacteria, as stated in the California Ocean Plan, are not applied to counts of those bacteria in the receiving water during storm runoff within the period November 1 - March 31. These regulatory standards are only applicable to periods following storms and during non-storm conditions within that time period. During the AB411 period, from April 1 – October 31, these regulatory standards are applied both during rainfall runoff and non-storm conditions. This is the approach employed by the Orange County Health Care Agency.

When rain falls on coastal watersheds, the numbers of total coliforms, fecal coliforms, enterococci and other bacteria increase markedly and rapidly in the runoff as water, soil, feces, organic debris and other materials containing them are washed into the drainage paths. To the layperson, such major increases in numbers of bacteria are alarming. However, essentially this same process occurs in all undeveloped and variously developed coastal waters of southern California. For example, the ranges and means of pathogen indicator bacteria counts are very similar during storm runoff in the undeveloped Muddy Canyon watershed on the Newport Coast, in Emerald Canyon, and in the Project watersheds. In addition, counts of pathogen indicator bacteria following and between storms have been found not to differ significantly among relatively undeveloped watersheds and those of moderate to very dense development along the coast from Corona Del Mar to southern Laguna Beach. This indicates that the process is relatively independent of the level of development and much more closely tied to the great variety of natural and human-induced sources of bacteria in the watersheds.

Based on data reported in the literature for sand filters of similar design to those that will be employed in the Project, removal efficiencies for bacteria range from 37-78%. This indicates that substantial amounts of the pathogen indicator bacteria will be removed from the runoff water before it enters the Harbor and surf zone receiving waters.

Although they are difficult to quantify, other proposed BMPs and Project features besides street and parking lot sweeping and sand filtration are expected to have an effect in reducing and controlling the counts of pathogen indicator bacteria, as well as the other truly pathogenic bacteria and viruses of direct concern to human health. These include public education and awareness programs, regular cleanup and proper disposal of domestic animal wastes, grass cuttings and other plant debris, proper disposal of food preparation wastes,

structural covers on dumpsters, disposal of restaurant and other commercial wash water into the sanitary sewer, proper maintenance of wastewater drains and sanitary sewer systems, maintenance of storm drain structures, as well as enforcement of the prohibition on washing or introducing organic waste and debris into storm drain openings during non-storm conditions.

A related BMP of major importance is the diversion of dry-weather and other non-storm runoff from the Project drainage system, as well as from the 34 acres of urban development outside of the Project, into the sanitary sewer. During rainy weather when this diversion cannot be operated, the detention and flow of runoff through the sand filters will serve as an automatic and very effective backup. The result of this diversion will be the virtual elimination of non-storm runoff containing bacteria, viruses and chemical constituents into Dana Point Harbor at watershed outlet A and into the ocean along Strand Beach.

While it is not possible to eliminate pathogen indicator bacteria, such as fecal coliforms, from storm water runoff, the results of this evaluation indicate that their numbers can be reduced substantially (37 - 78%) by employing sand filters. It is very clear that use of sand filters in conjunction with diversion to the sewer and the other structural and non-structural BMPs proposed for the Project will reduce bacterial counts in the watershed and marine receiving waters to the maximum extent practicable. As a result, the potential adverse effects on beneficial uses of Dana Point Harbor and Strand Beach from Project and adjoining area runoff will be significantly minimized.

The results of these evaluations indicate that implementation of this combination of BMPs and other Project design features would reduce and control the concentrations of runoff constituents to the maximum extent practicable. The results further indicate that the use of these Project features would reduce the potential impacts involving water quality in the runoff and in the marine receiving waters to less than significant levels. In view of this, any potential ecological impacts to the adjacent marine habitats and marine life refuges also would be reduced to less than significant levels.

SECTION 1

INTRODUCTION

The purpose of this report is to provide an evaluation of water quality issues for the Project. It is directly associated with the accompanying document included as Part 2 of this volume, entitled Water Quality Modeling Results, prepared by URS Corporation (2001). By reference, it incorporates the figures and tables of that report. In addition, it is also directly associated with the documents entitled Drainage Study for The Headlands, prepared by The Keith Companies, Inc. (2001), and Headlands Marine Biological Resources Technical Report, prepared by Applied Ecological Research (2001). Without proper structural and non-structural Best Management Practices (BMPs), water quality characteristics of storm runoff and dry-weather runoff from the Project could potentially affect the marine organisms and their habitats described in the latter report.

Headlands Reserve LLC proposes to develop a 121.3-acre coastal property located within the City of Dana Point and west of Dana Point Harbor, known as the Headlands. The regional location of the Headlands is indicated in Figure 1.1, and the boundaries of the Project site are shown in Figure 1.2. The City of Dana Point is situated southwest of the City of Laguna Niguel, and northwest of the cities of San Juan Capistrano and San Clemente (Figure 1.1). The Headlands is located in the west central portion of the city. The southern and western boundaries of the Headlands and the City of Dana Point are located adjacent to the Pacific Ocean (Figure 1.2).

As shown in Figures 1.1 and 1.2, the Headlands site is bounded by commercial and residential land uses to the north and west, residential and commercial development along Street of the Green Lantern, and Dana Point Harbor to the east. Immediately to the north of the Headlands are the Niguel Terrace Condominiums and the Orange County Salt Creek Beach Parking Lot adjacent to Selva Road. In the past, a portion of the Headlands area was used as a mobile home park (Figure 1.1). This use was abandoned, but pavement, infrastructure, support buildings and other facilities remain. In the center of the site there is a cluster of greenhouses, a parking lot, several buildings and related facilities associated with a former nursery. The area is now utilized by some small businesses and for material and boat storage. Several paved streets exist on the property that serve the two residential enclaves on the Headlands. These two enclaves are not part of the Project site.

Immediately adjacent to and offshore of the Project site are the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge, with their varied intertidal and subtidal marine habitats (Figure1.3). These habitats, their rich marine fauna and flora, and the importance of the two marine life refuges are described in the report entitled Draft Headlands Marine Biological Resources Technical Report. Because of the ecological importance of these marine habitats and their designation as marine life refuges by the State of California, water quality issues are of particular importance for the Project. In addition, because Dana Point Harbor is considered an impaired water body, water quality of runoff draining to it is of special concern.

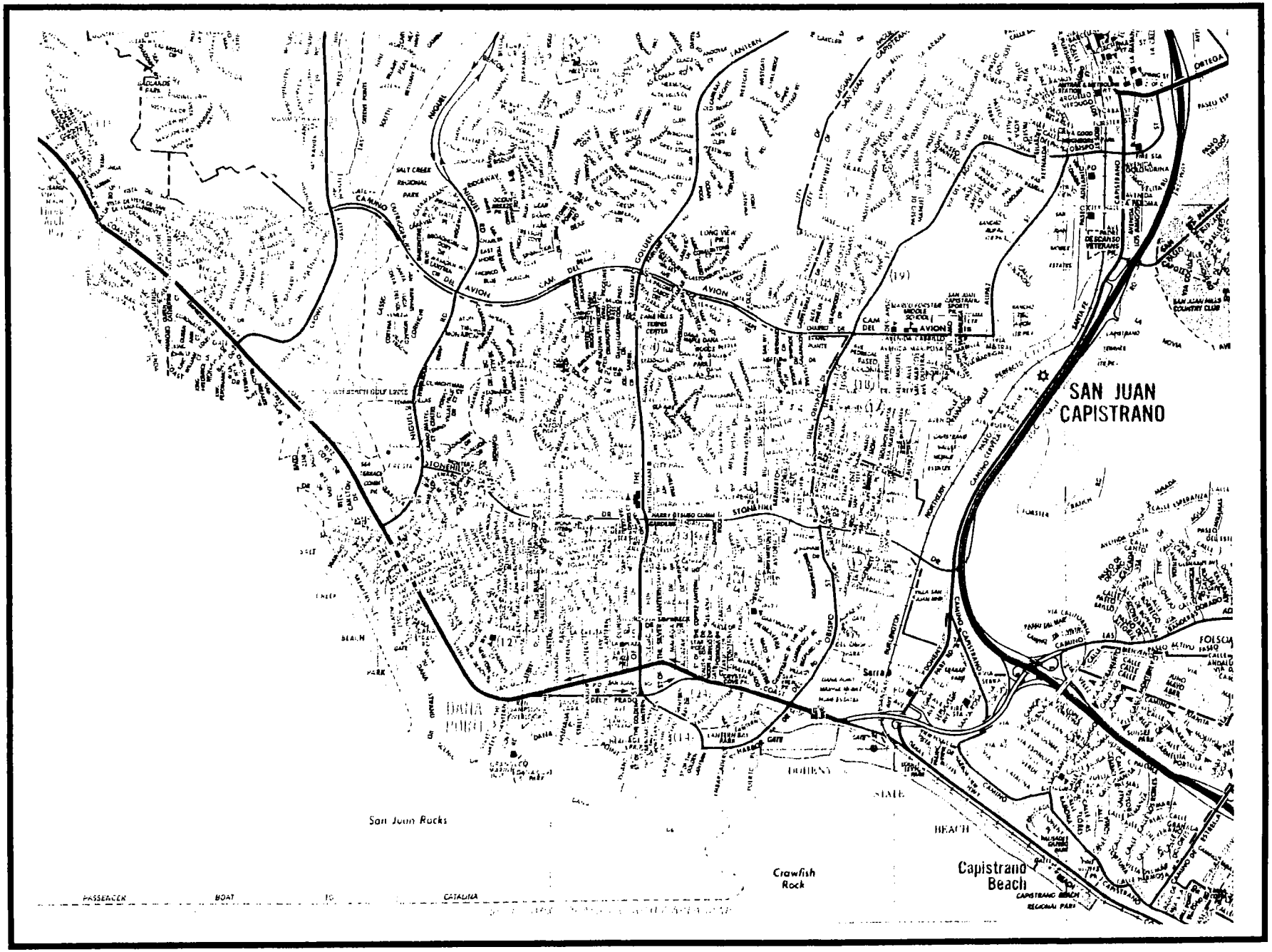


FIGURE 1.1 DANA POINT AND ADJACENT AREAS

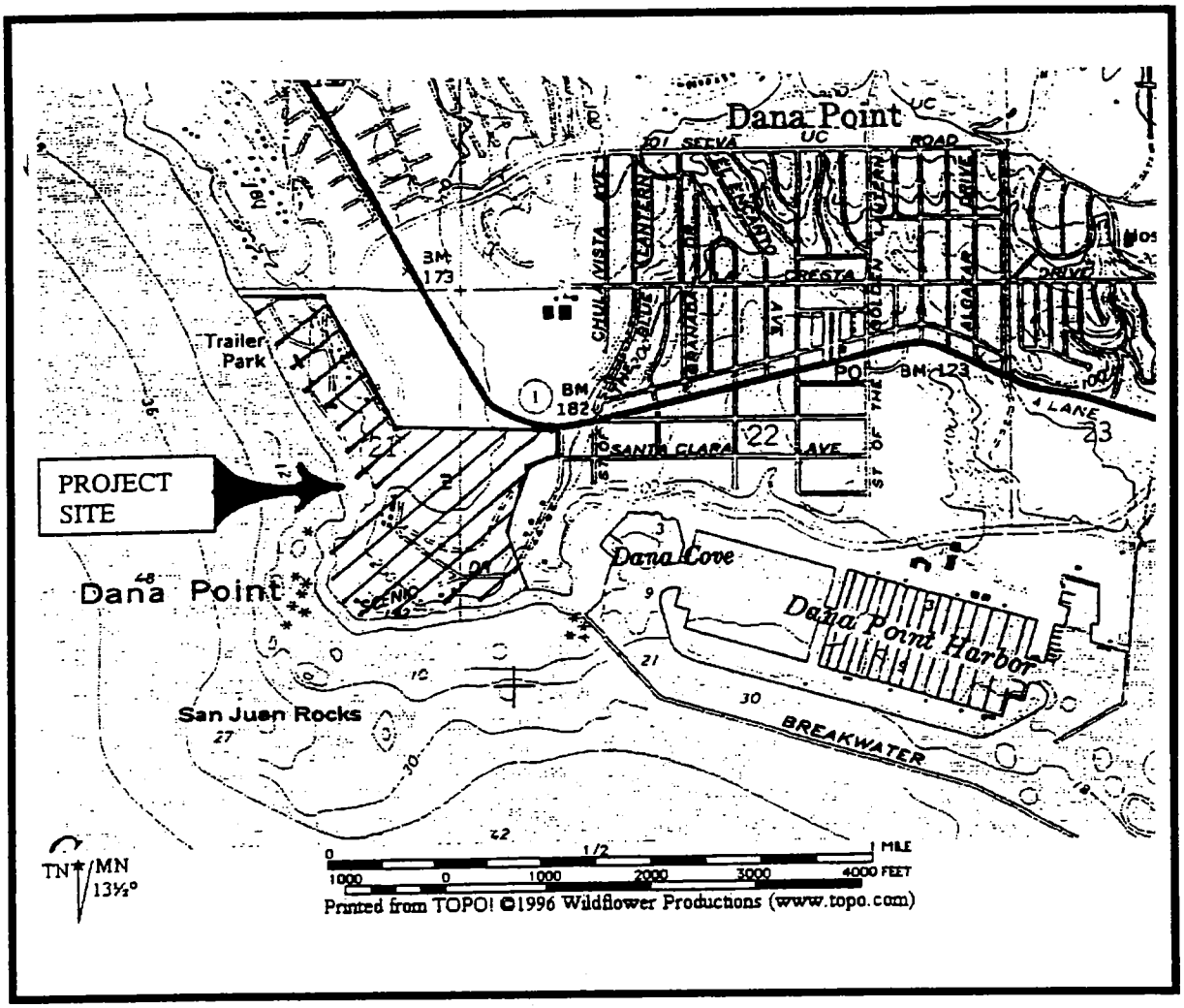


FIGURE 1.2

SITE OF THE HEADLANDS PROJECT

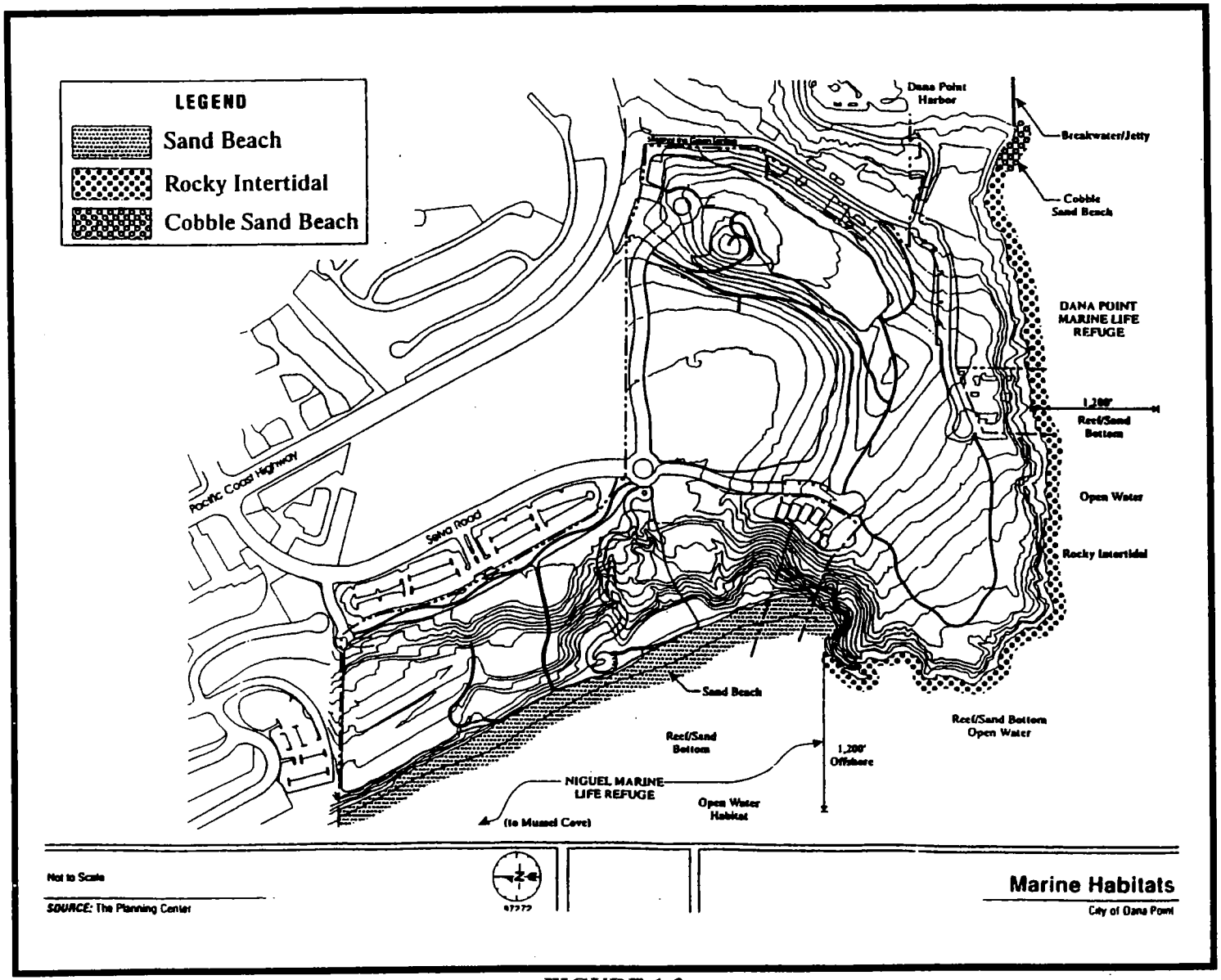


FIGURE 1.3
LOCATIONS OF THE DANA POINT AND NIGUEL MARINE LIFE REFUGES AND ASSOCIATED INTERTIDAL AND SUBTIDAL HABITATS

SECTION 2

EXISTING CONDITIONS

2.1 ADJACENT MAJOR WATERSHEDS

Two major watersheds carry runoff water to the Pacific Ocean in the vicinity of Dana Point. The Salt Creek Watershed, serving a drainage area of 4,500 acres, flows in a southerly direction. Storm runoff and dry-weather flows from this watershed enter the ocean at the Salt Creek Beach Access Way, located approximately 0.6 miles north of the Headlands (Figure 1.1). Runoff flow from this watershed may affect ocean water quality in the Strand Beach area. The much larger San Juan Creek/Arroyo Trabuco Watershed, serving a drainage area of 112,000 acres, carries runoff into the ocean at Doheny State Beach, located 1.5 miles to the southeast of the Headlands site (Figures 1.1 and 1.2). Runoff from this watershed might be close enough to have slight effects on ocean water quality adjacent to the Headlands area during and following major storms. However, this has not been established. Because the prevailing direction of longshore current flow is to the south in this area, such effects of runoff are likely to be very slight.

Technically, the most southerly portion of the Headlands falls within the San Juan Creek/Arroyo Trabuco Watershed, while the northern portion lies within the Salt Creek Watershed. However, from a practical standpoint, existing drainage areas of the Project have no small creeks or other surface water features that are tributary to those two major watersheds. Instead, they have their own relatively small drainage paths that flow directly to the ocean, as described in the following section.

2.2 WATERSHED DRAINAGE WITHIN AND DIRECTLY ADJACENT TO THE HEADLANDS

The Headlands has three primary drainages. Runoff from approximately 60 percent of the property flows to Strand Beach, while runoff from approximately 30 percent of the land drains over the bluff edges in the area extending from Harbor Point around to the northerly residential enclave (Figure 1.2). The remaining 10 percent of runoff from the Project drains to Dana Point Harbor. There are no true creeks within the Project area. Instead, overland flows pass through the small ephemeral drainage paths and flow over the bluff edges, to drains on Cove Road, or through a storm drain system installed for the former mobile home park. Five storm drain outlets at Strand Beach were constructed beginning in the 1950's to serve the then new mobile home park, as well as to carry other on site and off site runoff. The mobile home park improvements remain in place, although most are in disrepair. They include the five storm drain outlets, paved streets, mobile home pads, septic systems, and the storage and recreational facilities.

The former greenhouse nursery area that borders on PCH also drains to Strand Beach. Existing improvements in this area include the greenhouses, storage facilities, a private parking lot and private roadways. In addition, runoff from approximately half of the Orange County Salt Creek Parking Lot next to Selva Road, a portion of Selva Road, and the Niguel Terrace Condominium site drains through the Project property to Strand Beach. Storm drain

facilities must be constructed to accommodate these off site flows, as well as the ones from the new Project improvements. The County of Orange is responsible for the storm drain in the public access stairway that runs from the Salt Creek Beach Parking Lot to Strand Beach. This is located adjacent to the Niguel Shores Community just to the north of the Headlands site (Figures 1.1 and 1.2). All of the runoff carried in this drain structure comes from off site areas. No portion of the Headlands property utilizes this County drainage system and future drainage for the Project also will not utilize it.

Runoff from the area known as the Headlands Promontorv portion of the property, which includes the Dana Point Headland itself and surrounding coastal bluffs, passes directly over the bluff edges, following paths of historical or natural drainage.

Storm water runoff from the portion of the Project site that enters Dana Point Harbor comes from sections of the Street of the Green Lantern, Cove Road, Scenic Drive and the adjoining property in the vicinity of Harbor Point. This runoff passes to the existing concrete "V" ditches on either side of Cove Road and then flows into the Harbor through an existing storm drain (Figures 1.1 and 1.2).

Two series of hydrologic analyses were completed for existing conditions. They are the Rational Method analysis performed by The Keith Companies (2001) and modeling by URS Corporation. The latter involved calculations for both undeveloped and developed portions of nine watershed basin areas within the Project site, as described in Part 2 of this document.

2.3 QUALITY OF GROUNDWATER RESOURCES

The central area of the City of Dana Point falls within the lower portion of the San Juan Groundwater Basin. The water-bearing strata of this basin are typically present from approximately 30 – 110 feet below the ground surface. The level of the water table varies depending primarily on the season and the amount of recent rainfall. The lower portion of this groundwater basin is less permeable and has reduced infiltration capacity, as compared with the upper basin area. The major source of groundwater in the overall basin is the valley fill alluvium, which makes up approximately 10 percent of the watershed. Most recharge of groundwater in the basin is through existing streambeds. The Project site is not situated in a groundwater recharge area and supports no known beneficial uses of groundwater.

Most of the Project site is underlain by beach sand, San Onofre Breccia, Monterey Formation, marine terrace deposits, slope wash, artificial fill, and landslide material. There is no documentation regarding the presence or absence of groundwater beneath the Headlands Promontory. However, a few seeps occur along the base of cliffs and bluffs of this area.

As described in the Geotechnical Evaluation for the Project prepared by AMEC (2001), the dense, indurated geological condition of the San Onofre Breccia makes this unfractured rock essentially impermeable to groundwater and acts as a barrier to infiltration. The presence of small amounts of groundwater flowing along the top of the buried bedrock surface is a common feature of marine terraces along the California coast. This results from the

difference in permeability between the sandy terrace materials above and the relatively impervious underlying bedrock (AMEC 2001).

The large areal extent and general seaward inclination of the bedrock erosion surface to the east of the Project site tends to produce seaward flow of groundwater. Continual sources of recharge to local groundwater are the residential developments and their associated landscape irrigation located to the east of the Project site (AMEC 2001). More recent measurements of groundwater level at the Headlands site are typically slightly lower than those obtained in the 1980's. AMEC (2001) reported that these slight decreases probably resulted from closure of the Dana Strand Mobile Home Park, ending its associated discharges of water to the soil.

Along some ancient faults the water works its way to the bluffs. The depth to groundwater beneath the Strand area varies from approximately 40 to 50 feet along the eastern margin of the site, and to 20 to 30 feet along the middle and lower portions of the terraces that are underlain by landslide materials. The sources of groundwater in the Strand area are most likely irrigation water from urbanized areas off site and from natural recharge.
Overall, the quality of groundwater in the lower San Juan Basin is considered to be relatively poor. The concentrations of total dissolved solids (TDS) range from 1,500 to 2,000 ppm, values that are well above State standards. As noted in the Master Environmental Assessment prepared for the City of Dana Point, of the estimated 80,000 acre-feet of groundwater in the San Juan Creek Basin, approximately 30,000 acre-feet (37.5%) are presently unusable due to water quality problems arising from nitrate levels and salt content produced by agricultural return water, and highly mineralized upstream groundwater sources. The quality of groundwater also declines toward the ocean, primarily due to seawater intrusion.

The majority of the Project site is currently vacant and, except for minor ephemeral drainages, there are no natural surface water features. There are several unused service structures that are part of the abandoned mobile home park, and four former nursery buildings. Graded building pads, retaining walls, paved areas and mature landscaping remain where the former mobile home park was located in the Strand Beach area.

2.4 QUALITY OF EXISTING RUNOFF WATER AND RECEIVING WATER

BASELINE STUDY OF WATER QUALITY DURING STORMS

Because the Project site is largely vacant and contains partially developed areas not now in use, monitoring of storm water and dry-weather runoff has not been required for regulatory purposes. Baseline studies of water quality were conducted by Rivertech Inc. under the direction of Dr. Richard F. Ford, employing samples taken during storm runoff in 1999-2000 at representative locations within and adjacent to the Project site. The methods, results and discussion of this work are summarized in the following subsections. A full description and discussion of these baseline water quality studies are provided in Appendix Section A of this Technical Report, to which the reader should refer for specific details.

The primary purpose of this baseline study was to obtain representative data on storm runoff constituents under existing, pre-Project conditions, against which sampling data from

monitoring during the later construction and post-construction phases of the Project can be compared. In addition, the baseline study was conducted to determine if any existing water quality problems were present in storm runoff in the Project watersheds.

BASELINE STUDY METHODS

During the period January–April 2000, samples were taken from runoff water for three representative storm events. The nine sampling stations at which water quality samples were taken are shown in Figure 2.1. Six of these (Station Pairs A, B and C) were located along the Strand Beach area of the proposed Project. The first of each pair of stations was located at the outlet of the freshwater drainage area near the points where the runoff discharges to the beach (A1, B1, C1), while the second of each pair was located at the points where that storm water runoff enters the surf zone and mixed with ocean water (A2, B2, C2). Stations A1 and A2 were located at and near the discharge point of the public storm water drain (Figures 1.2 and 2.1). This drainage system is located within the public access stairway structure between the Orange County Salt Creek Beach Parking Lot and the beach. Note that the runoff reaching Stations A1 and A2 was not from the Project site and that future runoff from the Project also will not pass through it. Station C1 was located at the outlet of a gully leading to the Strand Beach area and Station C2 at the surf zone where runoff from that gully reached the ocean. An additional site, Station C, was located downstream of the County-owned parking lot (Figure 2.1). Runoff from Station C passed through the Project site before reaching Stations C1 and C2 (Figures 1.2 and 2.1). Runoff from the southern area of the Project site was sampled at Station D1, located in the existing roadside "V" ditch drainage structure near the upper end of Cove Road (Figure 2.1) leading down to Dana Point Harbor. The runoff from the road passes into a storm drain that discharges into the Harbor. Station D2 was located there (Figure 2.1).

During the three representative storm events in 2000 (sufficient rainfall to produce runoff to the beach or harbor in two or more of the drainages) a staff member of Rivertech Inc. took water grab sample series at all stations where there was runoff flow. For each storm event sampled, a set of water grab samples for analyses of constituents was taken at each station as close as possible to the time when the substantial, near-peak flow of runoff occurred there. A second set of constituent samples was taken at each station 2 to 3.5 hours after the first. In addition to the water sampling described above, salinity samples were taken at surf zone Stations A2, B2, and C2, and at Harbor Station D2. The purpose of this time series was to determine the level and duration of reduced salinity produced by storm runoff and to assess the degree of mixing and transport of runoff constituents by nearshore oceanographic processes (e.g. wave action, surge and longshore currents).

The physical, chemical and bacterial constituents of runoff water and ocean water analyzed in the study are shown in Table 2.1, together with the analytical methods used and the normal reporting limits attained by the laboratories. Del Mar Analytical and two affiliated laboratories analyzed all of the constituents except salinity. Detection limits employed by Del Mar Analytical and affiliated laboratories for analyses of all the chemical constituents were lower than the acute criteria of the California Ocean Plan (CRWQCB 1997) and for

freshwater as specified in the EPA Proposed California Toxics Rule (USEPA 1997) and the California Toxics Rule (USEPA 2000a).

STUDY RESULTS AND DISCUSSION

The dates of the three storm events sampled and the total rainfall amounts for each storm are shown in Table 2.2. These data are from the Palisades Reservoir rain gauge station nearby in San Clemente, CA. The relatively small storm of 1-25-00 (0.39 inch) was the first of the season. It produced no runoff flow at Stations B1 and C1 or into the surf zone at Stations B2 and C2. However, because of first flush effects at the start of the storm season, it is important. The second event sampled on 2-21/22-00 was the largest storm of the 1999-2000 season at this location (2.20 inches). This storm produced runoff at all nine stations, but runoff was of relatively short duration at Stations B1 and B2 (Table 2.3). The third storm event sampled on 4-17-00 was of moderate size (0.73 inch). It produced no runoff flow at Stations B1 and B2. One reason for the limited runoff at Stations B1 and B2 was the degraded condition of drainage structures leading to the B1 site.

The results of the water quality analyses of physical and chemical constituents for these stations are shown in Tables 2.3-2.7. They are: total dissolved solids, total suspended solids, and freshwater hardness (Table 2.3); total phosphorus, dissolved phosphorus, and oil and grease (Table 2.4); nitrate and nitrite (as N), total Kjeldahl nitrogen, and the 26 organophosphorus pesticides (Table 2.5); total recoverable concentrations of the trace metals cadmium, copper, and lead (Table 2.6) and of zinc, chromium (III), and nickel (Table 2.7).

Data for pH, specific conductance of freshwater, and seawater salinity are not summarized in table form. Measurements of these three constituents for all stations were within typical and normal limits for southern California watersheds (URS Greiner Woodward Clyde 1999; Ford et al 2000). Data for pH were within regulatory guidelines of the San Diego Basin Plan (CRWQCB 1994), EPA Parameter Benchmark guidelines (USEPA 2000b; Table 3, p 64768), and the California Ocean Plan (CSWRCB 1997).

In these tables the range and mean of values are shown for each station and sampling date. While based on a limited number of samples, those ranges and means for each station and storm event provide useful summary information about existing conditions of water quality at station sites within the Project (B, C and D station series). In addition, the data for Stations A1 and A2 provide baseline information on water quality conditions introduced directly adjacent to the northern boundary of the Project site by the public storm water drain system (Figures 1.1 and 1.2). It is important to consider water quality conditions introduced by this large off site drainage, because it contributes runoff constituents to the beach and surf zone at the northwestern boundary of the Project site on Strand Beach (Figures 1.1, 1.2 and 2.1), and add to background conditions of water quality there. Grand means, combining data from all three storm events, provide an overall representation of baseline water quality conditions within the Project boundaries (Tables 2.3 – 2.7). Stations A1 and A2 are associated with the public drainage system that carries runoff from areas outside the Project; therefore, data from those two stations were omitted in calculating grand means.

It is extremely important for the reader to recognize that the individual and mean concentration values of runoff constituents obtained by grab sampling in this baseline study cannot be compared in a meaningful way with the Event Mean Concentration (EMC) values and model predictions presented by URS Corporation (2001) in Part 2 of this technical report. EMCs and associated modeling predictions are based on large series of samples taken over the entire course of many storms. In contrast, the data from the two sets of grab samples taken during each storm in the baseline study are not EMCs. They simply represent typical concentrations measured near the time of peak runoff flow and at a time 2-3 hours after peak flow. Because of this sample timing, the concentrations of constituents measured from the baseline grab sampling are usually considerably higher than those of the EMCs, which represent average concentrations over the entire course of the storms sampled rather than those during peak flow.

Total Dissolved and Suspended Solids

As shown in Table 2.3, the values for total dissolved solids (TDS) at freshwater runoff Stations B1, C, C1 and D1 ranged from 120-1300 mg/L, with a mean of 409 mg/L. The values for TDS were considerably higher at Station A1 (off site runoff through the public storm drain) than at stations B1, C, C1 and D1 within the Project site (Range 1300-4700 mg/L). A logical explanation for this difference is that TDS varies considerably from one site to another. In addition, the degraded existing condition of some watershed features on the Project site may have contributed to the differences in TDS values observed. The concentrations of total suspended solids (TSS) measured at freshwater runoff Stations B1, C, C1 and D1 ranged from ND-21,000 mg/L, with a mean of 3,265 mg/L (Table 2.3). These levels of total suspended solids in the freshwater runoff are acceptable concentrations under the general guidelines described in the San Diego Basin Plan. The much higher TSS levels present in runoff at Station C1 (4,700-21,000 mg/L) and the somewhat higher ones at Station D1 (270-1400 mg/L) may reflect disturbed or degraded conditions in that part of the watershed. These TDS and TSS concentrations are well within the range of values reported for freshwater runoff sites in Los Trancos and Muddy Canyons on the Newport Coast and in Emerald Canyon at Laguna Beach (Ford et al 2000).

The levels of TSS observed at surf zone Stations A2, B2 and C2 and at Dana Point Harbor Station D2 had a range of 2-480 mg/L and a mean of 106 mg/L). Note that even during the strongest storm of 2-21-00, the higher TSS levels (4,700-21,000 mg/L) observed at freshwater runoff Station C1 apparently did not lead to high TSS levels (120-200 mg/L) at the adjacent surf zone Station C2 (Table 2.3).

The TDS and TSS values for the surf zone (Stations A2, B2, C2) and Dana Point Harbor (Station D2) are typical and normal for the nearshore ocean during storm conditions. They are very similar to TDS levels during and following storms reported by Ford et al (2000) for Emerald Cove in Laguna Beach and along the Newport Coast, both located near Dana Point Headlands, and elsewhere in southern California.The TDS and TSS levels observed at the Project site are within acceptable guidance criteria, to the extent that these are described in the San Diego Basin Plan and the California Ocean Plan.

Freshwater Hardness

All of the hardness values for freshwater runoff measured in this study (Table 2.3) are within typical or normal limits for southern California watersheds, including those reported by Ford et al (2000) in nearby Orange County coastal watersheds and those reported by URS Greiner Woodward Clyde (1999) for San Diego County. The hardness concentrations measured for off site storm runoff at the terminus of the public storm drain system (Station A1) were higher (means 525-535 mg/L) than those for runoff from the Project site (means 47-270 mg/L).

Oil and Grease

A majority (12/19) of the freshwater runoff samples had no oil and grease present at or above the detection limit (Table 2.4). Of the seven samples that contained detectable amounts of oil and grease, all were from Stations C and D1, both locations that received runoff directly from either parking lot or street surfaces (Figure 2.1). Because of this, the low to moderate levels of oil and grease observed there (1.1- 4.8 mg/L) would be expected. None of the ocean or harbor stations receiving runoff from the Project sites had oil and grease concentrations that were above the laboratory detection limits (all ND). One of the six samples taken at surf zone Station A2, located adjacent to the terminus of the off site public drainage, contained oil and grease at a concentration (2.0 mg/L) above the detection limit (Table 2.4). The data indicate that oil and grease do not represent a problem in runoff to the ocean or harbor from the Project sites.

Biostimulatory Nutrient Chemicals

The nutrient chemicals in runoff water containing phosphorus and nitrogen are considered as biostimulatory or "nuisance" constituents in storm runoff, rather than toxic constituents (CRWQCB 1994). Excess nutrient biostimulation can degrade water quality when resulting algal blooms depress the dissolved oxygen concentration of the water; the death of fishes and other aquatic life can occur as a result. Algal blooms also can cause changes in the water such as coloration, increased turbidity, and floating algal mats and scum. This general condition produced by excess nutrients is called eutrophication. It normally occurs in standing or gently flowing bodies of freshwater and in poorly circulated, enclosed bays and estuaries receiving excess nutrient concentrations from runoff water.

It is a commonly held misconception that these effects also occur or are likely to occur in open coastal ocean areas of southern California. While natural phytoplankton (plant plankton) blooms are a regular phenomenon in the coastal ocean, there is no evidence at all in the scientific literature indicating that biostimulatory nutrients in storm runoff produce such blooms or other eutrophication effects on the open coast. Natural nutrient chemical concentrations are relatively low in coastal ocean areas during the winter period of storm runoff; as a result, phytoplankton and bottom-living algae rapidly use any additional nutrients entering coastal ocean water.

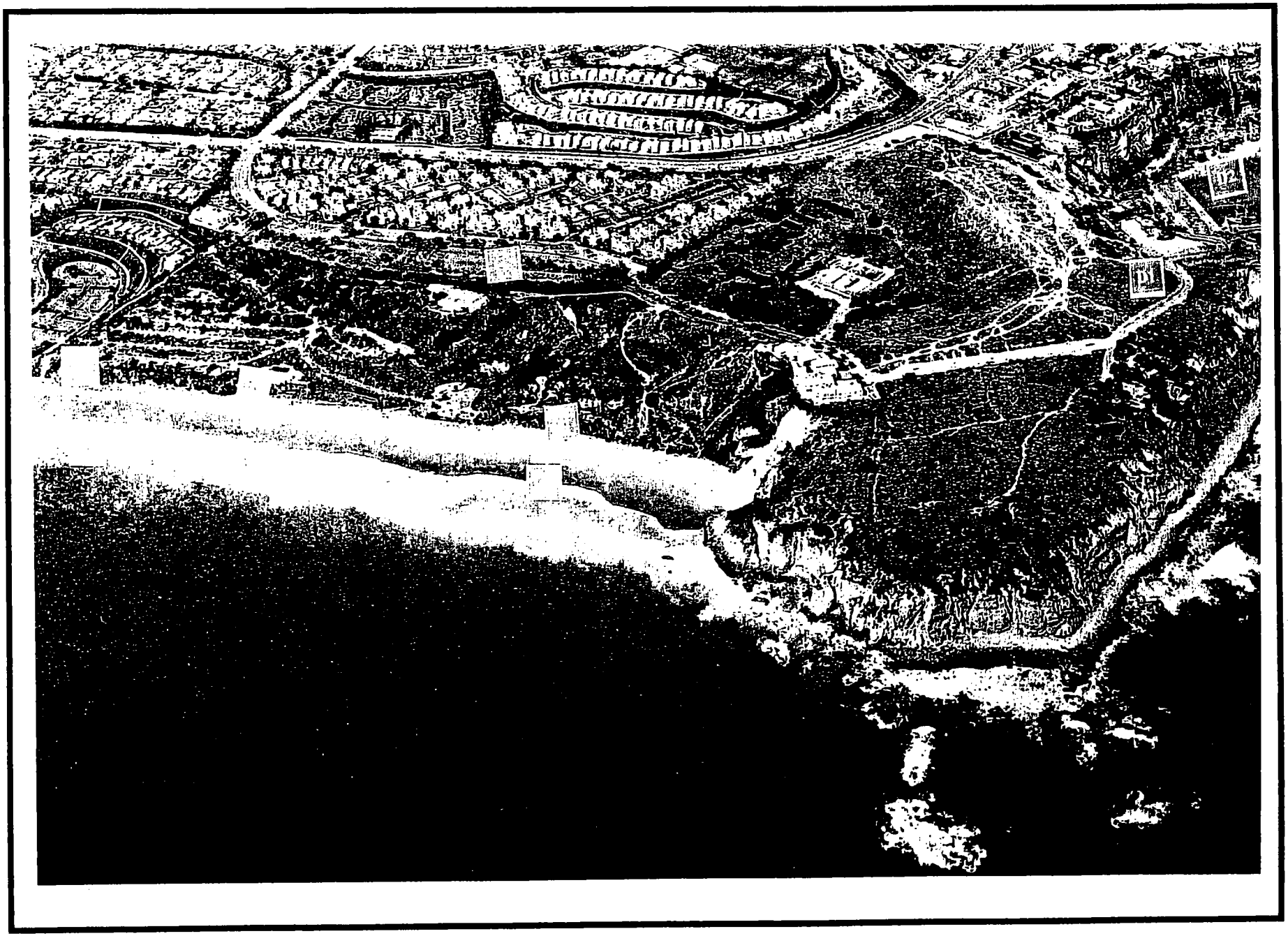


FIGURE 2.1 LOCATION OF WATER QUALITY SAMPLING STATIONS FOR BASELINE STUDY

TABLE 2.1

Constituents analyzed for freshwater and seawater runoff at Dana Point Headlands sites, 1999-2000. Analytical methods used and laboratory reporting limits for those methods are shown.

PHYSICAL CONSTITUENTS CONSTITUENT	REPORTING LIMIT	METHOD
Total Dissolved Solids (TDD)	10.0 mg/L	EPA 160.1
Total Suspended Solids (TSS)	10.0 mg/L	EPA 160.2
Freshwater Hardness	4.0 mg/L	EPA 130.2
CHEMICAL CONSTITUENTS		
CONSTITUENT	**REPORTING LIMIT**	**METHOD**
pH	0.1 pH unit	EPA 150.1
Specific Conductance (Freshwater)	1.0 mmhos/cm	EPA 120.1
Salinity (Seawater)	0.01 ppt	Comparison with Standard Seawater
Oil and Grease	1.0 mg/L	EPA 413.2
Total Phosphorus	0.050 mg/L	EPA 365.3
Dissolved Phosphorus	0.050 mg/L	EPA 365.3
Total Kjeldahl Nitrogen (TKN)	0.5 mg/L	EPA 353.3
Nitrate + Nitrite (as N)	0.01 mg/l	EPA 353.3
TOTAL RECOVERABLE TRACE OR HEAVY METALS		ALL EPA 6010B
Cadimum (Cd)	5 µg/L	
Chromium (Cr)	5 µg/L	
Copper (Cu)	10 µg/L	
Lead (Pb)	5 µg/L	
Nickel (Ni)	10 µg/L	
Silver (Ag)	10 µg/L	
Zinc (Zn)	20 µg/L	
ORGANOPHOSPHORUS PESTICIDES	All µg/L	ALL EPA 8141A
Azinphos methyl	1.0	
Bolstar	0.500	
Chlorpyrifos	0.500	
Coumaphos	1.0	
Demeton	0.500	
Diazinon	0.500	
Dichlorvos	0.500	
Disulfoton	0.500	
Ethion	0.500	
Ethoprop	0.500	
EPN	0.500	
Fensulfothion	0.500	
Fenthion	0.500	
Malathion	0.500	
Merphos	0.500	
Mevinphos	0.500	
Monocrotophos	0.500	

TABLE 2.1 (Cont'd)

CHEMICAL CONSTITUENTS

CONSTITUENT	REPORTING LIMIT	METHOD
ORGANOPHOSPHORUS PESTICIDES	All µg/L	ALL EPA 8141A
Naled	1.00	
Parathion-ethyl	0.500	
Parathion-Methyl	0.500	
Phorate	0.500	
Ronnel	0.500	
Stirophos	1.00	
Sulfotep	0.500	
Tokuthion (Prothiofos)	0.500	
Trichloronate	0.500	

PATHOGEN INDICATOR BACTERIA

CONSTITUENT	REPORTING LIMIT	METHOD
Total Coliforms (MPN/100ml)	2/100 ml	SM 9221B
Fecal Coliforms (MPN/100ml)	2/100 ml	SM 9221E
Enterococci (MPN/100ml)	2/100 ml	SM 9230B

The concentrations of total phosphorus in freshwater storm runoff at the Project site ranged from 0.28 - 1.9 mg/L, with a mean of 1.1 mg/L (Table 2.4). They were similar to and within the range of values reported for nearby coastal watersheds in Orange County by Ford et al (2000) and in San Diego County by URS Greiner Woodward Clyde (1999). Concentrations were highest at Station C1 and next highest at Station D1. The higher concentrations observed at both stations may reflect the fact that they receive substantial runoff flow from developed areas. This evidence indicates that total phosphorus in freshwater runoff at the Project site was within typical and normal limits for partially developed land, as well as within acceptable regulatory limits. The values for total phosphorus observed at the surf zone and Harbor stations were correspondingly low, ranging from ND – 0.70 mg/L and with a mean of 0.11 mg/L (Table 2.4). These are all well within the ranges reported for similar sites on the Newport Coast and at Emerald Cove in Laguna Beach (Ford 1995, 1997; Ford et al 2000).

The concentrations of dissolved phosphorus in freshwater runoff from the Project site ranged from 0.11 – 0.72 mg/L, with a mean of 0.37 mg/L (Table 2.4). They also were within the range of typical or normal concentrations reported for similar sites in Orange and San Diego Counties (Ford 1995, 1997; Ford et al 2000; URS Greiner Woodward Clyde 1999). While there are no specific guidelines for concentrations of dissolved phosphorus in the San Diego Basin Plan or the EPA Parameter Benchmark Values, it is clear that the levels observed are environmentally acceptable ones for a partially developed watershed of this kind. The primary evidence for this is that they are well below concentrations reported to cause eutrophication. Correspondingly low concentrations of dissolved phosphorus were observed for the surf zone and Harbor stations, ranging from ND – 0.53 mg/L and with a mean of 0.11 mg/L (Table 2.4). These were all within the range of storm runoff values reported for other similar coastal areas in Orange County (Ford 1995, 1997; Ford et al 2000). The Headlands data appear to be typical for nearshore ocean areas in Orange County and elsewhere in southern California.

The means and ranges of nitrate + nitrate (as N) concentrations in freshwater runoff ranged from 7.5 – 57.3 mg/L, with a mean of 22.1 mg/L (Table 2.5). As for several other constituents, the highest of nitrate + nitrite (as N) concentrations were measured at Stations C1 and D1. In common with the data for total phosphorus from Station C1, the higher nitrate + nitrite concentrations present there may have been due to runoff from areas of greater development.

It is instructive to compare these nitrate + nitrite concentrations with other storm water data from coastal watersheds nearby in Orange County (Ford et al 2000). Samples obtained in Los Trancos and Muddy Canyons at the Newport Coast and those taken in Emerald Canyon at Laguna Beach (the latter two canyons with minimal development) had a wide range of nitrate + nitrite concentrations (0.7-178.5 mg/L). With the exception of two samples each from Station C1 and Station D1, all the remaining nitrate + nitrite concentrations measured at the Project stations were well within that range. This indicates that nitrate + nitrite values for the Project Site probably are typical and normal for coastal watersheds in Orange County. The

results indicate suggest that the levels of nitrate + nitrite observed at the Project site are within environmentally acceptable limits (Table 2.8) and do not pose a problem.

The concentrations of nitrate + nitrite measured in samples from surf zone Stations A2, B2 and C2 and from Harbor Station D2 ranged from 4.5 – 11 mg/L, with a mean of 7.15 mg/L (Table 2.5). These are all within the range of values for the surf zone reported by Ford et al (2000), which was 0.94-7.1 mg/L for storms sampled at the Newport Coast and Emerald Cove. As for the freshwater runoff samples, the results indicate that the ocean and Harbor values observed at the Project sites are typical of those present elsewhere on the Orange County coast and that they are within acceptable limits from a regulatory standpoint.

Measurements of Total Kjeldahl Nitrogen (TKN) provide an accurate estimate of the concentration of total soluble organic nitrogen in a water sample, in contrast to the inorganic nitrogen represented by nitrate + nitrite. TKN concentrations in runoff had a range of 0.56 – 10 mg/L, with a mean of 3.6 mg/L (Table 2.5). They were well within the range of values measured for freshwater runoff at the Newport Coast and Emerald Canyon in Laguna Beach (Ford et al 2000), for which the range was ND-10.0 mg/L. The same was true for TKN values in the surf zone and harbor adjacent to the Project site, which fell within the range of ND-41.8 mg/L observed at the Newport Coast and in Emerald Cove (Ford et al 2000).

Organophosphorus Pesticide Compounds

As shown in Table 2.1, all storm runoff samples were analyzed for 26 organophosphorus pesticide compounds considered to be potential toxic constituents of storm water. Of these, chlorpyrifos, diazinon, and malathion occur most frequently in watershed samples and are considered to be the pesticide constituents of primary concern at the present time (URS Greiner Woodward Clyde 1999; Ford et al 2000).

None of the 26 organophosphorus pesticides was present in any of these samples at concentrations above the laboratory reporting limits (all ND, as shown in Table 2.5). It is possible that some of these constituents were present at concentrations below the detection limits of the screening method used. However, this screening method is sensitive enough to detect dangerously high concentrations of these toxic organic compounds if they were present. The results indicate that organophosphate pesticide compounds apparently did not represent a problem in either storm runoff or ocean and Harbor receiving waters at the Project sites.

Trace Metals

Trace or heavy metal concentrations sampled during storm runoff at the Project sites are shown in Tables 2.6 and 2.7. These are for trace metals in total recoverable form, expressed in µg/L. They represent the combined concentration of these metals present in both dissolved and un-dissolved forms.

In general, the occurrence and total recoverable concentrations of trace metals increased with increasing levels of total suspended solids (TSS), indicating that substantial portions of these

metal concentrations were directly associated with the fine suspended solid particles (Tables 2.3, 2.6 and 2.7). This is expected, given that trace metals adsorb (become attached) to the finer particles and are carried along with them in runoff.

It is difficult to identify with certainty the specific sources of trace metals, and particularly those in un-dissolved form, entering the storm runoff from the watershed features of the Project site. This is partly because of the varied natural processes involved, the variety of human activities that also may release these compounds into the watershed, and the different forms of the trace metals (Makepeace et al 1995; Bay et al 1998; URS Greiner Woodward Clyde 1999; Lee et al 1999).

The total recoverable concentrations (µg/L) of the potentially toxic trace metals cadmium, copper, and lead measured in the Headlands study are shown in Table 2.6. Almost all of these values for cadmium in the freshwater runoff were not present above laboratory detection limits (ND), ranging from ND – 100 µg/L and with a mean of 20.3 µg/L. As for other constituents, higher concentrations of total cadmium were present in all three runoff samples at Station C1 and in one sample at Station D1. These four cadmium values were the only ones out of 16 samples that exceeded the CTR acute water quality criteria to protect aquatic life (USEPA 2000a) and the EPA Parameter Benchmark Value (USEPA 2000b), as shown in Table 2.8.. In addition, none of the six samples from Station A1 (County storm drain from areas off site) exceeded these guidelines. All of the cadmium concentrations at the Project site fell within the range of those reported by Ford et al (2000) for freshwater storm runoff on the Newport Coast and in Emerald Canyon (ND-110 µg/L). This indicates that the total cadmium concentrations observed at the Project site, including those at Stations C1 and D1, probably are typical and normal for coastal watersheds in Orange County.

As shown in Table 2.6, all of the total cadmium concentrations at the surf zone and Harbor stations were below laboratory detection limits (ND). For that reason, none of them was above either the daily maximum or instantaneous maximum water quality objectives of the California Ocean Plan. These values also were essentially the same as those measured during storm runoff in the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

As for cadmium, many of the concentrations for total recoverable copper were ND, ranging from ND – 260 µg/L and with a mean of 51.6 µg/L (Table 2.6). The highest levels were observed at Stations C1 and D1, primarily during the strongest storm of 2-21-00, but also during the first storm of the season on 1-25-00. Eight of 20 samples had concentrations that were above CTR acute water quality criteria for total copper. Five of those were at Station D1, and one each at Stations B1, C and C1. Three of these concentrations also were above the EPA Parameter Benchmark Value (Table 2.8). One reason for this is evident in the case of Stations D1, C and C1, because all of them received substantial runoff from road and parking lot surfaces where copper accumulates from motor vehicles. In addition, TSS levels were relatively high at these stations, indicating that non-toxic copper adsorbed to the fine sediment particles probably contributed substantially to the total copper concentrations observed. All of the total copper concentrations for the Project site were well within the range of values measured in freshwater storm runoff at the Newport Coast and Emerald Canyon sites (ND-780 µg/L), as reported by Ford et al (2000).

With one exception, (C2; 33 µg/L), total copper concentrations measured in the surf zone were all ND. At Harbor Station D2, measurable amounts of total copper (22-68 µg/L) were observed during the strongest storm of 2-21-00; in contrast, the levels at this station were ND for samples taken during the other two storms. All three of these copper concentrations described above were greater than the daily maximum water quality guideline of the California Ocean Plan, while two of them (1C2 and 1D2) exceeded the instantaneous maximum guideline (Table 2.8). It is important to recognize that concentrations of copper, zinc, lead and other trace metals in Dana Point Harbor also are the result of vessel maintenance, vessel operation and other human activities, as described previously. Therefore, they reflect not only contributions from storm runoff but those from in-Harbor activities as well. All of these total copper concentrations were well within the range of values observed in samples (ND-380 µg/L) taken during storm run off to the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

Except for those at Station D1, almost all of the total lead concentrations in freshwater runoff samples at the Headlands sites were below laboratory detection limits, ranging from ND – 190µg/L and with a mean of 36 µg/L (Table 2.6). None of these 16 concentrations, including the ones observed at Station D1, was above CTR acute water quality criteria (Table 2.8). Only one (C1; 190 µg/L) was above the EPA Benchmark guideline (USEPA 2000b). All but three of the concentrations of lead in total recoverable form for the Headlands sites were within the range of values (ND-42 µg/L) measured during the 2000 storm season at Los Trancos, Muddy and Emerald Canyons nearby (Ford et al 2000).

With the exception of single samples at Station C2 (8.2 µg/L and D2 (929 µg/L), total lead concentrations were below detection limits (ND) at the surf zone and Harbor stations (Table 2.6). In addition, all but one of these total lead concentrations were well within the range of values (ND-42 µg/L) observed during storm runoff into the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

In combination, this evidence indicates that total cadmium, copper and lead concentrations in both freshwater storm runoff and in the surf zone and Harbor receiving waters probably are typical and normal for such partially developed coastal watersheds in Orange County and elsewhere in southern California. In addition, it indicates that these concentrations at the Headlands sites are acceptable from a regulatory standpoint.

Total recoverable concentrations of zinc, chromium (III), and nickel are shown in Table 2.7. As for other trace metals, the highest values in the freshwater runoff at the Project site were observed at Stations C1 and D1, particularly for runoff from the strongest storm of 2-21-00.

Concentrations of total recoverable zinc ranged from 24 – 1200 µg/L, with a mean of 192 µg/L (Table 2.7). Five of the 20 samples had concentrations that were above the CTR acute water quality criteria for total recoverable zinc (USEPA 2000a; Table 2.8). Of these, three were from Station D1 and two from Station C1. The primary reason for this appears to be that these two station sites receive considerable runoff from parking lot and street surfaces. Zinc is introduced to these surfaces in substantial quantities through tire and brake wear, as

well as other vehicle operations. These zinc concentrations were all well within the range of values (ND-1700 µg/L) reported by Ford et al (2000) for freshwater storm runoff nearby in Newport Coast and in Emerald Canyon watersheds.

The total recoverable concentrations of chromium (III) measured for freshwater samples are shown in Table 2.7. Only samples from Stations B1, C1 and D1 had concentrations of chromium above the laboratory detection limits (all others ND). Samples from those three stations had a range of 7.6-400 µg/L (Table 2.7). Of these, only the value of 400 µg/L observed for Station C1 during the strongest storm on 2-21-00 was above the CTR acute guidance criterion. Because only this one value exceeded the acute criterion and because runoff through Station C1 passed through disturbed areas, this is not considered to be an issue of concern. As for the other trace metals, the higher concentrations of chromium present at Stations C1 and D1 indicate that they probably originated on street and parking lot surfaces. Their association with higher TSS values indicates that part of the chromium probably was adsorbed to fine sediment particles. The total chromium concentrations in the freshwater runoff samples from the Project site all were within the range of concentrations reported for watersheds of the Newport Coast and Emerald Canyon (ND-870 µg/L) by Ford et al (2000).

Only two of the 11 samples taken at surf zone Stations B2 and C2 and Harbor Station D2 had concentrations of chromium (III) above the detection limit, one at Station C2 and the other at Station D2. In this case the water quality objective of the California Ocean Plan is not applicable, because it is stated only for the very toxic hexavalent form of chromium. Chromium (III) is a relatively non-toxic form of the metal. All receiving water values for total chromium (III) observed for the Project sites were well within the range of concentrations (ND-580 µg/L) reported for surf zone stations at Newport Coast and Emerald Cove (Ford et al 2000).

The concentrations of silver in total recoverable form were below laboratory detection limits (ND) for samples taken at all stations during all three storm events. As a result, the data are not shown in the table form. This suggests that silver may not occur in storm runoff at the Project sites, or is present infrequently.

Measurable concentrations of nickel in storm water samples were present at all freshwater watershed stations (2.7). They ranged from 10 – 136 µg/L, with a mean of 39 µg/L As for the other trace metals, these measurable concentrations were highest at Station C1 and Station D1, in part undoubtedly the result of runoff from streets and parking lots. Six of these 13 samples had total nickel concentrations that were above the CTR acute water quality guidelines. Four of these were observed in samples from Station D1 and two were the values observed for Station C1 (Table 2.7). All of these concentrations were well below the EPA Parameter Benchmark guideline value (1,417 µg/L) for nickel. It is important to recognize that all of these nickel concentrations were within the range of values reported for undeveloped freshwater watersheds at the Newport Coast and Emerald Canyon (ND-670 µg/L) by Ford et al 2000. Therefore, the values described above that exceeded CTR acute guidelines are not of concern. Total. nickel concentrations above the detection limit were

present in only two of the 11 samples taken at surf zone Stations B2 and C2 and at Harbor Station D2, one at Station C2 and one at Station D2 (Table 2.7).

In combination, this evidence indicates that concentrations of total recoverable zinc, chromium (III), silver and nickel in both storm runoff and receiving waters at the Project site probably are typical and normal for such partially developed coastal watersheds in Orange County and elsewhere in southern California. The evidence further indicates that the concentrations measured at the Headlands site are within acceptable limits from a regulatory standpoint.

Effects Of Natural Nearshore Processes On Salinity And Runoff Constituents

In general, there was a tendency for trace metals in total recoverable form, as well as nutrient chemicals and other runoff constituents, to have considerably lower concentrations at the surf zone stations than were present in the adjacent freshwater watersheds (Tables 2.3-2.7) There also was a downward trend in these surf zone concentrations over the course of runoff. These same effects have been well documented by other studies on the Orange County coast in which larger time series of samples were taken over the duration of runoff (Ford 1995, 1997; Ford et al 2000).

These salinity data indicate the degree to which nearshore physical processes mix and carry away seawater in the surf zone that has been diluted by storm water runoff. The implications of this for dilution and transport of potentially toxic chemical, nutrients and other runoff constituents are very significant. If these physical processes are efficient in mixing and transporting the diluted seawater, then one would expect to observe relatively high salinities in the inshore area, even during the runoff period, as well as a fairly rapid return to typical coastal seawater salinity levels soon after the storm runoff ceases. In addition, one would expect concentrations of runoff constituents to remain relatively low in the surf zone and to decline fairly rapidly following the end of runoff. These are, in fact, the results observed in both the Headlands study and the more comprehensive ones at the Newport Coast and Emerald Cove (Ford 1995, 1997; Ford et al 2000).

The nearshore oceanographic processes in the area are particularly important in this context, because they are a natural control mechanism for freshwater runoff (Ford 1995,1997, 2000b). There is very substantial mixing and transport of seawater in the nearshore region of circulation along the coastline of Strand Beach and adjacent areas, just as there is elsewhere along the Orange County coastline. This is because of the heavy surf and surge effects present there, the movement offshore of rip currents, as well as the movement of strong longshore currents and tidal flow. These effects are accentuated during and following storms. They are particularly important physical characteristics of the high-energy inshore marine environment, because they assure that freshwater runoff is mixed, diluted and transported from the nearshore area very rapidly.

In this same general context, it is important to recognize that there is very substantial circulation of ocean water through the permeable breakwater system of Dana Point Harbor. The US Army Corps of Engineers (USACE) designed the Harbor and its breakwater to provide self-cleaning features, as described in the USACE design memoranda and in the results of that agency's model studies for the Harbor (Tom Rossmiller, Coastal Engineer, PFRD Watershed and Coastal Resources Division, pers. comm., 2001). With the exception of circulation problems caused by eddies in the area of Baby Beach, these self-cleaning design features appear to be very effective for maintaining good water quality in both the outer and inner portions of Dana Point Harbor (Tom Rossmiller and Bruce Moore, PFRD Watershed and Coastal Resources Division, pers. comm., 2001)

Pathogen Indicator Bacteria

Pathogen indicator bacteria data shown in Tables 2.9-2.11 for samples taken after storms and during dry-weahter periods are example sets of those compiled as part of the Bacteriological Monitoring Program conducted by the Environmental Health Division of the Orange County Health Care Agency (OCHCA) under the direction of Monica Mazur. The data in the comparative format of these three tables are for 2000. They include values obtained by the OCHCA (Table 2.9) and two cooperating agencies, SERRA (Table 2.10) and AWMA (Table 2.11), at the bacteriological sampling stations in Dana Point Harbor, at Strand Beach, at the Ocean Institute Beach, and at closely adjacent sites. These data are for both dry-weather periods and those during and following rainfall. Data obtained during storm runoff as part of the Headlands baseline study were not employed in this evaluation because they were too limited and because regulatory standards for pathogen indicator bacteria in the receiving water do not apply during storms within the period November 1 – March 31 (Monica Mazur, OCHCA, pers. comm., July 2001).

Dr. Barbara Hemmingsen, Professor of Biology at SDSU and an expert in aquatic microbiology, has evaluated pathogen indicator bacteria in watersheds and ocean receiving water at the Newport Coast and Emerald Bay (Ford et at 2000). It is her opinion (pers. comm., 2001), and that of most other microbiologists, that counts of total coliforms are very unreliable as an indicator of pathogenic bacteria and viruses that pose a health risk to humans. There are two primary reasons for this. Counts of total coliforms include contributions from a wide variety of other sources in the watershed. In addition, there are several species of soil, freshwater and marine bacteria that mimic the actions of the coliforms, yielding false positives. That is, they behave like coliforms but are not necessarily associated with human feces or that of other animals. Instead, fecal coliforms are enumerated in preference to total coliforms. For these reasons, the data on total coliforms shown in Tables 2.9-2.11 for the Dana Point area were not evaluated. Instead, emphasis was placed on the results for fecal coliforms and enterococci. Enterococci are inhabitants of the digestive tracts of warm-blooded animals. Their presence in water above certain numbers indicates contamination by the feces of humans and other warm-blooded animals. Most regulatory agencies now prefer to use enterococci as the indicator bacteria of choice because they are thought to live longer in water than do fecal coliform bacteria. However, as shown in a recent

study at Huntington Beach, CA (Grant et al 2001), substantial contributions of enterococci can come from the feces of shore birds, making the use of these bacterial counts difficult in attempting to predict human health risks.

The pathogen indicator bacteria data for periods of storm runoff in the Dana Point area during 2000, summarized in Tables 2.9-2.11, are very similar to those reported for the Newport Coast and Emerald Canyon watersheds by aquatic microbiologist Dr. Barbara Hemmingsen (Ford et al 2000). When rain falls on the Project site and surrounding areas in amounts that produce runoff flow, the numbers of pathogen indicator bacteria increase markedly in the runoff water (Tables 2.9-2.11) as soil, feces and other materials containing them are washed into the drainage paths. The estimated numbers of these indicator bacteria in storm runoff at the Dana Point stations (Tables 2.9 and 2.11) fall well within the ranges for those reported under storm conditions at the Newport Coast and Emerald Bay sites (Ford et al 2000). Essentially this same process occurs in all coastal watersheds of southern California during storm runoff.

The single sample standard employed by the OCHCA and other agencies for total coliforms is10,000 MPN per 100 ml. For fecal coliforms (*E. coli*), it is 400 MPN per 100 ml, and for fecal enterococci it is 104 MPN per 100 ml. As described by PBS&J (1999), most of the surf zone stations sampled between Buck Gully and southern Laguna Beach did not have any values that exceeded these standards following and between storms, based on analyses during the three-year period 1996-1999. Little Corona Beach, Crystal Cove, Emerald Bay, and Laguna Main Beach were the primary surf zone sites where standards for total coliform were exceeded. These instances were few, representing about one percent of the data for each site. Two sampling sites, Little Corona Beach and Laguna Main Beach also exhibited low percentages of data exceeding the standard for enterococci, while there were no instances of this at the remaining sites.

Very similar results are evident for the Ocean Institute Beach sampling station and the Strand Beach station. None of the 69 samples reported in the full data set for Ocean Institute Beach in 2000 had fecal coliform counts that exceeded the 400 MPN per 100 ml single sample standard (Table 2.10). Only two of the 69 samples had enterococci counts that exceeded the 104 MPN per 100 ml single sample standard. Both were samples taken during or shortly after rainfall. None of the 81 samples reported in the full data set for Strand Beach in 2000 exceeded the single sample standard for fecal coliforms. Only two of these 81 samples exceeded the single sample standard for enterococci. Both were samples taken during or shortly after rainfall (Table 2.11). The results described above are similar to those for surf zone sites elsewhere along Orange County coast between Corona del Mar and Laguna Beach (PBS&J 1999) and for the Newport Coast (Ford et al 2000).

Comparisons reported by PBS&J (1999) demonstrated that there was not a statistically significant difference in the mean concentrations of pathogen indicator bacteria among the variously developed and undeveloped coastal watersheds sampled in Orange County. This is an important result, especially in interpreting the data for the Dana Point area, because it indicates very clearly that both undeveloped and variously urbanized watersheds produce about the same mean concentrations of the indicator bacteria. An important consideration

here is the fact that these bacterial indicators enter the watershed and its runoff from all kinds of warm-blooded animals besides humans, including land and shore birds, smaller native land mammals, and domestic pets.

The results reported by PBS&J (1999) also show that after storms and during dry-weather runoff the freshwater in the lower reaches of these watersheds had relatively high densities of pathogen indicator bacteria, while their densities in the adjacent surf zone were consistently much lower. In addition, they found that high bacterial densities in the freshwater watershed during dry-weather conditions do not appear to have an impact on the densities of those found in the surf zone. The evidence shown in Tables 2.9-2.11 indicates that this is also the case at the Dana Point Headlands site.

TABLE 2.2

Rainfall for the Dana Point area during storm events sampled in January–April 2000. Data are from the Palisades Reservoir rain gauge (OCPFRD No. 186) in San Clemente, CA. Total rainfall measured at this station during the 1999-2000 rainfall season was 8.80 inches.

Storm Event Sampled	Total Rainfall for Storm
January 25, 2000	0.39 inches
February 21-22, 2000	2.20 inches
April 17-18, 2000	0.73 inch

TABLE 2.3

Summary of water quality constituent data for total dissolved solids (mg/L), total suspended solids (mg/L) and freshwater hardness (mg/L of calcium carbonate) sampled at Dana Point stations during storm events on January 25, February 21, and April 17, 2000. Shown for comparison are arithmetic means of the data. NF indicates no flow at a station. ND indicates that the constituent was not detected in the sample at or above the laboratory detection limit.

STATION	DATE	TOTAL DISS. SOLIDS mg/L		TOTAL SUSP. SOLIDS mg/L		HARDNESS mg/L	
		MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
A1	1/25/00	3750	2800-4700	ND	ND	525	520-530
A1	2/21/00	1300	1300-1300	20	12-78	535	530-540
A1	4/17/00	2450	2000-2900	16	ND-16	1075	850-1300
A2	1/25/00	35,000	35,000-35,000	63	44-82		
A2	2/21/00	35,000	35,000-35,000	61	61-63		
A2	4/17/00	35,000	35,000-35,000	51	45-56		
B1	1/25/00	NF	NF	NF	NF	NF	NF
B1	2/21/00	120	NF-120	320	NF-320	47	NF-47
B1	4/17/00	NF	NF	NF	NF	NF	NF
B2	1/25/00	NF	NF	NF	NF		
B2	2/21/00	35,000	35,000-35,000	79	79-79		
B2	4/17/00	NF	NF	NF	NF		
C	2/21/00	380	150-610	177	17-160	164	59-270
C	4/17/00	250	NF-250	60	NF-60	92	NF-92
C1	1/25/00	NF	NF	NF	NF	NF	NF
C1	2/21/00	685	480-890	12,850	4700-21,000	88	80-96
C1	4/17/00	1,300	NF-1,300	14,000	NF-14,000	270	NF-270
C2	1/25/00	NF	NF	NF	NF		
C2	2/21/00	35,000	35,000-35,000	160	120-200		
C2	4/17/00	35,000	35,000-35,000	74	60-89		
D1	1/25/00	275	270-280	928	640-1200	57	40-75
D1	2/21/00	235	220-250	835	270-1400	49	38-60
D1	4/17/00	180	NF-180	190	NF-190	77	NF-77
D2	1/25/00	32,500	32,000-33,000	14	2-26		
D2	2/21/00	21,500	14,000-29,000	262	44-480		
D2	4/17/00	33,000	33,000-33,000	48	48-48		
B1,C,C1, D1	**GRAND MEAN**	**409 (243*)**		**3,265 (362*)**		**102**	
B2,C2, D2	**GRAND MEAN**	**32,000**		**106**		**---**	

*Mean excluding C1 data

TABLE 2.4

Summary of water quality constituent data for total phosphorus (mg/L), dissolved phosphorus (mg/L) and oil and grease (mg/L) sampled at Dana Point stations during storm events on January 25, February 21, and April 17, 2000. Shown for comparison are arithmetic means of the data. NF indicates no flow at a station. ND indicates that the constituent was not detected in the sample at or above the laboratory detection limit.

STATION	DATE	TOTAL PHOSPHORUS mg/L		DISSOLVED PHOSPHORUS mg/L		OIL & GREASE mg/L	
		MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
A1	1/25/00	0.37	0.20-0.54	0.28	0.12-0.43	ND	ND
A1	2/21/00	0.61	0.59-0.63	0.75	0.75-0.75	ND	ND
A1	4/17/00	0.44	0.31-0.58	0.41	0.29-0.53	ND	ND
A2	1/25/00	0.51	0.50-0.52	0.07	ND-0.11	ND	ND
A2	2/21/00	0.77	0.76-0.78	ND	ND	ND	ND
A2	4/17/00	0.93	0.66-1.2	ND	ND	1.25	ND-2.0
B1	1/25/00	NF	NF	NF	NF	NF	NF
B1	2/21/00	0.59	NF-O.59	0.25	NF-0.25	ND	NF-ND
B1	4/17/00	NF	NF	NF	NF	NF	NF
B2	1/25/00	NF	NF	NF	NF	NF	NF
B2	2/21/00	0.70	NF-0.70	ND	NF-ND	ND	NF-ND
B2	4/17/00	NF	NF	NF	NF	NF	NF
C	1/25/00	0.52	NF-0.52	0.38	NF-0.38	2.0	NF-2.0
C	2/21/00	0.59	0.59-0.59	0.60	0.48-0.72	1.1	ND-1.7
C	4/17/00	0.45	NF-0.45	0.37	NF-0.37	1.1	NF-1.1
C1	1/25/00	NF	NF	NF	NF	NF	NF
C1	2/21/00	1.4	0.87-1.9	0.21	0.15-0.27	ND	ND
C1	4/17/00	3.9	NF-3.9	0.26	NF-0.26	ND	NF-ND
C2	1/25/00	NF	NF	NF	NF	NF	NF
C2	2/21/00	0.47	0.41-0.53	0.28	ND-0.53	ND	ND
C2	4/17/00	1.94	0.44-1.5	0.07	ND-0.11	ND	ND
D1	1/25/00	2.2	1.7-2.6	0.54	0.54-0.54	4.6	4.3-4.8
D1	2/21/00	0.46	0.28-0.65	0.37	0.37-0.37	1.1	ND-1.6
D1	4/17/00	0.61	NF-0.61	0.36	NF-0.36	1.3	NF-1.3
D2	1/25/00	0.12	0.10-0.13	0.10	0.10-0.10	ND	ND
D2	2/21/00	0.30	ND-0.57	0.14	NF-0.14	ND	NF-ND
D2	4/17/00	ND	ND	0.053	0.053-0.053	ND	ND
B1,C,C1, D1	**GRAND MEAN**	**1.19 (0.77*)**		**0.37**		**1.34**	
B2,C2, D2	**GRAND MEAN**	**0.59**		**0.11**		**ND**	

* Mean excluding C1 data

TABLE 2.5

Summary of water quality constituent data for nitrate + nitrite as N (mg/L), total Kjeldahl nitrogen (mg/L) and the 26 organophosphorus pesticide compounds (Table 1) sampled at Dana Point stations during storm events on January 25, February 21, and April 17, 2000. Shown for comparison are arithmetic means of the data. NF indicates no flow at a station. ND indicates that the constituent was not detected in the sample at or above the laboratory detection limit

STATION	DATE	NITRATE +NITRITE mg/L		TOTAL KJELDAHL N mg/L		26 ORGANOPH. PEST. µ/L	
		MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
A1	1/25/00	6.6	6.5-6.6	NA	NA	ND	ND
A1	2/21/00	6.8	6.5-7.0	1.1	1.0-1.1	ND	ND
A1	4/17/00	7.6	6.0-9.1	3.25	2.0-4.5	ND	ND
A2	1/25/00	8.5	8.0-9.0	NA	NA	ND	ND
A2	2/21/00	5.5	5.0-6.0	1.0	0.9-1.1	ND	ND
A2	4/17/00	7.2	4.5-10	2.66	ND-5.3	ND	ND
B1	1/25/00	NF	NF	NF	NF	NF	NF
B1	2/21/00	11.5	NF-11.5	0.56	NF-0.56	ND	ND
B1	4/17/00	NF	NF	NF	NF	NF	NF
B2	1/25/00	NF	NF	NF	NF	NF	NF
B2	2/21/00	11	NF-11	2.0	NF-2.0	ND	ND
B2	4/17/00	NF	NF	NF	NF	NF	NF
C	1/25/00	9.4	NF-9.4	NA	NA	ND	ND
C	2/21/00	9.8	7.5-12	2.1	2.0-2.2	ND	ND
C	4/17/00	9.0	NF-9.0	3.9	NF-3.9	ND	ND
C1	1/25/00	NF	NF	NF	NF	NF	NF
C1	2/21/00	27.8	23.5-32	1.8	0.84-2.8	ND	ND
C1	4/17/00	57.3	NF-57.3	10	NF-10	ND	ND
C2	1/25/00	NF	NF	NF	NF	NF	NF
C2	2/21/00	6.5	4.5-8.5	0.84	0.84-0.84	ND	ND
C2	4/17/00	5.7	5.0-6.5	1.97	0.84-3.1	ND	ND
D1	1/25/00	30	NF-30	NA	NA	ND	ND
D1	2/21/00	27	26.5-27.5	2.8	1.1-4.5	ND	ND
D1	4/17/00	17.5	NF-17.5	5.3	NF-5.3	ND	ND
D2	1/25/00	6.4	6.4-6.5	NA	NA	ND	ND
D2	2/21/00	7.8	6.0-9.5	0.83	0.56-1.1	ND	ND
D2	4/17/00	5.5	5.5-5.5	1.82	0.84-2.8	ND	ND
B1,C,C1, D1	**GRAND MEAN**	**22.1 (16.3*)**		**3.67 (2.93*)**		**ND**	
B2,C2, D2	**GRAND MEAN**	**7.15**		**1.72**		**ND**	

* Mean excluding C1 data

TABLE 2.6

Summary of water quality constituent data for concentrations in total recoverable form of cadmium, copper, and lead (all in µg/L) sampled at Dana Point stations during storm events on January 25, February 21, and April 17, 2000. Shown for comparison are arithmetic means of the data. NF indicates no flow at a station. ND indicates that the constituent was not detected in the sample at or above the laboratory detection limit.

STATION	DATE	TOTAL CADMIUM µg/L		TOTAL COPPER µg/L		TOTAL LEAD µg/L	
		MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
A1	1/25/00	9.1	7.2-11	14	ND-23	ND	ND
A1	2/21/00	ND	ND	11.5	ND-18	ND	ND
A1	4/17/00	6.6	5-8.3	13	13-13	ND	ND
A2	1/25/00	ND	ND	ND	ND	ND	ND
A2	2/21/00	ND	ND	ND	ND	ND	ND
A2	4/17/00	ND	ND	ND	ND	ND	ND
B1	1/25/00	NF	NF	NF	NF	NF	NF
B1	2/21/00	ND	NF-ND	16	NF-16	33	NF-33
B1	4/17/00	NF	NF	NF	NF	NF	NF
B2	1/25/00	NF	NF	NF	NF	NF	NF
B2	2/21/00	ND	NF-ND	ND	NF-ND	ND	NF-ND
B2	4/17/00	NF	NF	NF	NF	NF	NF
C	1/25/00	ND	NF-ND	100	NF-100	ND	NF-ND
C	2/21/00	ND	ND	ND	ND	5.8	ND-9.0
C	4/17/00	ND	NF-ND	11	NF-11	ND	NF-ND
C1	1/25/00	NF	NF	NF	NF	NF	NF
C1	2/21/00	54.5	26-83	168	76-260	116.5	43-190
C1	4/17/00	110	NF-110	32	NF-32	8.2	NF-8.2
C2	1/25/00	NF	NF	NF	NF	NF	NF
C2	2/21/00	ND	ND	ND	ND	ND	ND
C2	4/17/00	ND	NF-ND	33	NF-33	8.2	NF-8.2
D1	1/25/00	ND	ND	68	51-86	91	73-110
D1	2/21/00	4	ND-5.5	51.5	26-77	53.5	25-82
D1	4/17/00	ND	NF-ND	13	NF-13	11	NF-11
D2	1/25/00	ND	ND	ND	ND	ND	ND
D2	2/21/00	ND	ND	45	22-68	15.7	ND-29
D2	4/17/00	ND	ND	ND	ND	ND	ND
B1,C,C1, D1	**GRAND MEAN**	**20.3 (2.71*)**		**51.6 (37.8*)**		**36.0 (28.5*)**	
B2,C2, D2	**GRAND MEAN**	**ND**		**16.3**		**5.6**	

* Mean excluding C1 data

TABLE 2.7

Summary of water quality constituent data for concentrations in total recoverable form of zinc, chromium (III) and nickel (all in µg/L) sampled at Dana Point stations during storm events on January 25, February 21, and April 17, 2000. Shown for comparison are arithmetic means of the data. NF indicates no flow at a station. ND indicates that the constituent was not detected in the sample at or above the laboratory detection limit.

STATION	DATE	TOTAL ZINC µg/L		TOTAL CHROMIUM µg/L		TOTAL NICKEL µg/L	
		MEAN	RANGE	MEAN	RANGE	MEAN	RANGE
A1	1/25/00	59	44-74	ND	ND	59	47-71
A1	2/21/00	61	61-61	ND	ND	20	20-20
A1	4/17/00	63	58-68	ND	ND	37.5	30-45
A2	1/25/00	ND	ND	ND	ND	ND	ND
A2	2/21/00	ND	ND	ND	ND	ND	ND
A2	4/17/00	ND	ND	ND	ND	ND	ND
B1	1/25/00	NF	NF	NF	NF	NF	NF
B1	2/21/00	160	NF-160	16	NF-16	18	NF-18
B1	4/17/00	NF	NF	NF	NF	NF	NF
B2	1/25/00	NF	NF	NF	NF	NF	NF
B2	2/21/00	ND	NF-ND	ND	NF-ND	ND	NF-ND
B2	4/17/00	NF	NF	NF	NF	NF	NF
C	1/25/00	110	NF-110	ND	NF-ND	14	NF-14
C	2/21/00	78	75-81	ND	ND	ND	ND
C	4/17/00	78	NF-78	ND	NF-ND	ND	NF-ND
C1	1/25/00	NF	NF	NF	NF	NF	NF
C1	2/21/00	765	330-1200	260	120-400	57.5	ND-110
C1	4/17/00	240	NF-240	7.6	NF-7.6	130	NF-130
C2	1/25/00	NF	NF	NF	NF	NF	NF
C2	2/21/00	ND	ND	ND	ND	ND	ND
C2	4/17/00	120	ND-210	3.8	ND-5.1	57.5	ND-110
D1	1/25/00	160	140-180	68.5	51-86	54	48-60
D1	2/21/00	118	56-180	105	50-160	57.5	29-86
D1	4/17/00	24	NF-24	ND	NF-ND	10	NF-10
D2	1/25/00	30	ND-47	ND	ND	ND	ND
D2	2/21/00	120	ND-230	36.5	ND-68	20.5	ND-36
D2	4/17/00	ND	ND	ND	ND	ND	ND
B1,C,C1, D1	**GRAND MEAN**	**192 (104*)**		**51.9 (28.8*)**		**39 (23.4*)**	
B2,C2, D2	**GRAND MEAN**	**50**		**8.2**		**16.3**	

*Mean excluding C1 data

TABLE 2.8

Water quality guidance values against which concentrations of freshwater storm runoff constituents sampled in the Headlands baseline study were compared. The reference source for each guidance value is cited. Guidance values for total recoverable, hardness-dependent trace metals are shown for four concentrations of freshwater hardness (100 mg/L – 400 mg/L). Also shown for seawater samples are guidance values for total recoverable trace metal concentrations provided in the California Ocean Plan (CSWRCB 1997).

Constituent	Units	Reference Source	Water Quality Guidance Values
Total Suspended Solids	mg/l	USEPA 92000b)	100
Total Dissolved Solids	mg/l	CRWQCB (1994)	300
Total P	mg/l	USEPA (2000b)	2
Dissolved P	mg/l		NA
Nitrate + Nitrite as N	mg/l	CRWQCB (1994-1995)	10
Nitrate + Nitrite as N	mg/l	USEPA (2000b)	0.7
TKN	mg/l		NA

		Hardness-Dependent Acute Freshwater Quality Guidance Values				
Trace Metal	Units	Reference Source	H100	H200	H300	H400
Total Cd	µg/l	(USEPA (2000a)	5	10	16	22
Total Cu	µg/l	(USEPA (2000a)	14	27	39	52
Total Pb	µg/l	(USEPA (2000a)	82	200	318	477
Total Ni	µg/l	(USEPA (2000a)	500	842	1155	1513
Total Zn	µg/l	(USEPA (2000a)	120	220	296	388
Total Ag	µg/l	(USEPA (2000a)	4	11	22	37

		Sea Water Quality Guidance Values		
Trace Metal	Units	Reference Source	Daily Maximum	Instantaneous Maximum
Total Cd	µg/l	CSWRCB (1997)	4	10
Total Cu	µg/l	CSWRCB (1997)	12	30
Total Pb	µg/l	CSWRCB (1997)	8	20
Total Ni	µg/l	CSWRCB (1997)	20	50
Total Zn	µg/l	CSWRCB (1997)	80	200
Total Ag	µg/l	CSWRCB (1997)	2.8	7

TABLE 2.9

Pathogen indicator data for total coliforms, *E. coli* (fecal coliforms) and enterococci compiled by the Environmental Health Division Bacteriological Monitoring Program of the Orange County Health Care Agency. Shown are representative data obtained at sampling station locations within Dana Point Harbor and at adjacent sites for the period November 1999 – December 2000. Samples taken during or just following periods of rain are identified. Data are expressed as most probable number (MPN) per 100 ml.

TABLE 2.9.1 Health Care Agency / Environmental Health Division Bacteriological Monitoring Program
Total Coliform (TC), E.coli (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		11/30/99	12/7/99	12/14/99	12/21/99	12/28&30/99	1/5/00	1/11/00	1/20/00	1/26/00 RAIN 1/25/00
DANA POINT (surfzone)											
OSL25	Monarch Beach	TC	<20	<20	<20	80	<20	<20	<20	80	40
	(North of Salt Creek)	EC	<10	<10	<10	63	<10	<10	<10	<10	<10
		ENT	<10	<10	<10	41	<10	<10	<10	10	<10
OSL23	Monarch Beach	TC	40	20	130	130	130	20	800	220	230
	(South of Salt Creek)	EC	31	10	10	10	<10	<10	10	108	30
		ENT	20	10	109	41	41	10	31	110	52
ODB02	North Beach - Doheny	TC	170	500	5000	210	800	3000	500	1300	>16000
		EC	63	1515	3784	41	1153	529	723	1414	>24192
		ENT	10	743	1112	256	712	1354	331	6131	3448
ODB04	Doheny Beach	TC	80	<20	40	40	<20	300	80	2400	5000
	(North of San Juan Creek)	EC	10	<10	30	41	<10	305	10	554	1012
		ENT	148	<10	41	73	10	364	63	839	1576
ODB05	Doheny Beach	TC	1300	500	170	80	40	110	2400	1300	1400
	(South Of San Juan Creek)	EC	727	2613	146	41	10	109	504	712	265
		ENT	1119	74	327	74	10	160	2382	1067	231
DANA POINT (creeks) All Creeks Flowing Unless*											
CSLSC	Salt Creek	TC	14136	9804	14136	>24192	>24192	>24192	>24192	24192	>24192
		EC	862	1012	359	1162	933	573	1259	12033	>24192
		ENT	504	448	594	771	1153	373	565	1789	15530
CDBNC	North Beach Creek	TC	*>24192	*>24192	>24192	*>24192	*12033	*>24192	*>24192	*>24192	>24192
		EC	4884	2187	15531	2489	717	601	459	909	11199
		ENT	884	413	617	959	697	331	457	547	12033
CSJC1	San Juan Creek Mouth	TC	*3654	*>24192	*>24192	*>24192	*419	24192	24192	>24192	98
		EC	620	9804	6131	6867	97	12033	8664	9208	20
		ENT	262	934	4611	3282	20	7270	6131	19863	<20
CSJC2	Upper San Juan Creek	TC	3873	3255	1239	5794	2602	3654	1785	6867	NS
		EC	31	294	175	354	364	181	175	228	NS
		ENT	<10	30	134	187	183	84	86	488	NS
DANA POINT HARBOR (in Harbor)			12/2/99								
BDP12	West End - Baby Beach	TC	40	40	20	80	<20	170	20	3000	300
		EC	20	63	<10	20	10	31	31	1153	24
		ENT	<10	31	<10	20	<10	>24192	<10	1624	20
BDP13	Buoy Line - Baby Beach	TC	230	230	20	2400	40	170	<20	500	9000
		EC	259	62	31	4106	10	148	31	336	17329
		ENT	10	20	41	305	10	20	10	74	12997
BPD14	Swim Area - Baby Beach	TC	40	20	5000	230	20	500	20	230	5000
		EC	41	<10	10	545	10	364	<10	41	11199
		ENT	10	<10	10	246	10	31	<10	98	24192
BDP15	East End - Baby Beach	TC	220	<20	<20	80	<20	40	40	230	170
		EC	109	10	31	52	<10	63	20	201	63
		ENT	10	<10	20	74	20	1054	<10	195	74
BDP08	Pier	TC	<20	<20	<20	<20	<20	20	<20	80	110
		EC	<10	<10	<10	<10	10	<10	<10	<10	30
		ENT	<10	41	<10	<10	<10	10	<10	10	<10
BDP16	Pilgrim	TC	20	70	<20	110	<20	40	<20	20	40
		EC	<10	<10	<10	52	10	10	10	10	<10
		ENT	<10	20	<10	10	31	<10	10	10	52
MDP11	Guest Dock - End	TC	130	<20	20	20	300	20	<20	<20	130
	(West Basin)	EC	<10	10	<10	<10	10	<10	<10	<10	31
		ENT	<10	10	41	<10	31	<10	<10	<10	41
BDP09	Harbor Entrance	TC	<20	<20	20	<20	20	<20	<20	20	<20
		EC	74	<10	41	<10	<10	<10	<10	20	<10
		ENT	<10	<10	31	<10	<10	<10	<10	41	<10
MDP10	Harbor Patrol Dock	TC	170	230	<20	20	<20	40	<20	<20	80
	(East Basin)	EC	<10	20	<10	<10	<10	<10	<10	10	98
		ENT	<10	10	<10	<10	<10	<10	10	<10	52
BDP17	Youth Dock	TC	20	20	<20	<20	<20	20	<20	80	140
		EC	110	10	<10	<10	10	<10	<10	52	121
		ENT	<10	10	<10	<10	<10	<10	<10	109	20
BDP07	Fuel Dock	TC	<20	<20	<20	20	20	<20	<20	<20	40
		EC	<10	20	20	10	10	<10	<10	10	20
		ENT	<10	20	<10	20	<10	<10	<10	<10	10

NS - NOT SAMPLED

TABLE 2.9.2 Health Care Agency / Environmental Health Bacteriological Monitoring Program
Total Coliform (TC), E.coli (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		1/11/00	1/20/00	1/26/00 RAIN 1/25/00	2/1&2/00	2/8&9/00	2/15&18/00 Rain 2/14&16/00	2/22/00 Rain 2/21/00	2/29&3/2/00 Rain 2/27&29/00	3/9&10/00 Rain 3/8/00	3/14/00
DANA POINT (surfzone)												
OSL25	Monarch Beach	TC	<20	80	40	20	<20	20	260	<20	230	230
	(North of Salt Creek)	EC	<10	<10	<10	10	<10	20	200	<10	<10	30
		ENT	<10	10	<10	<10	<10	<10	132	20	31	<10
OSL23	Monarch Beach	TC	800	220	230	<20	170	170	NS	40	110	<20
	(South of Salt Creek)	EC	10	108	30	<10	<10	20	NS	<10	<10	<10
		ENT	31	110	52	<10	10	20	NS	10	83	<10
ODB02	North Beach - Doheny	TC	500	1300	>16000	700	500	170	NS	3000	1700	3000
		EC	723	1414	>24192	98	309	96	NS	1576	341	882
		ENT	331	6131	3448	227	1274	598	NS	5475	1334	2359
ODB04	Doheny Beach	TC	80	2400	5000	220	20	16000	NS	9000	1800	16000
	(North of San Juan Creek)	EC	10	554	1012	63	85	1769	NS	1723	259	10462
		ENT	63	839	1576	122	51	2098	NS	624	480	12996
ODB05	Doheny Beach	TC	2400	1300	1400	80	130	1300	NS	270	5000	500
	(South Of San Juan Creek)	EC	504	712	265	52	20	565	NS	74	839	177
		ENT	2382	1067	231	199	86	1515	NS	10462	3255	160
DANA POINT (creeks) All Creeks Flowing Unless*												
CSLSC	Salt Creek	TC	>24192	24192	>24192	>24192	>24192	>24192	NS	15530	>24192	74
		EC	1259	12033	>24192	544	2062	5794	NS	620	1106	<10
		ENT	565	1789	15530	455	907	1850	NS	984	2063	10
CDBNC	North Beach Creek	TC	*>24192	*>24192	>24192	>24192	>24192	>24192	NS	19863	>24192	>24192
		EC	459	909	11199	24192	3076	1046	NS	122	3441	6488
		ENT	457	547	12033	4106	2351	5794	NS	169	5475	2046
CSJC1	San Juan Creek Mouth	TC	24192	>24192	98	19863	>24192	>24192	NS	14136	>24192	3000
		EC	8664	9208	20	4884	12997	8664	NS	2602	3255	441
		ENT	6131	19863	<20	1935	11199	7270	NS	6488	5172	238
CSJC2	Upper San Juan Creek	TC	1785	6867	NS	9606	9208	12997	NS	6131	>24192	4352
		EC	175	228	NS	958	285	309	NS	1529	3873	285
		ENT	86	488	NS	1396	121	426	NS	4884	2142	226
DANA POINT HARBOR (in Harbor)												
BDP12	West End - Baby Beach	TC	20	3000	300	20	40	9000	NS	80	170	500
		EC	31	1153	24	10	41	181	NS	10	63	419
		ENT	<10	1624	20	<10	20	226	NS	110	20	448
BDP13	Buoy Line - Baby Beach	TC	<20	500	9000	20	70	300	NS	40	110	300
		EC	31	336	17329	121	10	20	NS	52	<10	256
		ENT	10	74	12997	31	<10	74	NS	74	41	404
BPD14	Swim Area - Baby Beach	TC	20	230	5000	230	130	230	NS	300	170	300
		EC	<10	41	11199	98	31	134	NS	175	63	160
		ENT	<10	98	24192	30	10	228	NS	134	160	175
BDP15	East End - Baby Beach	TC	40	230	170	230	40	3000	NS	20	800	130
		EC	20	201	63	148	41	2809	NS	<10	2142	41
		ENT	<10	195	74	10	<10	1989	NS	31	3255	31
BDP08	Pier	TC	<20	80	110	20	<20	70	NS	<20	<20	130
		EC	<10	<10	30	10	<10	<10	NS	<10	10	31
		ENT	<10	10	<10	10	<10	10	NS	<10	<10	20
BDP16	Pilgrim	TC	<20	20	40	20	<20	20	NS	20	20	40
		EC	10	10	<10	10	<10	10	NS	<10	<10	<10
		ENT	10	10	52	<10	<10	<10	NS	10	31	<10
MDP11	Guest Dock - End	TC	<20	<20	130	<20	130	1300	NS	<20	<20	<20
	(West Basin)	EC	<10	<10	31	10	73	20	NS	<10	10	<10
		ENT	<10	<10	41	<10	10	10	NS	<10	<10	10
BDP09	Harbor Entrance	TC	<20	20	<20	<20	<20	3000	NS	20	<20	<20
		EC	<10	20	<10	10	<10	63	NS	<10	<10	<10
		ENT	<10	41	<10	52	<10	121	NS	10	<10	<10
MDP10	Harbor Patrol Dock	TC	<20	<20	80	20	40	3000	NS	170	<20	20
	(East Basin)	EC	<10	10	98	<10	<10	<10	NS	<10	<10	<10
		ENT	10	<10	52	10	<10	<10	NS	41	10	10
BDP17	Youth Dock	TC	<20	80	140	20	<20	110	NS	20	<20	80
		EC	<10	52	121	31	<10	20	NS	20	<10	10
		ENT	<10	109	20	<10	<10	10	NS	31	<10	30
BDP07	Fuel Dock	TC	<20	<20	40	40	<20	2400	NS	<20	110	20
		EC	<10	10	20	10	10	<10	NS	<10	20	<10
		ENT	<10	<10	10	10	<10	31	NS	<10	30	<10

NS - NOT SAMPLED

TABLE 2.9.3 Health Care Agency / Environmental Health Bacteriological Monitoring Program
Total Coliform (TC), *E.coli* (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		3/21-23/00	3/29&30/00	4/4&6/00	4/11&13/00	4/18&19/00 Rain 4/17&18/00	4/25/00	5/2/00	5/9&11/00	5/16&17/00
DANA POINT (surfzone)											
OSL25	Monarch Beach	TC	20	20	80	2400	800	<20	20	40	<20
	(North of Salt Creek)	EC	10	<10	20	31	41	<10	<10	<10	20
		ENT	10	20	31	160	41	<10	<10	<10	10
OSL23	Monarch Beach	TC	20	<20	<20	<20	80	300	20	80	<20
	(South of Salt Creek)	EC	<10	10	<10	<10	31	<10	20	10	<10
		ENT	<10	<10	<10	10	20	20	31	10	<10
ODB02	North Beach - Doheny	TC	700	40	40	20	800	220	110	2400	<20
		EC	86	10	<10	<10	135	86	10	1187	<10
		ENT	221	31	30	41	179	303	74	443	<10
ODB04	Doheny Beach	TC	170	20	20	170	3000	<20	40	<20	20
	(North of San Juan Creek)	EC	20	20	10	97	132	<10	10	62	<10
		ENT	122	63	41	97	120	<10	<10	41	20
ODB05	Doheny Beach	TC	500	16000	2400	2400	16000	230	230	2400	170
	(South Of San Juan Creek)	EC	345	6131	855	583	1918	135	131	20	<10
		ENT	295	5794	624	512	10463	183	85	1565	74
DANA POINT (creeks) All Creeks Flowing Unless*											
CSLSC	Salt Creek	TC	12033	12997	>24192	>24192	>24192	>24192	15531	>24192	>24192
		EC	364	988	512	281	>24192	464	988	1211	197
		ENT	411	364	860	1500	3784	354	749	1515	645
CDBNC	North Beach Creek	TC	14136	*>24192	>24192	*>24192	>24192	>24192	*>24192	*>24192	*>24192
		EC	256	1106	677	2187	3255	405	2382	4611	1455
		ENT	63	331	1396	189	637	484	301	4352	6867
CSJC1	San Juan Creek Mouth	TC	>24192	>24192	>24192	9804	>24192	12033	>24192	>24192	*>24192
		EC	17329	24192	>24192	<10	9804	6867	14136	12033	119
		ENT	17329	5172	>24192	24192	15531	2909	5172	19863	161
CSJC2	Upper San Juan Creek	TC	327	364	8664	>24192	>24192	933	1515	5475	5794
		EC	109	63	110	24192	9208	31	20	30	10
		ENT	31	20	109	31	11199	20	20	10	52
DANA POINT HARBOR (in Harbor)											
BDP12	West End - Baby Beach	TC	130	130	110	500	170	500	3000	40	<20
		EC	10	74	41	336	161	512	2613	<10	<10
		ENT	20	74	41	<10	120	213	1421	<10	<10
BDP13	Buoy Line - Baby Beach	TC	20	20	110	1700	40	170	300	300	<20
		EC	10	10	52	2143	98	<10	226	86	10
		ENT	10	<10	<10	20	<10	20	97	98	<10
BPD14	Swim Area - Baby Beach	TC	20	1300	40	<10	2800	40	130	80	<20
		EC	<10	2382	<10	41	1187	31	156	52	<10
		ENT	<10	<10	<10	10	10	<10	109	52	<10
BDP15	East End - Baby Beach	TC	300	<20	130	<20	40	40	170	20	<20
		EC	86	10	30	74	20	20	<10	<10	10
		ENT	10	<10	10	<10	84	20	216	<10	10
BDP08	Pier	TC	<20	<20	300	<20	20	110	40	<20	<20
		EC	20	<10	197	<10	<10	63	<10	<10	<10
		ENT	10	<10	216	<10	20	20	10	10	<10
BDP16	Pilgrim	TC	20	40	300	<20	800	20	70	20	<20
		EC	10	<10	109	<10	20	63	31	<10	<10
		ENT	<10	<10	132	<10	20	52	<10	<10	<10
MDP11	Guest Dock - End	TC	<20	130	300	80	130	<20	80	<20	40
	(West Basin)	EC	<10	<10	86	<10	<10	10	10	<10	10
		ENT	<10	10	41	<10	20	<10	<10	<10	<10
BDP09	Harbor Entrance	TC	<20	<20	80	<20	40	<20	<20	<20	<20
		EC	<10	<10	31	<10	41	<10	20	<10	<10
		ENT	<10	<10	85	<10	73	<10	20	<10	<10
MDP10	Harbor Patrol Dock	TC	<20	<20	230	<20	1400	20	<20	20	40
	(East Basin)	EC	<10	<10	63	<10	521	<10	10	<10	<10
		ENT	10	<10	74	<10	20	<10	10	<10	<10
BDP17	Youth Dock	TC	<20	<20	20	<20	20	<20	40	20	40
		EC	<10	<10	<10	10	<10	<10	189	<10	20
		ENT	<10	<10	10	<10	<10	10	<10	<10	<10
BDP07	Fuel Dock	TC	20	<20	220	<20	170	20	<20	20	20
		EC	20	<10	62	10	52	<10	<10	<10	<10
		ENT	<10	10	63	<10	62	<10	<10	<10	10

TABLE 2.9.4 Health Care Agency / Environmental Health Bacteriological Monitoring Program
Total Coliform (TC), *E.coli* (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		5/23&25/00	5/31&6/1/00	6/6&8/00	6/13&15/00	6/20&21/00	6/27&29/00	7/6/00	7/10&11/00	7/18&19/00
DANA POINT (surfzone)											
OSL25	Monarch Beach	TC	80	<20	40	<20	<20	<20	<20	230	<20
	(North of Salt Creek)	EC	<10	<10	31	<10	<10	<10	41	51	<10
		ENT	10	<10	20	<10	<10	10	<10	41	<10
OSL23	Monarch Beach	TC	<20	<20	<20	220	80	170	260	20	>16000
	(South of Salt Creek)	EC	<10	20	<10	41	<10	10	146	10	10
		ENT	<10	<10	<10	86	73	63	86	<10	97
ODB02	North Beach - Doheny	TC	40	70	<20	<20	20	<20	ERROR	20	140
		EC	74	52	63	63	119	52	3873	51	148
		ENT	31	41	10	52	<10	<10	19863	<10	30
ODB04	Doheny Beach	TC	80	20	<20	<20	<20	<20	<20	<20	<20
	(North of San Juan Creek)	EC	<10	74	<10	<10	<10	<10	10	<10	<10
		ENT	31	10	<10	10	<10	<10	<10	<10	10
ODB05	Doheny Beach	TC	500	500	300	40	<20	<20	20	20	<20
	(South Of San Juan Creek)	EC	20	218	226	10	10	<10	30	20	<10
		ENT	288	74	74	20	<10	<10	<10	74	<10
DANA POINT (creeks) All Creeks Flowing Unless*											
CSLSC	Salt Creek	TC	>24192	>24192	>24192	>24192	>24192	>24192	NS	>24192	>24192
		EC	609	816	2098	1354	457	886	NS	2909	2613
		ENT	1850	744	1100	1354	2481	1376	NS	2063	4884
CDBNC	North Beach Creek	TC	*>24192	*>24192	*>24192	*>24192	*>24192	*>24192	*>24192	*>24192	*>24192
		EC	495	677	12997	14136	7701	1669	189	132	404
		ENT	4160	364	830	487	3076	105	292	98	213
CSJC1	San Juan Creek Mouth	TC	*>24192	>24192	>24192	*467	*19863	*9804	*>24192	*24192	*>24192
		EC	2247	6131	7270	74	384	441	253	233	404
		ENT	199	4352	6488	20	145	160	30	173	52
CSJC2	Upper San Juan Creek	TC	>24192	>24192	>24192	>24192	>24192	>24192	>24192	24192	>24192
		EC	275	30	74	52	41	86	74	85	74
		ENT	601	450	218	175	1483	809	723	443	1081
DANA POINT HARBOR (in Harbor)											
BDP12	West End - Baby Beach	TC	230	130	20	500	80	40	40	<20	700
		EC	74	291	10	292	145	228	218	20	1250
		ENT	85	109	<10	74	216	<10	<10	<10	<10
BDP13	Buoy Line - Baby Beach	TC	300	230	20	70	170	<20	80	<20	300
		EC	201	97	31	97	30	145	86	<10	472
		ENT	52	10	10	20	97	10	10	<10	<10
BPD14	Swim Area - Baby Beach	TC	500	20	<20	800	170	<20	130	<20	20
		EC	504	41	20	538	63	161	<10	10	31
		ENT	345	<10	20	20	52	<10	<10	<10	10
BDP15	East End - Baby Beach	TC	1153	40	80	800	20	<20	20	20	<20
		EC	298	41	52	109	10	110	41	41	20
		ENT	213	<10	10	63	<10	<10	10	10	<10
BDP08	Pier	TC	130	<20	<20	20	<20	20	210	<20	20
		EC	130	10	<10	<10	<10	10	<10	<10	<10
		ENT	41	<10	<10	<10	<10	20	52	<10	<10
BDP16	Pilgrim	TC	40	<20	<20	40	<20	<20	500	<20	<20
		EC	86	10	<10	<10	<10	10	<10	10	<10
		ENT	41	<10	10	<10	<10	10	31	<10	<10
MDP11	Guest Dock - End	TC	16000	<20	20	<20	60	80	230	20	<20
	(West Basin)	EC	576	<10	<10	<10	<10	20	<10	10	<10
		ENT	96	<10	<10	<10	20	<10	122	10	<10
BDP09	Harbor Entrance	TC	80	<20	<20	<20	<20	80	<20	<20	<20
		EC	<10	10	<10	<10	<10	109	<10	<10	<10
		ENT	<10	<10	<10	<10	<10	20	<10	<10	10
MDP10	Harbor Patrol Dock	TC	130	80	20	<20	20	20	<20	<20	20
	(East Basin)	EC	31	10	<10	10	<10	<10	<10	<10	10
		ENT	31	<10	<10	<10	<10	<10	31	<10	<10
BDP17	Youth Dock	TC	<20	20	<20	20	<20	<20	300	500	<20
		EC	10	52	10	10	10	10	<10	<10	<10
		ENT	30	10	<10	<10	<10	<10	20	<10	<10
BDP07	Fuel Dock	TC	20	<20	20	<20	<20	<20	40	20	40
		EC	41	472	<10	10	<10	<10	<10	<10	<10
		ENT	10	<10	<10	<10	<10	<10	20	<10	<10

NS - NOT SAMPLED

TABLE 2.9.5 Health Care Agency / Environmental Health Bacteriological Monitoring Program
Total Coliform (TC), *E.coli* (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		8/15-16/00	8/22/00	8/29/00	9/6/00	9/12-13/00	9/19/00	9/25-26/00	10/3&4/00	10/11/00	10/17/00
DANA POINT (surfzone)											RAIN	
OSL25	Monarch Beach	TC	40	20	900	20	230	20	<20	110	80	40
	(North of Salt Creek)	EC	20	10	109	<10	10	31	10	<10	40	20
		ENT	10	31	231	<10	41	31	<10	10	10	<10
OSL23	Monarch Beach	TC	<20	110	<20	70	<20	300	>16000	130	1100	40
	(South of Salt Creek)	EC	10	41	31	74	<10	110	12033	52	231	<10
		ENT	<10	<10	41	20	<10	63	4884	118	336	10
ODB02	North Beach - Doheny	TC	9000	20	20	20	40	<20	20	40	5000	130
		EC	3654	20	74	<10	246	30	20	41	776	52
		ENT	146	<10	<10	10	<10	52	10	52	2613	145
ODB04	Doheny Beach	TC	<20	<20	20	<20	40	220	20	300	16000	1700
	(North of San Juan Creek)	EC	<10	<10	10	<10	20	135	30	1043	8664	203
		ENT	31	<10	<10	<10	<10	96	20	988	9208	1674
ODB05	Doheny Beach	TC	20	40	<20	300	130	300	130	2200	9000	230
	(South Of San Juan Creek)	EC	<10	31	<10	419	121	733	95	2014	4611	187
		ENT	10	169	31	708	272	712	<10	14136	11199	228
DANA POINT (creeks) All Creeks Flowing Unless*												
CSLSC	Salt Creek	TC	>24192	>24192	>24192	>24192	19863	>24192	768	>24192	>24192	>24192
		EC	4106	857	2400	1354	1100	1860	85	5475	>24192	1658
		ENT	1616	1043	7701	1664	1106	6867	987	9208	24192	2602
CDBNC	North Beach Creek	TC	*>24192	>24192	*>24192	*>24192	*>24192	*>24192	>24192	*>24192	>24192	>24192
		EC	238	199	1669	1374	583	295	529	256	>24192	6867
		ENT	<10	160	862	285	185	30	201	536	>24192	3448
CSJC1	San Juan Creek Mouth	TC	*>24192	>24192	*>24192	*10462	*>24192	*>24192	17329	*15531	>24192	>24192
		EC	959	1371	7270	700	6867	708	624	2359	>24192	>24192
		ENT	62	644	6488	1317	12997	404	336	2613	>24192	24192
CSJC2	Upper San Juan Creek	TC	12033	>24192	826	613	1012	1935	9804	1722	>24192	3873
		EC	173	663	320	10	<10	<10	327	171	24192	63
		ENT	83	354	211	63	10	20	285	345	19863	52
DANA POINT HARBOR (in Harbor)												
BDP12	West End - Baby Beach	TC	230	20	80	40	<20	1700	80	9000	2200	130
		EC	932	86	373	201	262	1722	419	2359	2063	97
		ENT	10	<10	63	63	30	86	110	373	2359	85
BDP13	Buoy Line - Baby Beach	TC	20	40	70	800	40	1300	140	5000	500	3000
		EC	52	185	512	156	1607	3255	586	4352	244	10462
		ENT	30	2247	<10	10	132	11199	160	798	1421	384
BPD14	Swim Area - Baby Beach	TC	40	<20	500	230	20	5000	800	800	2200	500
		EC	41	52	3076	74	1500	1860	464	2247	554	235
		ENT	31	134	4611	52	116	1012	368	74	1137	<10
BDP15	East End - Baby Beach	TC	40	20	130	70	130	2400	<20	800	3000	300
		EC	41	109	332	10	148	5172	355	1539	839	411
		ENT	20	31	52	86	52	663	20	122	1236	20
BDP08	Pier	TC	<20	40	<20	20	<20	<20	40	20	1300	170
		EC	<10	<10	52	<10	10	<10	20	<10	295	41
		ENT	10	<10	<10	<10	10	<10	<10	<10	373	20
BDP16	Pilgrim	TC	80	40	20	20	<20	230	40	<20	775	<20
		EC	<10	<10	10	<10	10	10	10	10	272	<10
		ENT	41	<10	<10	10	10	10	<10	<10	369	10
MDP11	Guest Dock - End	TC	80	300	80	80	20	80	80	20	5000	80
	(West Basin)	EC	<10	<10	20	<10	<10	10	393	20	3448	10
		ENT	<10	20	20	<10	<10	20	10	<10	2909	<10
BDP09	Harbor Entrance	TC	<20	20	<20	<20	20	<20	20	20	270	<20
		EC	<10	<10	31	<10	119	10	<10	<10	243	<10
		ENT	<10	10	<10	<10	<10	<10	20	10	148	10
MDP10	Harbor Patrol Dock	TC	130	40	130	<20	40	20	300	<20	1300	40
	(East Basin)	EC	<10	10	<10	10	31	<10	<10	<10	264	<10
		ENT	<10	10	<10	10	<10	<10	<10	<10	399	<10
BDP17	Youth Dock	TC	<20	20	40	20	<20	<20	80	<20	800	40
		EC	10	<10	10	<10	41	10	10	<10	175	<10
		ENT	<10	<10	10	<10	<10	<10	<10	<10	223	<10
BDP07	Fuel Dock	TC	40	20	40	40	20	<20	40	40	300	<20
		EC	<10	10	20	10	10	<10	41	<10	134	<10
		ENT	<10	<10	20	<10	<10	10	<10	<10	231	<10

NS - NOT SAMPLED

TABLE 2.9.6 Health Care Agency / Environmental Health Bacteriological Monitoring Program
Total Coliform (TC), *E.coli* (EC), Enterococcus (ENT) Most Probable Number / 100 ml Sample

STATION	Location Description		10/3&4/00	10/11/00	10/17/00	10/25/00	10/30/00	11/8/00	11/13/00	11/20/00	11/27/00	12/4/00
DANA POINT (surfzone)				RAIN			RAIN					
OSL25	Monarch Beach	TC	110	80	40	20	<20	500	<10	<20	<20	80
	(North of Salt Creek)	EC	<10	40	20	10	<10	10	<10	10	20	<10
		ENT	10	10	<10	<10	<10	20	<10	<10	<10	20
OSL23	Monarch Beach	TC	130	1100	40	230	80	170	70	70	80	40
	(South of Salt Creek)	EC	52	231	<10	85	52	10	<10	10	173	10
		ENT	118	336	10	86	41	10	20	52	74	20
ODB02	North Beach - Doheny	TC	40	5000	130	300	1300	1300	2200	800	1300	5000
		EC	41	776	52	201	262	1198	884	1789	512	7270
		ENT	52	2613	145	933	650	1012	3873	132	842	17329
ODB04	Doheny Beach	TC	300	16000	1700	1100	5000	130	300	800	170	500
	(North of San Juan Creek)	EC	1043	8664	203	249	794	86	98	480	121	272
		ENT	988	9208	1674	221	1565	109	327	1439	547	373
ODB05	Doheny Beach	TC	2200	9000	230	500	5000	230	170	700	16000	3000
	(South Of San Juan Creek)	EC	2014	4611	187	328	3873	110	109	160	7270	1515
		ENT	14136	11199	228	143	9208	345	313	1723	7270	3448
DANA POINT (creeks) All Creeks Flowing Unless*												
CSLSC	Salt Creek	TC	>24192	>24192	>24192	>24192	17328	>24192	>24192	15531	8164	>24192
		EC	5475	>24192	1658	1086	309	794	857	389	798	644
		ENT	9208	24192	2602	645	805	1374	813	934	1086	958
CDBNC	North Beach Creek	TC	*>24192	>24192	>24192	*19863	>24192	>24192	*>24192	*7701	*24192	*7270
		EC	256	>24192	6867	211	14136	3784	265	1017	6131	1233
		ENT	536	>24192	3448	169	17238	15531	292	4106	14136	1081
CSJC1	San Juan Creek Mouth	TC	*15531	>24192	>24192	*>24192	>24192	*24192	*17329	17329	>24192	>24192
		EC	2359	>24192	>24192	8664	15530	9804	2098	3130	7270	12033
		ENT	2613	>24192	24192	9208	24191	7270	1354	5475	3654	19863
CSJC2	Upper San Juan Creek	TC	1722	>24192	3873	3448	>24192	3448	2224	4611	>24192	4611
		EC	171	24192	63	134	8164	160	288	408	8164	272
		ENT	345	19863	52	749	19862	74	97	1046	9208	259
DANA POINT HARBOR (in Harbor)												
BDP12	West End - Baby Beach	TC	9000	2200	130	1300	1300	230	130	40	800	20
		EC	2359	2063	97	857	2481	213	185	31	379	20
		ENT	373	2359	85	512	2755	243	171	10	41	10
BDP13	Buoy Line - Baby Beach	TC	5000	500	3000	300	300	130	1300	20	1100	20
		EC	4352	244	10462	798	238	134	1658	<10	465	20
		ENT	798	1421	384	183	327	10	1162	10	265	<10
BPD14	Swim Area - Baby Beach	TC	800	2200	500	300	800	110	2200	<20	3000	20
		EC	2247	554	235	733	85	85	2282	<10	333	41
		ENT	74	1137	<10	131	160	121	1785	<10	384	20
BDP15	East End - Baby Beach	TC	800	3000	300	1700	500	170	2400	<20	500	40
		EC	1539	839	411	613	121	256	1259	<10	197	63
		ENT	122	1236	20	2359	98	228	1376	41	122	31
BDP08	Pier	TC	20	1300	170	20	230	40	20	40	<20	<20
		EC	<10	295	41	51	121	<10	30	<10	10	20
		ENT	<10	373	20	<10	145	<10	<10	10	<10	<10
BDP16	Pilgrim Dock	TC	<20	775	<20	20	500	<20	<20	<20	20	20
		EC	10	272	<10	<10	96	20	<10	<10	20	<10
		ENT	<10	369	10	10	86	20	<10	10	<10	<10
MDP11	Guest Dock - End	TC	20	5000	80	20	300	<20	<20	<20	80	20
	(West Basin)	EC	20	3448	10	<10	110	<10	<10	31	20	10
		ENT	<10	2909	<10	<10	259	<10	<10	<10	<10	<10
BDP09	Harbor Entrance	TC	20	270	<20	80	70	<20	20	20	<20	40
		EC	<10	243	<10	86	110	10	10	41	10	<10
		ENT	10	148	10	31	134	<10	10	<10	<10	<10
MDP10	Harbor Patrol Dock	TC	<20	1300	40	20	500	20	<20	<20	40	<20
	(East Basin)	EC	<10	264	<10	10	161	<10	<10	<10	10	10
		ENT	<10	399	<10	<10	187	10	20	<10	<10	10
BDP17	Youth Dock	TC	<20	800	40	300	1700	20	20	<20	170	<20
		EC	<10	175	<10	471	135	10	<10	10	20	<10
		ENT	<10	223	<10	228	171	<10	10	<10	<10	20
BDP07	Fuel Dock	TC	40	300	<20	<20	300	<20	20	<20	<20	<20
		EC	<10	134	<10	30	63	<10	<10	<10	10	<10
		ENT	<10	231	<10	<10	41	<10	10	<10	<10	<10

NS - NOT SAMPLED

TABLE 2.10

Pathogen indicator data for total coliforms, *E. coli* (fecal coliforms) and enterococci from samples taken by the SERRA program and reported by the Environmental Health Division of the Orange County Health Care Agency. Shown are representative data obtained during the period December 1999 – December 2000. Sampling station locations at the Ocean Institute Beach, the Dana Point Harbor Entrance and at adjacent sites are indicated. Samples taken during or just after periods of rain are identified. Data are expressed as most probable number (MPN) per 100 ml.

TABLE 2.10.1 **SERRA Bacteriological Monitoring Program**

Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		12/13/99	12/20/99	12/27/99	1/4/00	1/11/00	1/19/00	1/26/00 RAIN 1/25/00	2/1/00 Rain 1/30/00	2/8/00
DANA POINT (surfzone)											
ODP01 / S6	Marine Institute Beach	TC	10	<10	76	20	<2	60	30	70	20
		FC	40	<10	10	10	2	100	10	40	6
		ENT	<10	<10	46	<10	4	60	50	180	12
DANA POINT HARBOR (in Harbor)											
BDP09 / S4	Dana Point Harbor Entrance	TC	10	30	20	80	4	40	240	40	18
		FC	<10	40	<10	20	10	70	80	<10	16
		ENT	<10	10	<10	180	24	10	150	50	80
DOHENY BEACH (surfzone)											
ODB02 / S2	North Beach	TC	130	530	<10	360	20	140	>2000	700	230
		FC	30	350	<10	110	20	80	4000	200	60
		ENT	60	6500	20	310	20	300	7200	400	260
ODB05 / S1	1000' South Outfall	TC	20	160	10	50	130	240	3900	200	Cw/C
		FC	<10	50	<10	10	80	140	500	<100	250
		ENT	40	390	<10	60	450	620	780	1100	160
——— / S3	2000' South Outfall	TC	20	250	10	60	110	470	CW/C	300	140
		FC	20	70	10	90	70	160	290	300	30
		ENT	20	380	<10	210	350	990	580	1000	480
ODB03 / S5	3000' South Outfall	TC	20	280	40	100	460	460	>2000	400	190
		FC	<10	180	20	50	540	330	>2000	160	170
		ENT	10	600	110	290	390	1000	>2000	700	640
——— / S7	4000' South Outfall	TC	10	180	10	60	30	590	Cw/C	290	1100
		FC	40	90	<10	40	50	400	460	180	1100
		ENT	20	410	30	180	140	730	810	410	1200
ODB01 / S9	5000' South Outfall	TC	10	140	<10	<10	160	70	Cw/C	240	340
		FC	<10	80	10	10	80	20	210	70	550
		ENT	30	120	20	10	90	70	370	340	900
——— / S0	San Juan Cr/Ocean Interface	TC	70	170	10	60	150	50	8400	800	110
		FC	30	100	<10	<10	150	36	500	300	50
		ENT	70	860	10	64	330	240	780	2000	120
SAN JUAN CREEK											
CSJC1 / C1	San Juan Creek Mouth	TC	9700	10000	550	20000	7800	16000	>200000	64000	9600
		FC	4200	5400	180	7000	7000	7400	28000	37000	2900
		ENT	2000	5400	240	7300	5800	17000	29000	34000	3100
CSJC2 / C2	San Juan Creek North	TC	4100	1400	1000	7700	940	2500	>200000	44000	5500
		FC	4500	290	320	750	270	490	31000	2200	270
		ENT	810	630	220	1300	380	640	26000	3400	470
CAPISTRANO BEACH (surfzone)											
OCB11 / S11	7500' South Outfall	TC	<10	40	<10	20	60	90	Cw/C	700	460
		FC	<10	20	<10	<10	90	70	210	150	400
		ENT	20	10	<10	<10	90	350	350	540	480
OCB13 / S13	10000' South Outfall	TC	<10	<10	<10	<10	10	70	390	230	100
		FC	<10	20	<10	<10	<10	20	260	220	60
		ENT	<10	30	<10	<10	60	130	260	640	100
OCB15 / S15	14000' South Outfall	TC	<10	<10	160	20	20	<100	330	420	170
		FC	<10	<10	<10	<10	<10	400	110	80	160
		ENT	<10	70	20	<10	60	800	230	600	240
SAN CLEMENTE (surfzone)											
OSC05 / S17	20000' South Outfall	TC	<10	80	30	390	<10	360	Cw/C	190	20
		FC	<10	10	<10	540	20	380	140	90	10
		ENT	<10	10	<10	330	20	250	400	220	40
OSC19 / S19	Lifeguard Building	TC	<10	160	220	50	20	230	380	100	<10
		FC	<10	10	130	<10	30	30	100	40	20
		ENT	<10	<10	70	<10	40	30	160	100	40
OSC21 / S21	Avenida Calafia	TC	<10	20	<10	50	20	70	480	80	20
		FC	<10	20	<10	20	<10	30	20	60	10
		ENT	<10	<10	<10	<10	30	10	110	70	10

TABLE 2.10.2 **SERRA Bacteriological Monitoring Program**

Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		1/11/00	1/19/00	1/26/00	2/1/00	2/8/00	2/15/00	2/23/00	2/29/00	3/7/00
					RAIN 1/25/00	Rain 1/30/00		Rain 2/14/00	Rain	Rain 2/27/00	Rain 3/5/00
DANA POINT (surfzone)											
ODP01 / S6	Marine Institute Beach	TC	<2	60	30	70	20	100	340	90	300
		FC	2	100	10	40	6	10	50	50	50
		ENT	4	60	50	180	12	60	170	10	20
DANA POINT HARBOR (in Harbor)											
BDP09 / S4	Dana Point Harbor Entrance	TC	4	40	240	40	18	10	700	30	20
		FC	10	70	80	<10	16	10	270	<10	10
		ENT	24	10	150	50	80	50	390	20	40
DOHENY BEACH (surfzone)											
ODB02 / S2	North Beach	TC	20	140	>2000	700	230	1200	32000	2900	3500
		FC	20	80	4000	200	60	<100	4300	650	210
		ENT	20	300	7200	400	260	300	27000	1100	640
ODB05 / S1	1000' South Outfall	TC	130	240	3900	200	Cw/C	300	2400	200	Cw/C
		FC	80	140	500	<100	250	<100	200	120	280
		ENT	450	620	780	1100	160	<100	1100	320	570
——— / S3	2000' South Outfall	TC	110	470	CW/C	300	140	480	1500	100	840
		FC	70	160	290	300	30	200	190	120	70
		ENT	350	990	580	1000	480	540	550	480	360
ODB03 / S5	3000' South Outfall	TC	460	460	>2000	400	190	2800	900	300	1100
		FC	540	330	>2000	160	170	5600	20	91	110
		ENT	390	1000	>2000	700	640	4500	510	500	800
——— / S7	4000' South Outfall	TC	30	590	Cw/C	290	1100	5800	1800	300	1200
		FC	50	400	460	180	1100	3700	250	64	Cw/FC
		ENT	140	730	810	410	1200	5600	700	280	900
ODB01 / S9	5000' South Outfall	TC	160	70	Cw/C	240	340	400	1100	200	770
		FC	80	20	210	70	550	390	230	82	Cw/FC
		ENT	90	70	370	340	900	830	770	270	830
——— / S0	San Juan Cr/Ocean Interface	TC	150	50	8400	800	110	800	6600	150	4400
		FC	150	36	500	300	50	300	1400	60	800
		ENT	330	240	780	2000	120	400	1600	250	2100
SAN JUAN CREEK											
CSJC1 / C1	San Juan Creek Mouth	TC	7800	16000	>200000	64000	9600	26000	23000	7900	9500
		FC	7000	7400	28000	37000	2900	12000	4200	4300	3500
		ENT	5800	17000	29000	34000	3100	8300	5800	4700	2400
CSJC2 / C2	San Juan Creek North	TC	940	2500	>200000	44000	5500	4200	12000	10000	7000
		FC	270	490	31000	2200	270	800	3300	1000	1400
		ENT	380	640	26000	3400	470	1000	3800	100	2500
CAPISTRANO BEACH (surfzone)											
OCB11 / S11	7500' South Outfall	TC	60	90	Cw/C	700	460	Cw/C	Cw/C	130	900
		FC	90	70	210	150	400	850	340	40	Cw/FC
		ENT	90	350	350	540	480	1700	560	290	620
OCB13 / S13	10000' South Outfall	TC	10	70	390	230	100	1200	Cw/C	70	980
		FC	<10	20	260	220	60	950	170	30	Cw/FC
		ENT	60	130	260	640	100	1400	580	300	870
OCB15 / S15	14000' South Outfall	TC	20	<100	330	420	170	2100	3400	110	730
		FC	<10	400	110	80	160	1200	550	20	170
		ENT	60	800	230	600	240	5300	1500	130	560
SAN CLEMENTE (surfzone)											
OSC05 / S17	20000' South Outfall	TC	<10	360	Cw/C	190	20	400	1500	80	730
		FC	20	380	140	90	10	270	130	60	320
		ENT	20	250	400	220	40	420	560	180	320
OSC19 / S19	Lifeguard Building	TC	20	230	380	100	<10	330	420	110	250
		FC	30	30	100	40	20	240	90	30	40
		ENT	40	30	160	100	40	170	390	170	150
OSC21 / S21	Avenida Calafia	TC	20	70	480	80	20	260	700	2	200
		FC	<10	30	20	60	10	120	230	<10	40
		ENT	30	10	110	70	10	140	600	40	70
OSC23 / S23	Las Palmeras	TC	<10	50	280	110	10	200	210	30	140
		FC	<10	40	80	40	<10	90	20	10	10

SERRA Bacteriological Monitoring Program

TABLE 2.10.3 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		4/3/00	4/10/00	4/17/00	4/24/00	5/1/00	5/2/00	5/8/00	5/10/00	5/16/00	5/18/00
DANA POINT (surfzone)												
ODP01 / S6	Marine Institute Beach	TC	50	6	4	4	<10	<10	4	6	76	6
		FC	32	<2	<2	<2	<10	<10	2	<2	34	4
		ENT	12	<2	2	<2	<10	<10	<2	<2	2	4
DANA POINT HARBOR (In Harbor)												
BDP09 / S4	Dana Point Harbor Entrance	TC	8	6	<2	10	<10	10	6	30	52	34
		FC	4	2	<2	<10	<10	<10	<2	4	44	10
		ENT	24	<2	<2	10	<10	10	4	6	4	10
DOHENY BEACH (surfzone)												
ODB02 / S2	North Beach	TC	50	40	20	90	130	100	30	10	250	90
		FC	60	40	20	20	30	60	10	<10	270	30
		ENT	60	30	30	40	130	70	<10	50	90	10
ODB05 / S1	1000' South Outfall	TC	80	140	50	1400	30	10	450	50	90	260
		FC	30	40	10	910	10	30	250	<10	90	120
		ENT	80	70	40	810	10	20	110	10	30	210
——— / S3	2000' South Outfall	TC	40	90	<10	150	20	60	710	60	130	40
		FC	10	150	10	110	20	50	460	60	20	30
		ENT	20	<10	<10	80	20	40	310	120	100	90
ODB03 / S5	3000' South Outfall	TC	50	30	30	30	30	<10	770	90	Cw/C	72
		FC	10	10	20	10	10	30	490	<10	870	36
		ENT	40	20	30	<10	30	<10	410	110	40	100
——— / S7	4000' South Outfall	TC	130	50	480	10	60	50	610	100	54	30
		FC	150	40	360	<2	100	20	270	90	10	30
		ENT	140	10	330	2	150	10	280	330	20	50
ODB01 / S9	5000' South Outfall	TC	70	10	30	<10	20	10	400	50	60	80
		FC	30	20	<10	<10	20	10	130	10	10	45
		ENT	40	30	40	<10	10	10	180	80	40	45
——— / S0	San Juan Cr/Ocean Interface	TC	120	1200	40	6300	1900	400	3000	70	37	
		FC	82	630	54	4300	750	100	1300	10	50	
		ENT	170	920	81	2400	650	140	780	54	40	430
SAN JUAN CREEK												
CSJC1 / C1	San Juan Creek Mouth	TC	24000	4100	8700	>20000	>20000	1200	30000	200	27000	100000
		FC	5800	1500	2500	>20000	>20000	640	4900	200	1300	11000
		ENT	7300	2000	980	>20000	>20000	300	5000	<100	500	3900
CSJC2 / C2	San Juan Creek North	TC	4200	710	80	760	500	>30000	340	>20000	3000	150
		FC	420	310	45	280	120	17000	220	>20000	2200	88
		ENT	91	50	90	90	91	13000	110	20000	2400	91
CAPISTRANO BEACH (surfzone)												
OCB11 / S11	7500' South Outfall	TC	20	30	80	20	10	70	<10	20	10	20
		FC	10	10	<10	20	10	40	10	10	40	10
		ENT	20	20	10	90	20	40	30	30	10	10
OCB13 / S13	10000' South Outfall	TC	30	10	30	20	<10	10	10	160	260	<10
		FC	<10	<10	30	<10	<10	<10	30	110	150	20
		ENT	<10	<10	10	10	<10	<10	<10	100	90	10
OCB15 / S15	14000' South Outfall	TC	280	20	370	240	130	50	>2000	200	600	330
		FC	50	<10	90	70	20	30	2400	18	150	140
		ENT	20	<10	50	100	30	20	>2000	70	260	140
SAN CLEMENTE (surfzone)												
OSC05 / S17	20000' South Outfall	TC	400	130	20	30	10	<10	150	20	510	30
		FC	20	130	<10	10	<10	<10	20	<10	150	<10
		ENT	<10	<10	<10	10	<10	<10	50	<10	140	10
OSC19 / S19	Lifeguard Building	TC	50	<10	10	<10	<10	80	70	10	470	<10
		FC	2	<10	<10	<10	<10	40	10	30	110	<10
		ENT	10	<10	<10	<10	<10	40	20	<10	80	<10
OSC21 / S21	Avenida Calafia	TC	20	<2	2	10	<10	2	10	<2	52	10
		FC	4	<2	<2	<10	<10	2	8	<2	16	2
		ENT	12	<2	8	<10	<10	<2	38	<2	12	6
OSC23 / S23	Las Palmeras	TC	<2	<2	2	<10	<10	<2	<2	<2	34	<2
		FC	<2	<2	4	10	<10	<2	2	<2	8	<2

SERRA Bacteriological Monitoring Program

TABLE 2.10.4 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		5/16/00	5/18/00	5/22/00	5/25/00	5/30/00	5/31/00	6/5/00	6/7/00	6/12/00
DANA POINT (surfzone)											
ODP01 / S6	Marine Institute Beach	TC	76	6	4	42	4	4	10	2	<10
		FC	34	4	<2	46	<2	2	10	2	<10
		ENT	2	4	2	26	8	10	20	<2	<10
DANA POINT HARBOR (in Harbor)											
BDP09 / S4	Dana Point Harbor Entrance	TC	52	34	NS	20	12	22	<10	14	10
		FC	44	10	NS	10	2	4	<10	4	10
		ENT	4	10	NS	16	2	4	<10	2	<10
DOHENY BEACH (surfzone)											
ODB02 / S2	North Beach	TC	250	90	10	10	20	730	150	40	10
		FC	270	30	20	<10	<10	480	<10	<10	<10
		ENT	90	10	20	30	40	360	30	<10	<10
ODB05 / S1	1000' South Outfall	TC	90	260	10	20	10	70	10	30	<10
		FC	90	120	<10	<10	<10	100	20	20	<10
		ENT	30	210	10	10	<10	20	10	10	<10
——— / S3	2000' South Outfall	TC	130	40	30	10	<10	90	<10	70	<10
		FC	20	30	<10	<10	<10	20	<10	140	<10
		ENT	100	90	50	10	30	20	60	220	<10
ODB03 / S5	3000' South Outfall	TC	Cw/C	72	73	30	<10	10	10	20	10
		FC	870	36	10	45	20	<10	<10	20	10
		ENT	40	100	36	30	900	10	<10	<10	10
——— / S7	4000' South Outfall	TC	54	30	30	150	10	40	10	<10	10
		FC	10	30	20	140	<10	20	<10	<10	<10
		ENT	20	50	20	80	<10	<10	20	<10	<10
ODB01 / S9	5000' South Outfall	TC	60	80	50	50	10	<10	20	<10	10
		FC	10	45	<10	30	<10	20	10	<10	10
		ENT	40	45	<10	10	30	20	20	<10	<10
——— / S0	San Juan Cr/Ocean Interface	TC	37	680	18	660	1700	150	10	<10	<10
		FC	50	290	20	350	820	130	<10	<10	<10
		ENT	40	430	40	940	240	80	10	40	20
SAN JUAN CREEK											
CSJC1 / C1	San Juan Creek Mouth	TC	27000	100000	2900	5500	58000	4500	1500	60000	>200000
		FC	1300	11000	3300	1600	58000	1200	1400	51000	53000
		ENT	500	3900	2200	3600	16000	500	2300	13000	2600
CSJC2 / C2	San Juan Creek North	TC	3000	150	360	690	290	310	210	210	91
		FC	2200	88	230	290	150	70	40	110	50
		ENT	2400	91	450	520	310	200	1100	680	1200
CAPISTRANO BEACH (surfzone)											
OCB11 / S11	7500' South Outfall	TC	10	20	20	10	20	20	20	<10	<10
		FC	40	10	20	30	10	<10	20	<10	<10
		ENT	10	10	<10	10	50	<10	20	10	<10
OCB13 / S13	10000' South Outfall	TC	260	<10	60	20	<10	<10	10	<10	<10
		FC	150	20	10	<10	<10	<10	<10	<10	<10
		ENT	90	10	20	<10	<10	10	<10	<10	<10
OCB15 / S15	14000' South Outfall	TC	600	330	260	420	110	20	1000	340	<10
		FC	150	140	45	170	20	40	440	70	<10
		ENT	260	140	64	450	90	130	550	220	<10
SAN CLEMENTE (surfzone)											
OSC05 / S17	20000' South Outfall	TC	510	30	50	<10	<10	<10	20	9	20
		FC	150	<10	30	<10	<10	<10	20	<10	<10
		ENT	140	10	<10	<10	<10	<10	<10	10	<10
OSC19 / S19	Lifeguard Building	TC	470	<10	50	<10	70	40	80	30	10
		FC	110	<10	40	20	70	10	60	30	<10
		ENT	80	<10	<10	20	30	<10	20	10	<10
OSC21 / S21	Avenida Calafia	TC	52	10	2	<2	<2	8	<10	<2	<10
		FC	16	2	<2	<2	<2	10	<10	<2	<10
		ENT	12	6	<2	<2	<2	<2	<10	400	10
OSC23 / S23	Las Palmeras	TC	34	<2	<10	<10	<2	4	<10	<2	10
		FC	8	<2	<10	<10	<2	<2	<10	<2	10

SERRA Bacteriological Monitoring Program

TABLE 2.10.5 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		6/26/00	6/27/00	7/3/00	7/5/00	7/10/00	7/12/00	7/17/00	7/18/00	7/25/00
DANA POINT (surfzone)											
ODP01 / S6	Marine Institute Beach	TC	<2	4	2	<2	6	20	18	22	2
		FC	<2	4	2	<2	2	<10	6	<2	<2
		ENT	2	<2	10	6	10	10	6	16	<2
DANA POINT HARBOR (in Harbor)											
BDP09 / S4	Dana Point Harbor Entrance	TC	2	14	4	16	16	<10	18	8	4
		FC	<2	2	8	4	<2	<10	<2	<2	<2
		ENT	<2	<2	12	<2	2	30	4	<2	2
DOHENY BEACH (surfzone)											
ODB02 / S2	North Beach	TC	30	<10	20	<10	<10	30	100	110	<10
		FC	<10	<10	<10	<10	<10	<10	40	<10	<10
		ENT	<10	<10	<10	<10	60	<10	20	<10	<10
ODB05 / S1	1000' South Outfall	TC	10	<10	30	<10	30	<10	10	10	30
		FC	<10	<10	10	<10	40	<10	10	20	<10
		ENT	<10	10	10	<10	80	30	10	10	10
——— / S3	2000' South Outfall	TC	<10	10	10	<10	70	10	10	<10	30
		FC	<10	10	<10	<10	20	10	<10	<10	20
		ENT	<10	50	40	10	60	10	<10	<10	20
ODB03 / S5	3000' South Outfall	TC	20	10	30	<10	40	40	20	<10	10
		FC	10	10	<10	<10	40	<10	10	<10	<10
		ENT	<10	10	20	20	50	10	<10	<10	<10
——— / S7	4000' South Outfall	TC	10	70	10	<10	60	10	<10	<10	<10
		FC	10	20	<10	<10	40	20	10	<10	<10
		ENT	20	40	<10	10	50	50	10	<10	10
ODB01 / S9	5000' South Outfall	TC	7	14	<10	<10	<10	50	<10	<10	7
		FC	6	12	<10	<10	<10	40	<10	10	8
		ENT	8	22	10	<10	50	30	<10	10	2
——— / S0	San Juan Cr/Ocean Interface	TC	<10	<10	30	<10	2000	120	10	40	10
		FC	<10	<10	10	<10	2000	10	10	10	<10
		ENT	<10	<10	10	<10	540	10	20	10	10
SAN JUAN CREEK											
CSJC1 / C1	San Juan Creek Mouth	TC	4000	25000	400	300	6900	4600	37000	5400	37000
		FC	200	820	360	300	600	500	2900	1400	4700
		ENT	200	<100	200	<100	100	200	730	450	540
CSJC2 / C2	San Juan Creek North	TC	500	290	64	290	140	2600	3800	82	2800
		FC	73	130	64	110	70	270	2400	130	330
		ENT	1100	3600	1700	3000	3700	3200	4500	420	930
CAPISTRANO BEACH (surfzone)											
OCB11 / S11	7500' South Outfall	TC	16	12	10	<10	30	<10	6	<10	<10
		FC	12	10	10	<10	<10	<10	8	10	<10
		ENT	10	40	<10	<10	<10	20	4	<10	<10
OCB13 / S13	10000' South Outfall	TC	150	20	30	170	20	10	<10	<10	<10
		FC	10	20	<10	160	10	10	10	<10	<10
		ENT	10	10	10	60	10	10	10	<10	<10
OCB15 / S15	14000' South Outfall	TC	26	18	30	<10	730	470	10	10	10
		FC	22	10	30	<10	500	100	20	10	10
		ENT	18	18	50	<10	470	180	10	10	20
SAN CLEMENTE (surfzone)											
OSC05 / S17	20000' South Outfall	TC	20	<10	50	20	10	<10	<2	150	10
		FC	10	<10	10	30	<10	<10	<2	110	<10
		ENT	10	20	10	50	20	20	<2	20	<10
OSC19 / S19	Lifeguard Building	TC	60	20	10	4	70	190	20	<10	<10
		FC	40	20	40	8	30	190	<10	<10	<10
		ENT	40	<10	70	30	<10	<10	<10	20	<10
OSC21 / S21	Avenida Calafia	TC	14	22	<2	18	4	10	2	28	22
		FC	6	118	<2	12	<2	<10	4	6	8
		ENT	2	6	<2	12	2	<10	2	6	8
OSC23 / S23	Las Palmeras	TC	18	24	<2	12	2	<10	6	10	14
		FC	18	8	2	6	2	<10	<2	12	14

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TABLE 2.10.6 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		8/14/00	8/15/00	8/22/00	8/23/00	8/28/00	8/29/00	9/5/00	9/6/00	9/12/00	9/13/00
DANA POINT (surfzone)												
ODP01 / S6	Marine Institute Beach	TC	8	10	<2	<2	40	40	6	8	8	4
		FC	<2	2	<2	<2	20	38	4	4	8	14
		ENT	<2	<2	<2	<2	14	6	2	2	<2	8
DANA POINT HARBOR (In Harbor)												
BDP09 / S4	Dana Point Harbor Entrance	TC	10	8	6	28	10	4	18	4	48	18
		FC	6	4	4	2	4	<2	2	<2	26	26
		ENT	<2	<2	<2	<2	2	8	2	<2	16	22
DOHENY BEACH (surfzone)												
ODB02 / S2	North Beach	TC	37	58	<10	60	13	Cw/C	10	10	90	70
		FC	20	80	<10	20	28	14	<10	<10	80	80
		ENT	38	44	<10	10	20	42	<10	10	90	130
ODB05 / S1	1000' South Outfall	TC	20	10	10	170	80	10	10	100	210	50
		FC	7	6	20	80	10	<10	<10	140	110	60
		ENT	23	30	<10	260	20	20	10	700	240	340
——— / S3	2000' South Outfall	TC	10	10	30	80	80	Cw/C	20	50	120	70
		FC	10	<10	<10	40	10	20	<10	40	80	80
		ENT	<10	40	100	70	50	80	30	70	120	170
ODB03 / S5	3000' South Outfall	TC	70	40	40	60	160	180	20	<10	140	40
		FC	10	20	10	20	60	160	10	<10	40	90
		ENT	<10	10	30	20	60	170	10	80	190	100
——— / S7	4000' South Outfall	TC	30	40	40	30	60	Cw/C	<10	202	140	60
		FC	10	<10	20	10	10	100	<10	10	90	80
		ENT	10	20	40	30	30	50	<10	<10	110	70
ODB01 / S9	5000' South Outfall	TC	10	50	70	50	33	50	20	<10	200	150
		FC	<10	20	30	20	16	22	10	<10	90	150
		ENT	20	10	30	20	26	32	10	10	70	280
——— / S0	San Juan Cr/Ocean Interface	TC	17	30	50	20	130	50	<10	70	220	80
		FC	7	20	10	20	20	10	<10	80	120	150
		ENT	20	14	10	10	30	30	10	570	140	220
SAN JUAN CREEK												
CSJC1 / C1	San Juan Creek Mouth	TC	56000	32000	17000	6500	24000	9500	4300	2300	7400	2500
		FC	10000	4200	5400	4600	2500	2100	3300	1300	1600	2100
		ENT	3100	1400	1400	100	640	640	5200	1400	360	700
CSJC2 / C2	San Juan Creek North	TC	>30000	12000	6700	400	400	380	130	240	220	160
		FC	9800	860	900	130	60	300	18	10	82	40
		ENT	11000	1700	1800	210	270	240	110	120	72	54
CAPISTRANO BEACH (surfzone)												
OCB11 / S11	7500' South Outfall	TC	30	190	30	20	70	40	10	<10	260	70
		FC	<10	20	30	20	62	<10	<10	<10	40	60
		ENT	10	10	<10	20	28	10	<10	<10	100	150
OCB13 / S13	10000' South Outfall	TC	60	170	10	70	70	40	20	40	250	80
		FC	20	46	10	120	60	30	10	30	60	250
		ENT	20	50	10	20	20	42	<10	20	90	210
OCB15 / S15	14000' South Outfall	TC	840	730	850	440	810	1000	<10	10	840	940
		FC	130	74	640	90	180	830	<10	<10	330	580
		ENT	75	86	270	30	120	530	<10	<10	460	680
SAN CLEMENTE (surfzone)												
OSC05 / S17	20000' South Outfall	TC	130	90	20	30	110	10	<10	80	60	10
		FC	60	10	<10	40	20	30	<10	40	50	10
		ENT	<10	20	<10	<10	70	<10	<10	<10	10	10
OSC19 / S19	Lifeguard Building	TC	350	120	Cw/C	64	250	140	<10	76	390	120
		FC	50	80	60	66	80	230	<10	86	90	70
		ENT	80	20	32	17	20	90	<10	8	40	50
OSC21 / S21	Avenida Calafia	TC	16	10	<2	2	16	98	2	4	12	6
		FC	10	4	<2	2	<2	92	<2	6	4	2
		ENT	6	2	<2	<2	2	44	<2	<2	2	<2
OSC23 / S23	Las Palmeras	TC	6	<2	<2	8	<2	4	<2	<2	2	<2
		FC	<2	<2	<2	2	<2	2	<2	<2	<2	<2

SERRA Bacteriological Monitoring Program

TABLE 2.10.7 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		9/20/00	9/25/00	9/27/00	10/2/00	10/4/00	10/10/00	10/11/00	10/16/00	10/18/00
DANA POINT (surfzone)									RAIN		
ODP01 / S6	Marine Institute Beach	TC	38	4	10	10	4	60	80	10	14
		FC	30	2	10	4	<2	<10	<10	10	6
		ENT	20	8	<10	<10	<2	20	20	4	4
DANA POINT HARBOR (in Harbor)											
BDP09 / S4	Dana Point Harbor Entrance	TC	8	28	20	12	8	10	230	8	22
		FC	12	<2	20	2	2	20	170	10	<2
		ENT	6	<2	60	4	10	10	40	8	14
DOHENY BEACH (surfzone)											
ODB02 / S2	North Beach	TC	140	190	200	10	120	170	730	760	210
		FC	60	80	220	10	80	60	500	380	140
		ENT	210	70	330	10	210	170	1800	400	160
ODB05 / S1	1000' South Outfall	TC	130	10	200	20	200	20	60	20	100
		FC	130	<10	180	20	160	10	70	<10	30
		ENT	200	20	550	50	110	30	150	100	110
——— / S3	2000' South Outfall	TC	160	100	130	10	10	30	200	20	230
		FC	70	60	160	10	30	10	270	20	150
		ENT	340	120	470	20	160	20	690	20	270
ODB03 / S5	3000' South Outfall	TC	880	210	470	<10	80	110	150	20	140
		FC	690	80	420	10	60	80	50	<10	100
		ENT	>2000	270	880	20	300	80	230	10	80
——— / S7	4000' South Outfall	TC	160	310	160	20	660	20	380	20	70
		FC	70	180	150	10	1200	<10	180	10	50
		ENT	180	130	460	100	700	20	560	<10	90
ODB01 / S9	5000' South Outfall	TC	80	170	150	10	310	110	160	10	45
		FC	70	210	70	30	290	80	80	30	15
		ENT	110	140	270	50	410	30	320	60	10
——— / S0	San Juan Cr/Ocean Interface	TC	310	100	260	40	110	50	30	770	950
		FC	130	40	400	20	140	<10	110	610	570
		ENT	340	30	800	30	370	120	280	490	440
SAN JUAN CREEK											
CSJC1 / C1	San Juan Creek Mouth	TC	32000	56000	6700	4500	6300	6600	42000	61000	>200000
		FC	13000	6000	1700	1200	3400	3700	4000	22000	190000
		ENT	15000	1200	1000	700	3500	1800	2400	20000	140000
CSJC2 / C2	San Juan Creek North	TC	350	4600	930	810	610	4100	66000	1400	1700
		FC	100	770	300	340	300	900	24000	550	640
		ENT	90	590	200	110	80	64	54000	190	1100
CAPISTRANO BEACH (surfzone)											
OCB11 / S11	7500' South Outfall	TC	30	40	40	60	90	10	700	<10	10
		FC	20	50	40	50	80	10	240	<10	<10
		ENT	40	50	70	30	90	10	310	10	10
OCB13 / S13	10000' South Outfall	TC	120	60	130	220	170	20	410	150	30
		FC	60	10	170	110	40	<10	70	<10	<10
		ENT	110	40	110	60	110	10	150	<10	<10
OCB15 / S15	14000' South Outfall	TC	150	630	50	Cw/C	930	2600	2100	300	4500
		FC	100	180	40	510	730	220	400	80	2200
		ENT	64	130	70	540	930	110	400	40	2200
SAN CLEMENTE (surfzone)											
OSC05 / S17	20000' South Outfall	TC	40	80	60	10	20	40	9700	10	50
		FC	20	10	30	10	30	20	5500	80	30
		ENT	20	10	50	<10	10	<10	14200	60	10
OSC19 / S19	Lifeguard Building	TC	50	1100	100	80	60	30	720	68	60
		FC	40	860	60	30	10	30	390	46	20
		ENT	10	20	30	30	10	<10	590	26	30
OSC21 / S21	Avenida Calafia	TC	<10	40	<10	12	4	30	130	30	10
		FC	20	40	10	6	12	<10	70	10	<10
		ENT	30	12	10	4	<2	10	100	10	<10
OSC23 / S23	Las Palmeras	TC	<10	<2	<10	6	2	<10	150	<10	20
		FC	<10	4	<10	6	<2	<10	230	<10	10

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TABLE 2.10.8 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		10/25/00	10/30/00	11/1/00	11/6/00	11/13/00	11/20/00	11/27/00	12/4/00
DANA POINT (surfzone)										
ODP01 / S6	Marine Institute Beach	TC	4	50	50	20	<10	64	42	2
		FC	6	20	10	<10	<10	46	20	<2
		ENT	4	<10	<10	30	<10	10	20	4
DANA POINT HARBOR (In Harbor)										
BDP09 / S4	Dana Point Harbor Entrance	TC	8	350	20	30	50	<2	6	6
		FC	12	90	<10	10	<10	4	8	10
		ENT	10	90	30	<10	20	6	14	6
DOHENY BEACH (surfzone)										
ODB02 / S2	North Beach	TC	330	3800	1800	400	550	80	300	160
		FC	270	2300	240	350	140	30	240	70
		ENT	790	2200	440	1000	700	130	640	180
ODB05 / S1	1000' South Outfall	TC	650	9600	1200	250	40	50	130	60
		FC	450	3300	380	340	<10	60	40	50
		ENT	1000	5200	1100	1200	10	140	510	90
——— / S3	2000' South Outfall	TC	830	>2000	810	140	20	50	40	70
		FC	550	1300	390	140	<10	160	10	30
		ENT	1400	>1000	1100	410	<10	610	250	110
ODB03 / S5	3000' South Outfall	TC	750	Cw/C	730	80	220	230	60	30
		FC	560	850	260	40	20	90	30	<10
		ENT	540	1300	480	170	830	830	330	30
——— / S7	4000' South Outfall	TC	130	Cw/C	590	10	<10	40	90	20
		FC	110	700	170	<10	<10	40	40	20
		ENT	110	940	2200	50	10	270	330	30
ODB01 / S9	5000' South Outfall	TC	630	Cw/C	290	40	<10	20	30	220
		FC	400	840	50	10	<10	20	10	140
		ENT	440	890	1300	40	120	120	90	90
——— / S0	San Juan Cr/Ocean Interface	TC	780	15000	1800	200	45	510	40	440
		FC	880	87000	770	200	40	180	30	210
		ENT	1800	13000	2000	480	240	280	450	580
SAN JUAN CREEK										
CSJC1 / C1	San Juan Creek Mouth	TC	36000	70000	42000	21000	11000	11000	15000	>2000
		FC	9400	26000	17000	10000	4100	4600	11000	3800
		ENT	6500	27000	20000	8600	7000	4300	8800	2700
CSJC2 / C2	San Juan Creek North	TC	550	50000	6600	3600	5100	1000	60	140
		FC	120	25000	820	1200	730	330	10	20
		ENT	150	30000	1000	700	900	230	20	30
CAPISTRANO BEACH (surfzone)										
OCB11 / S11	7500' South Outfall	TC	20	Cw/C	340	<10	20	30	20	10
		FC	<10	780	70	<10	<10	10	10	40
		ENT	40	1300	160	10	<10	90	50	50
OCB13 / S13	10000' South Outfall	TC	10	880	130	310	<10	<2	50	60
		FC	<10	380	10	130	<10	<2	20	10
		ENT	40	390	30	110	10	<2	30	50
OCB15 / S15	14000' South Outfall	TC	2800	480	54	280	30	2	20	100
		FC	700	280	10	40	<10	<2	40	20
		ENT	780	200	64	70	60	2	130	10
SAN CLEMENTE (surfzone)										
OSC05 / S17	20000' South Outfall	TC	160	1300	50	20	210	50	70	10
		FC	90	430	<10	40	30	20	10	20
		ENT	60	680	30	<10	80	40	220	20
OSC19 / S19	Lifeguard Building	TC	180	1300	130	10	70	20	150	10
		FC	100	280	<10	<10	30	10	20	40
		ENT	50	640	10	<10	10	20	30	110
OSC21 / S21	Avenida Calafia	TC	<10	1400	40	<10	10	30	6	12
		FC	20	290	10	10	<10	8	2	4
		ENT	<10	690	10	<10	<10	6	4	6
OSC23 / S23	Las Palmeras	TC	10	790	60	20	<10	20	8	10
		FC	<10	140	<10	<10	<10	8	4	2

TABLE 2.11

Pathogen indicator data for total coliforms, *E. coli* (fecal coliforms) and enterococci from samples taken by the AWMA program and reported by the Environmental Health Division of the Orange County Health Care Agency. Shown are representative data obtained during the period January - December 2000. Sampling station locations at the Dana Strands Beach surf zone and at adjacent sites are indicated. Samples taken during or just after periods of rain are identified. Data are expressed as most probable number (MPN) per 100 ml.

AWMA Bacteriological Monitoring Program

TABLE 2.11.1 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		1/24/00	1/26/00	1/31/00	2/2/00	2/7/00	2/9/00	2/14/00	2/15/00	2/22/00
LAGUNA BEACH (surfzone)				RAIN 1/25/00	Rain 1/30/00				Rain		Rain 2/21/00
OLB16 / S16	Laguna Hotel	TC	10	690	1000	60	60	22	90	270	220
		FC	<10	50	400	20	10	2	20	70	30
		ENT	10	70	200	<10	10	<2	30	80	40
OLB15 / S15	Projection of Mountain Road	TC	<10	340	440	480	64	8	90	400	280
	9/1/99 - Station changed to	FC	<10	30	240	60	13	<2	10	230	110
	Projection of Bluebird Canyor	ENT	<10	80	300	130	10	7	10	410	70
OLB14 / S14	Victoria Beach	TC	30	150	140	20	10	8	90	40	230
		FC	<10	10	10	<01	12	12	10	10	64
		ENT	10	10	10	140	82	6	50	<10	91
OLB13 / S13	Blue Lagoon	TC	2	110	150	10	32	12	<10	50	190
		FC	<2	10	50	4	2	4	<10	10	50
		ENT	<2	20	290	<2	40	<2	<10	<10	70
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	6	60	20	4	20	12	<10	50	100
		FC	<2	10	<10	2	26	4	<10	<10	20
		ENT	<2	40	<10	<2	12	2	10	<10	<10
OSL11 / S11	Treasure Island Sign	TC	4	30	50	6	8	12	20	30	160
		FC	<2	20	<10	2	2	4	<10	60	10
		ENT	<2	10	<10	<2	4	<2	10	<10	30
OSL10 / S10	Aliso-North	TC	2	50	20	<10	16	12	20	50	250
		FC	2	10	<10	<10	<2	2	<10	30	40
		ENT	<2	10	10	<10	2	<2	10	40	50
OSL09 / S09	Aliso-Middle	TC	<10	12000	8500	10	290	<10	NS	4100	9400
		FC	<10	1200	1700	<10	20	<10	NS	250	1800
		ENT	20	1200	6800	9	10	<10	NS	210	5800
OSL08 / S08	Aliso-South	TC	10	>2000	9300	10	10	28	30	970	2300
		FC	<2	330	4700	30	<10	4	<10	180	260
		ENT	<2	340	9800	10	<10	6	<10	210	880
OSLO7 / S07	Camel Point	TC	6	510	170	6	<2	16	30	110	960
		FC	<2	30	10	2	2	8	<10	30	280
		ENT	2	140	10	6	<2	2	<10	20	620
OSL06 / S06	Table Rock	TC	<2	560	160	14	6	10	30	240	2800
		FC	<2	20	10	6	<2	2	<10	20	190
		ENT	2	20	20	8	2	<2	<10	90	440
OSL05 / S05	Laguna Lido Apt.	TC	<2	310	10	4	2	6	20	50	340
		FC	<2	<10	10	2	2	6	<10	10	50
		ENT	<2	10	<10	<2	<2	<2	<10	10	170
OSL04 / S04	9th St. 1000 Steps Beach	TC	<2	20	<10	6	<2	14	<10	190	330
		FC	<2	<10	10	4	2	<2	<10	30	76
		ENT	2	<10	<10	4	<2	2	<10	40	98
OSL03 / S03	Three Arch Bay	TC	2	100	170	6	22	34	40	50	230
		FC	6	50	30	2	6	22	20	20	20
		ENT	110	10	130	2	<2	2	<10	20	60
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	1400	>20000	200000	3500	3500	2500	18000	23000	42000
		FC	50	Cw/FC	4800	200	260	70	1200	640	6400
		ENT	90	14000	7800	100	610	240	2800	360	25000
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	8	680	790	42	8	58	190	270	640
		FC	2	54	40	6	10	18	20	20	110
		ENT	5	90	160	<2	2	8	<10	100	170
ODP01 / S01	Marine Institute Beach	TC	20	600	490	10	10	6	250	310	620
	9/1/99 station changed to	FC	<2	10	140	<10	<10	6	20	40	110
	Dana Strand Beach	ENT	<2	20	130	<10	4	<2	20	40	190

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TABLE 2.11.2 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		2/14/00	2/15/00	2/22/00	2/23/00	2/25/00	2/29/00	3/6/00	3/7/00	3/13/00
LAGUNA BEACH (surfzone)			Rain		Rain 2/21/00	Rain	Rain 2/23/00	Rain 2/27/00	Rain 3/5/00		
OLB16 / S16	Laguna Hotel	TC	90	270	220	>2000	120	80	830	70	20
		FC	20	70	30	400	20	10	120	10	<10
		ENT	30	80	40	1400	30	<10	300	30	<10
OLB15 / S15	Projection of Bluebird Canyon	TC	90	400	280	1600	580	330	570	350	1900
		FC	10	230	110	100	120	140	82	20	60
		ENT	10	410	70	150	100	240	180	50	240
OLB14 / S14	Victoria Beach	TC	90	40	230	>2000	70	10	350	170	10
		FC	10	10	64	930	<10	<10	50	70	<10
		ENT	50	<10	91	>2000	<10	10	200	120	<10
OLB13 / S13	Blue Lagoon	TC	<10	50	190	260	70	20	690	70	<10
		FC	<10	10	50	20	<10	10	50	<10	<10
		ENT	<10	<10	70	70	20	80	40	20	<10
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	<10	50	100	330	70	80	150	190	170
		FC	<10	<10	20	<10	<10	<10	20	50	<10
		ENT	10	<10	<10	20	10	<10	10	10	<10
OSL11 / S11	Treasure Island Sign	TC	20	30	160	70	80	<10	750	40	10
		FC	<10	60	10	<10	<10	<10	<10	10	<10
		ENT	10	<10	30	30	<10	<10	20	10	<10
OSL10 / S10	Aliso-North	TC	20	50	250	70	70	60	410	160	30
		FC	<10	30	40	<10	<10	<10	<10	<10	<10
		ENT	10	40	50	30	<10	<10	30	10	<10
OSL09 / S09	Aliso-Middle	TC	NS	4100	9400	1700	23000	1200	730	830	45
		FC	NS	250	1800	<100	280	<100	36	50	10
		ENT	NS	210	5800	600	330	100	130	60	<10
OSL08 / S08	Aliso-South	TC	30	970	2300	170	3500	210	520	20	10
		FC	<10	180	260	<10	50	10	10	<10	<10
		ENT	<10	210	880	90	60	<10	30	<10	10
OSLO7 / S07	Camel Point	TC	30	110	960	260	1400	160	180	40	10
		FC	<10	30	280	10	20	<10	<10	<10	<10
		ENT	<10	20	620	50	10	<10	30	<10	<10
OSL06 / S06	Table Rock	TC	30	240	2800	210	1500	120	140	160	<10
		FC	<10	20	190	30	10	<10	<10	<10	<10
		ENT	<10	90	440	70	20	<10	30	20	<10
OSL05 / S05	Laguna Lido Apt.	TC	20	50	340	200	750	90	320	210	20
		FC	<10	10	50	10	20	<10	10	<10	<10
		ENT	<10	10	170	80	10	10	30	30	<10
OSL04 / S04	9th St. 1000 Steps Beach	TC	<10	190	330	430	740	140	440	50	<10
		FC	<10	30	76	30	20	10	10	<10	<10
		ENT	<10	40	98	80	40	<10	80	20	<10
OSL03 / S03	Three Arch Bay	TC	40	50	230	180	190	10	170	100	60
		FC	20	20	20	10	<10	<10	20	10	40
		ENT	<10	20	60	60	<10	<10	20	10	3200
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	18000	23000	42000	41000	Cw/C	9900	20000	6800	3500
		FC	1200	640	6400	4600	4900	600	4900	200	450
		ENT	2800	360	25000	4300	3300	800	10000	400	200
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	190	270	640	270	770	60	370	50	30
		FC	20	20	110	10	30	20	20	20	10
		ENT	<10	100	170	70	80	10	50	<10	<10
S01	Dana Strand Beach	TC	250	310	620	160	300	20	260	40	<10
		FC	20	40	110	20	60	<10	<10	10	<10
		ENT	20	40	190	50	10	10	30	50	<10

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TABLE 2.11.3 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		4/24/00	4/26/00	5/1/00	5/2/00	5/8/00	5/10/00	5/15/00	5/17/00	5/22/00
LAGUNA BEACH (surfzone)											
OLB16 / S16	Laguna Hotel	TC	8	10	2	20	40	4	20	4	22
		FC	2	10	<2	12	12	5	14	6	6
		ENT	2	<10	12	>400	10	2	6	2	8
OLB15 / S15	Projection of Bluebird Canyon	TC	7	<10	26	12	22	>400	2	32	10
		FC	4	<10	4	2	8	>400	2	8	<2
		ENT	8	<10	32	>400	2	250	<2	6	8
OLB14 / S14	Victoria Beach	TC	6	<10	2	2	2	8	<2	<2	<2
		FC	<2	<10	<2	2	2	<2	<2	<2	<2
		ENT	<2	<10	4	88	<2	2	<2	<2	2
OLB13 / S13	Blue Lagoon	TC	6	10	2	6	<2	4	<2	6	<2
		FC	<2	10	<2	<2	4	<2	<2	<2	<2
		ENT	<2	<10	<2	2	<2	<2	<2	<2	<2
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	<2	<10	4	<2	2	2	<2	<2	<2
		FC	<2	<10	<2	<2	<2	<2	<2	<2	2
		ENT	2	10	<2	<2	<2	2	<2	<2	<2
OSL11 / S11	Treasure Island Sign	TC	7	<10	14	12	<2	4	<2	<2	50
		FC	<2	<10	4	<2	<2	6	2	<2	4
		ENT	8	<10	6	10	<2	<2	<2	<2	28
OSL10 / S10	Aliso-North	TC	10	20	10	8	6	14	8	<2	80
		FC	<10	<10	2	<2	<2	4	2	<2	26
		ENT	10	10	2	4	<2	10	12	<2	24
OSL09 / S09	Aliso-Middle	TC	260	240	27	20	140	110	40	12	10
		FC	20	60	12	10	42	110	42	<2	20
		ENT	60	20	4	10	40	52	14	6	<10
OSL08 / S08	Aliso-South	TC	110	40	<2	16	22	24	2	2	8
		FC	10	10	<2	6	4	18	<2	<2	2
		ENT	<10	10	<2	8	6	22	<2	<2	4
OSLO7 / S07	Camel Point	TC	22	70	<2	2	12	20	6	4	14
		FC	12	<10	<2	<2	4	14	2	<2	14
		ENT	<2	10	<2	<2	<2	16	<2	<2	2
OSL06 / S06	Table Rock	TC	38	40	<2	2	6	16	2	2	4
		FC	4	10	<2	4	<2	6	2	<2	4
		ENT	4	<10	2	<2	2	4	<2	<2	2
OSL05 / S05	Laguna Lido Apt.	TC	22	<10	2	8	8	2	4	<2	6
		FC	4	10	<2	4	<2	<2	<2	2	<2
		ENT	<2	<10	2	6	8	8	<2	<2	<2
OSL04 / S04	9th St. 1000 Steps Beach	TC	10	10	2	6	4	4	4	6	6
		FC	2	<10	<2	2	<2	4	<2	<2	2
		ENT	<2	10	<2	<2	2	2	<2	2	<2
OSL03 / S03	Three Arch Bay	TC	2	<10	4	6	<2	10	4	<2	4
		FC	<2	<10	<2	6	<2	8	<2	<2	<2
		ENT	<2	<10	<2	<2	<2	4	<2	<2	<2
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	3200	2600	2900	2300	2000	2600	510	2000	2100
		FC	220	290	370	620	770	280	100	280	170
		ENT	300	140	160	100	190	200	91	130	130
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	46	120	4	50	82	2	6	12	18
		FC	2	10	<2	24	14	<2	4	4	14
		ENT	8	<10	<2	2	80	<2	2	<2	16
S01	Dana Strand Beach	TC	16	30	4	<2	14	4	20	6	12
		FC	16	<10	2	2	4	<2	2	<2	2
		ENT	8	<10	<2	<2	<2	2	<2	2	<2

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TABLE 2.11.4 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		6/19/00	6/21/00	6/26/00	6/27/00	7/3/00	7/4/00	7/10/00	7/12/00	7/17/00
LAGUNA BEACH (surfzone)											
OLB16 / S16	Laguna Hotel	TC	<2	2	12	50	58	<10	10	10	20
		FC	<2	<2	2	40	28	<10	4	10	<10
		ENT	<2	22	>400	20	2	<10	<2	<10	50
OLB15 / S15	Projection of Bluebird Canyon	TC	4	4	10	20	14	<10	12	10	4
		FC	4	2	10	12	8	<10	4	30	2
		ENT	<2	<2	<2	2	6	<10	<2	<10	<2
OLB14 / S14	Victoria Beach	TC	<2	4	2	8	16	10	16	<10	<2
		FC	<2	2	<2	8	10	<10	2	10	4
		ENT	<2	<2	170	4	2	<10	2	<10	<2
OLB13 / S13	Blue Lagoon	TC	2	<2	2	<2	4	4	<2	<10	8
		FC	2	<2	2	<2	<2	<2	<2	30	<2
		ENT	<2	<2	<2	2	2	214	<2	<10	2
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	6	<2	<2	<2	<2	<2	4	*NS	NS
	(construction on site -	FC	2	<2	<2	<2	<2	2	<2	NS	NS
	no access)	ENT	6	<2	<2	<2	2	<2	<2	NS	NS
OSL11 / S11	Treasure Island Sign	TC	2	4	<2	<2	2	2	<2	<10	6
		FC	<2	2	<2	<2	<2	2	<2	<10	<2
		ENT	<2	<2	<2	<2	<2	<2	<2	<10	18
OSL10 / S10	Aliso-North	TC	14	130	300	<10	6	4	10	<10	42
		FC	6	8	25	<10	2	<2	4	<10	2
		ENT	10	120	28	<10	<2	<2	8	<10	38
OSL09 / S09	Aliso-Middle	TC	8	10	80	50	12	100	20	10	47
		FC	<2	10	10	20	8	30	<10	<10	8
		ENT	<2	10	20	<10	8	130	20	30	130
OSL08 / S08	Aliso-South	TC	2	20	6	4	2	32	8	<10	10
		FC	<2	<10	2	2	<2	10	2	10	2
		ENT	<2	<10	4	<2	6	14	6	<10	12
OSLO7 / S07	Camel Point	TC	2	10	<2	4	6	<2	2	<10	12
		FC	2	2	<2	4	2	<2	2	<10	<2
		ENT	<2	<2	14	<2	32	<2	<2	<10	18
OSL06 / S06	Table Rock	TC	2	8	4	<2	<2	<2	2	10	6
		FC	<2	<2	<2	<2	<2	<2	<2	<10	4
		ENT	<2	6	8	<2	2	<2	<2	<10	10
OSL05 / S05	Laguna Lido Apt.	TC	12	6	<2	6	2	<2	2	<10	10
		FC	2	10	<2	6	<2	2	2	<10	10
		ENT	<2	<10	<2	30	36	2	<2	<10	2
OSL04 / S04	9th St. 1000 Steps Beach	TC	4	2	6	2	2	6	4	<10	20
		FC	2	<2	2	2	<2	2	4	10	20
		ENT	<2	<2	<2	4	180	<2	2	<10	<2
OSL03 / S03	Three Arch Bay	TC	12	4	<2	8	<2	4	30	<10	14
		FC	<2	<2	<2	2	<2	<2	6	<10	<2
		ENT	<2	4	<2	4	<2	<2	<2	<10	4
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	1300	2600	2200	1300	370	800	1200	1400	1700
		FC	590	160	250	330	130	180	760	230	54
		ENT	170	400	110	260	350	3100	2100	1100	6200
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	180	74	10	16	120	64	10	10	100
		FC	30	22	2	10	44	22	<10	<10	12
		ENT	14	4	4	8	24	18	<10	<10	14
S01	Dana Strand Beach	TC	<2	10	8	8	<2	<2	10	<10	2
		FC	<2	<2	2	<2	<2	2	10	<10	<2
		ENT	<2	4	4	4	4	<2	<10	<10	<2

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TABLE 2.11.5 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		7/17/00	7/18/00	7/24/00	7/26/00	7/31/00	8/2/00	8/6/00	8/8/00	8/14/00
LAGUNA BEACH (surfzone)											
OLB16 / S16	Laguna Hotel	TC	20	<2	8	<2	76	74	4	<2	120
		FC	<10	<2	4	<2	19	42	2	<2	12
		ENT	50	4	2	<2	22	68	4	<2	6
OLB15 / S15	Projection of Bluebird Canyon	TC	4	<2	10	26	16	30	4	2	2
		FC	2	<2	2	4	<2	12	2	<2	<2
		ENT	<2	12	<2	2	4	6	<2	<2	<2
OLB14 / S14	Victoria Beach	TC	<2	<2	<2	<2	6	2	<2	4	4
		FC	4	2	<2	<2	6	4	<2	<2	<2
		ENT	<2	2	<2	<2	2	6	4	2	<2
OLB13 / S13	Blue Lagoon	TC	8	4	4	2	20	8	12	<2	2
		FC	<2	2	6	4	2	2	10	4	2
		ENT	2	<2	<2	<2	4	2	4	2	<2
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	NS	NS	NS	NS	NS	NS	NS	NS	NS
	(construction on site -	FC	NS	NS	NS	NS	NS	NS	NS	NS	NS
	no access)	ENT	NS	NS	NS	NS	NS	NS	NS	NS	NS
OSL11 / S11	Treasure Island Sign	TC	6	10	2	2	12	50	<2	4	2
		FC	<2	<2	2	<2	8	28	<2	2	2
		ENT	18	<2	<2	<2	2	140	2	2	2
OSL10 / S10	Aliso-North	TC	42	<2	<2	4	10	10	6	<2	10
		FC	2	<2	<2	2	7	2	2	2	<2
		ENT	38	<2	<2	4	7	8	6	32	<2
OSL09 / S09	Aliso-Middle	TC	47	25	6	<2	10	<10	3	6	12
		FC	8	<2	2	2	<10	<10	<2	4	6
		ENT	130	210	160	2	<10	<10	7	10	4
OSL08 / S08	Aliso-South	TC	10	2	2	<2	4	30	<2	<2	12
		FC	2	2	<2	<2	10	<2	<2	4	2
		ENT	12	8	2	2	2	<2	<2	<2	<2
OSLO7 / S07	Camel Point	TC	12	6	2	<2	6	4	2	84	12
		FC	<2	4	<2	<2	2	<2	<2	34	4
		ENT	18	2	2	<2	2	2	<2	34	2
OSL06 / S06	Table Rock	TC	6	2	2	<2	6	2	6	2	8
		FC	4	<2	<2	<2	2	<2	2	<2	<2
		ENT	10	4	<2	4	<2	8	<2	<2	<2
OSL05 / S05	Laguna Lido Apt.	TC	10	<2	2	<2	10	10	6	4	16
		FC	10	<2	2	<2	2	2	2	4	<2
		ENT	2	4	<2	26	<2	2	2	<2	<2
OSL04 / S04	9th St. 1000 Steps Beach	TC	20	6	2	2	37	6	10	4	6
		FC	20	2	<2	<2	2	<2	<2	<2	2
		ENT	<2	6	2	>400	2	2	<2	<2	<2
OSL03 / S03	Three Arch Bay	TC	14	26	6	4	16	6	2	<2	8
		FC	<2	8	<2	2	22	<2	<2	2	2
		ENT	4	2	<2	<2	6	2	<2	<2	12
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	1700	2200	NS	300	NS	6700	1800	NS	2600
		FC	54	54	NS	20	NS	1100	20	NS	40
		ENT	6200	7000	NS	11000	NS	520	7000	NS	1000
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	100	200	10	8	12	8	202	270	24
		FC	12	26	<2	12	2	<2	20	56	8
		ENT	14	180	4	2	10	4	42	40	<2
S01	Dana Strand Beach	TC	2	4	42	2	20	16	16	<2	96
		FC	<2	4	<2	<2	12	2	2	<2	6
		ENT	<2	4	8	<2	6	6	<2	<2	2

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TABLE 2.11.6 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		8/14/00	8/16/00	8/21/00	8/22/00	8/28/00	8/29/00	9/5/00	9/6/00	9/11/00	9/13/00
LAGUNA BEACH (surfzone)												
OLB16 / S16	Laguna Hotel	TC	120	290	<2	4	34	16	10	6	4	8
		FC	12	23	2	2	28	16	6	<2	<2	6
		ENT	6	22	2	<2	6	46	<2	2	<2	10
OLB15 / S15	Projection of Bluebird Canyon	TC	2	17	2	10	22	16	4	6	100	40
		FC	<2	2	<2	<2	2	2	2	<2	2	12
		ENT	<2	<2	2	<2	2	6	4	16	2	16
OLB14 / S14	Victoria Beach	TC	4	22	2	2	2	4	8	8	22	<2
		FC	<2	<2	<2	2	2	4	<2	14	16	6
		ENT	<2	2	<2	<2	<2	2	2	2	8	<2
OLB13 / S13	Blue Lagoon	TC	2	58	<2	18	2	24	8	210	16	2
		FC	2	6	2	6	2	<2	4	150	8	6
		ENT	<2	4	<2	<2	<2	<2	2	2	24	<2
ALISO BEACH (surfzone)												
OSL12 / S12	Treasure Island Pier	TC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	(construction on site -	FC	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	no access)	ENT	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
OSL11 / S11	Treasure Island Sign	TC	2	26	6	6	2	16	4	6	6	<2
		FC	2	8	2	6	2	<2	<2	<2	<2	4
		ENT	2	<2	<2	<2	4	2	<2	10	<2	14
OSL10 / S10	Aliso-North	TC	10	15	<2	4	10	12	4	<2	<2	6
		FC	<2	5	2	<2	<2	2	<2	<2	<2	6
		ENT	<2	2	2	<2	2	10	<2	<2	<2	4
OSL09 / S09	Aliso-Middle	TC	12	120	<2	2	6	84	6	<2	8	2
		FC	6	<2	<2	<2	8	12	2	<2	10	<2
		ENT	4	12	<2	2	4	26	<2	4	24	8
OSL08 / S08	Aliso-South	TC	12	60	2	2	34	<2	>400	<10	3	<2
		FC	2	<2	<2	<2	14	<2	170	<10	<2	<2
		ENT	<2	2	2	2	12	<2	30	10	10	<2
OSLO7 / S07	Camel Point	TC	12	18	8	2	66	6	6	2	6	14
		FC	4	<2	2	2	62	6	<2	<2	<2	14
		ENT	2	<2	2	<2	2	2	<2	8	<2	22
OSL06 / S06	Table Rock	TC	8	34	<2	4	6	32	8	4	2	2
		FC	<2	<2	<2	<2	<2	<2	<2	<2	22	<2
		ENT	<2	4	2	<2	2	2	<2	2	<2	2
OSL05 / S05	Laguna Lido Apt.	TC	16	4	16	8	8	6	12	2	18	<2
		FC	<2	<2	6	10	<2	2	4	<2	2	<2
		ENT	<2	<2	4	<2	6	2	<2	2	16	<2
OSL04 / S04	9th St. 1000 Steps Beach	TC	6	4	<2	28	30	8	6	4	8	<2
		FC	2	<2	<2	<2	4	6	<2	4	<1	<2
		ENT	<2	<2	6	<2	2	<2	<2	4	<2	10
OSL03 / S03	Three Arch Bay	TC	8	4	4	12	16	14	34	4	2	<2
		FC	2	<2	2	<2	10	6	14	<2	<2	<2
		ENT	12	<2	<2	<2	<2	4	6	10	<2	<2
ALISO CREEK												
CABAC / C1	Aliso Creek Mouth	TC	2600	NS	440	NS	4100	290	2200	NS	590	NS
		FC	40	NS	10	NS	360	340	60	NS	30	NS
		ENT	1000	NS	91	NS	420	440	200	NS	140	NS
DANA POINT (surfzone)												
OSL02 / S02	Salt Creek Beach	TC	24	24	10	200	120	100	88	340	20	8
		FC	8	2	2	58	30	18	16	80	4	2
		ENT	<2	22	8	38	42	8	32	30	2	<2
S01	Dana Strand Beach	TC	96	72	180	18	8	100	40	<10	4	4
		FC	6	20	54	<2	<2	24	<2	<10	<2	8
		ENT	2	12	34	2	2	6	2	<10	2	4

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TABLE 2.11.7 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		9/20/00	9/25/00	9/27/00	10/2/00	10/4/00	10/10/00	10/11/00	10/18/00	10/19/00
LAGUNA BEACH (surfzone)											
OLB16 / S16	Laguna Hotel	TC	58	430	250	30	4	<10	520	15	56
		FC	6	110	40	48	2	<10	230	4	44
		ENT	2	80	70	18	6	<10	82	<2	32
OLB15 / S15	Projection of Bluebird Canyon	TC	8	50	310	18	8	48	54	4	2
		FC	4	18	60	12	<2	40	60	5	2
		ENT	2	50	10	<2	2	2	30	2	2
OLB14 / S14	Victoria Beach	TC	4	4	<10	14	<2	16	<10	12	8
		FC	<2	<2	10	6	2	8	<10	12	6
		ENT	<2	<2	<10	8	<2	4	20	<2	8
OLB13 / S13	Blue Lagoon	TC	2	50	20	8	<2	<2	80	16	4
		FC	2	6	10	<2	<2	12	90	<2	<2
		ENT	2	12	<10	4	<2	2	10	<2	<2
ALISO BEACH (surfzone)											
OSL12 / S12	Treasure Island Pier	TC	NS	NS	NS	NS	NS	NS	NS	NS	NS
	(construction on site -	FC	NS	NS	NS	NS	NS	NS	NS	NS	NS
	no access)	ENT	NS	NS	NS	NS	NS	NS	NS	NS	NS
OSL11 / S11	Treasure Island Sign	TC	8	54	<10	2	6	20	10	8	8
		FC	<2	4	<10	2	2	2	<10	8	2
		ENT	2	2	10	6	4	2	<10	16	<2
OSL10 / S10	Aliso-North	TC	4	84	10	4	4	8	10	20	10
		FC	2	8	10	<2	2	2	<10	<10	<2
		ENT	10	4	<10	<2	<2	2	10	10	<2
OSL09 / S09	Aliso-Middle	TC	4	>400	20	10	6	<10	54	<10	66
		FC	2	90	<10	10	3	40	<10	<10	18
		ENT	2	12	<10	6	2	10	100	<10	8
OSL08 / S08	Aliso-South	TC	4	18	10	<2	<2	14	10	4	6
		FC	<2	6	30	<2	4	<2	20	2	2
		ENT	4	<2	<10	4	<2	2	<10	4	4
OSLO7 / S07	Camel Point	TC	8	18	20	2	10	6	20	<2	6
		FC	<2	<2	<10	2	4	2	30	<2	<2
		ENT	6	<2	<10	2	2	2	10	<2	<2
OSL06 / S06	Table Rock	TC	2	4	<10	<2	8	8	<10	6	2
		FC	<2	2	<10	<2	<2	<2	<10	2	<2
		ENT	<2	<2	<10	4	<2	2	<10	<2	<2
OSL05 / S05	Laguna Lido Apt.	TC	2	10	30	6	14	10	<10	6	16
		FC	<2	6	20	<2	8	4	<10	8	8
		ENT	<2	<2	20	<2	<2	4	20	2	16
OSL04 / S04	9th St. 1000 Steps Beach	TC	2	8	70	4	4	6	10	4	20
		FC	2	<2	30	2	<2	<2	<10	16	4
		ENT	2	<2	20	<2	<2	<2	30	<2	2
OSL03 / S03	Three Arch Bay	TC	14	6	<10	74	6	28	50	12	44
		FC	2	<2	<10	110	2	<2	30	2	2
		ENT	<2	<2	<10	>400	<2	<2	70	2	<2
ALISO CREEK											
CABAC / C1	Aliso Creek Mouth	TC	NS	14000	NS	2500	3100	2400	1300	2200	80
		FC	NS	3200	NS	400	630	260	1000	190	70
		ENT	NS	160	NS	50	150	200	200	180	120
DANA POINT (surfzone)											
OSL02 / S02	Salt Creek Beach	TC	110	46	160	100	94	40	430	70	56
		FC	23	8	60	30	84	10	200	30	12
		ENT	33	8	<10	30	70	<10	440	10	6
S01	Dana Strand Beach	TC	6	28	<10	20	38	48	110	8	14
		FC	4	4	10	10	4	8	50	12	2
		ENT	2	14	<10	40	2	2	40	30	<2

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TABLE 2.11.8 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		10/23/00	10/25/00	10/30/00	10/31/00	11/6/00	11/8/00	11/13/00	11/15/00
LAGUNA BEACH (surfzone)										
OLB16 / S16	Laguna Hotel	TC	62	Cw/C	940	120	130	98	210	22
		FC	50	76	200	50	170	25	150	18
		ENT	54	26	610	27	60	8	100	7
OLB15 / S15	Projection of Bluebird Canyon	TC	14	6	380	60	30	310	>2000	74
		FC	6	6	90	40	10	140	>2000	10
		ENT	4	2	150	20	30	7	420	8
OLB14 / S14	Victoria Beach	TC	8	26	50	50	<10	4	160	10
		FC	8	34	50	<10	<10	2	80	4
		ENT	4	14	30	<10	10	6	30	6
OLB13 / S13	Blue Lagoon	TC	10	<2	50	50	<10	16	<10	2
		FC	4	2	<10	<10	<10	10	<10	<2
		ENT	20	<2	30	<10	<10	4	<10	4
ALISO BEACH (surfzone)										
OSL12 / S12	Treasure Island Pier	TC	NS	NS	NS	NS	NS	NS	NS	NS
	(construction on site -	FC	NS	NS	NS	NS	NS	NS	NS	NS
	no access)	ENT	NS	NS	NS	NS	NS	NS	NS	NS
OSL11 / S11	Treasure Island Sign	TC	6	8	180	10	10	2	<10	8
		FC	2	4	40	<10	<10	2	<10	<2
		ENT	2	<2	20	<10	<10	<2	<10	<2
OSL10 / S10	Aliso-North	TC	6	2	640	20	10	4	30	2
		FC	2	2	230	<10	10	6	20	2
		ENT	6	<2	150	20	10	<2	20	2
OSL09 / S09	Aliso-Middle	TC	13	17	13000	520	<10	<10	<10	4
		FC	3	20	5500	150	9	40	20	4
		ENT	30	8	14000	490	<10	50	70	7
OSL08 / S08	Aliso-South	TC	24	4	1600	260	<10	20	<10	4
		FC	8	<2	710	18	10	<2	<10	6
		ENT	46	2	710	45	<10	4	10	<2
OSLO7 / S07	Camel Point	TC	12	24	1000	160	<10	<2	<10	4
		FC	6	2	310	<10	<10	<2	<10	<2
		ENT	<2	4	570	30	<10	<2	<10	2
OSL06 / S06	Table Rock	TC	8	2	830	120	<10	2	<10	4
		FC	2	<2	260	20	<10	<2	<10	<2
		ENT	2	<2	410	<10	<10	<2	<10	2
OSL05 / S05	Laguna Lido Apt.	TC	8	16	460	180	<10	4	10	2
		FC	<2	4	80	20	<10	<2	<10	2
		ENT	<2	2	120	10	<10	<2	<10	<2
OSL04 / S04	9th St. 1000 Steps Beach	TC	4	<2	330	410	<10	4	<10	<2
		FC	<2	<2	70	<10	<10	2	<10	<2
		ENT	4	<2	120	20	<10	6	<10	<2
OSL03 / S03	Three Arch Bay	TC	10	12	70	130	<10	<2	<10	2
		FC	12	10	30	10	10	<2	<10	4
		ENT	2	2	10	10	<10	<2	<10	10
ALISO CREEK										
CABAC / C1	Aliso Creek Mouth	TC	990	610	61000	6300	910	1100	4900	850
		FC	170	190	30000	1500	400	360	400	470
		ENT	120	100	63000	1400	200	200	400	230
DANA POINT (surfzone)										
OSL02 / S02	Salt Creek Beach	TC	560	30	570	240	<10	34	20	32
		FC	20	<10	80	<10	<10	10	<10	4
		ENT	60	<10	210	10	<10	6	10	26
S01	Dana Strand Beach	TC	2	52	600	260	20	4	160	8
		FC	8	24	110	50	<10	2	10	2
		ENT	6	8	130	<10	<10	2	<10	<2

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TABLE 2.11.9 Total Coliform (TC), Fecal Coliform (FC), Enterococcus (ENT) Colony Forming Units / 100 ml Sample

STATION	Location Description		11/13/00	11/15/00	11/20/00	11/21/00	11/27/00	11/29/00	12/4/00	12/6/00
LAGUNA BEACH (surfzone)										
OLB16 / S16	Hotel Laguna	TC	210	22	220	350	220	40	2	8
		FC	150	18	190	200	190	30	2	6
		ENT	100	7	100	90	270	27	10	8
OLB15 / S15	Projection of Bluebird Canyon	TC	>2000	74	72	80	38	17	2	46
		FC	>2000	10	12	80	32	8	<2	17
		ENT	420	8	12	60	12	10	2	10
OLB14 / S14	Victoria Beach	TC	160	10	2	<10	44	10	<2	6
		FC	80	4	<2	<10	16	10	2	<2
		ENT	30	6	<2	<10	16	<2	<2	2
OLB13 / S13	Blue Lagoon	TC	<10	2	6	<10	70	86	<2	<2
		FC	<10	<2	<2	<10	60	6	<2	<2
		ENT	<10	4	<2	10	76	2	2	<2
ALISO BEACH (surfzone)										
OSL12 / S12	Treasure Island Pier	TC	NS	NS	NS	NS	NS	NS	NS	NS
	(construction on site -	FC	NS	NS	NS	NS	NS	NS	NS	NS
	no access)	ENT	NS	NS	NS	NS	NS	NS	NS	NS
OSL11 / S11	Treasure Island Sign	TC	<10	8	4	<2	8	8	<10	8
		FC	<10	<2	4	4	2	10	<10	10
		ENT	<10	<2	<2	<2	8	2	10	<2
OSL10 / S10	Aliso-North	TC	30	2	6	6	4	2	<10	<2
		FC	20	2	6	18	12	2	<10	6
		ENT	20	2	6	<2	6	4	10	8
OSL09 / S09	Aliso-Middle	TC	<10	4	2	5	54	16	40	6
		FC	20	4	6	13	28	24	10	6
		ENT	70	7	<2	6	64	8	40	2
OSL08 / S08	Aliso-South	TC	<10	4	2	6	28	6	4	2
		FC	<10	6	<2	6	16	6	<2	<2
		ENT	10	<2	4	4	36	4	4	<2
OSLO7 / S07	Camel Point	TC	<10	4	<2	2	10	4	<2	2
		FC	<10	<2	<2	<2	2	4	<2	4
		ENT	<10	2	2	<2	12	<2	<2	2
OSL06 / S06	Table Rock	TC	<10	4	8	<2	6	<2	2	<2
		FC	<10	<2	8	<2	2	4	2	2
		ENT	<10	2	4	<2	<2	2	<2	<2
OSL05 / S05	Laguna Lido Apt.	TC	10	2	4	4	130	4	2	46
		FC	<10	2	2	<2	130	4	<2	56
		ENT	<10	<2	2	<2	52	<2	<2	2
OSL04 / S04	9th St. 1000 Steps Beach	TC	<10	<2	2	2	14	20	10	4
		FC	<10	<2	2	<2	20	4	6	2
		ENT	<10	<2	<2	2	6	<2	46	2
OSL03 / S03	Three Arch Bay	TC	<10	2	6	4	36	2	28	6
		FC	<10	4	2	<2	26	2	10	<2
		ENT	<10	10	<2	<2	360	<2	100	12
ALISO CREEK										
CABAC / C1	Aliso Creek Mouth	TC	4900	850	300	230	440	340	200	420
		FC	400	470	120	73	150	210	190	300
		ENT	400	230	100	90	130	70	110	130
DANA POINT (surfzone)										
OSL02 / S02	Salt Creek Beach	TC	20	32	68	12	Cw/C	52	20	16
		FC	<10	4	<2	2	100	12	5	8
		ENT	10	26	18	<2	180	8	10	16
S01	Dana Strand Beach	TC	160	8	2	6	30	10	16	2
		FC	10	2	<2	10	20	8	6	2
		ENT	<10	<2	2	2	30	2	2	<2

WATER QUALITY CONDITIONS IN DANA POINT HARBOR

The human uses of Dana Point Harbor itself and urban runoff from upstream locations in the watershed that enters the Harbor both contribute to existing water quality conditions there. The primary facilities of the Harbor include an extensive marina, commercial sites, a boat launching area, boat repair facilities, a small public swimming area at Baby Beach and the Orange County Ocean Institute. There is also a net pen aquaculture facility for production of white seabass, operated as part of the California Department of Fish and Game Ocean Resources Enhancement and Hatchery Program to evaluate stock enhancement of this species.

Pollutants typically associated with harbor activities that can contribute to impaired water quality conditions include fuels and lubricants from boat engines, antifouling paints, other materials released by cleaning boats, and human and animal wastes containing bacteria and viruses. Urban runoff from upstream sources in the watershed that ultimately enters Dana Point Harbor can contain high concentrations of pathogen indicator bacteria, particulate matter, nutrient chemicals and oxygen-demanding substances. Runoff also can contain oils, fuels, trace (heavy) metals, pesticides and herbicides, and other chemical products associated with urban development. Unless effectively controlled and monitored, runoff containing these contaminants that are discharged to Dana Point Harbor can adversely affect the water quality of the Harbor itself. In order to protect water quality in the Harbor, runoff in the City of Dana Point is managed in accordance with applicable laws and regulations. The monitoring portion of the compliance program includes dry-weather and storm water sampling in selected runoff channels to estimate the quantities of chemical and other constituents discharged through each. Receiving water quality also is monitored, as described below.

Storm runoff and dry-weather runoff that flows into Dana Point Harbor is discharged below the prevailing tidal water level at eight separate locations, including the Station D2 site that receives runoff from 10% of the proposed Project watershed (Figure 2.1). The Orange County Public Facilities and Resources Department (PFRD) conducts semi-annual sampling of water in Dana Point Harbor for nutrients, seven trace metals, dissolved oxygen, and total suspended solids (TSS). In addition to the monitoring described above, bottom sediments are sampled semi-annually by the PFRD to determine the possible longer-term effects of human activities within the Harbor, as well as those caused by runoff. Sediment samples from the Harbor are analyzed for several urban pollutants, including volatile organic compounds (VOCs), chlorinated pesticides, polychlorinated biphenyl (PCB) compounds, and trace metals. These data are provided to the San Diego and Santa Ana Regional Water Quality Control Boards by the Orange County PFRD in their Semi-Annual Status Reports required by the NPDES permit. The results of this testing at the Dana Point Harbor monitoring sites have shown that the overall water quality is good with respect to those constituents, indicating that existing water quality apparently has not been adversely affected by storm and dry-weather runoff or within-Harbor boat operations and other activities (Bruce Moore, Watershed and Coastal Resources Division, Orange County PFRD, pers. comm., 2001). Overall, sediment quality also does not appear to have been affected by discharges into the

Harbor. This is further evidence that the self-cleaning design of the Harbor breakwater system is effective in maintaining good water quality (Tom Rossmiller, Watershed and Coastal Resources, Division, Orange County PFRD, pers. comm., 2001)

In addition to the chemical constituents, the water is also tested for pathogen indicator bacteria. This monitoring program is conducted by the OCHCA Division of Environmental Health (see, for example, Table 2.9). That agency also reports data for several additional Dana Point stations sampled by the allied SERRA and AWMA programs (Tables 2.10- 2.11). Concentrations of the indicator bacteria in runoff have been sufficiently elevated in recent years that closure of Baby Beach was necessary to protect public health. Subsequent investigation by the OCHCA Division of Environmental Health and the PFRD indicated that the high coliform levels were attributable to eddy conditions at Baby Beach, bird populations at the beach and to bacteria in water from urban runoff (Tom Rossmiller, PFRD, pers. comm., 2001). Similar effects of enterococcus bacteria introduced in high concentrations from the feces of shore birds have recently been reported in Huntington Beach, CA (Grant et al 2001). Dana Point Harbor is on the most recent (1998) list of sites having high coliform counts under Section 303a of the Federal Clean Water Act (CWA). The County has taken steps to reduce the potentially harmful levels of fecal pathogens entering the harbor by installing special devices that detain runoff and by other means. This is done by collecting and holding sediment and other matter until it is removed or until testing shows that indicator bacteria concentrations do not exceed established public health standards.

SECTION 3

WATER QUALITY PLANS AND POLICIES

The narratives in this section discuss relevant plans, policies and regulations that apply to water quality issues for the Project or are likely to apply in the near future.

3.1 COMPREHENSIVE WATER QUALITY CONTROL PLAN, SAN DIEGO BASIN (SAN DIEGO BASIN PLAN)

The State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Boards (RWQCB) are responsible for ensuring implementation and compliance with the provisions of the Federal Clean Water Act (CWA) and of California's Porter-Cologne Water Quality Control Act. Orange County is located in Region 8 (Santa Ana) and Region 9 (San Diego) of the California Regional Water Quality Control Board (RWQCB). The Project site is situated in the southern portion of Orange County, within the jurisdiction of the San Diego Board (Region 9). The San Diego RWQCB has the authority to implement water quality protection standards through the regulation of discharges to waters within this jurisdiction.

The San Diego RWQCB has adopted a Water Quality Control Plan for its region of responsibility, the San Diego Basin (CRWQCB 1994). Because the City of Dana Point and the Project site are located within the San Diego RWQCB's jurisdiction, all discharges to surface water or groundwater are subject to requirements of the San Diego Basin Plan.

WATER RESOURCE AREA BOUNDARIES

The San Diego RWQCB has delineated water resource area boundaries within its jurisdiction based on hydrologic features. The Headlands is located within the Laguna Hydrologic Area of the San Juan Hydrologic Unit. For purposes of achieving and maintaining water quality protection, specific beneficial uses and water quality objectives have been identified for each of the hydrologic areas within the San Diego Basin. The San Diego RWQCB has also designated beneficial uses and water quality objectives for coastal waters. These are defined as waters subject to tidal action. Beneficial uses and water quality objectives are presented and described in the Basin Plan. The Plan also establishes implementation programs to achieve water quality objectives and requires monitoring to evaluate the effectiveness of that implementation.

PROTECTION OF BENEFICIAL USES

Policy Three of the San Diego Basin Plan requires that both point source and nonpoint source pollution shall be controlled to protect designated beneficial uses of water. Beneficial uses of water are defined in the Basin Plan as those necessary for the survival or well being of humans, plants, and wildlife. Examples of beneficial uses include drinking water supplies, swimming, industrial and agricultural water supply, and the support of freshwater and marine habitats and their organisms. Specific beneficial uses that could be affected by runoff at a given site are typically evaluated by the staff of the Regional Board on an individual basis.

Runoff from part of the Project will flow to Strand Beach and then into the Pacific Ocean. Additional runoff will be carried to one site in Dana Point Harbor. Both the Pacific Ocean and Dana Point Harbor are considered as "coastal waters," according to the Basin Plan, because they are subjected to tidal action. Table 2-3 of the Basin Plan (CRWQCB 1994) specifies the following existing beneficial uses of coastal waters:

1. Contact Water Recreation (REC-1) – Includes uses of water for recreational activities involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin diving, SCUBA diving, surfing, white water activities, fishing, or use of natural hot springs.

2. Non-Contact Water Recreation (REC-2) – Includes the uses of water for recreational activities involving proximity to water, but not normally involving body contact with water, where ingestion of water is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

3. Commercial and Sport Fishing (COMM) – Includes the uses of water for commercial or recreational collection of fish, shellfish, or other organisms including, but not limited to, uses involving organisms intended for human consumption or as bait.

4. Preservation of Biological Habitats of Special Significance (BIOL) – Includes uses of water that support designated areas or habitats, such as established refuges, parks, sanctuaries, ecological reserves, or Areas of Special Biological Significance (ASBS), where the preservation or enhancement of natural resources requires special protection.

5. Wildlife Habitat (WILD) – Includes uses of water that support terrestrial ecosystems including, but not limited to, preservation and enhancement of terrestrial habitats, vegetation, wildlife (e.g., mammals, birds, reptiles, amphibians, invertebrates), or wildlife water and food sources.

6. Rare, Threatened, or Endangered Species (RARE) – Includes uses of water that support habitats necessary, at least in part, for the survival and successful maintenance of plant or animal species established under State or Federal law as rare, threatened, or endangered.

7. Marine Habitat (MAR) – Includes uses of water that support marine ecosystems including, but not limited to, preservation or enhancement of marine habitats, marine vegetation, fish, shellfish, or wildlife (e.g., marine animals, shorebirds).

8. Aquaculture (AQUA) – Includes the uses of water for aquaculture or mariculture operations including, but not limited to, propagation, cultivation, maintenance, or harvesting of aquatic plants and animals for human consumption or as bait.

9. Migration of Aquatic Organisms (MIGR) – Includes uses of water that support habitats necessary for migration, acclimatization between fresh and salt water, or other temporary activities by aquatic organisms, such as anadromous fish.

10. Spawning, Reproduction, and/or Early Development (SPWN) – Includes uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish. This use is applicable only for the protection of anadromous fish.

11. Shellfish Harvesting (SHELL) – Includes uses of water that support habitats suitable for the collection of filter-feeding shellfish (e.g., clams, oysters and mussels) for human consumption, commercial, or sport purposes.

12. Industrial Service Supply (IND) – Includes uses of water for industrial activities that do not depend primarily on water quality including, but not limited to mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, or oil well re-pressurization.

13. Navigation (NAV) – Includes uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

All but uses 6, 8, 10, 11 and 12 are most directly relevant to water quality issues for the Project. Beneficial use 13 (Navigation) is relevant because of vessel activity in and adjacent to Dana Point Harbor. Information concerning marine biological resources and habitat conditions is discussed in the document entitled Headlands Marine Biological Resources Technical Report (Applied Ecological Research 2001).

RELATIONSHIP TO FEDERAL CLEAN WATER ACT

Section 303 of the Federal Clean Water Act (CWA) requires that the State adopt water quality objectives (called water quality criteria) for surface waters. Because of this, the Basin Plan also contains water quality objectives that are considered necessary to protect the specific beneficial uses it identifies. Numerical water quality objectives have been adopted for a wide range of inorganic and organic chemical compounds and naturally occurring materials such as sediment, as well as biological constituents (e.g., pathogen indicator bacteria). The San Diego RWQCB employs EPA water quality criteria and benchmark values for guidance purposes in determining if beneficial uses are affected by storm and dry-weather runoff (Phillip Hammer, SDRWQCB Beaches Section, Pers. Comm., 2001). For potentially toxic constituents, primarily trace (heavy) metals and organic compounds, the water quality criteria provided in California Toxics Rule of May 12, 2000, (USEPA 2000a) are used for guidance. In addition, the EPA Parameter Benchmark Values (USEPA 2000b) that also include criteria for constituents not considered to be toxic, are employed for guidance

purposes. By definition, water quality objectives must protect the most sensitive of the beneficial uses that have been designated for a water body. Water quality objectives are provided either in the form of numerical values or narrative descriptions. As indicated in section 2 of this report, Dana Point Harbor is on the most recent (1998) list of sites with high coliform bacteria counts under Section 303a of the Clean Water Act.

3.2 WATER QUALITY CONTROL PLAN FOR OCEAN WATERS OF CALIFORNIA (CALIFORNIA OCEAN PLAN)

The State Water Resources Control Board (SWRCB) adopted a Water Quality Control Plan for Ocean Waters of California, called the California Ocean Plan (CSWRCB 1997). With the exception of Wildlife Habitat, the Ocean Plan identifies the same beneficial uses as those of the San Diego Basin Plan. The Ocean Plan similarly has established water quality objectives (specifically those provided in CSWRCB 1997, Table B) for bacteriological, physical, chemical, and biological characteristics, and for radioactivity. The plan also incorporates general requirements for the management of wastes discharged directly into the ocean, effluent quality requirements for waste discharges, discharge prohibitions, and general provisions. The California Ocean Plan is incorporated, by reference, into the San Diego Basin Plan.

Since there are no specific numneric standards for stormwater discharges, the values listed in Table B for both the Daily Maximum and the Instantaneous Maximum concentrations are the ones appropriate for use as guidelines in evaluations of the surf zone and Harbor samples at the Project site .The water quality objectives for trace (heavy) metals provided in the California Ocean Plan (CSWRCB 1997; Table B) are expressed only as total recoverable concentrations.

It is particularly important for the reader to note that values exceeding the guidelines do not necessarily indicate that a water quality problem exists, as they are employed only for guidance in the evaluation process (Lee and Jones-Lee 1995a-b). This is particularly true of values for trace metals in total recoverable form, because in most cases they are not biologically available and exist in non-toxic form (Makepeace et al 1995, Eisler 1998, Lee et al 1999).

3.3 CWA NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES)

The Federal Clean Water Act (CWA) established the NPDES, program. One purpose of the NPDES program is to provide a comprehensive runoff water quality program to manage urban storm water and minimize the effects of water pollution on the environment to the maximum extent practicable. The NPDES program consists of (1) characterizing receiving water quality; (2) identifying harmful constituents; (3) targeting potential sources of pollutants; and (4) implementing a Comprehensive Storm Water Management Program (CSWMP).

Nonpoint sources of potential water pollution are diffuse and originate over a wide area rather than from a definable point. As defined in the federal regulations, such nonpoint sources are generally exempt from Federal NPDES permit program requirements. However, two types of nonpoint source discharges are controlled by the NPDES program. These are: 1) nonpoint source discharges caused by general construction activities, and 2) the general quality of storm water in municipal storm water systems. The latter applies to storm water either as part of a combined system or as a separate system in which runoff is carried through a developed conveyance system to specific discharge locations.

MUNICIPAL STORM WATER PERMIT

On February 21, 2001, the SDRWQCB issued Order No. 2001-01, a revised San Diego Municipal Storm Water Permit (Storm Water Permit). The Storm Water Permit outlines waste discharge requirements for discharges of urban runoff from municipal separate storm sewer systems, draining the watersheds of San Diego County, the incorporated cities of San Diego County, and the San Diego Unified Port District. The City of Dana Point operates under a separate municipal permit issued by the SDRWQCB. Although the City of Dana Point is not now one of the Municipal Co-permittees identified in the Storm Water Permit, it is expected that since the Headlands is located within Region 9 of the RWQCB the requirements outlined in this permit will ultimately apply to the Project. Therefore, the applicable regulatory criteria outlined in this permit were incorporated into the modeling effort by URS Corporation, as described in Part 2 of this Technical Report.

Item F.l.b. of the Storm Water Permit requires the implementation of Best Management Practices (BMP) control measures, involving both source control and treatment control, to ensure that pollutants in runoff from new developments will be reduced to the maximum extent practicable and will not cause or contribute to constituent concentrations that exceed receiving water quality objectives. Standard Urban Storm Water Mitigation Plans (SUSMPs) will be required for all new developments and redevelopment projects falling under several priority project categories. These categories include, but are not limited to: the creation or addition of at least 5,000 feet of impervious surfaces on an already developed site; home subdivisions of 100 housing units or more; restaurants or paved areas where the area of land development is over 5,000 square feet; and areas that are adjacent to or discharge directly to an environmentally sensitive area (such as Clean Water Act Section 303d impaired water bodies). Based on these criteria, the Headlands site would be considered a priority project.

The SUSMP requires that the proposed structural BMPs for a project be located so that they infiltrate, filter, or treat the required runoff volume or flow prior to its discharge to any body of receiving water supporting beneficial uses. It further stipulates that the structural BMPs should be sized to comply with either volume-based or flow-based numeric sizing criteria.

GENERAL CONSTRUCTION ACTIVITY STORM WATER PERMIT

In accordance with NPDES regulations, to minimize the potential effects of construction runoff on receiving water quality, the State of California requires that any construction activity affecting five acres or more must obtain a General Construction Activity Storm

Water Permit. Permit applicants are required to prepare a Storm Water Pollution Prevention Plan (SWPPP) and implement Best Management Practices (BMPs) to reduce construction effects on receiving water quality by implementing erosion control measures. In 1997, EPA proposed revisions to the 1992 general permit to clarify that all construction activity, including small construction sites that are part of a larger common plan (e.g., sites under five acres), would be eligible for coverage under the revised permit. The State Water Resources Control Board (SWRCB) has prepared a draft State permit that reflects the revised EPA requirements, but it has not been adopted. Because implementation of the proposed project (through build-out) will collectively involve more than five acres, the Project would be subject to permit requirements both now and if the revised permit is adopted.

GRADING REQUIREMENTS

Erosion and sediment control are integral components of water quality protection. A project must comply with the Orange County Grading and Excavation Code, as adopted by the City of Dana Point. The Grading Code currently controls sediment loads only. In addition, all construction activity must comply with the City of Data Point Grading Ordinance, including the implementation of Best Management Practices.

GROUNDWATER REQUIREMENTS

Recognizing the need for effective management of extracted groundwater, the San Diego RWQCB has adopted Waste Discharge Requirements (Order No. 96-41, NPDES Permit No. CAG919002, "General Waste Discharge Requirements for Groundwater Extraction and Similar Waster Discharges from Construction and Remediation Projects to Surface Waters Within the San Diego Region, Except for San Diego Bay." Among other discharges, the general permit also applies to construction dewatering and foundation dewatering in which the discharge to receiving waters would exceed 100,000 gallons per day (GPD), or, for discharges less than 100,000 GPD, where groundwater contains pollutants exceeding limits specified in the permit or which have the potential to cause pollution, contamination, or nuisance in the receiving water. The general permit includes numerical concentration limits and narrative criteria for discharges to bays and harbors (such as Dana Point Harbor) and the surf zone to ensure that water quality objectives are not adversely affected. The general permit also specifies standards for testing, monitoring, and reporting, receiving water limitations, and discharge prohibitions.

ORANGE COUNTY DRAINAGE AREA MANAGEMENT PLAN

In cooperation with other cities and with Orange County and the Orange County Flood Control District, the City of Dana Point has helped to compile the "Orange County Drainage Area Management Plan" (DAMP). This plan satisfies the requirements of the NPDES urban runoff permit program and identifies measures intended to reduce the discharge of pollutants to the maximum practical extent, using BMPs, control techniques and systems, engineering methods, and other appropriate provisions. The City of Dana Point is a co-permittee with Orange County under the NPDES municipal permit program. Orange County's municipal NPDES permit process requires all new developments, such as the Headlands, to prepare a

long-term post-construction storm water management plan incorporating structural and non-structural BMPs. Such BMPs to control constituents of urban runoff may include, but are not limited to, sand filters, grease traps, porous concrete, multi-chambered water quality inlets to storm drains, automatically controlled watering, proper selection and application of fertilizers and pesticides, sprinkler maintenance, routine drain cleaning, street sweeping, trash control and public awareness and education programs.

3.4 RELATIONSHIPS OF THE PROJECT TO OTHER LOCAL WATER QUALITY PROTECTION PROGRAMS

In Orange County, the Orange County Health Care Agency (OCHCA) monitors and enforces the State health standards for swimming and related water contact sports and other water-oriented activities. This includes coastal water resources at Orange County beaches. The Watershed and Coastal Resources Division of the Orange County Public Facilities and Resources Department also monitors water quality in the Salt Creek and San Juan Creek Watersheds and in Dana Point Harbor. The Orange County Water District (OCWD) and the Municipal Water District of Orange County monitor the quality of imported water.

3.5 CALIFORNIA COASTAL ACT

The California Coastal Act (Section 30231) requires the maintenance of biological productivity and the quality of coastal waters, streams, wetlands, and estuaries appropriate for optimum populations of aquatic organisms and for the protection of human health. These conditions are to be met in part by controlling runoff containing surface flow and by maintaining Headlands vegetation.

SECTION 4

PROJECT IMPACTS

The information available concerning both watershed characteristics and water quality, as discussed in this section and the preceding Section 2, in Appendix Section A, and in Part 2 of this Technical Report document, is sufficient to analyze the potential effects of the Project on water quality conditions, as well as on associated coastal resources. This information also is sufficient to determine and evaluate appropriate Best Management Practices (BMPs) and other Project features. Additional information will be required in accordance with Standard Conditions of Approval, General Plan Policies, and other applicable State and local regulations and standards prior to development of final grading plans and project implementation. Adherence to all applicable regulations, standards, and conditions is assumed as part of this water quality evaluation.

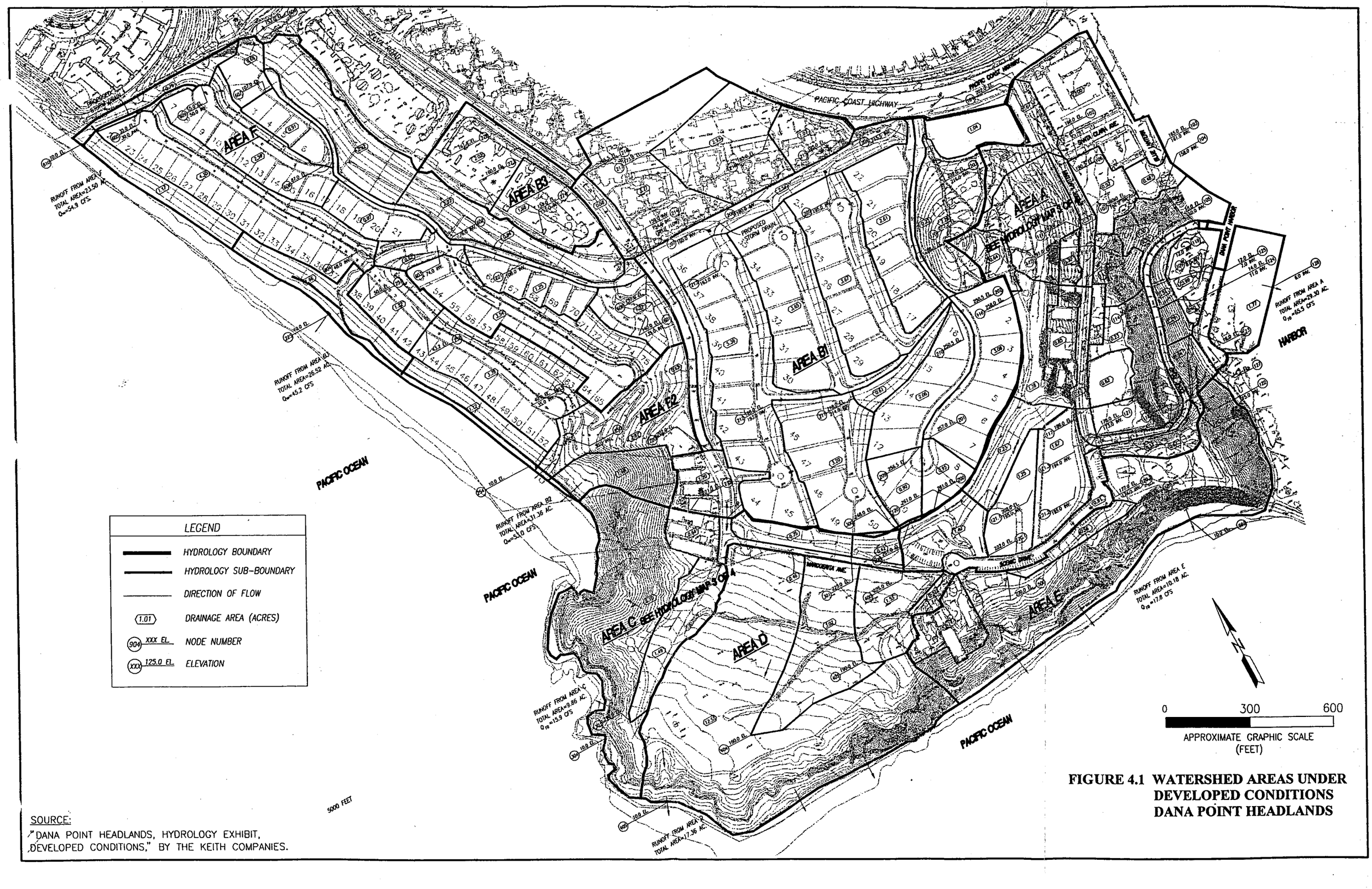
4.1 DRAINAGE AND RUNOFF MANAGEMENT

The Project will consist primarily of single-family residences and areas of open space, access roads, together with a Seaside Inn and restaurant, and a commercial site located adjacent to PCH. Figure 4.1 provides a detailed representation of the eight watershed drainage areas (sub-watershed areas) planned for the developed condition. Also shown in Figure 4.1 are the locations of the runoff drainage outlets, each serving a separate watershed drainage basin area. In addition, the areas and flow rates (cfs) for each watershed drainage basin are shown in Table 4.1. These rates are based on storm events of 10 and 100-year frequency. The flow rates shown do not account for the proposed energy dissipation structures or the runoff detention effects of the sand filters. Figure 4.1 and Table 4.1 are from The Keith Companies (2001).

DESIGN OF DRAINAGE AND RUNOFF MANAGEMENT SYSTEM

The placement of these runoff outlets, shown in Figure 4.1, and the runoff flow rates indicated in Table 4.1 represent an ideal and optimal drainage and runoff management design for this Project site. As shown by studies at the nearby Newport Coast (Rivertech 1995, 1997; Ford 1995, 1997, 1999) and elsewhere, the most effective way to control storm water runoff and associated constituents is to mimic natural conditions by maintaining a series of smaller and relatively lower flows of storm water runoff spaced along the entire reach of the shoreline. These characteristics of the watershed drainage design for the Project are evident in Figure 4.1 and Table 4.1. Relatively low flows of runoff will enter the nearshore zone at three widely spaced points along Strand Beach (Outlets B2, B3, and F). Runoff from a relatively small watershed area will flow into Dana Point Harbor through one existing storm drain (Outlet A).

Three of the eight watershed areas shown in Figure 4.1, Watershed Areas C, D and E of the Headlands Promontory will remain essentially undeveloped and will continue to function in a sheet flow condition. Watershed Areas B1, B2, F and G will be developed primarily with single-family residential units. Runoff will flow to Dana Point Harbor from Watershed Area A (Figure 4.1).



LEGEND

- HYDROLOGY BOUNDARY
- HYDROLOGY SUB-BOUNDARY
- DIRECTION OF FLOW
- (1.01) DRAINAGE AREA (ACRES)
- (904) XXX EL. NODE NUMBER
- (XXX) 125.0 EL. ELEVATION

SOURCE:
"DANA POINT HEADLANDS, HYDROLOGY EXHIBIT, DEVELOPED CONDITIONS," BY THE KEITH COMPANIES.

FIGURE 4.1 WATERSHED AREAS UNDER DEVELOPED CONDITIONS DANA POINT HEADLANDS

TABLE 4.1
COMPARISON OF CONDITIONS

EXISTING CONDITIONS:				
Drainage Basin	**Area (Acres)**	**Q_{10} (CFS)**	**Q_{100} (CFS)**	**Comments**
Area A	30.57	66.3	102.1	Outlet to Harbor
Area B	36.86	54.2	92.2	Existing storm drain to westerly beach
Area C	10.61	16.3	26.7	Surface flow over bluff
Area D	18.66	35.5	59.4	Surface flow over bluff
Area E	11.17	18.5	29.7	Surface flow over bluff
Area F	19.08	41.5	66.1	Existing storm drain to westerly beach inc offsite fl
Area G	8.08	22.6	35.2	Existing storm drain to westerly beach
Area H	2.24	7.2	11.2	Existing storm drain to westerly beach
Area I	10.33	23.9	38.1	Existing storm drain to westerly beach
DEVELOPED CONDITIONS:				
Drainage Basin	**Area (Acres)**	**Q_{10} (CFS)**	**Q_{100} (CFS)**	**Comments**
Area A	29.30	65.5	103.6	Outlet to Harbor
Area B1	42.36	73.5	118.7	To flow diverter at node 214
Area B2	10.18	53.0	86.2	Proposed storm drain system to westerly beach including offsite flow
Area B3	5.34	45.2	73.0	Proposed storm drain system to westerly beach including offsite flow
Area C	9.86	15.9	26.3	Surface flow over bluff
Area D	17.36	28.5	47.3	Surface flow over bluff
Area E	10.18	17.8	28.6	Surface flow over bluff
Area F	23.50	54.9	87.5	Proposed storm drain system to westerly beach

Source: The Keith Companies, Inc. (2001; Table 1)

The Project area will be provided with a new storm water drainage system, based on the hydrologic design and calculations developed by The Keith Companies. Details regarding the locations, sizes and other design features are shown in Figure 4.1 and Table 4.1 and in other data provided as part of the report entitled Drainage Study for the Headlands, prepared by The Keith Companies (2001). In addition, the slopes and terraces within the Strand Beach area of the Project will be stabilized and the revetment rebuilt to meet current standards. In combination with the new storm water drainage management system, this will prevent further erosion and sloughing on the slopes of this area. As shown in Figure 4.1 and Table 4.1, flow patterns in the developed condition will continue to drain to the same three zones. These flows will be in approximately the same proportions as those of the existing condition (The Keith Companies 2001).

STRAND BEACH

In several areas, the existing storm drain improvements that previously served the mobile home park have deteriorated and become clogged, resulting in most of the storm water runoff flowing on the surface. As described by The Keith Companies (2001), storm drain improvements proposed for the project will eliminate most of that existing surface runoff to Strand Beach. In addition, the storm drain system has been designed to accept the off site flow from the east that currently passes through the site. As the drain system is designed, the surface runoff from the proposed single-family residences and the commercial site along PCH will flow to Strand Beach. The proposed storm drain improvements will include catch basins in the streets, storm drain lines sized to serve the project site and adjoining tributary areas, sand filter devices for detention and maintenance of water quality, energy dissipating structures, and the three outlets on Strand Beach.

DANA POINT HARBOR

Within Watershed Area A, new storm drain improvements will be installed to capture the surface flows on site. As described by The Keith Companies (2001), these improvements will include catch basins on Scenic Drive, a sand filter for detention and water quality, and a storm drain line extending from the proposed development to an existing inlet along Cove Road approximately 400 feet east of Scenic Drive. The proposed commercial development at PCH and Street of the Green Lantern will be graded in a manner that will direct storm water flow into new abutting storm drain systems within the Project boundary, rather than to Green Lantern or PCH where only limited storm drain improvements exist. The new storm drains serving the PCH commercial site will direct storm water to Strand Beach rather than to Dana Point Harbor. This will be done to reduce the quantity of storm water runoff and associated constituents reaching the Harbor and Baby Beach. Under developed conditions, approximately 12.3 acres of the 29.3-acre drainage area will be from the Project. Of the 12.3-acre area, approximately 2.9 acres will be from the Seaside Inn site, and 1.5 acres from Scenic Drive, Green Lantern and Cove road on site, with the remaining area consisting of slopes and open space.

Thus, the project designates only 4.4 acres of developed area on site within this watershed but proposes to construct a BMP system sized to treat 29.3 acres, of which 17 acres are off

site. This is made possible by locating the sand filter and nuisance water diversion at the downstream end of the watershed near the outlet in the Harbor.

COASTAL BLUFFS

In the developed condition, there will be very little change in the existing surface flow conditions for watershed areas C, D and E. As described by The Keith Companies (2001), the realignment of Scenic Drive will slightly reduce the amount of surface flow that occurs over the adjoining bluffs at Harbor Point. The removal of pavement on Marguerita Road and restoration of this area to a more natural condition will slightly reduce surface flow of runoff. The only runoff from impervious areas that will pass over the bluffs will come from the existing residential enclaves. These drainage areas will result in an overall reduction of the watersheds by 3 acres.

STORM DRAIN IMPROVEMENTS

The storm drain improvements will be designed to provide protection at the level required by the Orange County Local Drainage Manual (The Keith Companies 2001). As a result of Project design features, much of the erosion throughout the Project site will be eliminated. Surface flow that was once the cause of severe erosion will now be confined inside the storm drain system. The storm drain improvements will also accept flow from off site areas (approximately 12 acres) located to the north and east of the Project site. These areas outside the Project boundaries (Salt Creek parking lot, Selva Road and Niguel Terrace condominiums) are highly impervious and produce a considerable amount of runoff.

As described by The Keith Companies (2001), non-erodible velocities at the outlet locations along Strand Beach will be achieved by employing a vertical drop structure or a similar internal dissipation structure to dissipate the energy before runoff passes to the beach. The vertical drop structure would not be seen from the beach because it will be underground.

After development, a slight increase (2.5% for 10-year return storm) in peak flow to Strand Beach is anticipated. This increase is due in part form the diversion of storm flows from the proposed 1.6 acre PCH commercial site away from Dana Point Harbor, an impaired water body, to Strand Beach. The storm drain system has been designed to accommodate the proposed development in a manner that will have the least detrimental impact.

Currently, concrete "V" ditches on either side of Cove Road accept up-stream runoff from Scenic Drive and Green Lantern. An analysis conducted by the Keith Companies (2001) determined that improvements are required along Cove Road. The proposed improvements will consist of extending a storm drain from the development along Cove Road and replacing an existing headwall located approximately 400 feet east of Scenic Drive. By constructing this storm drain facility, downstream properties will be protected.

SAND FILTERS AND OTHER PROJECT DESIGN FEATURES

As described and illustrated by The Keith Companies (2001), sand filters will be installed upstream of each of the three storm runoff outlets along the shoreline of Strand Beach and in the single drainage leading to Dana Point Harbor. These outlet locations are shown in Figure 4.1. The specific sand filters to be used also are described and illustrated by The Keith Companies (2001) and by URS Corporation (2001), in Part 2 of this Technical Report.

In addition, the outlet at location B1 will provide for diversion of low runoff flow to Watershed Area F. This will be employed to divert first flush runoff from Watershed Area B1 to Watershed Area F. The diverted runoff water will then pass through the sand filter associated with outlet F. The purpose of this diversion is to carry away a majority of the runoff from the first flush event so that it does not flow into the ecologically sensitive areas of the Niguel and Dana Point Marine Life Refuges located near outlet B2 (Figures 1.3 and 4.1). This is a particularly significant design feature that will help to assure normal receiving water quality and protect marine life in those sensitive areas.

As described by URS Corporation (2001) in Part 2 of this Technical Report document, the sand filters will be an extremely effective Project feature in substantially reducing the concentrations and resulting pollutant loads of many major physical and chemical constituents of the runoff water. They will also serve to provide detention of runoff water during the filtration process. These four sand filters represent the primary structural BMP for the Project. The effectiveness of the sand filters and the associated post-construction BMPs in improving and maintaining water quality is discussed and evaluated in Section 4.4 of this report.

DIVERSION OF NON-STORM RUNOFF

In addition, dry-weather ("nuisance") runoff and other non-storm runoff from all developed watershed areas of the Project will be diverted and released to the existing sanitary sewer system, with the sand filters serving as a continually available backup system should this diversion be interrupted. This additional preventative measure for dry-weather runoff is an extremely beneficial one, because it will protect water quality in both the watershed and in the adjacent marine receiving water. It will be a particularly important Project feature in reducing the levels of pathogen indicator bacteria entering Dana Point Harbor and reaching Strand Beach through dry-weather runoff.

4.2 IMPACTS ON GROUNDWATER

As indicated in the Geotechnical Report prepared by AMEC in May 2001, there is past evidence of relatively shallow groundwater conditions and potential for seepage at the Headlands site, although such conditions do not appear to exist there at the present time. Observations at the Niguel Shores Community adjacent to the Strand area (Figure 1.1) have identified groundwater seepage from fractures of exposed bedrock located in the surf zone and from cut slopes in proximity to the Strand. Much of the groundwater discharging as

seeps within the Niguel Shores Community has been captured and controlled by installation of ground water collection trenches and sub-drainage pipelines. Because of this historic evidence of conditions adjacent to the project site, it is assumed that dewatering could be necessary at some locations to protect the stability of trenches or excavations during remedial grading in the Strand area. Sub-drain systems will also be needed to protect sub-grade building features from corrosion and to prevent water from seeping into sub-grade features. If necessary, removal of groundwater during construction is expected to occur only for a limited duration of time. If dewatering is necessary, the majority of the extracted water can be employed for dust control and for placement of fills during grading operations. Furthermore, the extraction and disposal of extracted groundwater would be subject to any applicable provisions of the General Waste Discharge Requirements Order No 96-41 adopted by the San Diego RWQCB. Compliance with these provisions would minimize potential water quality impacts, as discussed above.

Because the project site is not located in an area of significant recharge potential, and the amount of dewatering is expected to occur only for a limited time, there would be little effect, if any, on groundwater recharge or groundwater resources. Consequently, the project could not create impacts on groundwater that would be considered significant

4.3 WATER QUALITY EFFECTS RELATED TO CONSTRUCTION

Implementation of the Project will involve the construction of buildings, roadways, parking lots, and other structures. This will require the remediation of landslides at the Strand Beach site, grading, excavation, and other construction-related activities that could cause soil erosion at an accelerated rate during storm events.

Construction activities such as grading, removal of vegetation, excavation and trenching, both for site improvements and to install the runoff management systems, would result in disturbance of soils at the project site. Runoff from a construction site can contain sediments and other materials from these activities. Dust from construction sites can also be transported to other nearby locations, where it could enter the ocean or harbor receiving waters. Hydrocarbon spills or leaks from heavy equipment and machinery, staging areas, or building sites can also enter the runoff and receiving waters. Typical pollutants introduced in this way could include petroleum projects and trace (heavy) metals from equipment, and products such as paints, solvents, and cleaning agents that could contain hazardous constituents. Sediment from erosion of graded or excavated surface material, as well as sediment exposed to leaks or spills from equipment, or inadvertent releases of building products, could result in adverse water quality effects of runoff containing that sediment if it entered the marine receiving waters. Similarly, if runoff containing the contaminants reached Strand Beach, people might be exposed to potential hazards associated with construction-generated pollutants that could be present in the runoff.

In accordance with NPDES regulations, to minimize the potential effects of construction runoff on receiving water quality, the State of California requires that any construction activity affecting five acres or more must obtain a General Construction Activity Storm Water Permit. Permit applicants are required to prepare a Storm Water Pollution Prevention

Plan (SWPPP) and implement Best Management Practices (BMP) to reduce construction effects of receiving water quality by implementing erosion control measures. Because implementation of the proposed project through build-out will involve more than five acres, the Project would be subject to permit requirements.

Erosion and sediment control are integral components of water quality protection. A project must comply with the Orange County Grading and Excavation Code, as adopted by the City of Dana Point. The Grading Code currently controls sediment loads only. In addition, all construction activity must comply with the City of Dana Point Grading Ordinance, including the implementation of Best Management Practices.

CONTROL OF WIND-BORNE DUST EFFECTS ON WATER QUALITY

The following are suggested, specific Project features to minimize the effects of wind-borne dust from construction on water quality:

1. Water trucks shall be employed for dust suppression at the site during site grading operations, or when unpaved haul roads are used to prevent visible dust emissions from extending beyond project site boundaries.
2. All trucks hauling building debris or excavated material, soil or other loose materials shall have the cargo portion covered, or shall have at least two feet of cargo freeboard visible.
3. No grading shall occur during high velocity (>30 mph) Santa Ana wind conditions.
4. Exposed stockpiles with five percent or greater silt content shall be enclosed, covered, watered twice daily, or treated with non-toxic chemical soil stabilizers.

There would be no significant impacts to water quality from wind-born dust, assuming the implementation of these Project features.

CONTROL OF EROSION EFFECTS ON WATER QUALITY.

The following are suggested, specific Project features to minimize the effects of erosion from construction sites on water quality:

1. Prior to the issuance of a grading permit, an erosion control report shall be prepared by a licensed civil engineer and submitted for approval by the City of Dana Point. The report shall propose the implementation of BMPs for grading and related construction activities on site. This report may include the following:
    a. For grading activities during the rainy season or if slopes are exposed to erosion, Standard Construction Best Management Practices (BMPs), as described by State of California (1993; vol. 3), shall be employed at the construction site at all times. BMPs would include stabilization and compaction of exposed slopes, use of jute or a similar material or technology in covering of exposed slopes, and covering of fill material.
    b. This plan shall include the design and installation of silt fencing, hay bales sand bags, temporary detention basins, and other facilities that will control the

transportation of material from the site into runoff water and the marine environment.

2. During the rainy season the following measures shall be implemented, unless other equally effective measures are approved in the erosion control report
    a. Silt fencing shall be installed around the perimeter of the construction site during grading operations and remain in place until all graded areas are completed with compacted pads or vegetation.
    b. Silt fencing shall be inspected by qualified personnel at least once every two (2) weeks and within two (2) days prior to any predicted storm. The construction supervisor shall maintain a log of these inspections.
    c. All graded slopes not scheduled for construction shall be planted with appropriate vegetation as soon as possible, in order to prevent storm erosion. Associated application of fertilizers shall be done at manufacturer recommended concentrations and in a manner that minimizes introduction of nutrient chemicals (N and P) into runoff water. Exposed areas shall utilize sand bags on the perimeters.
    d. The site shall be monitored frequently during storm events to ensure that the measures designed to reduce erosion and transport of soil and other materials are working effectively. If necessary, the civil engineer shall prepare an amended erosion control report.

Potential impacts to water quality caused by erosion from the construction sites would not be significant, assuming the implementation of these Project features.

CONTROL OF CONSTRUCTION SPILL EFFECTS ON WATER QUALITY

The following are suggested, specific Project features to minimize the effects of potential construction spills on water quality:

1. Standard Construction Best Management Practices (BMPs), as described by State of California (1993, vol. 3), shall be used on the construction sites at all times.
2. A spill recovery plan shall be developed before the initiation of construction on the site. All employees, including vehicle maintenance contractors, shall be required to read this plan and understand their respective responsibilities.
3. Prior to issuance of a grading permit, a vehicle maintenance area shall be designated in a location where any potential runoff can be diverted into a temporary on site basin. The objective of this measure is to attempt to have all routine maintenance occur within an area that can be easily monitored and to assure the ability of construction personnel to contain any accidental spills that may occur. While maintenance of damaged or inoperable machinery may occur outside of this area, all reasonable attempts should be made to move the equipment to the maintenance area before extensive repairs are attempted. No repairs shall be completed within 50 feet of areas that could drain directly to intertidal or subtidal marine habitats, unless there is imminent danger of greater contamination or there is a direct safety hazard.

4. The construction supervisor shall be responsible for monitoring maintenance activities and ensuring that hydrocarbon spills are minimized, and reported if they occur. The construction supervisor shall be responsible for implementation of the spill recovery plan and to ensure that employees on the site are familiar with their specific responsibilities under the plan.
5. Any soil that becomes contaminated must be removed from the site and disposed at a site designated for such material by the State of California.

Potential water quality impacts to sensitive resources from construction spills would not be significant, assuming implementation of these Project features.

4.4 WATER QUALITY FOLLOWING CONSTRUCTION

TYPES, SOURCES AND TRANSPORT OF RUNOFF CONSTITUENTS

As an important basis for evaluating impacts on water quality, it is valuable to consider background information about the types and sources of storm water constituents that may be associated with the Project site during and following construction, and about the processes involved in the accumulation and transport of these constituents through the watershed. This will serve as a basis for understanding and evaluating both the potential water quality and ecological influences of runoff from the sites and the effectiveness of BMPs and other Project features of storm water management and water quality control described.

Until recent years, storm water runoff from urban sources was ignored as a potential environmental problem, because such runoff was thought to be relatively uncontaminated, and principally because of the difficulties involved in controlling large volume flows and providing any effective sort of water treatment under these conditions. There is now an extensive literature on non point source water quality problems associated with storm water runoff and its constituents. Recent literature reviews and field studies pertinent to these water quality problems as they may affect southern California coastal areas are provided by Pomeroy, Johnson and Bailey, Inc. (1972), Ford (1995, 1997, 1999, 2000a-b), Ford et al (2000), Rivertech (1990, 1994, 1995, 1997), SCCWRP (1992), Makepeace et al (1995), Bay and Shiff (1997, 1999), Bay et al (1998, 1999) and Bergen et al (1999). This literature includes many reports by governmental agencies and others, in which attempts have been made to evaluate and better define the problems and to establish control and study methods (see, for example, USEPA 1992, 1996; Shubinski 1974). Formal guidelines and best management practices (BMPs) for preventing and managing storm water runoff problems also have been established, including those of the California Storm Water Best Management Practice Handbooks (State of California 1993; vols. 1-3).

The main components of storm water runoff from the Project that could affect the adjacent marine environment are freshwater, eroded sediments, nitrogen (N) and phosphorus (P) nutrient compounds, pesticide and herbicide chemicals, petrochemicals, trace (heavy) metals, organic debris, and pathogenic fecal bacteria and viruses. Potential sources of sediment and pollutants in runoff water from the Project would include the following activities or materials:

1. Excavation and grading of land during the construction phases without required erosion control measures.
2. Storage of material stockpiles, consisting of a wide variety of substances.
3. Construction of residences, tourist and community-oriented commercial buildings, roadways, and other facilities without required erosion control measures.
4. Natural sediment erosion and that induced by human modifications of the land.
5. Debris from littering and from accumulation of material in streets, street- side areas, and parking lots.
6. Dust fall and accumulation of atmospheric pollutants on impervious surfaces, such as streets, parking areas, walkways and roofs, and the subsequent removal of this material by rainfall and runoff.
7. Operation and parking of motor vehicles, involving primarily petroleum products, rubber products, gasoline exhaust, zinc oxide from tire wear, copper, cadmium, nickel, and other trace (heavy) metals.
8. Unauthorized or improper spillage or deposition of waste materials into streets, parking areas, and storm drains; these include petroleum products, detergents, nutrient chemicals, other chemical and physical constituents, as well as animal wastes and their associated bacteria and viruses.
9. Improper storage and excessive applications of fertilizers in home gardens, parks, and the other landscaped areas of the development combined with excessive irrigation runoff, causing higher concentrations of nitrogen and phosphorus compounds (biostimulatory nutrient chemicals) and other constituents to enter the watershed and the nearshore ocean.
10. Improper storage and applications of pesticides, herbicides, and fungicides to home gardens, parks, and other landscaped areas, contributing both those chemicals and possibly in some cases their resistant residues to the runoff and receiving water.
11. Improper maintenance, leading to blockage or failure of waste water or sewer lines and resulting in the release of a variety of constituents, including nutrients.
12. Improper maintenance, leading to accumulations of organic debris, including animal waste, leaves, grass and shrub trimmings, and other vegetation that often cause constituents to enter the runoff and receiving water.
13. Improper maintenance, leading to accumulations of a variety of materials in catch basins and other drainage structures, causing the same effects described in 12.

The creation of impervious surfaces in the form of roofs, streets, sidewalks, other walkways, parking areas, and driveways typically increases the amount of runoff. It also increases the amount of surface on which pollutants can settle without being carried into the soil or other non-impervious substrates, leading to higher total amounts of these pollutants accumulating there and entering the watershed, and thus compounding water quality problems.

The three major constituents from this source are: 1) a floatables fraction consisting of petrochemicals, such as oil and grease, and various types of litter; 2) a settleables fraction, consisting primarily of silt and sandy sediments, together with many chemicals attached to or closely associated with these sediments; and 3) a dissolved fraction, consisting primarily of nutrient chemicals, pesticides, and herbicides. Many of the chemicals, particularly chlorinated hydrocarbon compounds, trace metals, and nutrients, are most closely associated with sediments making up the settleables fraction, because they are adsorbed onto the fine sediment and other particulate matter. This is particularly true for the silt material. It is very important to recognize that trace (heavy) metals are primarily associated in this way with the sediments and other particulate matter, rather than with the water.

As indicated by Ford (1999) and others, contaminants from street surfaces and associated vehicle activity usually represent a major contribution of materials to the runoff water. However, it is important to note that vehicular traffic in most areas of the Project will be very light. The residential streets are proposed to be private and closed to public vehicular traffic through the use of controlled access gates. In addition, the vehicles of residents in this community will typically be relatively new and professionally maintained. These factors will help to minimize contributions of vehicle contaminants to the runoff.

Initially, potential pollutant substances accumulate on the land surfaces and on vegetation, structures, streets, and other features. This occurs as a function of the amount of spillage and dust fall, the method and frequency with which street and parking lot sweeping is done, characteristics of the rainfall, and other factors. When rain occurs, the energy of dissipating raindrops dislodges contaminants from street surfaces, roofs and other structures, causing some contaminant particles to become suspended in solution. The soluble fraction of these materials goes into solution. Runoff transports the contaminants across the land into gutters, storm drains, and natural watercourses, and the runoff then passes into the ocean or Harbor. The concentrations of these materials are generally higher at the beginning of a rainfall event and, as the rainfall continues, subsequent runoff of storm generally contains lower concentration of water quality constituents that can cause pollution. In southern California, the first major rainfall of the year may entrain fairly high levels of pollutants in the runoff water because rainfall is so seasonal. Therefore, it is particularly important to consider this first major storm of the year in conducting water quality and ecological studies, because it usually provides information about "worst case" levels of constituents in the runoff.

Pollutants are transported at different times and rates, depending on their physical and chemical characteristics. Several types of materials, including oil and grease, silt, and light-weight solid wastes such as litter, are quickly mobilized either by flotation or dissolution at the start of rainfall, leading to what is commonly called the "first flush." The volume of material and the distance it is transported by runoff are dependent primarily on the physical and chemical nature of each material and the velocity and volume of runoff water. Heavier sedimentary material (sand, heavier silts, and solid wastes) will be carried a shorter distance than finer silts and floating material (oil, grease, and trash). Because of this, catch basins, storm drains, storm channels, and natural water courses will be laden by heavier materials, while the downstream receiving water, in this case the nearshore ocean areas adjacent to

Strand Beach and the Headlands Promontory itself, as well as Dana Point Harbor, will receive higher proportional loads of finer, lighter-weight, and dissolved materials.

POST-CONSTRUCTION PROJECT FEATURES TO ASSURE ACCEPTABLE WATER QUALITY

The following are suggested, specific Project features to minimize the effects of storm runoff and dry-weather runoff and assure acceptable water quality:

1. Sand filters of an appropriate design shall be installed and used upstream of the three runoff outlets along the reach of Strand Beach and the runoff outlet to Dana Point Harbor, (Figure 4.1) to provide detention and effective filtration of runoff water.
2. An upstream diversion structure (smart box) shall be used at runoff outlet B-1 in order to divert first flush runoff to watershed basin area F and then through the sand filter at outlet F.
3. Regular examination, maintenance and servicing of the structures described in 1 and 2 above shall be conducted, as required by their engineering specifications.
4. Dry-weather runoff and other non-storm runoff from the developed areas of the Project sites shall be released to the existing sanitary sewer system for treatment.
5. The Developer, business owners, and the Home Owners Associations for the residential communities shall establish and maintain an active and continuing public education and participation program to involve Project residents and business people in helping to maintain high water quality. This shall be done, in part, by employing the specific approaches described in the Municipal Best Management Practice Handbook (State of California 1993; vols. 1 and 2). It should also incorporate the BMPs for which descriptions follow below.
6. The Developer, business owners and Home Owners Associations involved shall establish and maintain good housekeeping practices as they relate to on site control of runoff constituents affecting water quality. This shall be done, in part, by employing the specific suggestions and information provided in Municipal and Industrial Best Management Practice Handbooks (State of California 1993; vols. 1 and 2). Special emphasis shall be placed on practices that are effective in controlling the introduction of nutrient compounds (N and P) and pathogenic bacteria and viruses into the watershed.
7. The groups identified in 5 and 6 above shall establish guidelines and regulations to promote the use of alternative products (e.g., fertilizers, pesticides, cleaning solutions, and automotive and paint products) that are less harmful to water quality, as described in Municipal and Industrial Best Management Practice Handbooks (State of California 1993; vol. 1). Special emphasis shall be placed on assuring that chlorpyrifos, diazinon, and other pesticide compounds that are banned or being phased out by the EPA, are not stored or applied.
8. The groups identified in 5 and 6 above shall establish and enforce guidelines and regulations for proper storage and control of materials that degrade water quality, using the approaches described in the BMP Handbook State of California (1993; vol. 1). Special emphasis shall be placed on assuring that proper storage and application procedures are employed for pesticides and herbicides, and for fertilizers and other

sources of nutrient chemicals (N and P), in order to reduce substantially their introduction into the watershed.

9. The groups identified in 5 and 6 above shall establish and maintain a program of stenciling inlets to the storm drain systems to discourage illegal disposal of materials harmful to water quality, using the specific approaches described in the BMP Handbook State of California (1993; vol. 1).
10. The groups identified in 5 and 6 above shall establish and maintain a program for special collection of hazardous household wastes, and the recycling of used motor oil, as described by State of California (1993, vol. 1) and by using the approaches suggested in that Municipal Handbook.
11. The groups identified in 5 and 6 above shall establish and maintain a street and parking lot cleaning program, as described in the BMP Handbook State of California (1993; vol. 1). This program shall employ an air regenerative vacuum sweeper, with sweeping of all street and parking lot surfaces conducted once per week for both residential streets and parking lots on site.
12. The groups identified in 5 and 6 above shall undertake and maintain a program that encourages cooperation by the Homeowners Associations and residents of off site residential areas, and officials responsible for the Orange County Salt Creek Beach Parking Lot, to improve their control of pollutants entrained by runoff water that then flows through the Project site. In this effort, special emphasis shall be placed on reducing the introduction of nutrient chemicals, trace metals, pesticides and herbicides, and pathogenic bacteria and viruses into this runoff.
13. Regular cleaning and maintenance of storm drain structures shall be conducted.
14. The Developer and the Homeowners Associations involved shall implement a program to promote water-efficient landscaping in order to reduce irrigation and maintenance requirements in both residential and public/common areas. Emphasis also shall be placed on grouping plants with similar water requirements together.
15. Interior and exterior water conservation measures shall be implemented within all planning areas, including both residential and commercial property. These measures shall include, but are not limited to, low flush toilets, low flow faucets, water-conserving appliances, use of reclaimed water for irrigation, and the use of efficient, electronically-controlled irrigation and residential yard sprinkler systems equipped with moisture sensors to minimize both evaporation and runoff of freshwater, nutrient chemicals, and other constituents.
16. In commercial areas such as the Seaside Inn and the Pacific Coast Highway commercial site, trash receptacles of all sizes shall be kept in a fully covered space to prevent rainwater from entering them.
17. In commercial areas such as those noted in 16, regulations shall ensure that all restaurant and food service establishments install and use a wash-down area that drains directly to the sanitary sewer system for treatment and disposal.
18. A three-year water quality and marine ecological study shall be conducted during the construction and post-construction phases in order to assess in a quantitative manner possible effects of the Project on water quality and marine ecological resources, and to determine and evaluate the effectiveness of the BMPs employed. This study shall include the following elements:

a. During and following representative storm events, measure, and evaluate in relationship to applicable regulatory criteria and guidelines, standard chemical and physical constituents of the runoff and receiving waters by sampling over the course of storm flow at appropriate station locations upstream and downstream of the sand filters, as well as in the surf zone and at the point runoff enters the Harbor.
b. Sample and evaluate ecological characteristics of representative marine indicator species and indicator species groups, such as algal epiphytes living on surfgrass, and selected invertebrates of rocky habitats.

EVALUATION OF PROJECT FEATURES CONCERNING WATER QUALITY

The purpose of this section is to provide a discussion and evaluation of the proposed post-construction BMPs and other Project features as they relate to improving and maintaining water quality conditions. The primary water quality data on which this evaluation centers are those presented by URS Corporation (2001) in Part 2 of this Technical Report.

Water Quality Modeling

URS employed the PCSWMM 2000 model to evaluate the water quality of storm water runoff under three site conditions. They are: 1) existing watershed conditions; 2) developed watershed conditions without BMPs in use; and 3) developed watershed conditions with one or two major BMPs in use. PCSWMM 2000 is a modeling program for water quality that utilizes the EPA Storm Water Management Model (SWMM), version 4.4GU.

PCSWMM was used for the Project to predict water quality concentrations in storm water runoff at the Headlands site for 12 water quality constituents under various land use conditions and for their concentrations in runoff entering and exiting the sand filters. The two BMPs evaluated in the modeling effort were weekly street and parking lot sweeping and the sand filters. Tables 1 and 2 of Part 2 summarize the specific land uses in the Project for existing and developed watershed conditions, respectively.

Water quality constituents were modeled using a build-up/wash-off procedure in the model, allowing runoff constituents to increase in the watershed prior to a storm event. Utilizing the build-up/wash-off method allowed site-specific information to be entered into the model, such as the average number of antecedent days during a storm season and specific land use build-up rates for the constituents. Another benefit of using the build-up/wash-off option for water quality constituents was the ability to incorporate BMPs into the model to assess their effectiveness. Build-up rates were determined from published information in the literature and example models developed by Computational Hydraulics International (James 2000). In addition, build-up rates were adjusted to correlate with flow-weighted concentrations that were comparable to published event mean concentrations (EMCs) for the San Diego and Los Angeles areas (URS Greiner Woodward Clyde 1999; Los Angeles County DPW 1999). The EMCs for Los Angeles and San Diego are shown in Part 2, Table 3. To verify that the model was accurately predicting the water quality concentrations, URS Corporation (2001) compared the results from the existing watershed conditions with the EMCs (Part 2, Table 3)

and the baseline storm water quality data for the Headlands (summarized in Part 1, Tables 2.3-2.8). Developed conditions were modeled by adjusting the land use characteristics from the existing to the developed conditions, as these are shown in the report entitled Drainage Study for The Headlands (The Keith Companies 2001).

As indicated in Part 2 by URS Corporation (2001), sand filters are now a commonly used structural BMP for water quality treatment of storm runoff. The effectiveness of sand filters in reducing concentrations of storm water contaminants is well documented (USEPA 1999; Barrett and Borroum 2001).

These units can be installed below ground level and under streets and parking lots, so consequently can be incorporated easily at most sites. A portion of the sand filter area is designed as a retention basin, where sediment removal and runoff detention occurs. This very beneficial design feature also attenuates the discharge of storm water into the receiving waters. Illustrations of the sand filters proposed for use in the Project are shown in the Drainage Study for the Headlands (Keith Companies 2001).

Constituent removal associated with sand filters was assessed by URS Corporation using the model results from the developed watershed conditions with street and parking lot sweeping. Removal rates for particular constituents were obtained from "A Preliminary Assessment of the Cost, maintenance Requirements and Performance of Sand Filters" by Barrett and Borroum (2001) and "Preliminary Data Summary of Urban Storm Water Best Management Practices" by the USEPA (1999).

Removal of runoff constituents by the sand filters was assessed using the model results from the developed watershed conditions, with street and parking lot sweeping included. Estimated constituent removals employed by URS are presented as percentages, based on water quality monitoring in the Los Angeles and San Diego area watersheds. The predicted concentrations of each runoff constituent from this analysis are summarized by sub-watershed area in Part 2.

The performance of the street and parking lot sweeping BMPs were evaluated using the built-in options of PCSWMM. Street sweeping will be performed once per week. Removal efficiency of sweeping was assessed for each runoff constituent modeled by proportioning the amount of street and parking lot surface area within a watershed with its associated impervious area. Sweeping was modeled for 1-day and 6-day antecedent conditions (sweeping 1 and 6 days prior to a storm event) to identify the differences in total constituent removal. Many of the removal efficiencies for specific constituents used for sweeping date back to the 1970s when sweepers were less efficient (Table 4.5; James and James 2000). Advanced vacuum sweeping devices to be employed in the Project area will undoubtedly have greater removal efficiencies than those used in the model.

Water Quality Objectives Used for Guidance

Water quality objectives from several agency sources were employed for purposes of guidance in evaluating these predicted concentrations for existing and developed conditions with no BMPs, and developed conditions with street sweeping and sand filters in use. In considering constituents of freshwater runoff, these sources were the San Diego Basin Plan (CRWQCB 1994) and the Santa Ana River Basin Plan (CRWQCB 1995) for toxic and non-toxic constituents, the California Toxics Rule (USEPA 2000a) for trace metals, and the EPA Parameter Benchmark guidelines (USEPA 2000b; Table 3) for toxic and non-toxic constituents. The use of these Parameter Benchmark values for guidance in conjunction with general water quality objectives stated in the San Diego Basin Plan was specifically recommended for this evaluation by water quality specialist Phillip Hammer of the San Diego RWQCB Beaches Section (pers. comm., 2001). In evaluating concentrations of constituents that enter the nearshore ocean and Dana Point Harbor, water quality objectives of the California Ocean Plan (CSWRCB 1997; Table B) were employed. These are shown in Table 2.8.

While no modeling was done of data concerning pathogen indicator bacteria, the single sample standards employed by the Orange County Health Care Agency (OCHCA) and other southern California agencies were used for general guidance in evaluating these constituents. It is extremely important for the reader to recognize that these standards are not applied by OCHCA and other southern California agencies in evaluating indicator bacteria counts present during storm runoff, as opposed to those sampled following storms or during dry-weather periods (Monica Mazur, OCHCA, pers. comm., July 2001).

These water quality guideline values for physical and chemical constituents are summarized in Table 4.6. No such quantitative water quality objectives have been established for dissolved phosphorus or total Kjeldahl nitrogen (TKN). It is very important to recognize that the use of all these water quality objectives in the evaluations was for guidance purposes only. It was not done to determine if specific regulatory criteria were met.

Evaluation of Constituent Concentrations in Runoff

Shown in Tables 4.7 - 4.12 are the predicted concentrations for the 12 runoff constituents considered by URS Corporation, based on flow weighted averages modeled using PCSWMM 2000. These are given separately for each sub-watershed area of the Project site, in Tables 4.7 - 4.10. These data are presented separately for existing conditions (Table 4.7), developed conditions assuming the use of no BMPs (Table 4.8), developed conditions assuming weekly street and parking lot sweeping under 1-day and 6-day antecedent conditions (Tables 4.9 - 4.10). Tables 4.11 and 4.12, respectively, provide overall predicted constituent concentrations for the watersheds draining to Dana Point Harbor and Strand Beach, with both sweeping and sand filter BMPs in use. Also shown in these two tables are the percentage reductions in constituent concentrations from existing watershed conditions to developed watershed conditions with these two major BMPs in use.

Data concerning the removal efficiencies of sand filters for constituents of storm water runoff were also used directly in these evaluations. The constituent removal efficiencies reported by Barrett and Borroum (2001), based on data for installations at six different sites, are summarized in Table 4.3. Removal efficiencies for an additional series of different sand filter installations, compiled by USEPA (1999), are shown in Table 4.4. The USEPA (1979) compilation includes removal efficiency data for dissolved (soluble) phosphorus, the trace metal cadmium and for bacteria, three constituents for which Barrett and Borroum (2001) did not provide information. Because of the similar sizes and characteristics of fecal coliforms and other pathogen indicator bacteria, it is reasonable to assume that the removal efficiencies for unspecified bacteria reported by USEPA (1999) also are valid for indicator bacteria.

Sweeping of streets and parking lots reduces the concentrations of runoff constituents that are associated with both particulate matter and those pavement surfaces (Table 4.5). Additional benefits of sweeping include the removal of litter material and the reduction or air borne dust.

The predicted results shown for the Project in Tables 4.9 and 4.10 illustrate the benefits of a frequent and efficient sweeping program. They summarize modeling results for sweeping conducted 1-day (Table 4.9) and 6-days (4.10) prior to the design storm. For example, these include 4% reductions in TKN and total zinc and 3-6 % reduction in total copper for Watershed Area A draining to Dana Point Harbor. Similarly, predicted concentrations of TKN and total zinc are reduced by 8% and 9% (Table 4.9) in sub-watershed area B3, while total copper is reduced by 8.6% (Table 4.10). Zinc and copper are two of the major runoff constituents from operation of motor vehicles that are associated with street and parking lot surfaces.

As expected, these reductions were less pronounced under conditions where sweeping was last done 6 days prior to the storm (Table 4.10). This indicates that a provision in the Project for additional sweeping just prior to predicted storms may be beneficial.

As described by URS Corporation (2001), the PGSWMM model for the Headlands was developed using 8 days of build-up time for constituents prior to sweeping. It is apparent that a build-up period greater than 8 days would result in increased EMCs and constituent loads. The Project plan forstreet sweeping on a weekly basis will effectively reduce the build-up of pollutants on street and parking lot surfaces. Therefore, the potential storm EMCs under that sweeping regime would be maintained at levels similar to those predicted by the model.

Importance of Other Proposed BMPs In Reducing Constituent Concentrations It is extremely important for the reader to recognize that the data shown in Tables 4.11 - 4.12 do not incorporate the beneficial effects of the many additional structural and non-structural BMPs and other design features of the Project. Only the effects of sand filters and sweeping are included.

Adequate quantitative information is not yet available to predict levels of reduction in constituent concentrations by the large series of other proposed BMPs and design features described in the previous section entitled Post-Construction Project Features to Assure Acceptable Water Quality. Individually and in combination, these additional prevention and

control measures will have substantial effects in reducing the concentrations of most runoff constituents. They will accomplish this primarily by reducing the levels of constituents entering the runoff water, thereby substantially reducing concentrations of these constituents that then pass into the sand filters. This means that the predicted constituent concentrations shown in Tables 4.9 - 4.12 are "worst case" values that do not take into account the prevention and removal effects of the additional water quality design features besides sweeping and the action of the sand filters.

Total Phosphorus All of the predicted concentrations for total phosphorus in existing and developed conditions shown in Tables 4.7 - 4.12 are far below the water quality guidance value (Table 4.6) of 2000 mg/L (USEPA 2000b). The range among the sub-watershed areas for existing conditions is 0.02 – 0.23 mg/L (Table 4.7). That for developed conditions with no BMPs is 0.06 – 0.27 mg/L (Table 4.8). In contrast, predicted concentrations of total phosphorus under developed conditions and employing sweeping and sand filters are markedly reduced, with values of 0.13 - 0.14 mg/L for the watershed draining to Dana Point Harbor (Table 4.11) and 0.14 mg/L for the combined watersheds draining to Strand Beach (Table 4.12). This is a reflection of the removal percentages achieved by sand filters (35-45%) shown in Tables 4.2 - 4.4. Several additional BMPs and Project features, including proper storage and application of fertilizers, controlled watering, good housekeeping practices, and associated education and awareness programs, will lead to further reductions in total phosphorus concentrations that reach the filters.

The San Diego Basin Plan (CRWQCB 1994; p.3.6) states that a desired goal in order to prevent eutrophication in streams and other flowing waters "appears to be 0.1 mg/L total P." While it is very unlikely that this specific concentration would apply to the Project watersheds, the combination of BMPs and other Project features probably will reduce total phosphorus concentrations to 0.1mg/L or below. In any case, employing the water quality control measures proposed as project features would maintain total phosphorus concentrations within environmentally sound and fully acceptable limits. This evidence indicates that the combination of BMPs will reduce total phosphorus concentrations to the maximum extent practicable.

Dissolved Phosphorus Predicted concentrations of dissolved (soluble) phosphorus under existing conditions have a range of 0.02 – 0.19 mg/L (Table 4.7). Under developed conditions and without BMPs, the concentrations are predicted to increase slightly, with a range of 0.01 – 0.21 mg/L (Table 4.8). This is expected due to changes in land use of the development itself, particularly the associated increases in residential and common area landscaping and other human activities that introduce dissolved phosphorus into the runoff water.

As shown in table 4.11, the concentrations of dissolved phosphorus in the Project watershed draining to Dana Point Harbor are predicted to increase from 0.14 mg/L in the existing condition to 0.19 mg/L under developed conditions with sweeping and sand filters in use. This represents a 38% increase. Similarly, as shown in Table 4.12, these concentrations in the combined Strand Beach watershed are predicted to increase slightly (15%) from 0.16 mg/L in

the existing conditions to 0.18 mg/L under developed conditions with street and parking lot sweeping and sand filters in use.

These predicted increases are most likely the result of the disassociation of organic or particulate-bound nutrients as they pass through the sand filters. Such increases in dissolved phosphorus are a function of total phosphorus. Therefore, other non-structural BMPs to be employed in the Project that reduce total phosphorus also will assist indirectly in the reduction of dissolved phosphorus in the runoff water. These non-structural BMPs controls on the types of fertilizers applied in the Project area, as well as on their proper storage and application. Project features to help assure proper irrigation practices, good housekeeping practices, and appropriate landscaping also will be of benefit.

There are no specific agency water quality objectives for dissolved phosphorus concentrations in storm water runoff. However, it is instructive to compare the predicted concentrations shown in Tables 4.7 - 4.12 with those measured by extensive sampling during storm runoff in the essentially undeveloped Newport Coast Watershed of Muddy Canyon and the undeveloped upstream watershed of Emerald Canyon nearby in Laguna Beach (Ford et al 2000). The range of dissolved phosphorus concentrations observed in Muddy Canyon during storms in 2000 was 0.06 - 0.25 mg/L. During these same storms, the range of concentrations measured in the undeveloped watershed of Emerald Canyon upstream of all residences was very similar (0.06 - 0.30 mg/L). These appear to be typical values for dissolved phosphorus in undeveloped Orange County watersheds and can serve as a comparative standard for the area.

It is significant to note in Tables 4.11 and 4.12 that the range of concentrations predicted for the developed conditions with BMPs in the Project watersheds (0.18 - 0.19 mg/L) fall well within the above ranges for undeveloped watershed areas in Muddy and Emerald Canyons. This indicates that the concentrations predicted for this developed condition in the Project are within typical and normal ranges and are fully acceptable from an environmental standpoint.

As discussed above for total phosphorus, many of the additional BMPs and other Project features directed at proper fertilizer storage and application, properly controlled irrigation, good housekeeping practices, together with associated education and awareness efforts, would reduce the concentrations of dissolved phosphorus below those predicted by the URS modeling. In combination, the evidence indicates that these Project features for controlling water quality will reduce and maintain the concentrations of dissolved phosphate in storm runoff and the ocean and Harbor receiving waters to the maximum extent practicable.

Nitrate Nitrate (as N) is a standard measure of dissolved inorganic nitrogen in runoff water. The range of predicted concentrations among the watershed areas of the Project under existing conditions is 0.33 - 0.76 mg/L (Table 4.7). All of these values are below or very close to the water quality guideline for nitrate of 0.7 mg/L established by USEPA (2000b). In addition, the San Diego Basin Plan and the Santa Ana River Basin Plan (CRWQCB 1994,1995) employ a higher nitrogen concentration of 10 mg/L as a water quality objective. Nitrate concentrations in the Project watersheds under developed conditions, but with no BMPs, are predicted to range from 0.26 - 0.83 mg/L (Table 4.8). With the exception of the predicted values for watershed areas B2 (0.79 mg/L) and F (0.88 mg/L), all of these

concentrations are below the EPA guideline of 0.7 mg/L. In addition, all of these values are more than an order of magnitude lower than the Regional Board water quality objective of 10 mg/L (Table 4.6).

The data concerning removal efficiencies of sand filters shown in Tables 4.2 - 4.4 indicate that these devices usually cause an increase in the concentrations of nitrate as runoff water flows through them. Barrett and Borroum (2001) reported a 40% increase (Table 4.3), while USEPA (1999) reported a median increase of 13%, with a range from 27% removal to an increase of 100% (Table 4.4). As shown in Table 4.11 for the Project watershed draining to Dana Point Harbor, the predicted concentration of nitrate for developed conditions and with sweeping and sand filters employed is 0.95 mg/L, representing a 24% increase over existing conditions (0.76 mg/L). Similarly, for the combined watershed draining to Strand Beach, the predicted nitrate concentration for developed conditions with these BMPs is 1.03 mg/L, representing an increase of 53% over the value of 0.68 mg/L for existing conditions (Table 4.12). While both of these predicted values are slightly higher than the water quality guidance value of 0.7 mg/L (USEPA 2000b), they are an order of magnitude lower than the San Diego and Orange County water quality objective of 10 mg/L (CRWQCB 1994, 1995).

It is instructive to compare these predicted values with the nitrate concentrations for storm runoff samples obtained in minimally developed Muddy Canyon on the Newport Coast and Emerald Canyon at Laguna Beach (Ford et al 2000). These samples had a wide range of nitrate concentrations (0.7 - 178.5 mg/L), extending far above the predicted concentrations of 0.95 - 1.03 mg/L shown in Tables 4.11 and 4.12. This suggests that the latter predicted concentrations are well within the typical range for other representative sites nearby on the Orange County coast. All of this evidence indicates that, despite increases produced by sand filtration, the resulting concentrations of nitrate as N in the watersheds will be fully acceptable from regulatory and environmental standpoints. It further indicates that such concentrations will not have any adverse effects on beneficial uses.

As for dissolved phosphorus, the predicted increases in nitrate most likely result primarily from the disassociation of organic or particulate-bound nutrients as runoff containing them passes through the sand filters. Because these increases in dissolved nitrate are partly a function of total Kjeldahl nitrogen (TKN), a measure of dissolved organic nitrogen, the reduction of TKN concentrations by other non-structural BMPs employed in the Project also will help to reduce nitrate levels.

As discussed above for total and dissolved phosphorus, many of the additional BMPs and other Project features directed at responsible storage and application of fertilizers, well-controlled irrigation, good housekeeping methods and associated education and awareness programs will be effective in further reducing the concentrations of nitrate in the watershed. In combination, these Project features for water quality control will minimize the concentrations of nitrate in storm runoff and in the ocean and Harbor receiving waters to the maximum extent practicable. As a result, there will be no adverse effects of nitrate on beneficial uses in the Harbor and ocean receiving waters.

TABLE 4.2

Removal Efficiencies of Sand Filters Employed in Modeling for Headlands Project by URS Corporation (2001;Table 4)

Constituent Modeled	Percent Removal
TSS	85%
TDS	NA
BOD5	70%
COD	NA
Nitrate-N	-40%
TKN	45%
Total P	35%
Dissolved P	-31%
Total Cd	26%
Total Cu	50%
Total Zn	84%
Total Pb	85%

Notes:

NA indicates constituents for which percent removal values were not available

Data Sources: USEPA (1999); Barrett and Borroum (2001).

TABLE 4.3

Removal Efficiencies of Sand Filters for the Runoff Constituents Indicated. Source: Barrett and Barroum (2001).

Constituent	Influent Conc. (mg/L)	Effluent Conc. (mg/L)	Conc. Reduction %
TSS	75	11	85%
Nitrate	0.60	0.84	-40%
TKN	2.29	1.26	45%
N Total	2.89	2.10	27%
P Total	0.41	0.27	35%
Cu Total	0.020	0.010	51%
Pb Total	0.020	0.003	85%
Zn Total	0.216	0.035	84%
Cu Dissolved	0.010	0.008	19%
Pb Dissolved	0.002	0.001*	50%
Zn Dissolved	0.098	0.023	77%

*equals value of reporting limit

TABLE 4.4

Removal Efficiencies of Sand Filters for the Runoff Constituents Indicated. Source: USEPA (1999).

Parameter	Median or Average Removal Efficiency (percent)	Range of Removal (percent)		Number of Observations
		Low	High	
Soluble Phosphorus	-31	-37	-25	2
Total Phosphorus	45	-25	80	15
Ammonia-Nitrogen	68	43	94	4
Nitrate	-13	-100	27	13
Organic Nitrogen	28	0	56	2
Total Nitrogen	32	13	71	9
Suspended Solids	81	8	98	15
Bacteria	37	36	83	5
Organic carbon	57	10	99	11
Cadmium	26	N/A	N/A	1
Chromium	54	47	61	2
Copper	34	22	84	9
Lead	71	-16	89	11
Zinc	69	33	91	15

TABLE 4.5

Removal Efficiencies for Street Sweeping (James and James 2000)

Constituent Modeled	Percent Reduction
TSS	31%
TDS	NA
BOD5	24%
COD	16%
Nitrate-N	NA
TKN	26%
Total P	NA
Dissolved P	8%
Total Cd	23%
Total Cu	30%
Total Zn	34%
Total Pb	40%

Notes:

NA indicates constituents for which no removal efficiency value was available.

Constituent removals were modeled for roadways and parking lots within the watersheds, as described in URS Corporation (2001;Section 4.0).

TABLE 4.6

Water Quality Guidance Values Against Which Concentrations of Storm Runoff Constituents Predicted by the PCSWMM Model were Compared. BOD is 5-Day Biochemical Oxygen Demand, COD is Chemical Oxygen Demand, P is Phosphorus, N is Nitrogen and TKN is Total Kjeldahl Nitrogen. The Reference Source for Each Water Quality Guidance Value is Cited. Water Quality Guidance Values for Hardness-Dependent Trace Metals are Shown for Four Concentrations of Freshwater Hardness: H100 mg/L, H200 mg/L, H300 mg/L and H400 mg/L. NA Indicates that No Water Quality Guidance Value is Available.

Constituent Modeled	Units	Reference Source	Water Quality Guidance Values
Total Suspended Solids	mg/l	USEPA (2000b)	100
Total Dissolved Solids	mg/l	CRWQCB (1994)	300
BOD (5 day)	mg/l	USEPA (2000b)	30
COD	mg/l	USEPA (2000b)	120
Total P	mg/l	USEPA (2000b)	2
Dissolved P	mg/l		NA
Nitrate as N	mg/l	CRWQCB (1994-1995)	10
Nitrate as N	mg/l	USEPA (2000b)	0.7
TKN	mg/l		NA

		Hardness-Dependent Acute Water Quality Guidance Values				
Trace Metal	Units	Reference Source	H100	H200	H300	H400
Total Pb	µg/l	USEPA (2000a)	82	200	318	477
Total Cu	µg/l	USEPA (2000a)	14	27	39	52
Total Zn	µg/l	USEPA (2000a)	120	220	296	388
Total Cd	µg/l	USEPA (2000a)	5	10	16	22

TABLE 4.7

PCSWMM Model Results Showing Predicted Constituent Concentrations for Existing Conditions

Concentrations for Each Headlands Watershed Under Existing Conditions[1]										
Constituent Modeled	Units	A	B	C	D	E	F	G	H	I
TSS	mg/l	94	59	67	38	52	112	132	88	101
TDS	mg/l	33	27	29	19	21	23	20	34	36
BOD5	mg/l	26	17	18	11	13	22	22	28	25
COD	mg/l	53	38	41	26	30	35	26	57	52
Nitrate-N	mg/l	0.76	0.50	0.55	0.33	0.41	0.69	0.67	0.73	0.76
TKN	mg/l	1.43	0.90	0.99	0.60	0.74	1.30	1.26	1.38	1.41
Total P	mg/l	0.22	0.12	0.13	0.08	0.10	0.22	0.23	0.21	0.21
Dissolved P	mg/l	0.14	0.04	0.05	0.02	0.03	0.17	0.19	0.14	0.11
Total Cd	µg/l	0.51	0.34	0.37	0.23	0.28	0.42	0.37	0.49	0.50
Total Cu	µg/l	38	26	29	17	22	35	36	36	39
Total Zn	µg/l	204	148	162	101	121	169	158	194	212
Total Pb	µg/l	25	20	22	14	17	21	21	24	28

Notes:

1. Constituent concentrations are based on flow-weighted averages modeled with PCSWMM 2000.

TABLE 4.8

PCSWMM Model Results Showing Predicted Constituent Concentrations for Developed Conditions (Without BMPs)

Concentrations for Each Headlands Watershed Under Developed Conditions (Without BMPs)[1]									
Constituent Modeled	**Units**	**A**	**B1**	**B2**	**B3**	**C**	**D**	**E**	**F**
TSS	mg/l	84	70	131	91	67.6	30	55	151
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	25	22	18.5	9.0	14	23
COD	mg/l	46	48	44	40	41.5	21	31	34
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.3	1.0	1.5	1.4	1.0	0.47	0.78	1.56
Total P	mg/l	0.21	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.44	0.38	0.48	0.49	0.37	0.18	0.29	0.48
Total Cu	µg/l	33	29	42	35	28.9	14	23	44
Total Zn	µg/l	172	163	209	181	163	80	127	203
Total Pb	µg/l	20	22	28	20	22.3	11	17	27

Notes:

1. Constituent concentrations are based on flow-weighted averages modeled with PCSWMM 2000.

TABLE 4.9

PCSWMM Model Results Showing Constituent Concentrations for Developed Conditions with Street Sweeping One Day Prior to Storm

Concentrations for Each Headlands Watershed Under Developed Conditions With Street Sweeping One Day Prior to Storm[1]									
Constituent Modeled	**Units**	**A**	**B1**	**B2**	**B3**	**C**	**D**	**E**	**F**
TSS	mg/l	84	69	125	81	66.1	30	55	144
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	24	20	18.4	9	14	23
COD	mg/l	46	48	44	39	41.5	21	31	33
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.23	1.03	1.43	1.31	0.99	0.47	0.78	1.51
Total P	mg/l	0.20	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.43	0.38	0.47	0.45	0.37	0.18	0.29	0.47
Total Cu	µg/l	31	29	41	32	28.6	14	23	42
Total Zn	µg/l	165	163	203	164	162	80	127	194
Total Pb	µg/l	20	22	27	18	22.0	11	17	26

Notes:

1. Constituent concentrations are based on flow weighted averages modeled through PCSWMM 2000.

TABLE 4.10

PCSWMM Model Results Showing Constituent Concentrations for Developed Conditions with Street Sweeping Six Days Prior to Storm

Concentrations for Each Headlands Watershed Under Developed Conditions With Street Sweeping Six Days Prior to Storm[1]									
Constituent Modeled	**Units**	**A**	**B1**	**B2**	**B3**	**C**	**D**	**E**	**F**
TSS	mg/l	84	70	129	88	67.6	30	55	149
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	25	22	18.5	9	14	23
COD	mg/l	46	48	44	40	41.5	21	31	34
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.26	1.03	1.46	1.39	0.99	0.47	0.78	1.54
Total P	mg/l	0.21	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.44	0.38	0.48	0.48	0.37	0.18	0.29	0.48
Total Cu	µg/l	32	29	42	34	28.8	14	23	43
Total Zn	µg/l	170	163	207	176	163	80	127	201
Total Pb	µg/l	20	22	28	19	22.2	11	17	27

Notes:

1. Constituent concentrations are based on flow-weighted averages modeled through PCSWMM 2000.

TABLE 4.11

PCSWMM Model Results Showing Predicted Constituent Concentrations for Existing Conditions, Developed Conditions and Developed Conditions With BMPs – Dana Point Harbor Watershed

Concentrations for Headlands Project Watershed Draining to Dana Point Harbor[1]						
Constituent Modeled[2]	Units	Existing Watershed Conditions	Developed Watershed Conditions	Developed Watershed Conditions With BMPs[3] (1-day)	Developed Watershed Conditions With BMPs[4] (6-day)	Percent Reduction From Existing to Developed Watershed Conditions
TSS	mg/l	94	84	12	12	87%
TDS	mg/l	33	26	26	26	19%
BOD5	mg/l	26	24	7	7	72%
COD	mg/l	53	46	46	46	13%
Nitrate-N	mg/l	0.76	0.68	0.95	0.95	-24%
TKN	mg/l	1.4	1.3	0.7	0.7	53%
Total P	mg/l	0.22	0.21	0.13	0.14	39%
Dissolved P	mg/l	0.14	0.15	0.19	0.19	-38%
Total Cd	µg/l	0.51	0.44	0.32	0.32	37%
Total Cu	µg/l	38	33	16	16	59%
Total Zn	µg/l	204	172	27	28	87%
Total Pb	µg/l	25	20	3	3	88%

Notes:

1. Watershed A is the only project site watershed that drains to Dana Point Harbor.
2. Constituent concentrations are flow-weighted averages based on total pollutant load and cumulative flow for all watersheds draining to the receiving water, as determined by PCSWMM 2000.
3. Developed watershed conditions with street sweeping one day prior to storm and sand filter treatment prior to discharge into Dana Point Harbor.
4. Developed watershed conditions with street sweeping six days prior to storm and sand filter treatment prior to discharge into Dana Point Harbor.

TABLE 4.12

PCSWMM Model Results Showing Predicted Constituent Concentrations for Existing Conditions, Developed Conditions and Developed Conditions With BMPs - Strand Beach Watersheds

Concentrations for Headlands Project Watersheds Draining to Strand Beach[1]						
Constituent Modeled[2]	Units	Existing Watershed Conditions	Developed Watershed Conditions	Developed Watershed Conditions With BMPs[3] (1-day)	Developed Watershed Conditions With BMPs[4] (6-day)	Percent Reduction From Existing to Developed Watershed Conditions
TSS	mg/l	109	114	16	17	85%
TDS	mg/l	25	31	31	31	-26%
BOD5	mg/l	22	24	7.0	7.1	68%
COD	mg/l	36	44	44	44	-21%
Nitrate-N	mg/l	0.68	0.74	1.03	1.03	-53%
TKN	mg/l	1.26	1.37	0.73	0.75	42%
Total P	mg/l	0.21	0.22	0.14	0.14	35%
Dissolved P	mg/l	0.16	0.14	0.18	0.18	-15%
Total Cd	µg/l	0.41	0.46	0.33	0.34	19%
Total Cu	µg/l	35	39	18.6	19.1	46%
Total Zn	µg/l	170	195	31	31	82%
Total Pb	µg/l	22	26	3.8	3.9	83%

Notes:

1. Watersheds B1, B2, B3, and F drain to Strand Beach through three outfalls, each served by a sand filter.
2. Constituent concentrations are flow-weighted averages based on total pollutant load and cumulative flow for all watersheds draining to the receiving water as determined by PCSWMM 2000.
3. Developed watershed conditions with street sweeping one day before storm and sand filter treatment before discharge to Strand Beach.
4. Developed watershed conditions with street sweeping six days before storm and sand filter treatment before discharge to Strand Beach.

Total Kjeldahl Nitrogen Measurements of total Kjeldahl nitrogen (TKN) provide an accurate estimate of the total soluble organic nitrogen present in runoff or receiving water. As shown in Table 4.7, the range of TKN concentrations among the Project sub-watershed areas under existing conditions is 0.60 - 1.43 mg/L. Under developed conditions without BMPs in use, these predicted concentrations have a greater range of 0.47 - 1.56 mg/L (Table 4.8).

As shown in Table 4.11, the predicted concentration of TKN in the watershed draining to Dana Point Harbor is 0.7 mg/L, for the developed condition with BMPs in use, representing a substantial reduction of 53% from existing conditions. For the watersheds draining to Strand Beach, this predicted concentration ranges from 0.73 - 0.75 mg/L, representing a substantial reduction of 42% from existing conditions (Table 4.12).

There are no published guidelines for TKN concentrations in storm runoff or receiving water. However, as for dissolved phosphorus and nitrate, it is instructive to compare the predicted concentrations with those observed in storm runoff through essentially undeveloped upstream areas of the nearby Muddy Canyon and Emerald Canyon watersheds (Ford et al 2000). The ranges of these TKN concentrations in both upper canyon watersheds were 0.84 - 3.6 mg/L and may serve as a comparative standard for the area. All of the predicted TKN concentrations for the Project watersheds are either below or well within that range.

This indicates that TKN concentrations at the Project site would be relatively low and fully acceptable from an environmental standpoint. It also indicates that the Project BMPs will be effective in maintaining acceptable levels of TKN to the maximum extent practicable.

Significance of Biostimulatory Nutrient Chemicals Chemicals in runoff water containing phosphorus and nitrogen are considered as biostimulatory or "nuisance" constituents in storm runoff, rather than toxic constituents (CRWQCB 1994). This is because their primary effect, when present in sufficiently high concentrations, is to stimulate the growth and reproduction of algae and other aquatic plants. Nutrient biostimulation can degrade water quality when resulting algal blooms depress the dissolved oxygen concentration of the water; the death of fishes and other aquatic life can occur as a result. Algal blooms also can cause changes in the water such as coloration, increased turbidity, and floating algal mats and scum. This general condition produced by nutrients in excess is called eutrophication.

Eutrophication normally occurs in standing or gently flowing bodies of freshwater and in poorly circulated, fully enclosed bays and estuaries (unlike Dana Point Harbor) that receive excess nutrient concentrations entering in runoff. It is a commonly held misconception that these effects also occur or are likely to occur in open coastal ocean areas of southern California. While natural phytoplankton (plant plankton) blooms are a regular phenomenon in these ocean waters, there is no evidence at all in the scientific literature indicating that biostimulatory nutrients in storm runoff produce such blooms or other eutrophication effects on the open coast in southern California. Natural nutrient chemical concentrations are relatively low in coastal ocean areas during the winter period of storm runoff; as a result, phytoplankton and bottom-living algae rapidly use any additional nutrients entering coastal ocean water at that time. In addition, the effects of wave and surge action, longshore currents

and other oceanographic processes in the high-energy nearshore zone rapidly mix, dilute and transport nutrients entering the surf zone in storm runoff (Ford 1995, 1997; Ford et al 2000; Jenkins and Wasyl 2000). Clearly, these nearshore processes cannot be considered as a Project feature or BMP. Yet they are completely natural processes that serve to buffer and protect marine habitats against the potential effects of runoff constituents from both developed and natural coastal watersheds. It is important to recognize these facts in evaluating the potential effects of biostimulatory nutrient chemicals entering the ocean in runoff water.

The San Diego Basin Plan (CRWQCB 1994, p. 3-6) provides the following general and non-quantitative guidelines for phosphorus and nitrogen nutrient constituents in freshwater:

> Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.
>
> Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those that stimulate algae and emergent plant growth.

It is very clear from the concentrations of total and dissolved phosphorus, nitrate and TKN predicted for developed conditions, and with the proposed BMPs and other Project features in use, that all nutrient concentrations in the Project runoff and adjacent marine receiving waters will meet these guidelines fully. As a result, they will not produce any adverse ecological effects in the receiving water of Strand Beach or Dana Point Harbor. The Project design features proposed will control and maintain acceptable concentrations for all of these nutrient constituents to the maximum extent practicable.

BOD and COD Biochemical oxygen demand (BOD) is a measure of the amount of oxygen necessary to oxidize organic material that is degradable by microorganisms in the runoff or receiving water. It is reported as the amount of oxygen (mg/L) consumed in this process over a five-day period. Chemical oxygen demand (COD) is determined by measuring the equivalent quantity of an oxidizing agent necessary for degradation of the organic matter present. BOD and COD determinations are both used as collective measures of the amount of organic matter in the water. High BOD and COD values indicate high concentrations of this organic matter, as well as environmentally degraded or unbalanced conditions in the water at a site.

The predicted BOD values for existing conditions in the Project sub-watersheds ranged from 11 - 28 mg/L (Table 4.7). Under developed conditions, but without BMPs in use (Table 4.8), the predicted values have a reduced range (9 - 25 mg/L). The predicted COD values are reduced fairly substantially from the existing condition (26 - 57 mg/L) to the developed condition without any BMPs in use (21 - 48 mg/L) as shown in Tables 4.7 and 4.48 These predicted values show only a slight reduction with the addition of weekly sweeping (Tables 4.9 and 4.10).

For the watershed draining to Dana Point Harbor, the predicted BOD level for developed conditions and with sweeping and sand filtration in use is 7 mg/L, representing a very substantial reduction of 73% from the existing condition (Table 4.11). For COD, this predicted value is 46 mg/L, representing a 13% reduction from the existing condition (Table 4.11). Similarly, for the watersheds draining to Strand Beach, the predicted BOD levels for developed conditions with these BMPs in use are 7.0 - 7.1 mg/L, a substantial reduction of 68% from the existing condition (Table 2.12). For COD this predicted level is 44 mg/L, representing an increase of 21% over the existing condition. The most likely explanation for this is that it represents an artifact of the modeling process. No removal efficiency data are available for the effect of sand filters on COD. As a result, the predicted levels of COD are over-estimated by the model. In fact, a reduction of COD levels by the sand filters would be expected, parallelling those for BOD.

All of the predicted BOD levels (Tables 4.7 - 4.12) are below the water quality guidance value of 30 mg/L (USEPA 2000b). Predicted BOD values for developed conditions and with frequent street and parking lot sweeping (7 mg/L) are far below that 30 mg/L guidance value. The same is true for all of the predicted COD levels (Tables 4.11 - 4.12); they are substantially below the water quality guidance value of 120 mg/L (Table 4.6).

These results indicate that the predicted concentrations of organic matter would be normal in runoff and receiving waters associated with the Project, and that frequent sweeping of streets and parking lot surfaces will be a particularly valuable BMP for control of organic matter that otherwise might enter the runoff. They further indicate that the proposed BMP will maintain BOD and COD levels within acceptable limits to the maximum extent practicable.

Total Suspended Solids Predicted levels of total suspended solids (TSS) for existing conditions at the Project watershed sites have a range of 38-132 mg/L (Table 4.7). Those for the developed condition without BMPs have a larger range of 30 - 150 mg/L (Table 4.8).

In contrast, based on adding both weekly sweeping of streets and parking lots and the sand filters in the developed condition, the predicted TSS levels are substantially lower than for the other conditions (Tables 4.11 and 4.12). For the Project watershed draining to Dana Point Harbor, the predicted TSS level under developed conditions with sweeping and sand filtration in use is 12 mg/L, a very substantial reduction of 87% from the value of 94 mg/L for the existing condition (Table 4.11). For the watersheds draining to Strand Beach, the predicted TSS levels under developed conditions and with these BMPs are 16 - 17 mg/L, representing a similar, substantial reduction of 85% from the value of 109 m/L for the existing condition (Table 4.12).

Both of these BMPs are known to be very effective controls for solids that become entrained in runoff water. As shown in Tables 4.2 and 4.4, the removal efficiencies of sand filters for TSS are high, ranging from 8 - 98%, with an average efficiency of 81% (USEPA 1999). Sweeping is reported to reduce TSS levels by 31%, as shown in Table 4.5 (James and James 2000).

The water quality guidance value for TSS shown in Table 4.6 is 100 mg/L (USEPA 2000b). In the developed condition with no BMPs employed, two of the eight watershed areas (B2 and F) have predicted TSS levels that are slightly above this guidance value, with the remainder below it (Table 4.8). In contrast, with both weekly street and parking lot sweeping and sand filters employed, the predicted TSS levels (12 – 17 mg/L) are all substantially below the guidance value (Tables 4.11 and 4.12).

This indicates that by employing the proposed BMPs and other design features, TSS levels in runoff from the Project and in adjacent marine receiving waters will be maintained within environmentally sound and fully acceptable limits. It further indicates that these Project design features will maintain acceptably low TSS levels to the maximum extent practicable.

Total Dissolved Solids The predicted levels of total dissolved solids (TDS) under existing conditions among the watershed areas have a range of 19 - 36 mg/L (Table 4.7). Under developed conditions without BMPs, the predicted levels are slightly lower, with a range of 15 - 33mg/L (Table 4.8). The potential effect of the sand filters on TDS levels could not be incorporated into these predictions because no information is available for this constituent (Tables 4.2 - 4.4).

For the Project watershed draining to Dana Point Harbor, the predicted TDS level for developed conditions with BMPs is 26 mg/L, representing a reduction of 26% from existing conditions (Table 4.11). In contrast, the predicted TDS value for the watersheds draining to Strand Beach under developed conditions with BMPs is 31 mg/L, representing an increase of 26% over existing conditions. This predicted increase is most likely an artifact of the modeling process, because no removal efficiency value is available for sand filters (Tables 4.2 - 4.4). However, given that the predicted value of 31 mg/L is an order of magnitude lower than the most conservative water quality guidance value for TDS of 300 mg/L (CRWQCB 1994), it clearly does not represent a problem from a regulatory or environmental standpoint.

One water quality guidance value established in the San Diego Basin Plan (CRWQCB 1994; Table 3.2, p 3-22) for the Laguna area of the San Juan Hydrologic unit that includes Dana Point Headlands is 1000 mg/l (Table 4.6). This document also specifies a more conservative TDS guidance value of 300 mg/L for inland surface waters (CRWQCB 1994; Table C-1, p C-4). All of the predicted TDS values for existing and developed conditions are far below both guidelines (Tables 4.7 – 4.12).

As shown above, the modeling results indicate that weekly sweeping of streets and parking lot surfaces will be an important control feature. Other proposed Project features besides sweeping that control the passage of dissolved solids into the runoff water, including controlled irrigation and good housekeeping practices, probably will produce further reductions in TDS levels.

These results indicate that TDS levels in the runoff of the Project and that reaching the adjacent marine receiving waters will be maintained well within fully acceptable limits and will produce no adverse effects on beneficial use. They further indicate that the proposed

Project design features will maintain these acceptable levels of TDS to the maximum extent practicable.

Trace Metals Predicted total recoverable concentrations of the trace metals lead (Pb), copper (Cu), zinc (Zn) and cadmium (Cd) for the existing and developed Project watersheds are shown in Tables 4.7 – 4.12. Table 4.6 summarizes acute water quality guidance criteria values for four representative water hardness concentrations (100 – 400 mg/L calcium carbonate: H100 - H400). These guidance values for total trace metal concentrations were converted from the acute guidance criteria that are expressed as dissolved concentrations in the EPA California Toxics Rule (CTR) recently established by USEPA (2000a). The conversions were done using CTR protocols (USEPA 1997, 2000a).

As described in Appendix Section A, concentrations of the trace metals cadmium, copper, lead, and zinc, as well as others, are dependent on the hardness of the water in which they occur. Because of this, corrections must be made to adjust the water quality guidance criteria for these trace metals as a function of water hardness. The adjusted criteria for the total recoverable concentrations of these trace metals are shown in Table 4.6 for representative, specific hardness values of the freshwater runoff samples. The criteria values were calculated by using the standard equations and the constants described in USEPA (2000a). These corrected criteria values were the ones applied to the predicted data for the hardness-dependent trace metals analyzed in the Headlands study. Note that for water with a hardness value of 400 mg/L or greater, the CTR (USEPA 2000a) specifies that 400 mg/L is to be used as the ceiling value. Therefore, the water quality criteria values for the category H400 (400mg/L) shown in Table 4.6 apply to all samples with hardness values >400 mg/L.

The primary sources of calcium and magnesium in freshwater are their mineral forms that contain carbonate. Because of this, as water hardness increases there is a corresponding increase in the concentration of carbonate ions. These and the resulting bicarbonate and hydroxide ions can form weakly bound molecules, called complexes, with cadmium, copper, zinc, lead and other trace metal ions. This reduces the concentration of potentially toxic trace metal ions in the water. As a result, the concentrations of these metal ions that are biologically available are reduced, with a corresponding reduction in their potential toxic effects on aquatic organisms.

As shown in Table 2.3, hardness values for runoff water in the Project and adjacent watersheds during the 2000 baseline study had a range of 38-1300 mg/L of calcium carbonate. The mean value for the Project watersheds was 102 mg/L, while the mean for Project and adjacent off site watersheds combined was 271 mg/L. The latter figure probably is the most representative of what the mean freshwater hardness will be in the Project watersheds under developed conditions. Accordingly, the acute water quality guidance criteria are shown in Table 4.6 for representative hardness values of 100, 200, 300 and 400 mg/L calcium carbonate.

In addition, separate water quality criteria are provided for acute and chronic levels of toxicity to aquatic organisms (USEPA 2000a). The almost universally accepted approach is to apply only the acute toxicity criteria as guidance in evaluating constituents from storm

water runoff samples. This is because the exposures to chemical constituents during typical storm runoff in southern California are of relatively short duration, approximating those of 48-96 hour exposures in acute toxicity tests. That standard approach of using only acute water quality criteria was employed in evaluating the predicted trace metal concentrations for the Headlands watersheds.

The water quality objectives for trace metals provided in the California Ocean Plan (CSWRCB 1997; Table B) are expressed only as total recoverable concentrations (Table 2.8). Trace metals are the only runoff constituents modeled for which the California Ocean Plan provides specific water quality objectives. For seawater samples, these water quality objectives values do not require adjustment for hardness. The values listed in Table B of CSWRCB (1997) for the Instantaneous Maximum concentrations (Table 2.8) were employed as guidelines in these evaluations of predicted trace metal concentrations entering the surf zone and Harbor in storm runoff.

It is important for the reader to note that values exceeding the above criteria and guidelines do not necessarily indicate that a water quality problem exists, as they are employed only for guidance in the evaluation process (Lee and Jones-Lee 1995a-b). This is particularly true of values for trace metals in un-dissolved form that are adsorbed to fine suspended solids, because in most cases they are present in non-toxic forms and are not biologically available.

In general, the predicted concentrations of all four trace metals were somewhat higher in watershed areas of the Project that had correspondingly higher predicted total suspended solids levels (Table 4.7 - 4.10). This indicates, as also shown in the Headlands baseline water quality study and by Ford et al 2000, that substantial portions of the total metal concentrations are the less toxic ones adsorbed to fine suspended solids particles.

The predicted total concentrations of lead for existing conditions have a range among watershed areas of 14 - 28 μg/L (Table 4.7). These values are predicted to remain essentially the same in the developed condition, without BMPs, with a range of 11 - 28 μg/L (Table 4.8).

In contrast, for the developed condition with the weekly street and parking lot sweeping and sand filter BMPs in use, the predicted total concentrations of lead are substantially reduced (Tables 4.11 - 4.12. For Watershed Area A draining to Dana Point Harbor, the predicted total lead concentration under developed conditions and with these BMPs was 3 μg/L, a very marked reduction of 88% from the value of 25 μg/L predicted for existing conditions (Table 4.11). Similarly, for the watersheds draining to Strand Beach, the predicted total lead concentrations under these developed conditions with BMPs are 3.8 - 3.9 μg/L, a similar, very substantial reduction of 83% from the predicted value of 22 μg/L for existing conditions (Table 4.12).

One reason for this substantial reduction in total lead is its high level of removal by the sand filters. Barrett and Borroum (2001) reported a removal efficiency of 84%, while USEPA (1999) reported a median removal efficiency of 71% (Tables 4.3 and 4.4). Surprisingly, Barrett and Borroum (2001) also found that sand filters have a substantial effect in reducing the dissolved concentrations of lead by 50%. They offered no explanation for this, but it

probably is related to the dynamics of changes between dissolved and adsorbed forms of lead as the runoff water passes through the sand filters. In any case, this is a very important effect, because it indicates that the more toxic dissolved form of lead will be reduced by as much as 50% as the runoff passes through the filters and enters the receiving water.

Frequent sweeping of streets and parking lot surfaces is known to be very effective in removing lead and other trace metals adsorbed to the finer solids particles the sweeping also removes (Table 4.5). This makes frequent sweeping an important on site BMP that prevents adsorbed lead and other trace metals from becoming entrained in the runoff water.

As shown in Tables 4.6 - 4.12, all of the predicted total lead concentrations are far below the CTR acute water quality guidance criteria, even for a water hardness of 100 mg/L. This indicates that all of the predicted concentrations of lead, and particularly those following application of the two BMPs, will be environmentally sound and fully acceptable ones.

While the modeling predictions by URS Corporation (2001) do not include values of trace metals once they enter the marine receiving water, the predicted concentrations of these trace metals following treatment by the sweeping and sand filter BMPs (Tables 4.11 and 4.12) provide a "worst case" estimate of what they might be as they first enter the surf zone or Dana Point Harbor. The Instantaneous Maximum guidance criterion (Table 2.8) for lead in the California Ocean Plan (CSWRQB 1997; Table B) is 20 µg/L. The range of predicted total lead concentrations (3.0 - 3.9 µg/L) is substantially below that guidance value, indicating that lead entering these marine receiving waters would be well within acceptable regulatory limits and would have no adverse ecological effects. The effect of nearshore processes would quickly further reduce the lead concentrations well below the predicted ones, as shown in the Headlands baseline study (Table 2.6) and by Ford et al (2000).

The total concentrations of copper predicted for the existing condition have a range within Project sub-watershed areas of 17 - 39 µg/L (Table 4.7). For the developed condition, with no BMPs in use, the predicted values are somewhat higher overall (range 14 - 44 µg/L), as shown in Table 4.8.

In contrast, the predicted total copper concentrations are lower in the developed condition employing frequent sweeping and sand filtration (Tables 4.11 and 4.12). For the Watershed Area A draining to Dana Point Harbor, the predicted total copper concentration of 16 µg/L for developed conditions with sweeping and sand filtration in use represents a substantial reduction of 59% from the value of 38 µg/L predicted for the existing condition (Table 4.11). Similarly, for the watersheds draining to Strand Beach, (Table 4.12) the predicted total copper concentrations under these developed conditions are 18.6 - 19.1 µg/L, representing a substantial reduction of 46% from that of the existing condition (35 µg/L).

As shown in Tables 4.2 - 4.4, the reported removal efficiencies of sand filters for total copper have a wide range (22 - 84%), with a median efficiency of 34% (USEPA 1999). In addition, Barrett and Borroum (2001) reported a removal efficiency of 19% for the much more toxic dissolved form of copper in the sand filter evaluations they conducted. This is an extremely important effect because it indicates that the filtration process will remove a substantial amount of the potentially toxic dissolved copper. Together, the evidence indicates that the

four sand filters proposed will be a very important Project feature in controlling both total and dissolved concentrations of copper.

Frequent sweeping of streets and parking lot surfaces also is known to be an effective on site control for copper, as it is for other trace metals adsorbed to the fine solids particles targeted by sweeping (Table 4.5). In addition, Project features such as sound storage and handling of products containing copper, as well as good housekeeping practices, can be expected to reduce dissolved and total copper concentrations in the runoff below those predicted by the model.

As shown in Table 4.6, the CTR acute water quality guidance value for total copper in runoff water with a hardness of 100 mg/L is 14 µg/L (USEPA 2000a). The total copper concentrations of 16.0 - 19.1 µg/L predicted for the developed condition, with sweeping and sand filters in use are slightly higher than that guidance value. However, the guidance values for total copper at freshwater hardness levels of 200 - 400 mg/L (Table 4.6) are at or well above those predicted under developed conditions and employing the two BMPs (Tables 4.11 and 4.12). Baseline sampling indicated that the mean hardness of runoff water in and adjacent to the Project site was 271 mg/L (Table 2.3). Because of this, the most appropriate CTR acute water quality guidance value for total copper is 347 µg/L. All of the predicted total copper concentrations shown in Table 4.7 - 4.12 are well below that value.

In combination, this information indicates that with the proposed BMPs and other Project features in place, total concentrations of copper would remain within environmentally sound and fully acceptable limits. The information further indicates that sweeping and sand filtration will be very effective control measures for copper.

Similarly, "worst case" estimates of total copper concentrations at the point where they first enter the surf zone or Dana Point Harbor (range 16.0 - 19.1 µg/L) are well below the Instantaneous Maximum water quality objective of 30 µg/L (Table 2.8) specified by the California Ocean Plan (CSWRCB 1997; Table B). Because the copper and other trace metals in runoff quickly become diluted, mixed and transported away by nearshore processes, as shown in the Headlands baseline study (Table 2.6) and that of Ford et al (2000), copper actually will be present in the receiving water at lower concentrations than those predicted by these "worst case" estimates.

The total concentrations of zinc predicted by the modeling for existing conditions have a range among sub-watershed areas of 101 - 212 µg/L. (Table 4.7). Under developed conditions with no BMPs, the predicted concentrations have a wider range of 80 - 209 (Table 4.8). In contrast, the predicted total zinc concentrations under developed conditions with weekly sweeping and sand filters in use are somewhat lower, as shown in Tables 4.11 and 4.12.

For the Watershed Area A draining to Dana Point Harbor (Table 4.11), the predicted total zinc concentrations for developed conditions with sweeping and sand filtration are 27 – 28 µg/L, a very substantial reduction of 87% from the predicted value for existing conditions. (204 µg/L). Similarly, for the Project watersheds draining to Strand Beach, the predicted total zinc concentration for developed conditions with these BMPs is 31 µg/L, representing a

reduction of 83% from the predicted value of 170 µg/L for existing conditions (Table 2.12). As for lead and copper, these are very significant reductions.

Total concentrations of zinc will be reduced both by frequent sweeping and by sand filtration (Tables 4.2 - 4.5). Given that zinc is one of the most prominent elements accumulating on street and parking lot surfaces from tire and brake wear, as well as other vehicle sources, weekly sweeping of these surfaces will be a particularly important Project feature. Removal efficiencies of sand filters for total zinc are high, ranging from 33 – 91% (Tables 4.5 – 4.6) with a median efficiency of 69% (Tables 4.2 - 4.4).

Surprisingly, as for lead and copper, the concentrations of dissolved zinc were reduced by an estimated 77% in the sand filters evaluated by Barrett and Borroum (2001), as shown in Table 4.3. This makes the use of sand filters a particularly important Project feature, because they are likely to remove a substantial part of the potentially toxic dissolved zinc that may be present in the runoff.

As shown in Table 4.6, the CTR water quality guideline for total zinc is 120 µg/L for a freshwater hardness of 100 mg/L, and 220 µg/L for a hardness value of 200 mg/L. All of the predicted total zinc concentrations for the developed condition with BMPs in use are lower than both of these CTR acute water quality guidance values. The mean freshwater hardness from runoff in and directly adjacent to the Project site was 271 mg/L (Table 2.3), for which the CTR acute water quality guideline for total zinc is 279 µg/L. All predicted concentrations of total zinc are substantially lower than that guideline.

The Instantaneous Maximum water quality objective for total zinc in marine receiving water specified in the California Ocean Plan is 200 µg/L (CSWRCB 1997; Table B). All predicted concentrations of total zinc entering the surf zone at Strand Beach and in Dana Point Harbor (27 - 31 µg/L) are well below that guideline (Tables 4.11 and 4.12).

In combination, this evidence indicates that concentrations of zinc from Project runoff will be maintained within fully acceptable limits. The evidence further indicates that zinc concentrations in storm runoff entering the ocean and Dana Point Harbor will cause no adverse ecological effects.

The predicted concentrations of total cadmium are uniformly very low for all site conditions. The overall range of values is 0.18 - 0.51 µg/L (Tables 4.7 - 4.12). For the Watershed Area A draining to Dana Point Harbor (Table 4.11), the predicted total cadmium concentration under developed conditions and with sweeping and sand filtration is 0.32 µg/L, representing a 37% reduction from the existing condition. Similarly, for Project watersheds draining to Strand Beach, the predicted concentrations under developed conditions with these BMPs are 0.33 - 0.34 µg/L, representing a 19% reduction from existing conditions. As shown in Table 4.2, the removal efficiency of sand filters for cadmium is 26%. All of these values are far below the CTR acute water quality criterion of 5 µg/L for freshwater hardness of 100 mg/L. They are also farther below those criteria at higher hardness levels (Table 4.6).

Similarly, all of the predicted concentrations of total cadmium entering the Strand Beach surf zone and Dana Point Harbor (Table 4.4) are very far below the Instantaneous Maximum

water quality objective of 10 µg/L (Table 2.8) established by the California Ocean Plan (CSWRCB 1997; Table B).

In combination, this evidence indicates that cadmium concentrations will be present at very low levels in runoff of the Project watersheds, and they will be maintained within fully acceptable limits by the sand filtration and other Project features. As a result, there will be no adverse ecological effects of this trace metal from Project runoff into the ocean and Harbor receiving waters.

The evidence presented above for the four trace metals lead, copper, zinc and cadmium indicates very clearly that the concentrations of all will be reduced very significantly in storm runoff by the action of frequent street and parking lot sweeping and by the use of sand filters. These reductions will maintain the concentrations of the trace metals well below established water quality guidelines. The evidence further indicates that these BMPs, together with other non-structural BMPs proposed for the Project, will be effective in reducing and maintaining these trace metal concentrations within environmentally sound limits to the maximum extent practicable. As a result, the four trace metals will not have any adverse marine ecological effects or adverse effects on other beneficial uses in the watershed or in the receiving waters of Dana Point Harbor or Strand Beach.

Pesticides and Herbicides No modeling predictions were made of possible pesticide and herbicide concentrations in the Project watersheds, because adequate EMC data do not exist. The results of the Headlands baseline study (Tables 1.1 and 2.5) found no concentrations of 26 organophosphorus pesticide compounds present above the laboratory detection limits, suggesting that they probably do not represent a problem under existing conditions.

The EPA has recently banned the use of chlorpyrifos (used in a variety of insecticides and for termite control) and is in the process of banning and phasing out the use of the insecticide compound diazinon. These are the two organophosphorus pesticides of greatest concern in runoff from coastal watersheds. By the time the Project is established, these two compounds should be virtually non-existent in storm runoff.

In addition, many of the proposed non-structural BMPs for the Project are directed at effective control of pesticides and herbicides. These include public education and awareness programs, controls on the use of banned compounds, procedures for the proper storage and application of approved compounds and the use of efficient irrigation to reduce runoff from treated areas.

Frequent sweeping of parking lot and street surfaces should be an effective Project feature by removing pesticide and herbicide chemicals associated with accumulated sediment, grass clippings and other plant debris. There is no information available concerning the possible removal of pesticides and herbicides by sand filtration. However, in common with sweeping, sand filters may help to remove these compounds if they are associated with debris and with suspended solids (Tables 4.3 - 4.4).

Based on this information, it appears that pesticides and herbicides will be controlled within fully acceptable limits. Accordingly, there should be no adverse ecological effects or effects

on other beneficial uses caused by these compounds in runoff from the Project into the adjacent marine receiving water.

Pathogen Indicator Bacteria As described in Section 2.4 and Appendix A of this Technical Report, regulatory guidelines for indicator bacteria, as stated in the San Diego Basin Plan and the California Ocean Plan, are not applied to counts of those bacteria during storm runoff within the period November 1 – March 31 (Monica Mazur, OCHCA, pers. comm., July 2001). During that period of the year, these regulatory standards are applied only to samples taken following storms and during non-storm conditions (see, for example, Tables 2.9 - 2.11). However, they are applied to both storm and dry-weather conditions during the AB411 period, which is April 1 – October 31. This is the approach employed by the Orange County Health Care Agency, which has responsibility for the Dana Point region and the other coastal areas of Orange County (Monica Mazur, pers. comm., July 2001).

Dr. Barbara Hemmingsen, a research specialist in aquatic microbiology at SDSU, has observed (Ford et al 2000) that when rain falls on coastal watersheds, the numbers of total coliforms, fecal coliforms and other bacteria increase markedly and rapidly in the runoff as water, soil, feces, organic debris and other materials containing them are washed into the drainage paths. To the layperson, such major increases in numbers of bacteria are alarming. However, essentially this same process occurs in all undeveloped and variously developed coastal waters of southern California. For example, the ranges and means of pathogen indicator bacteria counts were found to be very similar during storm runoff in 2000 at Los Trancos and Muddy Canyons on the Newport Coast, in Emerald Canyon (Ford et al 2000), and in the Project watersheds. In addition, counts of pathogen indicator bacteria following and between storms have been found not to differ significantly among relatively undeveloped watersheds and those of moderate to very dense development along the coast from Corona Del Mar to southern Laguna Beach (PBS&J 1999). This suggests that the process is relatively independent of the level of development and much more closely tied to the great variety of natural and human-induced sources of bacteria in the watersheds.

Detailed discussions of pathogen indicator bacteria in the context of the Dana Point area and Dana Point Harbor are provided in Appendix Section A.2 and Section 2.4 of this Technical Report. There is considerable interest in this topic because of problems with high indicator bacteria counts in portions of Dana Point Harbor.

Counts of indicator bacteria in runoff have been sufficiently elevated in recent years that periodic closure of Baby Beach was necessary to protect public health. Subsequent investigation by the OCHCA Division of Environmental Health and the Watershed and Coastal Resources Division of the Orange County PFRD indicated that the high coliform levels were attributable to eddy conditions at Baby Beach, bird populations at the beach and to bacteria entering in water from urban runoff (Tom Rossmiller, PFRD, pers. comm., 2001). Dana Point Harbor is on the most recent (1998) list of sites having high coliform counts under Section 303a of the Federal Clean Water Act (CWA). The County has taken steps to reduce the potentially harmful levels of fecal pathogens entering the Harbor by installing special devices that detain runoff. This is done primarily by collecting and holding sediment and other matter until it is removed, or until testing shows that indicator bacteria counts do

not exceed established public health standards. Outlet A of the Project watershed (Figure 4.1) is one of the sites where this control is employed.

No predictions of bacterial concentrations based on modeling were attempted by URS Corporation. The reasons for this are described in Part 2 of this technical report (URS Corporation 2001). Evaluations of different sand filter installations described by USEPA (1999), as summarized in Tables 4.2 - 4.4, indicated that they have removal efficiencies for bacteria ranging from 37 – 78%. Based on this evidence, the use of sand filters in the Project will produce significant reductions of pathogen indicator bacteria during storm runoff.

Frequent sweeping of street and parking lot surfaces is expected to provide at least a moderate contribution in removing total and fecal coliforms and other pathogen indicator bacteria on site, before they become entrained in the runoff. This probably occurs primarily through the removal of bacteria living in animal waste, plant debris, and other particulate matter suspended and drawn into the proposed vacuum sweepers. However, there are no data available in the literature to provide quantitative reduction estimates.

Although they are also difficult to quantify, other proposed Project features are expected to have a positive effect in reducing and controlling the counts of pathogen indicator bacteria, as well as the other truly pathogenic bacteria and viruses of direct concern to human health. These include public education and awareness programs, regular cleanup and proper disposal of domestic animal wastes, grass cuttings and other plant debris, proper disposal of food preparation wastes, disposal of restaurant and other commercial wash water into the sanitary sewer, proper maintenance of the wastewater drains and sanitary sewer systems, maintenance of storm drain structures, as well as enforcement of the prohibition on washing or introducing organic waste and debris into storm drain openings during non-storm conditions.

A Project feature of major importance is the diversion of dry-weather and other non-storm runoff from the Project drainage system into the existing sanitary sewer. At times when this diversion cannot be operated, the detention and flow of runoff through the sand filters will serve as an automatic and very effective backup. The result of this diversion will be the virtual elimination of non-storm runoff containing bacteria, viruses and chemical constituents into Dana Point Harbor at outlet A and into the ocean along Strand Beach (Figure 4.1).

The proposed Project features will be very effective in reducing and maintaining bacterial counts at substantially reduced levels, both through removal at their sources and by the filtration and diversion processes described above for bacteria in the runoff water.

While it is not possible to eliminate pathogen indicator bacteria, such as fecal coliforms, from storm water runoff, the evidence presented above indicate that these bacterial counts can be reduced very substantially (37 - 78%) by employing the prposed sand filters. It is very clear that use of sand filters in conjunction with the other non-structural PMBs proposed for the Project, as discussed above, will reduce bacteria counts in the watershed and marine receiving waters to the maximum extend practicable. As a result, the potential adverse effects on beneficial uses of Dana Point Harbor and Strand Beach from Project runoff will be significantly reduced or eliminated.

4.5 CONCLUSIONS CONCERNING WATER QUALITY AND MARINE ECOLOGICAL IMPACTS

The evaluations discussed in preceding Sections 4.1 - 4.4 consider in detail the design features of the Project and its drainage and management system. Of particular importance are the widely spaced outlets carrying relatively low runoff flows to the receiving water, the use of sand filters and their associated detention capabilities and high removal efficiencies for many runoff constituents, and diversion of first flush runoff away from the ecologically sensitive marine habitats and marine refuge areas close to the Headlands Promontory. In addition, the proposed diversion of non-storm runoff and its associated bacterial and chemical constituents into the sanitary sewer is a key Project feature.

Additional structural and non-structural BMPs for both the construction and post-construction phases of the Project are described and evaluated. Finally, based on the forgoing information, a baseline water quality study, and the results of flow-based modeling to predict concentrations of 13 runoff constituents, evaluations are made to compare those concentrations with agency water quality objectives and guidelines and to consider the related effectiveness of the proposed BMPs and other Project design features.

The results of these evaluations show that under developed conditions, with the sweeping and sand filters employed, all of the 12 physical and chemical constituents for which modeling predictions were made have concentrations that are well below the specific guidance values provided in appropriate agency water quality guidelines. This indicates very clearly that these runoff constituents would have no adverse ecological effects, either in the Project watersheds or in the adjacent receiving waters of Dana Point Harbor and Strand Beach. It further indicates that these constituents would have no adverse effects on other beneficial uses in the receiving waters, as those are specified in the San Diego Basin Plan and the California Ocean Plan.

The results from the modeling show that, with the exception of dissolved phosphorus and nitrate (and of TDS and COD in one instance), the predicted concentrations of these 13 constituents in the developed condition will be very substantially reduced by the combination of frequent street and parking lot sweeping and the removal effects of the sand filters. These predicted reductions are: 85-87% for TSS, 19% for TDS, 68-72% for BOD, 13% for COD, 43-53% for TKN, 35-39% for total phosphorus, 19-37% for total cadmium, 46-59% for total copper, 82-87% for total zinc and 83-88% for total lead. Predicted removal efficiencies of bacteria by these sand filters (37 – 78%) further indicate that numbers of bacteria in storm runoff will be reduced very substantially. The use of additional non-structural BMPs and other design features described in this section, but for which specific efficiencies are not available, will further reduce the concentrations of these constituents. This evidence indicates that the proposed Project design features will be very effective in maintaining the concentrations of these constituents within fully acceptable ranges from an environmental and regulatory standpoint.

Concentrations of dissolved phosphorus and nitrate (as N) are predicted to increase by 15-38% and 24-53%, respectively, as the result of the sand filtration process. These predicted increases would most likely be due to the disassociation of organic or particulate-bound

nutrients as the runoff water passes through the filters. However, the modeling does not take into account the fact that increases in dissolved phosphorus and nitrate during sand filtration are a function of the total phosphorus and TKN concentrations present. As a result, the series of additional proposed non-structural BMPs and other Project design features that remove total phosphorus, particulate-bound nutrients and TKN from the watershed upstream of the filters would have the end result of reducing dissolved phosphorus and nitrate concentrations below the levels predicted. In one instance each, under developed conditions with BMPs, the levels of TDS and COD are predicted to increase in the Strand Beach watershed by 26 and 21%, respectively. These predicted increases probably are simply artifacts of the modeling process, because no removal efficiencies for TDS and COD by sand filters are available.

Despite these predicted increases for dissolved phosphorus, nitrate, TDS and COD, all of the resulting predicted values are very far below the applicable agency water quality guidelines. This indicates clearly that the levels of these runoff constituents will have no adverse ecological effects or adverse effects on other beneficial uses in the watershed or receiving waters.

It is important to recognize the that regulatory guidelines for indicator bacteria, as stated in the San Diego Basin Plan and the California Ocean Plan, are not applied to counts of those bacteria during storm runoff itself. These regulatory guidelines are applicableonly to periods following storms and during non-storm conditions. This is the approach normally employed by the Orange County Health Care Agency.

When rain falls on coastal watersheds, the numbers of total coliforms, fecal coliforms and other bacteria increase markedly and rapidly in the runoff as water, soil, feces, organic debris and other materials containing them are washed into the drainage paths. To the layperson, such major increases in numbers of bacteria are alarming. However, essentially this same process occurs in all undeveloped and variously developed coastal waters of southern California. For example, the ranges and means of pathogen indicator bacteria counts are very similar during storm runoff at Los Trancos and Muddy Canyons on the Newport Coast, in Emerald Canyon, and in the Project watersheds. In addition, counts of pathogen indicator bacteria following and between storms have been found not to differ significantly among relatively undeveloped watersheds and those of moderate to very dense development along the coast from Corona Del Mar to southern Laguna Beach. This indicates that the process is relatively independent of the level of development and much more closely tied to the great variety of natural and human-induced sources of bacteria in the watersheds.

Although they are difficult to quantify, other proposed BMPs and Project features besides street and parking lot sweeping and sand filtration (removal efficiencies of 37 – 78%) are expected to have a significant effect in reducing and controlling the counts of pathogen indicator bacteria, as well as the other truly pathogenic bacteria and viruses of direct concern to human health. These include public education and awareness programs, regular cleanup and proper disposal of domestic animal wastes, grass cuttings and other plant debris, proper disposal of food preparation wastes, disposal of restaurant and other commercial wash water into the sanitary sewer, proper maintenance of wastewater drains and sanitary sewer systems, maintenance of storm drain structures, as well as enforcement of the prohibition on washing

or introducing organic waste and debris into storm drain openings during non-storm conditions.

A related Project feature of major importance is the diversion of dry-weather and other non-storm runoff from the Project drainage system into the existing sanitary sewer. At times when this diversion cannot be operated, the detention and flow of runoff through the sand filters will serve as an automatic and very effective backup. The result of this diversion will be the virtual elimination of non-storm runoff containing bacteria, viruses and chemical constituents into Dana Point Harbor at Watershed Outlet A and into the ocean along Strand Beach. As a consequence, bacterial counts from Project runoff entering these receiving waters would remain below regulatory guidelines applied by the OCHCA

While it is not possible to eliminate pathogen indicator bacteria, such as fecal coliforms, from storm water runoff, the results of this evaluation indicate that these counts can be reduced very substantially by using sand filters. It is very clear that these sand filters, in conjunction with the other non-structural BMPs proposed for the Project, will reduce fecal bacteria counts in the watershed and marine receiving waters to the maximum extent practicable. As a result, the potential adverse effects on beneficial uses of Dana Point Harbor and Strand Beach from Project runoff will be significantly reduced or eliminated.

The results of these evaluations indicate that implementation of this combination of BMPs and other Project design features would reduce and control the concentrations of runoff constituents to the maximum extent practicable. The results further indicate that the use of these Project features would reduce the potential impacts involving water quality in the runoff and in the marine receiving waters to less than significant levels. In view of this, any potential ecological impacts to the adjacent marine habitats and marine life refuges also would be reduced to less than significant levels.

APPENDIX SECTION A

BASELINE STUDY OF WATER QUALITY DURING STORMS

The Project site is largely vacant and contains partially developed areas not now in use. Because of this, monitoring of storm water and dry-weather runoff has not been required for regulatory purposes. Baseline studies of water quality were conducted by Rivertech Inc under the direction of Dr. Richard F. Ford, employing samples taken during storm runoff in 1999-2000 at representative locations within and adjacent to the Project site. The methods, results and discussion of this work are presented in detail in this Appendix. A summary discussion of the study is provided in Part 1, Section 2. Also shown in that Section are Figure 2.1 and Tables 2.1-11 to which reference is made in this detailed study description.

A.1 STUDY METHODS

During the period January–April 2000, samples were taken from runoff water for three representative storm events. These included the largest storm of the 1999–2000 rainfall season (2-21-00) and the first substantial rainfall of the season (1-25-00). The nine sampling stations at which water quality samples were taken are shown in Figure 2.1 (part 1, Section 2). Six of these (Station Pairs A, B and C) were located along the Strand Beach area of the proposed Project. The first of each pair of stations was located at the outlet of the freshwater drainage area near the point where the runoff discharged to the beach (A1, B1, C1), while the second of each pair was located at the point where that storm water runoff entered the surf zone and mixed with ocean water (A2, B2, C2). Stations A1 and A2 were located at and near the discharge point of the Orange County storm water drain (Figures 1.2 and 2.1). This large drainage system is located within the public access stairway structure that extends between the Orange County Salt Creek Beach Parking Lot and the beach. It is very important to note that the runoff reaching Stations A1 and A2 was not from the Project site. Future runoff from the Project also will not pass through this drainage path. Station C1 was located at the outlet of a gully leading to the Strand Beach area and Station C2 at the surf zone where runoff from that gully reached the ocean. An additional site, Station C, was located downstream of the County-owned parking lot (Figure 2.1). Runoff from Station C passed through the Project site before reaching Stations C1 and C2 (Figures 1.2 and 2.1). Runoff from the southern area of the Project site was sampled at Station D1, located in the existing roadside "V" ditch drainage structure near the upper end of Cove Road (Figure 2.1) leading down to Dana Point Harbor. The runoff from the road passes into a storm drain that discharges into the Harbor. Station D2 was located at that point of discharge (Figure 2.1).

During the three representative storm events in 2000 (sufficient rainfall to produce runoff to the beach or harbor in two or more of the drainages) a staff member of Rivertech Inc took water grab sample series at all stations where there was runoff flow. For each storm event sampled, a set of water grab samples for analyses of constituents was taken at each station as close as possible to the time when the substantial, near-peak flow of runoff occurred there. A second set of constituent samples was taken at each station 2 to 3.5 hours after the first. In the case of the freshwater stations, samples were taken only if runoff flow was present at those subsequent sampling times. Because of conditions during storms and the difficulty of access

to some stations, the timing between samples at a given station sometimes varied, but was always within the range of 2 to 3.5 hours.

In addition to the water sampling described above, salinity samples were taken at surf zone Stations A2, B2, and C2, and at Harbor Station D2. These were obtained at the same time and water depth as the samples described above. Second and third sets of salinity samples were obtained at approximately one-hour intervals after the first set. Finally, a fourth set of salinity samples was taken 24 hours after the first set. The purpose of this time series was to determine the level and duration of reduced salinity produced by storm runoff and to assess the degree of mixing and transport of runoff constituents by nearshore oceanographic processes (eg wave action, surge and longshore currents).

In sampling at the freshwater stations, the individual bottles and the sterile containers used for bacteriological samples were filled directly from the runoff flow. Care was taken to place the sampling containers only in flowing water above the bottom, so that sediment or debris from the drainage bed was not introduced into the sample. In cases where the bottom sediment of the flow path was disturbed by walking through it, sampling was shifted just upstream to avoid introducing unrepresentative sediment-water mixtures into the containers.

In the surf zone, a composite water sample was taken with a clean, disposable polyethylene bucket, and all sample containers except those for bacteria were filled from it. All water quality samples in the surf zone and in the harbor were taken by wading out as far as possible with safety, to an average water depth of approximately three feet. Then, the samples were obtained within six inches of the water surface.

These water samples were taken and held in labeled polyethylene or amber glass bottles, using the standard treatment and refrigeration methods specified by the primary analytical laboratory, Del Mar Analytical of Irvine, CA. Water samples for analysis of pathogen indicator bacteria were taken using sterile plastic containers provided by the laboratory. The field technician completed chain of custody forms for all samples, which were then placed on ice and transported to the laboratory as soon as possible after sampling and within the established holding time limits specified by the analytical laboratories.

The physical, chemical and bacterial constituents of runoff water and ocean water analyzed in the study are shown in Table 2.1 (Part 1, Section 2), together with the specific analytical methods that were used and the normal analytical reporting limits attained by the laboratories. Del Mar Analytical and two affiliated laboratories (Sequoia Analytical and Sierra Analytical) analyzed all but one of the constituents of storm water samples taken at the freshwater and ocean stations. These laboratories are all State certified. Salinity was analyzed by James Zimmer at San Diego State University. Salinity samples were measured to the nearest 0.01 ppt, using a Plessey Model 6230N oceanographic laboratory salinometer accurate to ±0.001 ppt, which compares the sample to standard seawater. This instrument was calibrated prior to each series of sample runs. Standard Quality Assurance/Quality Control (QA/QC) procedures were employed in all of this laboratory work.

Detection limits employed by Del Mar Analytical and affiliated laboratories for analyses of all the chemical constituents were lower than the acute toxicity criteria specified in the California Ocean Plan (CRWQCB 1997) and for freshwater as specified in the EPA Proposed California Toxics Rule (USEPA 1997) and the subsequent California Toxics Rule (USEPA 2000a). Selection of the constituents for the study was based in part on information provided in U.S. Environmental Protection Agency guidelines (USEPA 1992, 1996) and from recommendations by staff of the Storm Water Group at the San Diego Regional Water Quality Control Board and water quality specialist Bruce Moore of the Orange County Public Facilities and Resources Department (pers. comm., 1999).

A.2 STUDY RESULTS AND DISCUSSION

The dates of the three storm events sampled and the total rainfall amounts for each storm are shown in Table 2.2. These data are from the Palisades Reservoir rain gauge station nearby in San Clemente, CA (OCPFRD No 186), recommended as the most representative location by Mel Newman of the Orange County Public Facilities and Resources Department (pers. comm., 2001).

The relatively small storm of 1-25-00 (0.39 inch) was the first of the season. As shown in Table 2.2, it produced no runoff flow at Stations B1 and C1 or into the surf zone at Stations B2 and C2. However, because of first flush effects at the start of the storm season, it is an important element of the study. The second event sampled on 2-21/22-00 was the largest storm of the 1999-2000 season at this location (2.20 inches). This storm produced runoff at all nine stations, but runoff was of relatively short duration at Stations B1 and B2 (Table 2.3). The third storm event sampled on 4-17-00 was of moderate size (0.73 inch). It produced no runoff flow at Stations B1 and B2. One reason for the limited runoff at Stations B1 and B2 was the degraded condition of drainage structures leading to the B1 site.

The results of the water quality analyses of physical and chemical constituents for these stations are shown in Tables 2.3-2.7 (Part 1, Section 2). They are: total dissolved solids, total suspended solids, and freshwater hardness (Table 2.3); total phosphorus, dissolved phosphorus, and oil and grease (Table 2.4); nitrate and nitrite (as N), total Kjeldahl nitrogen, and the 26 organophosphorus pesticides (Table 2.5); total recoverable concentrations of the trace metals cadmium, copper, and lead (Table 2.6) and of zinc, chromium (III), and nickel (Table 2.7). Shown in Table 2.8 are the water quality guidance values against which these concentrations of freshwater and seawater constituents were compared. Also shown in Table 2.8 are the reference sources of these agency guidelines.

Data for total silver were not included because this trace metal was not detected above reporting limits (ND) in any samples. In addition, data for pH, specific conductance of freshwater, and seawater salinity are not summarized in table form. Measurements of these three constituents for all stations were well within typical and normal limits for southern California watersheds (URS Greiner Woodward Clyde 1999; Ford et al 2000). Data for pH were well within regulatory guidelines of the San Diego Basin Plan (CRWQCB 1994), EPA Parameter Benchmark guidelines (USEPA 2000b; Table 3, p 64768), and the California Ocean Plan (CSWRCB 1997).

In these tables the range and mean of values are shown for each station and sampling date. While based on a limited number of samples, those ranges and means for each station and storm event provide useful summary information about existing conditions of water quality at station sites within the Project (B, C and D station series). In addition, the data for Stations A1 and A2 provide baseline information on water quality conditions introduced directly adjacent to the northern boundary of the Project site by the Orange County storm water drain system (Figures 1.1 and 1.2). This drainage carries storm and dry-weather runoff only from land areas outside the Project boundaries, and this will continue to be the case after completion of the Project. However, it is important to consider water quality conditions introduced by this relatively large off site drainage, because they contribute runoff constituents to the beach and surf zone at the northwestern boundary of the Project site on Strand Beach (Figures 1.1, 1.2 and 2.1), and add to background conditions of water quality there.

Grand mean values are given for the data obtained at Stations B1, C, C1 and D1 (all freshwater sampling sites within the Project boundaries) and at Stations B2, C2 and D2 (all surf zone or Harbor sites sampled that receive runoff from the proposed Project). These grand means, combining data from all three storm events, provide an overall representation of baseline water quality conditions within the Project boundaries. As described above, Stations A1 and A2 are associated with the Orange County drainage system that carries runoff from areas outside the Project. Therefore, data from those two stations were omitted in calculating grand means for the Project site.

In calculating the means shown in Tables 2.3-2.7, non-detect (ND) values were assigned a small value of one-half the laboratory reporting limit for that constituent (Table 2.1), following conventional practice (Helsel and Hirsch 1992, Gonzalez et al 1998). In cases where all measured values were ND, the resulting mean also was simply recorded as ND.

TOTAL DISSOLVED SOLIDS

As shown in Table 2.3, the values for total dissolved solids (TDS) at freshwater runoff stations (B1, C, C1 and D1) ranged from 120-1300 mg/L, with a mean of 409 mg/L. The values for total dissolved solids (TDS) were considerably higher at Station A1 (off site runoff through Orange County Drain) than at stations B1, C, C1 and D1 within the Project site (Range 1300-4700 mg/L).

A logical explanation for this difference is that TDS varies considerably from one site to another. In addition, the somewhat degraded existing condition of some watershed features on the Project site may have contributed to the differences in TDS values observed. With one exception (Station C1; 4-17-00), all of the TDS values for freshwater runoff from the Project sites (Table 2.3) were well below the benchmark water quality objective of 1000 mg/l specified for the Laguna Hydrologic Unit in the San Diego Basin Plan (CRWQCB 1994). This Plan further specifies that the 1000 mg/L concentration not be exceeded more than 10 percent of the time within a one year period. These TDS concentrations also are well within

the range of values reported for freshwater runoff sites in Los Trancos and Muddy Canyons on the Newport Coast and in Emerald Canyon at Laguna Beach (Ford et al 2000).

The TDS values for the surf zone (Stations A2, B2, C2) and Dana Point Harbor (Station D2) are typical and normal for the nearshore ocean during storm conditions. They are very similar to TDS levels during and following storms reported by Ford et al (2000) for Emerald Cove in Laguna Beach and along the Newport Coast, both located near the Dana Point Headlands site. The California Ocean Plan (CSWQCR 1997) does not provide any specific guidelines for TDS.

The TDS levels observed at the Project site are within acceptable guidance criteria, to the extent that these are specified by the San Diego Basin Plan and the California Ocean Plan. The proposed runoff management system and associated BMPs may reduce TDS concentrations somewhat during and following development.

TOTAL SUSPENDED SOLIDS

The concentrations of total suspended solids (TSS) measured at freshwater runoff Stations B1, C, C1 and D1 ranged from ND-21,000 mg/L, with a mean of 3,265 mg/L (Table 2.3). These levels of total suspended solids in the freshwater runoff are acceptable concentrations under the general guidelines described in the San Diego Basin Plan (Table 2.3). The much higher TSS levels present in runoff at Station C1 (4,700-21,000 mg/L) and the somewhat higher ones at Station D1 (270-1400 mg/L) may reflect disturbed or degraded conditions in that part of the watershed. If this is the case, then establishment of the proposed runoff management system and associated BMPs may help to reduce TSS levels during and following development. Another equally valid explanation is that the higher levels of TSS in runoff observed at Stations C1 and D1 are normal for the sites. For example, Ford et al (2000) have routinely encountered TSS concentrations as high as 4,000-18,000 mg/L in the storm runoff through relatively natural canyon watersheds at the Newport Coast and at Emerald Canyon in Laguna Beach.

The levels of TSS observed at surf zone Stations A2, B2 and C2 and at Dana Point Harbor Station D2 (range 2-480 mg/L; mean 106 mg/L) are typical and normal for inshore coastal waters during storm runoff. They are all well within the ranges of such values observed at Emerald Cove in Laguna Beach and along the Newport Coast by Ford et al (2000) and elsewhere in southern California (see, for example, Bay and Schiff 1997; Bay et al 1998). It is also important to note that even during the strongest storm of 2-21-00, the higher TSS levels (4,700-21,000 mg/L) observed at freshwater Station C1 apparently did not lead to high TSS levels (120-200 mg/L) at the adjacent surf zone Station C2 (Table 2.3). The California Ocean Plan contains no specific water quality criteria or guidance values for TSS in ocean areas receiving storm runoff.

FRESHWATER HARDNESS

The hardness of water is due primarily to the concentrations of calcium and magnesium it contains. This study employed the standard practice of measuring hardness of the freshwater runoff samples as calcium carbonate concentrations (Table 2.3). Concentrations of hardness are useful as an indication of the source and quality of runoff water. In addition, measurements of freshwater hardness are essential in calculating the specific water quality criteria values for protection of aquatic organisms that apply to most trace or heavy metals (USEPA 2000a). The primary sources of calcium and magnesium in freshwater are their mineral forms that contain carbonate. Because of this, as water hardness increases there is a corresponding increase in the concentration of carbonate ions. These and the resulting bicarbonate and hydroxide ions can form weakly bound molecules, called complexes, with copper, zinc, lead and other trace metal ions. This reduces the concentration of potentially toxic trace metal ions in the water. As a result, the concentrations of these metal ions that are biologically available are reduced, with a corresponding reduction in their potential toxic effects on aquatic organisms. For this reason it is important to know the hardness of a freshwater sample in order to evaluate the possible toxic effects of trace metals it contains (USEPA 2000a).

All of the hardness values for freshwater runoff measured in this study (Table 2.3) were within typical or normal limits for southern California watersheds. These values all are well within the ranges reported by Ford et al (2000) in nearby Orange County coastal watersheds and those reported by URS Greiner Woodward Clyde (1999) for San Diego County. As shown in Table 2.3, the hardness concentrations measured for off site storm runoff at the terminus of the Orange County storm drain system (Station A1) were consistently higher (means 525-535 mg/L) than those for runoff from the Project sites (means 47-270 mg/L). However, even the higher values for Station A1 were within the range of those observed for nearby coastal watersheds (Ford et al 2000).

OIL AND GREASE

A majority (12/19) of the freshwater runoff samples had no oil and grease present at or above the detection limit (Table 2.4). Of the seven samples that contained detectable amounts of oil and grease, all were from Stations C and D1, both locations that received runoff directly from either parking lot or street surfaces (Figure 2.1). Because of this, the low to moderate levels of oil and grease observed there (1.1- 4.8 mg/L) would be expected. All of these concentrations (1.0-4.8 mg/L) are considerably below the USEPA Parameter Benchmark Value (USEPA 2000b) of 15 mg/L. This and other benchmark values are employed for general guidance by the San Diego RWQCB in evaluating compliance with the San Diego Basin Plan (Phillip Hammer, SDRWQCB Beaches Section, pers. comm., 2001).

None of the ocean or harbor stations receiving runoff from the Project sites had oil and grease concentrations that were above the laboratory detection limits (all ND). One of the six samples taken at surf zone Station A2, located adjacent to the terminus of the off site County drainage, contained oil and grease at a concentration (2.0 mg/L) above the detection limit (Table 2.4). Similarly, Ford et al (2000) observed no concentrations of oil and grease above

the detection limit in extensive surf zone samples taken during storm runoff at similar Orange County sites. The California Ocean Plan contains no specific water quality criteria or guidelines for concentrations of oil and grease in coastal seawater. However, the data indicate that oil and grease do not represent a problem in runoff to the ocean or harbor from the Project sites.

BIOSTIMULATORY NUTRIENT CHEMICALS

The nutrient chemicals in runoff water containing phosphorus and nitrogen are considered as biostimulatory or "nuisance" constituents in storm runoff, rather than toxic constituents (CRWQCB 1994). This is because their primary effect, when present in sufficiently high concentrations, is to stimulate the growth and reproduction of algae and other aquatic plants. Nutrient biostimulation can degrade water quality when resulting algal blooms depress the dissolved oxygen concentration of the water; the death of fishes and other aquatic life can occur as a result. Algal blooms also can cause changes in the water such as coloration, increased turbidity, and floating algal mats and scum. This general condition produced by nutrients in excess is called eutrophication.

Eutrophication normally occurs in standing or gently flowing bodies of freshwater and in bays and estuaries receiving excess nutrient concentrations from runoff water. It is a commonly held misconception that these effects also occur or are likely to occur in open coastal ocean areas of southern California. While natural phytoplankton blooms are a regular phenomenon in these ocean waters, there is no evidence at all in the scientific literature indicating that biostimulatory nutrients in storm runoff produce such blooms or other eutrophication effects on the open coast. This is due in part to the fact that natural nutrient chemical concentrations are relatively low in coastal ocean areas during the winter period of storm runoff; as a result, phytoplankton (plant plankton) and bottom-living algae rapidly use any additional nutrients entering coastal ocean water. In addition, the effects of wave and surge action, longshore currents and other oceanographic processes in the high-energy nearshore zone rapidly mix, dilute and transport nutrients entering the surf zone in storm runoff (Ford 1995, 1997; Ford et al 2000; Jenkins and Wasyl 2000). These are completely natural processes that act on runoff constituents from both developed and natural coastal watersheds. It is extremely important to recognize these facts in evaluating the potential effects of biostimulatory nutrient chemicals entering the ocean in runoff water.

The San Diego Basin Plan (CRWQCB 1994, p. 3-6) provides the following general benchmark guidelines for phosphorus and nitrogen nutrient constituents in freshwater:

> Inland surface waters, bays and estuaries and coastal lagoon waters shall not contain biostimulatory substances in concentrations that promote aquatic growth to the extent that such growths cause nuisance or adversely affect beneficial uses.
>
> Concentrations of nitrogen and phosphorus, by themselves or in combination with other nutrients, shall be maintained at levels below those that stimulate algae and emergent plant growth.

The Parameter Benchmark Value for total phosphorus of 2.0 mg/L (USEPA 2000b) is used for guidance purposes in conjunction with the San Diego Basin Plan. This Basin Plan and the EPA Parameter Benchmark Values do not provide specific water quality criteria for nitrogen compounds. No guidance criteria for either phosphorus or nitrogen compounds are given in the California Ocean Plan. The results for phosphorus and nitrogen constituents obtained in the baseline study for the Project are considered in the following three subsections.

TOTAL PHOSPHORUS

The concentrations of total phosphorus in freshwater storm runoff at the Project site ranged from 0.28 - 1.9 mg/L, with a mean of 1.1 mg/L (Table 2.4). They were also similar to and within the range of values reported for nearby coastal watersheds in Orange County by Ford et al (2000) and in San Diego County by URS Greiner Woodward Clyde (1999). Concentrations were highest at Station C1 and next highest at Station D1. The higher concentrations observed at both stations may reflect the fact that they receive substantial runoff flow from developed areas. Storm water that flows through the abandoned nursery site also could contribute higher levels of phosphorus to the runoff if residual nutrients from plant fertilizers remain at that site.

Only one of the concentrations of total phosphorus in freshwater runoff shown in Table 2.4, that of Station C1 (2.6 mg/L; 1/25/00), slightly exceeds the EPA Parameter Benchmark Value of 2.0 mg/L (Table 2.8). All of this evidence indicates that total phosphorus in freshwater runoff at the Project site was within typical and normal limits for partially developed land, as well as within acceptable regulatory limits.

The values for total phosphorus observed at the surf zone and harbor stations were correspondingly low, ranging from ND – 0.70 mg/L and with a mean of 0.11 mg/L (Table 2.4). These are all well within the ranges reported for similar sites on the Newport Coast and at Emerald Cove in Laguna Beach (Ford 1995, 1997; Ford et al 2000).

DISSOLVED PHOSPHORUS

The concentrations of dissolved phosphorus in freshwater runoff from the Project site ranged from 0.11 – 0.72 mg/L, with a mean of 0.37 mg/L (Table 2.4). They also were within the range of typical or normal concentrations reported for similar sites in Orange and San Diego Counties (Ford 1995, 1997; Ford et al 2000; URS Greiner Woodward Clyde 1999). While there are no specific guidelines for concentrations of dissolved phosphorus in the San Diego Basin Plan or the EPA Parameter Benchmark Values, it is clear that the levels observed are environmentally acceptable ones for a partially developed watershed of this kind. The primary evidence for this is that they are well below concentrations reported to cause eutrophication.

Correspondingly low concentrations of dissolved phosphorus were observed for the surf zone and Harbor stations, ranging from ND – 0.53 mg/L and with a mean of 0.11 mg/L (Table 2.4). These were all within the range of storm runoff values reported for other similar coastal

sites in Orange County (Ford 1995, 1997; Ford et al 2000). The Headlands data are typical for nearshore ocean areas in Orange County and elsewhere in southern California.

NITRATE + NITRITE (as N)

Concentrations of nitrate + nitrite (as N) determined from samples taken during storm runoff at the Project sites and from the off site County storm drain system are shown in Table 2.5. The means and ranges of these concentrations in freshwater runoff ranged from 7.5 – 57.3 mg/L, with a mean of 22.1 mg/L. As for several other constituents, the highest of these nitrate + nitrite concentrations were measured at Stations C1 and D1. In common with the data for total phosphorus from Station C1, the higher nitrate + nitrite concentrations present there may have been due to runoff from off site areas of greater development and possibly from the abandoned nursery site.

It is instructive to compare these nitrate + nitrite concentrations with other storm water data from coastal watersheds nearby in Orange County (Ford et al 2000). Samples obtained in Los Trancos and Muddy Canyons at the Newport Coast and those taken in Emerald Canyon at Laguna Beach (the latter two canyons with minimal development) had a wide range of nitrate + nitrite concentrations (0.7-178.5 mg/L). With the exception of two samples each from Station C1 and Station D1, all the remaining nitrate + nitrite concentrations measured at the Project stations fell well within that range. Furthermore, it is important to note that the Newport Coast and Laguna Beach data were obtained from samples taken during two of the same storms in January and February of 2000 also sampled in the study at Dana Point Headlands. This indicates that nitrate + nitrite values for the Project Site (Table 2.5) probably are typical and normal for the Orange County coastal watersheds.

Both the San Diego Basin Plan (CRWQCB 1994) and the Santa Ana Basin Plan (CRWQCB 1995) for the region adjacent to Dana Point contain a water quality objective or general guidance value for nitrate + nitrite in freshwater runoff of 10.0 mg/L that is useful for this evaluation (Table 2.8). Six samples from Stations B1, C1 and D1 were either below or very near this guidance value of 10.0 mg/L. All of these considerations suggest that the levels of nitrate + nitrite observed at the Project site, with the possible exception of the Station C1 and D1 data, are within environmentally acceptable limits and do not pose a problem.

The concentrations of nitrate + nitrite measured in samples from surf zone Stations A2, B2 and C2 and from Harbor Station D2 ranged from 4.5 – 11 mg/L, with a mean of 7.15 mg/L (Table 2.5). These are all within the range of values for the surf zone reported by Ford et al (2000), which was 0.94-7.1 mg/L for storms sampled at the Newport Coast and Emerald Cove. As for the freshwater runoff samples, these results indicate that the ocean and harbor values observed at the Project sites are typical of those elsewhere on the Orange County coast and that they are within acceptable limits from a regulatory standpoint.

TOTAL KJELDAHL NITROGEN

Measurements of Total Kjeldahl Nitrogen (TKN) provide an accurate estimate of the concentration of total soluble organic nitrogen in a water sample, in contrast to the inorganic nitrogen represented by nitrate + nitrite. The concentrations of TKN measured during storm runoff for samples from the freshwater stations are shown in Table 2.5. As indicated in that table, TKN concentrations had a range of 0.56 – 10 mg/L, with a mean of 3.67. They also were well within the range of values measured for freshwater runoff at the Newport Coast and Emerald Canyon in Laguna Beach (Ford et al 2000), for which the range was ND-10.0 mg/L. The same was true for TKN values in the surf zone and harbor adjacent to the Project site, which fell well within the range of ND-41.8 mg/L observed at the Newport Coast and in Emerald Cove (Ford et al 2000).

No specific water quality criteria or guidance concentrations are provided for TKN in the San Diego Basin Plan, the EPA Parameter Benchmark Values (USEPA 2000b), or the California Ocean Plan. However, based on comparisons with data from other similar sites, the concentrations of TKN measured at the Headlands site appear to be typical and normal for southern California watersheds.

ORGANOPHOSPHORUS PESTICIDE COMPOUNDS

As shown in Table 2.1, all storm runoff samples were analyzed for 26 organophosphorus pesticide compounds considered to be potential toxic constituents of storm water. Of these, chlorpyrifos, diazinon, and malathion occur most frequently in watershed samples and are considered to be the pesticide constituents of primary concern at the present time (URS Greiner Woodward Clyde 1999; Ford et al 2000).

The results summarized in Table 2.5 indicate that none of the 26 organophosphorus pesticides was present in any of these samples at concentrations above the reporting limits of the laboratory method used (all ND). Laboratory reporting limits for these pesticide analyses are shown in Table 1.1. It is possible that some of these constituents were present at concentrations below the detection limits of the screening method used. However, this screening method is sensitive enough to detect dangerously high concentrations of these toxic organic compounds if they were present. Therefore, the results indicate that organophosphate pesticide compounds apparently did not represent a problem in either storm runoff or ocean and Harbor receiving waters at the Project sites.

TRACE METALS

Trace or heavy metal concentrations sampled during storm runoff at the Project sites are shown in Tables 2.6 and 2.7. These are for trace metals in total recoverable form, expressed in µg/L. They represent the combined concentration of these metals present in both dissolved and un-dissolved forms.

In general, the occurrence and total recoverable concentrations of trace metals increased with increasing levels of total suspended solids (TSS), indicating that substantial portions of these metal concentrations were directly associated with the fine suspended solid particles (Tables 2.3, 2.6 and 2.7). This is expected, given that trace metals adsorb (become attached) to the finer particles and are carried along with them in runoff.

It is difficult to identify with certainty the specific sources of trace metals, and particularly those in un-dissolved form, entering the storm runoff from the watersheds features of the Project site. This is partly because of the varied natural processes involved, the variety of human activities that also may release these compounds into the watershed, and the different forms of the trace metals (Makepeace et al 1995; Bay et al 1998; URS Greiner Woodward Clyde 1999; Lee et al 1999).

The data concerning total suspended solids and trace metals shown in Tables 2.1 and 2.6-2.7, as well as similar data from the Newport Coast studies, were examined by Dr. Edward Goldberg, Professor Emeritus at the Scripps Institution of Oceanography, and Dr. Kathe Bertine, Professor of Geological Sciences at San Diego State University. Both are respected geochemists and research specialists in studies of trace metals. Drs. Goldberg and Bertine concluded that an important source of trace metals is the natural process of weathering in these watersheds (pers. comm., 2000). They also identified airborne transport of trace metals to the soil, and subsequent entrainment of these metals and associated fine particles by runoff water, as another important source. Such airborne introduction of trace metals undoubtedly occurs from the Pacific Coast Highway and other roads in the area that are fairly heavily used.

In addition, trace metals in both dissolved and un-dissolved forms are introduced from a variety of ongoing and past human activities in the area. Foremost among these is the operation of motor vehicles and other equipment, leading to the accumulation of copper, zinc, lead, and other trace metals on and adjacent to road surfaces and parking lots. These are then carried into the watershed both by direct runoff and through airborne transport. Residential and commercial areas also contribute trace metals to the watershed through a wide variety of activities.

Therefore, it is clear that the concentrations of trace metals present in storm runoff through the watersheds of the Project are contributed by a combination of natural and human-induced processes. However, a more specific assessment of the relative importance of these different sources is not possible from the information available.

In May 2000, the final version of the California Toxics Rule (USEPA 2000a) was published as the official document containing water quality guidelines for trace metals in freshwater runoff. It provides water quality criteria only for trace metals in dissolved form. Because the trace metal samples from the baseline study in 2000 at the Project sites were analyzed only for concentrations in total recoverable form, the water quality criteria for dissolved concentrations (USEPA 2000a) were converted to total recoverable concentrations (Table 2.8), using CTR protocols.

As described in the subsection on freshwater hardness, concentrations of the trace metals cadmium, chromium (III), copper, lead, nickel, silver, and zinc, as well as others, are dependent on the hardness of the water in which they occur. Because of this, corrections must be made to adjust the water quality criteria for these trace metals as a function of water hardness. The adjusted criteria for both the dissolved and total recoverable fractions of these trace metals are shown in Ford et al (2000; Table 19) for the specific hardness values of the freshwater runoff samples. The criteria values were calculated by using the standard equations and the constants described in USEPA (2000a). These corrected criteria values were the ones applied to data for the hardness-dependent trace metals analyzed in the Headlands study. Note that for water with a hardness value of 400 mg/L or greater, the CTR (USEPA 2000a) specified that the criteria be adjusted using 400 mg/L as the ceiling value. Therefore, the water quality criteria values for the category >400mg/L in Ford et al (2000) apply to all samples with hardness values >400 mg/L.

In addition, separate water quality criteria are provided for acute and chronic levels of toxicity (USEPA 1997, 2000a). The almost universally accepted approach is to apply only the acute toxicity criteria as guidance in evaluating constituents from storm water runoff samples. This is because the exposures to chemical constituents during typical storm runoff in southern California are of relatively short duration, approximating those of 48-96 hour exposures in acute toxicity tests. That standard approach of using only acute water quality criteria was employed in evaluating the Headlands data (Table 2.8).

EPA Parameter Benchmark Values (USEPA 2000b) also were employed for general guidance in evaluation of the Headlands data for freshwater runoff at the suggestion of Phillip Hammer, San Diego RWQCB Beaches Section, (pers. comm., 2001). These benchmark values are given in the form of total recoverable concentrations of trace metals.

The water quality objectives for trace metals provided in the California Ocean Plan (CSWRCB 1997; Table B) are expressed only as total recoverable concentrations. For seawater samples, these water quality objectives values do not require adjustment for hardness. The values listed in Table B of CSWRCB (1997) for both the Daily Maximum and the Instantaneous Maximum concentrations were employed as guidelines in these evaluations of the surf zone and harbor samples (Table 2.8).

It is particularly important for the reader to note that values exceeding the above criteria and guidelines do not necessarily indicate that a water quality problem exists, as they are employed only for guidance in the evaluation process (Lee and Jones-Lee 1995a-b). This is particularly true of values for trace metals in un-dissolved form, because in most cases they are not biologically available and exist in non-toxic form (Makepeace et al 1995, Eisler 1998, Lee et al 1999). Dr. Edward Goldberg, an internationally recognized geochemist specializing in trace metals, stated that water quality criteria for trace metals, other than in dissolved form, must be applied with great caution, because most such trace metals are not toxic to aquatic organisms (pers. comm., 2000). In addition, he has concluded that, with the exception of mercury, the concern about the toxicity of trace metals in general has been over-emphasized.

CADMIUM, COPPER AND LEAD

The total recoverable concentrations (µg/L) of the potentially toxic trace metals cadmium, copper, and lead measured in the Headlands study are shown in Table 2.6. Almost all of these values for cadmium in the freshwater runoff were not present above laboratory detection limits (ND), ranging from ND – 100 µg/L and with a mean of 20.3 µg/L. As for other constituents, higher concentrations of total cadmium were present in all three runoff samples at Station C1 and in one sample at Station D1. These four cadmium values were the only ones out of 16 samples that exceeded the CTR acute water quality criteria to protect aquatic life (USEPA 2000a) and the EPA Parameter Benchmark Value (USEPA 2000b), as shown in Table 2.8. In addition, none of the six samples from Station A1 (County storm drain from areas off site) exceeded these guidelines (Table 2.6).

It is unclear what conditions at or upstream of Station C1 would produce the higher total cadmium concentrations encountered there, particularly in view of the fact that concentrations observed further upstream at Station C were all ND. The most likely explanation is that adsorbed cadmium was associated with suspended sediment to a greater degree at or upstream of the C1 site than elsewhere, probably as the result of greater disturbance and erosion there.

It also is useful to compare the cadmium concentrations for the Project site with those measured during storms of the same rainfall season in Los Trancos, Muddy and Emerald Canyons just to the northwest of Dana Point (Ford et al 2000). All of the cadmium concentrations at the Project site fell within the range of those measured for freshwater storm runoff on the Newport Coast and in Emerald Canyon (ND-110 µg/L). This indicates that the total cadmium concentrations observed at the Project site, including those at Stations C1 and D1, probably are typical and normal for coastal watersheds in Orange County.

As shown in Table 2.6, all of the total cadmium concentrations at the surf zone and Harbor stations were below laboratory detection limits (ND). For that reason, none of them was above either the daily maximum or instantaneous maximum water quality objectives of the California Ocean Plan. These values also were essentially the same as those measured during storm runoff in the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

As for cadmium, many of the concentrations for total recoverable copper were ND, ranging from ND – 260 µg/L and with a mean of 51.6 µg/L (Table 2.6). The highest levels were observed at Stations C1 and D1, primarily during the strongest storm of 2-21-00, but also during the first storm of the season on 1-25-00. Eight of 20 samples had concentrations that were above CTR acute water quality criteria for total copper (Table 2.8). Five of those were at Station D1, and one each at Stations B1, C and C1. Three of these concentrations also were above the EPA Parameter Benchmark Value. One reason for this is evident in the case of Stations D1, C and C1, because all of them receive substantial runoff from road and parking lot surfaces where copper accumulates from motor vehicles. In addition, TSS levels were relatively high at some of these stations, indicating that non-toxic copper adsorbed to the fine sediment particles probably contributed to the higher total copper concentrations observed.

With the high values for Station C1 omitted from consideration, the station means and the grand mean (37.8 µg/L) for total copper were lower. Similarly the range of values, 11 – 100 µg/L was less extreme. All of the total copper concentrations for the Project sites were well within the range of values measured in freshwater storm runoff at the Newport Coast and Emerald Canyon sites (ND-780 µg/L), as reported by Ford et al (2000).

With one exception, (C2; 33 µg/L), total copper concentrations measured in the surf zone were all ND. At Harbor Station D2, measurable amounts of total copper (22-68 µg/L) were observed during the strongest storm of 2-21-00; in contrast, the levels at this station were ND for samples taken during the other two storms. All three of these copper concentrations described above were greater than the daily maximum water quality guideline of the California Ocean Plan (Table 2.8), while two of them (1C2 and 1D2) exceeded the instantaneous maximum guideline. It is important to recognize that concentrations of copper, zinc, lead and other trace metals in Dana Point Harbor also are the result of vessel maintenance and operation and other human activities, as described in Part 1, Section 2. Therefore, they reflect not only contributions from storm runoff but those from in-Harbor activities as well. In addition, all of these total copper concentrations were well within the range of values observed in samples (ND-380 µg/L) taken during storm run off to the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

In combination, this evidence indicates that total cadmium and copper concentrations in both storm runoff and receiving waters probably are typical and normal for such partially developed watersheds in Orange County. The evidence also indicates that the values observed at the Headland Project sites are acceptable from a regulatory standpoint.

Except for those at Station D1, almost all of the total lead concentrations in freshwater runoff samples at the Headlands sites were below laboratory detection limits, ranging from ND – 190µg/L and with a mean of 36 µg/L (Table 2.6). None of these 16 concentrations, including the ones observed at Station D1, was above CTR acute water quality criteria (USEPA 2000a), as shown in Table 2.8. Only one (C1; 190 µg/L) was above the EPA Benchmark guideline (USEPA 2000b).

With the data for Station C1 omitted, all of the station means and the grand mean for total lead (28.5 µg/L) were lower (Table 2.6). The range of their concentrations was ND – 11µg/L. In addition, all but three of the concentrations of lead in total recoverable form for the Headlands sites were within the range of values (ND-42 µg/L) measured during the 2000 storm season at Los Trancos, Muddy and Emerald Canyons nearby (Ford et al 2000).

With the exception of single samples at Station C2 (8.2 µg/L and D2 (929 µg/L), total lead concentrations were below detection limits (ND) at the surf zone and Harbor stations (Table 2.6). Of these, only the concentration for Station D2 was above the daily maximum and instantaneous maximum water quality objectives for total lead in the California Ocean Plan (Table 2,8). As for copper, the concentration of lead observed at Station D2 may have been produced, in part, by activities within Dana Point Harbor. In addition, all but one of these total lead concentrations were well within the range of values (ND-42 µg/L) observed

during storm runoff into the surf zone at the Newport Coast and Emerald Cove (Ford et al 2000).

All of this evidence indicates that total lead concentrations in both freshwater storm runoff and in the surf zone and Harbor receiving waters probably are typical and normal for such partially developed coastal watersheds in Orange County and elsewhere in southern California. In addition, it indicates that these concentrations of lead at the Headlands sites are acceptable from a regulatory standpoint.

ZINC, CHROMIUM (III), SILVER AND NICKEL

Total recoverable concentrations of zinc, chromium (III), and nickel are shown in Table 2.7. As for other trace metals, the highest values in the freshwater runoff at the Project site were observed at Stations C1 and D1, particularly for runoff from the strongest storm of 2-21-00.

Concentrations of total recoverable zinc ranged from 24 – 1200 µg/L, with a mean of 192 µg/L (Table 2.7). Five of the 20 samples had concentrations that were above the CTR acute water quality criteria for total recoverable zinc (USEPA 2000a; Ford et al 2000b), as shown in Table 2.8. The same five values also were above the EPA Parameter Benchmark guidelines (USEPA 2000b). Of these, three were from Station D1 and two from Station C1. The primary reason for this appears to be that these two station sites receive considerable runoff from parking lot and street surfaces. Zinc is introduced to these surfaces in substantial quantities through tire and brake wear, as well as other vehicle operations. These zinc concentrations were all well within the range of values (ND-1700 µg/L) reported by Ford et al (2000) for freshwater storm runoff nearby in Newport Coast and in Emerald Canyon watersheds.

Four of the five samples taken in the surf zone at the Project sites had total zinc concentrations that were below laboratory detection limits (ND). Only one sample at Station C2 had a zinc concentration above the detection limit. Similarly, only two of the six samples from Harbor Station D2 had zinc concentrations above the detection limit (Table 2.7). While these concentrations at Station D2 were due in part to runoff through Station D1, other activities in the harbor probably contributed to them. The concentrations of total zinc in these surf zone and Harbor samples were either slightly higher or well within the range of values (ND-180 µg/L) observed in the surf zone during storms at the Newport Coast and at Emerald Cove (Ford et al 2000).

In combination, this evidence indicates that total recoverable zinc concentrations measured at the Project sites probably are typical and normal ones for partially developed coastal watersheds in Orange County and elsewhere in southern California. The evidence also indicates that these values for the Project site are acceptable from a regulatory standpoint.

The total recoverable concentrations of chromium (III) measured for freshwater storm water samples are shown in Table 2.7. Only samples from Stations B1, C1 and D1 had concentrations of chromium above the laboratory detection limits (all others ND). Samples from those three stations had a range of 7.6-400 µg/L (Table 2.7). Of these, only the value of

400 µg/L observed for Station C1 during the strongest storm on 2-21-00 (Table 2.7) was above the CTR acute water quality guidance criterion. The EPA Parameter Benchmark listing (USEPA 2000b) does not contain a guideline value for chromium (III). As for the other trace metals, the higher concentrations of chromium present at Stations C1 and D1 indicate that they probably originated on street and parking lot surfaces. However, they also may have originated in other developed parts of the watershed. Their association with higher TSS values further indicates that part of the chromium probably was adsorbed to fine sediment particles. The total chromium concentrations in the freshwater runoff samples from the Project sites all were well within the range of concentrations reported for watersheds of the Newport Coast and Emerald Canyon (ND-870 µg/L) by Ford et al (2000).

Only two of the 11 samples taken at surf zone Stations B2 and C2 and Harbor Station D2 had concentrations of chromium (III) above the detection limit, one at Station C2 and the other at Station D2. In this case the water quality objective of the California Ocean Plan is not applicable, because it is stated only for the much more toxic hexavalent form of chromium. Chromium (III) is a relatively non-toxic form of the metal. All receiving water values for total chromium (III) observed for the Project sites were well within the range of concentrations (ND-580 µg/L) reported for surf zone stations at Newport Coast and Emerald Cove (Ford et al 2000).

These results indicate that total recoverable concentrations of chromium (III) at the Project sites probably are typical and normal ones for such partially developed coastal watersheds in Orange County and elsewhere in southern California. They also indicate that these concentrations are within acceptable limits from a regulatory standpoint.

The concentrations of silver in total recoverable form were below laboratory detection limits (ND) for samples taken at all stations during all three storm events. As a result, the data are not shown in the table form. This suggests that silver may not occur in storm runoff at the Project sites, or is present infrequently. The same results were reported from the storm water study at the Newport Coast and Emerald Canyon (Ford et al 2000), where no silver was detected in the large number of runoff samples analyzed.

Total concentrations of nickel determined for storm water samples taken at the Project sites are shown in Table 2.7. Measurable concentrations were present at all freshwater watershed stations. They ranged from 10 – 136 µg/L, with a mean of 39 µg/L. As for the other trace metals, these measurable concentrations were highest at Station C1 and Station D1, in part undoubtedly the result of runoff from streets and parking lots. Six of these 13 samples had total nickel concentrations that were above the CTR acute water quality guidelines. Four of these were observed in samples from Station D1 and two were the values observed for Station C1 (Table 2.7). All of these concentrations were well below the EPA Parameter Benchmark guideline value (1,417 µg/L) for nickel. It is important to recognize that all of these nickel concentrations were within the range of values reported for freshwater watersheds at the Newport Coast and Emerald Canyon (ND-670 µg/L) by Ford et al 2000.

Total nickel concentrations above the detection limit were present in only two of the 11 samples taken at surf zone Stations B2 and C2 and at Harbor Station D2, one at Station C2

a d one at Station D2 (Table 2.7). The concentrations for both of these samples were above the daily maximum water quality guideline for total nickel of the California Ocean Plan; neither was above the instantaneous maximum guideline of that Plan. It is important to note that both of these total nickel concentrations were well below the highest concentration reported for surf zone stations at the Newport Coast and Emerald Cove (range ND-510 µg/L) by Ford et al (2000) for the storm season of 2000.

All of this evidence indicates that concentrations of total recoverable nickel in both storm runoff and receiving waters at the Project sites probably are typical and normal for such partially developed coastal watersheds in Orange County and elsewhere in southern California. The evidence further indicates that the concentrations measured at the Headlands sites are within acceptable limits from a regulatory standpoint.

EFFECTS OF NATURAL NEARSHORE PROCESSES ON SALINITY AND RUNOFF CONSTITUENTS

In general, there was a tendency for trace metals in total recoverable form, as well as nutrient chemicals and other runoff constituents, to have considerably lower concentrations at the surf zone stations than were present in the adjacent freshwater watersheds (Tables 2.3-2.7) There also was a downward trend in these surf zone concentrations over the course of runoff. These same effects have been well documented by other studies on the Orange County coast in which larger time series of samples were taken over the duration of runoff (Ford 1995, 1997; Ford et al 2000).

Both the Newport Coast and Emerald Cove studies cited above and those conducted at the Headlands sites involved taking time series of salinity samples in the surf zone over the course of storm runoff. These salinity time series are useful for three purposes (Ford 2000a-b). First, they indicate the degree and timing of freshwater dilution that occurs when storm water runoff enters the ocean at surf zone sites. Second, they indicate the actual levels of salinity to which intertidal and shallow subtidal habitats and organisms in the immediate areas of runoff were subjected during storm events. Third, and equally important, these salinity data provide a direct indication of the degree to which nearshore physical processes mix and carry away seawater in the surf zone that has been diluted by storm water runoff. The implications of this for dilution and transport of potentially toxic chemical, nutrients and other runoff constituents are very significant. If these physical processes are efficient in mixing and transporting the diluted seawater, then one would expect to observe relatively high salinities in the inshore area, even during the runoff period, as well as a fairly rapid return to typical coastal seawater salinity levels soon after the storm runoff ceases. In addition, one would expect concentrations of runoff constituents to remain relatively low in the surf zone and to decline fairly rapidly following the end of runoff. These are, in fact, the results observed in both the Headlands study and the more comprehensive ones at the Newport Coast and Emerald Cove (Ford 1995, 1997; Ford et al 2000).

The nearshore oceanographic processes in the area are particularly important in this context, because they are a natural control mechanism for freshwater runoff (Ford 2000b). There is very substantial mixing and transport of seawater in the nearshore region of circulation along

the coastline of Strand Beach and adjacent areas and even within Dana Point Harbor, just as there is elsewhere along the Orange County coastline. This is because of the heavy surf and surge effects present there, the movement offshore of rip currents, as well as the movement of strong longshore currents and tidal flow. These effects are accentuated during and following storms. They are particularly important physical characteristics of the high energy inshore marine environment, because they assure that freshwater runoff is mixed, diluted and transported from the nearshore area very rapidly. The salinity data obtained in the Headlands study provide very convincing evidence of just how effective these mixing and transport processes are along Strand Beach.

In this same general context, it is important to recognize that there is very substantial circulation of ocean water through the permeable breakwater system of Dana Point Harbor. The US Army Corps of Engineers (USACE) designed the breakwater to provide self-cleaning features, as described in the USACE design memoranda and in the results of that agency's model studies for the Harbor (Tom Rossmiller, Coastal Engineer, Orange County PFRD Watershed and Coastal Resources Division, pers. comm., 2001). With the exception of circulation problems caused by eddies in the area of Baby Beach, these self-cleaning design features appear to be very effective in maintaining good water quality in both the outer and inner portions of Dana Point Harbor (Tom Rossmiller and Bruce Moore, PFRD Watershed and Coastal Resources Division, pers. comm., 2001)

PATHOGEN INDICATOR BACTERIA

The pathogen indicator bacteria data shown in Tables 2.9-2.11 are example sets of those compiled as part of the Bacteriological Monitoring Program conducted by the Environmental Health Division of the Orange County Health Care Agency (OCHCA) under the direction of Monica Mazur. The data in the comparative format of these three tables are for year 2000. They include values obtained by the OCHCA (Table 2.9) and two cooperating agencies, SERRA (Table 2.10) and AWMA (Table 2.11), at the bacteriological sampling stations in Dana Point Harbor, at Strand Beach, at the Ocean Institute Beach (shown as Marine Institute Beach in the Table), and at closely adjacent sites. These data are primarily for dry-weather periods and those just following rainfall.

Additional data on pathogen indicator bacteria were obtained during storm runoff at the Headlands site as part of the baseline monitoring study. These storm runoff data were not considered in this evaluation and are not reported in this document. One reason for this is that the number of values obtained was small and insufficient for a representative evaluation. A second reason is that the OCHCA and other agencies in southern California do not apply regulatory standards for pathogen indicator bacteria during storm runoff within the period November 1 – March 31, although they do advise the public to stay out of the water for a minimum of 72 hours during and following storms (Monica Mazur, OCHCA, pers. comm., July 2001). As described by Monica Mazur, the following single sample and 30-day log mean standards are applied only to bacterial samples taken at OCHCA stations after storms and during dry-weather conditions within the November – March period. However, these standards are applied to both storm runoff conditions and dry-weather conditions during the AB411 period, extending from April1 – October 31.

Single sample standards:	Total Coliforms	10,000 organisms per 100 ml sample
	Fecal Coliforms	400 organisms per 100 ml sample
	Enterococci	104 organisms per 100 ml sample
	Fecal: Total ratio	>1000 Total Coliforms if ratio exceeds 0.1
30-day log mean standards:	Total Coliforms	1,000 organisms per 100 ml sample
	Fecal Coliforms	200 organisms per 100 ml sample
	Enterococci	35 organisms per 100 ml sample

Sample data collected within three days following rain storms are not used in calculating the 30-day log means.

All natural waters contain bacteria, the most common life form on earth. Clear, unpolluted ocean water far from land contains 100,000 to 1 million bacteria per 100 ml, coastal water 1-10 million per 100 ml, and estuarine water 100 million bacteria per 100 ml. The coastal ocean contains bacteria that are indigenous, marine species, as well as foreign bacteria that are washed into it from land sources. Most of the latter bacteria are harmless to humans. However, should their source be human or animal feces, pathogenic bacteria, viruses, parasites, or fungi also may be present. If these pathogens are ingested by humans swimming in or otherwise in contact with the seawater, then the pathogens could cause disease. It is for this reason that recreational waters are closed to human contact when evidence is obtained that suggests unacceptable levels of fecal contamination, usually from evidence provided by bacterial sampling.

The direct detection of pathogenic microorganisms in any water sample is too time consuming and costly to be practical. Rather, certain "indicator" bacteria are enumerated by using a variety of techniques. These pathogen indicator bacteria are either coliforms or enterococci, or both. They are not usually pathogenic themselves (although some strains can cause disease, especially in immuno-compromised or very sick humans) and are shed by all healthy humans and other animals in the feces. They are relatively easy to detect and count. Their presence above certain numbers in water is taken as evidence that the water has been contaminated with feces.

Dr. Barbara Hemmingsen, Professor of Biology at SDSU and an expert in aquatic microbiology, has conducted extensive evaluations of pathogen indicator bacteria in watersheds and ocean receiving water at the Newport Coast and Emerald Bay (Ford et at 2000). It is her opinion (pers. comm., 2001), and that of many other microbiologists, that counts of total coliforms are very unreliable as an indicator of pathogenic bacteria and viruses that pose a health risk to humans. There are two primary reasons for this. Counts of total coliforms include contributions from a wide variety of other sources in the watershed. In addition, there are several species of soil, freshwater and marine bacteria that mimic the actions of the coliforms, yielding false positives. That is, they behave like coliforms but are not necessarily associated with human feces or that of other animals. Instead, a sub-set of coliforms -fecal coliforms- are enumerated in preference to total coliforms. For these reasons,

the data on total coliforms shown in Tables 2.9-2.11 for the Dana Point area were not evaluated. Instead, emphasis was placed on the results for fecal coliforms and enterococci.

Enterococci are inhabitants of the digestive tract of warm-blooded animals. Their presence in water above certain numbers indicates contamination by the feces of humans and other warm-blooded animals. Most regulatory agencies now prefer to use enterococci as the indicator bacteria of choice because they are thought to live longer in water than do fecal coliform bacteria. However, as shown in a recent study at Huntington Beach, CA (Grant et al 2001), substantial contributions of enteroccocci can come from the feces of shore birds. This makes the application of enterococci counts more difficult when attempting to predict human health risks.

As indicated by URS Greiner Woodward Clyde (1999), fecal coliforms, fecal streptococci, and fecal enterococci are three separate residents in the digestive tracts of warm-blooded animals. Their distribution among these mammal and bird species varies. A major problem is that none of them is specific only to humans. Because of this, none can serve as a truly accurate indicator and public health warning signal for the presence of potential human pathogens. It is very important to recognize this limitation of the methods used and the resulting problems in applying the associated water quality criteria accurately (see, for example, Grant et al 2001).

Obviously, risks of contamination by potential human pathogens in water could be better evaluated if the specific sources of fecal bacteria can be identified. In other words, knowing that certain percentages of these fecal bacteria came from birds, grazing farm animals, or small terrestrial mammals in the watershed, and a certain percentage from humans, would allow a much more accurate risk assessment. If the source is exclusively non-human, the risk is lower because occurrences of human health problems caused by pathogens coming from the feces of other species are not very common. Knowledge of the source would allow for informed and more accurate selection of actions to protect public health, through beach closures and other means.

Source characterization of fecal bacteria using molecular techniques is a new methodology that will eventually allow this identification of animals that contribute fecal bacteria to the watershed. Unfortunately, these methods are not yet sufficiently developed to provide accurate results (Dr. Barbara Hemmingsen, pers. comm., 2001). This is evident in the results of such a study for Agua Hedionda Lagoon watershed in San Diego County described by URS Greiner Woodward Clyde (1999), which were relatively inconclusive.

The pathogen indicator bacteria data for periods following storm runoff and during dry-weather conditions in the Dana Point area during 2000, for which example sets are summarized in Tables 2.9-2.11, are very similar to those reported for the Newport Coast and Emerald Canyon watersheds by aquatic microbiologist Dr. Barbara Hemmingsen. Her results are described in Ford et al (2000). When rain falls on the Project sites and surrounding areas in amounts that produce runoff flow, the numbers of pathogen indicator bacteria increase markedly in the runoff water as soil, feces and other materials containing them are washed into the drainage paths. The estimated numbers of these indicator bacteria in storm runoff at

the Project sites fall well within the ranges for those reported under storm conditions at the Newport Coast and Emerald Bay sites (Ford et al 2000). Essentially this same process occurs in all coastal watersheds of southern California during storm runoff.

PBS&J (1999) conducted a comparative evaluation to consider the impact of urban development on bacteriological water quality in the major watersheds and surf zone areas along the Newport Coast and the adjacent coastlines of Corona Del Mar and Laguna Beach. The results of this study are particularly pertinent to the Project located nearby. Data obtained in sampling by the OCHCA Division of Environmental Health during the period November 1996 through October 1999 were employed. The data used in the study were from sampling at Buck Gully and at all other OCHCA stations along the coast southeast to Laguna Beach and Treasure Island Pier (Golf Island).

As described by PBS&J (1999), most of the surf zone stations sampled did not have any values that exceeded the agency standards described above, based on sampling during the three-year period 1996-1999. Little Corona Beach, Crystal Cove, Emerald Bay, and Laguna Main Beach were the primary surf zone sites where standards for total coliform were exceeded. These instances were few, representing about one percent of the data for each site. Two sampling sites, Little Corona Beach and Laguna Main Beach also exhibited low percentages of data exceeding the standard for enterococci, while there were no instances of this at the remaining sites.

Very similar results are evident for the Ocean Institute Beach sampling station (Table 2.10) and the Strand Beach station (Table 2.11), both surf zone locations at Dana Point. For the representative data set shown in Table 2.11, none of the 69 samples reported in the full data set for Ocean Institute Beach in 2000 had fecal coliform counts that exceeded the 400 MPN per 100 ml single sample standard. Only two of the 69 samples had enterococci counts that exceeded the 104 MPN per 100 ml single sample standard. Both were samples taken shortly after rainfall (Table 2.11). As shown in Table 2.11, none of the 81 samples reported in the full data set for Strand Beach in 2000 exceeded the single sample standard for fecal coliforms. Only two of these 81 samples exceeded the single sample standard for enterococci. Both were samples taken shortly after rainfall (Table 2.11). The results described above are similar to those for surf zone sites elsewhere along Orange County coast between Corona del Mar and Laguna Beach (PBS&J 1999) and for the Newport Coast (Ford et al 2000).

Comparisons reported by PBS&J (1999) demonstrated that there was not a statistically significant difference in the mean concentrations of pathogen indicator bacteria among the variously developed and undeveloped coastal watersheds sampled in Orange County. This is an important result, especially in interpreting the data for the Dana Point area, because it indicates very clearly that both undeveloped and variously urbanized watersheds produce about the same mean concentrations of the indicator bacteria. An important consideration here is the fact that these bacterial indicators enter the watershed and its runoff from all kinds of warm-blooded animals besides humans, including land and shore birds, smaller native land mammals, and domestic pets.

The results reported by PBS&J (1999) also show that after storms and during dry-weather runoff the freshwater in the lower reaches of these watersheds had relatively high densities of pathogen indicator bacteria, while their densities in the adjacent surf zone were consistently much lower. In addition, they found that high bacterial densities in the freshwater watershed do not appear to have an impact on the densities of those found in the surf zone. The evidence shown in Tables 2.9-2.11 indicates that this is also the case at the Dana Point Headlands sites.

The data reported by PBS&J (1999) further confirm that nearshore physical processes are very effective in diluting, mixing, and transporting indicator bacteria and pathogens once the runoff containing them enters the surf zone, just as these processes do for other runoff constituents. This is an extremely important result in evaluating bacterial water quality for the Project and for other coastal areas.

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TECHNICAL REPORT

HEADLANDS WATER QUALITY TECHNICAL REPORT

PART 2 – WATER QUALITY MODELING RESULTS

URS Project No. 58-00161042.01-06000

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Appendices

Appendix A Water Quality Modeling Results – PCSWMM Output Files (on Compact Disc)

HEADLANDS
WATER QUALITY TECHNICAL REPORT
PART 2
WATER QUALITY MODELING RESULTS

1.0 INTRODUCTION

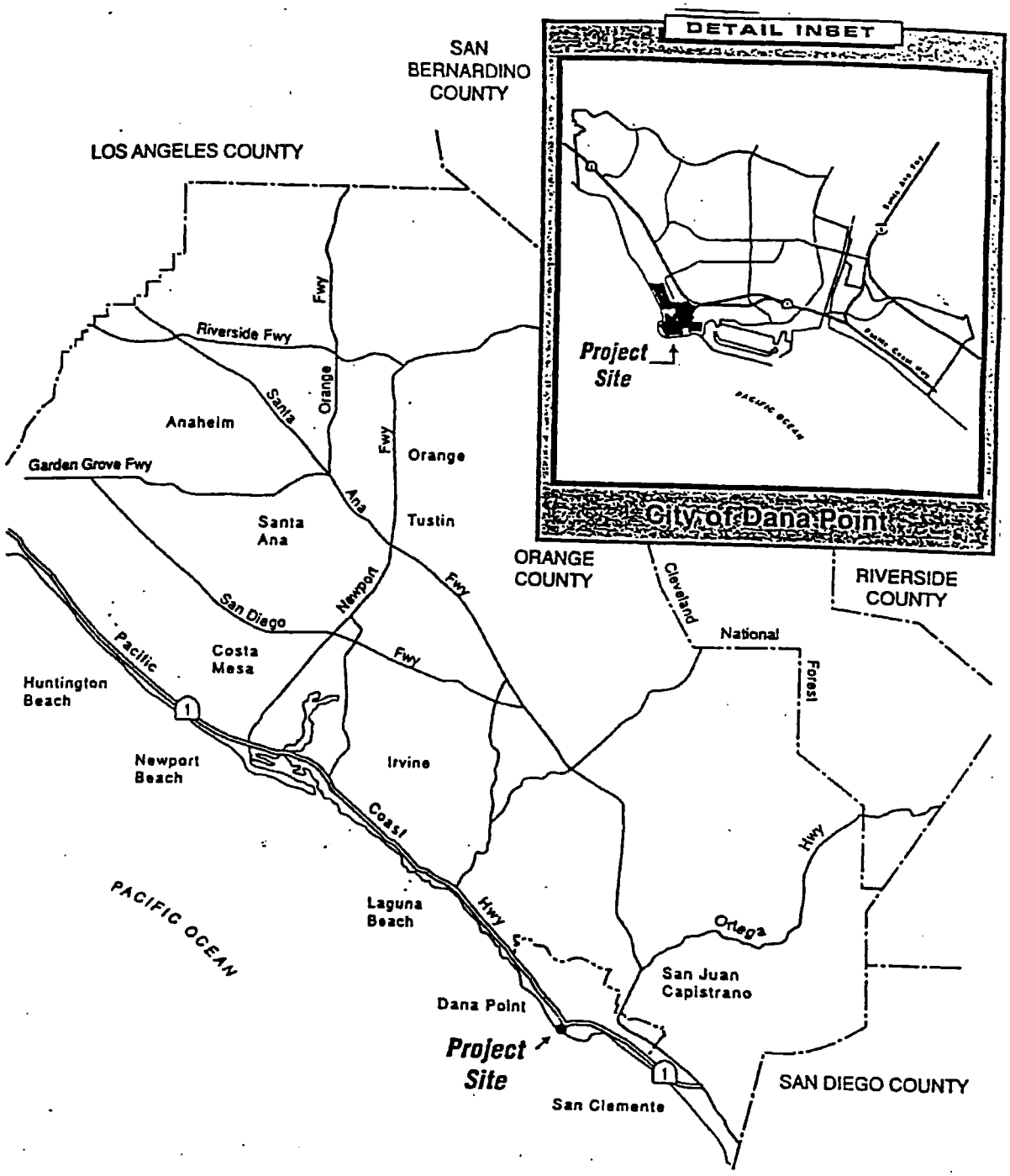
URS Corporation (URS) has performed an evaluation of the potential water quality impacts of the proposed Headlands project on receiving waters. Potential water quality impacts were evaluated by modeling the hydrology and hydraulics of the project watersheds with PCSWMM 2000, which utilizes the U.S. EPA Storm Water Management Model (SWMM). The model was run based on existing and future developed watershed conditions and implementation of structural and nonstructural best management practices (BMPs) on the developed watershed.

2.0 PROJECT SITE DESCRIPTION

The Headlands project site (Project Site) consists of approximately 121.3 acres of coastal terraces and bluffs located on the headlands that form Dana Point overlooking the Pacific Ocean, and Dana Point Harbor in the City of Dana Point, California. The regional location of the Project Site is shown on Figure 1. Local access to the Project Site is from Cove Road, Dana Strand Road, Street of the Green Lantern, Scenic Drive, and Selva Road. Pacific Coast Highway (SR-1) also provides local access to the Project Site (Figure 2). The area adjacent to the Project Site is urbanized and includes residential and commercial properties, a public parking lot, and Dana Point Harbor.

2.1 Existing Watershed Conditions

The Project Site contributes 113.6 acres to a larger, 147.6-acre watershed area that drains to three primary areas, including Strand Beach, the coastal bluffs associated with Dana Point and Harbor Point, and Dana Point Harbor. The remaining 7.7 acres of the Project Site consist of the beach area immediately adjacent to the Pacific Ocean and therefore are not included in the watershed analysis. The Keith Companies, Inc. (TKC) produced the drainage study for the Project Site, which outlines the existing watershed boundaries. TKC identified nine watershed areas (A through I) within the Project Site boundary. TKC estimated the area associated with each current land use within each of the nine watershed areas. The percent of impervious land associated with each of these land uses was also estimated by TKC. This information is discussed below and summarized in Table 1. The existing watershed boundaries are shown on Figure 3 (TKC, 2001).

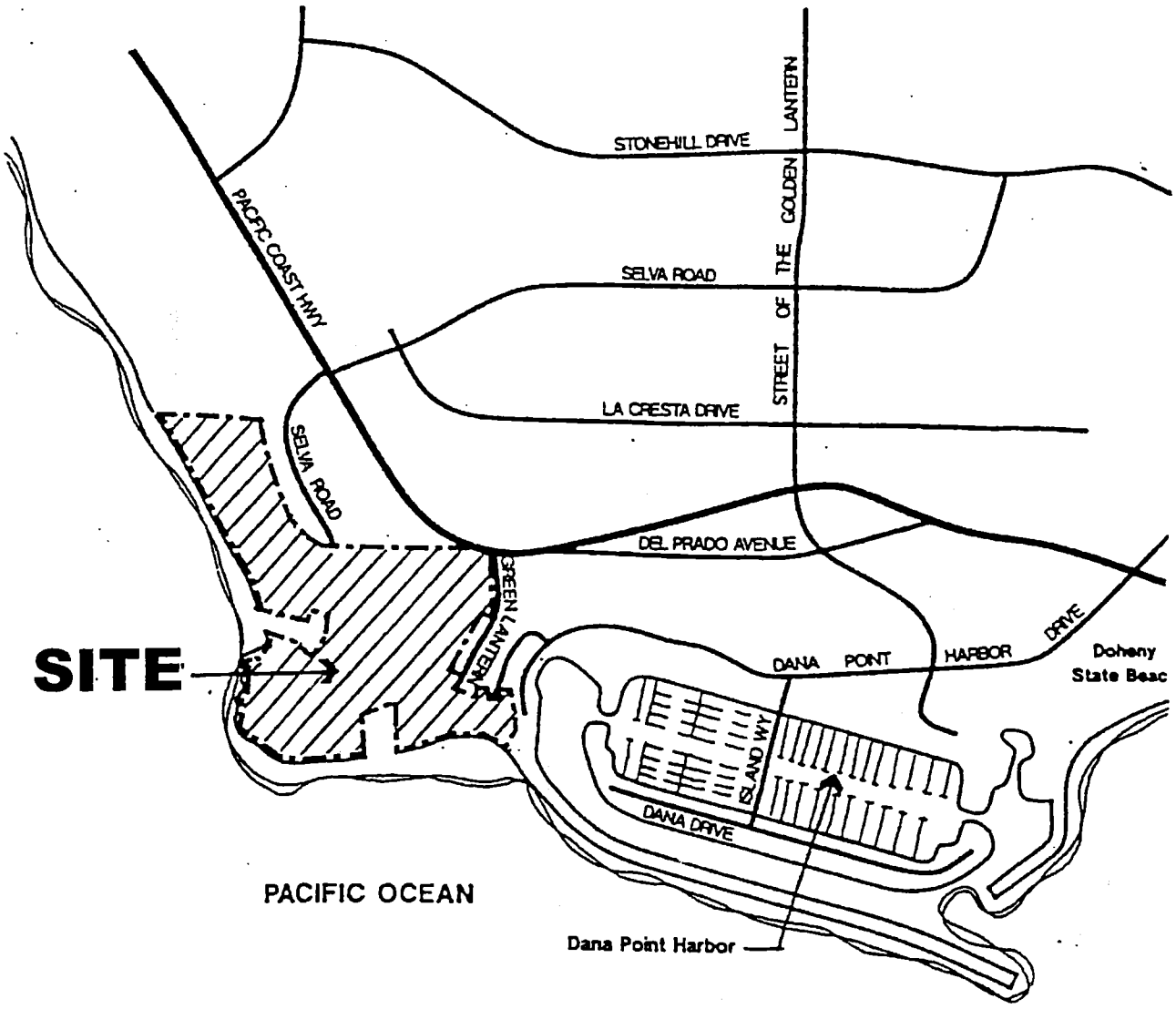


SOURCE: EDAW, Inc.

REGIONAL LOCATION MAP
HEADLANDS

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SOURCE: PBR

LOCAL VICINITY MAP
HEADLANDS

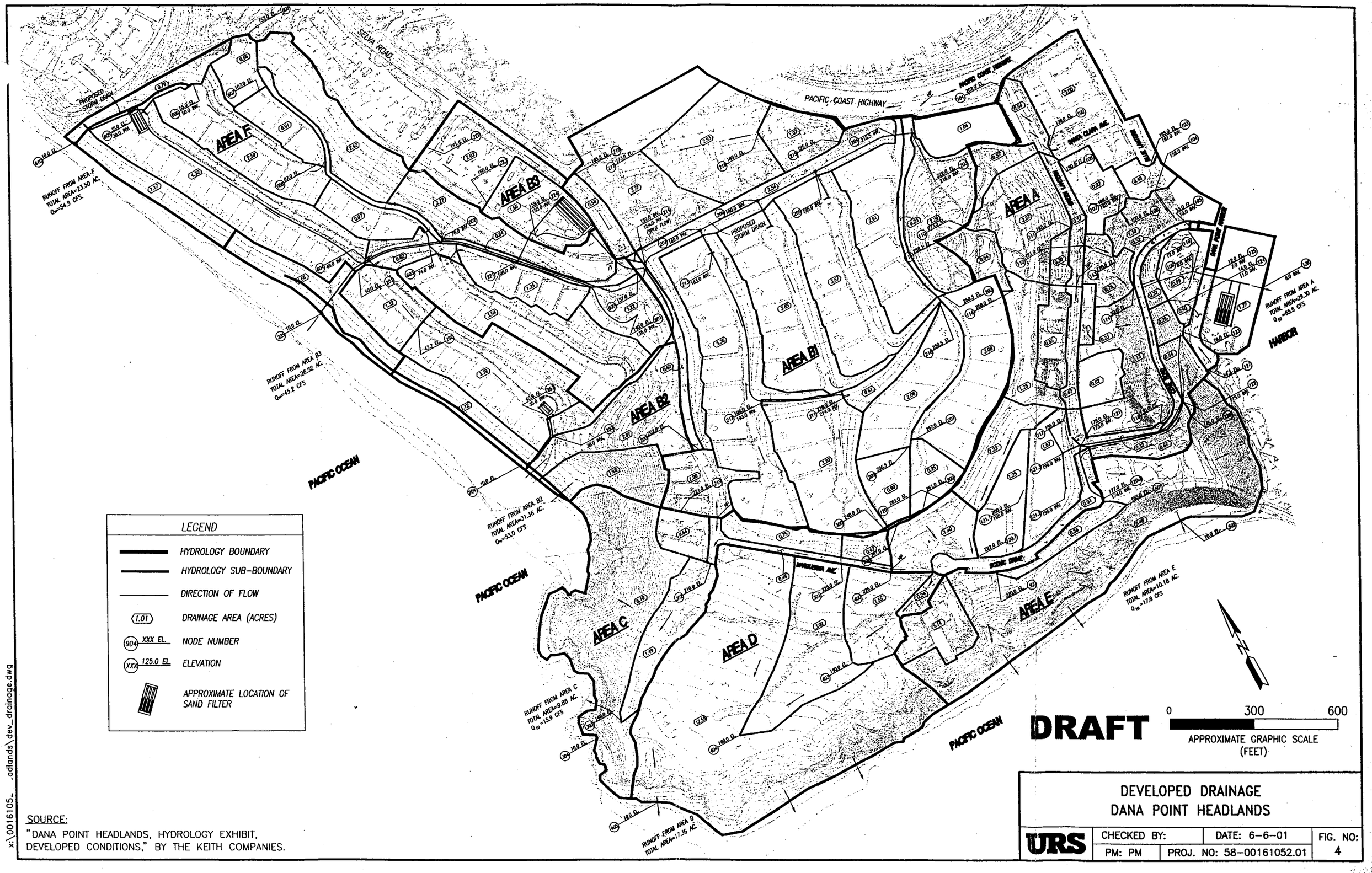
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Table 1
LAND USE AREAS FOR THE HEADLANDS WATERSHEDS - EXISTING CONDITIONS

	Watersheds Areas (Acres)[1]									
Land Use[2]	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**I**	**Total**
Commercial	11.04	2.05	0.43	0.47	0	4.75	0	0.97	1.67	21.38
Residential	1.38	0.92	0.64	0	1.14	8.36	6.96	0	1.38	20.78
Vacant/Undeveloped	18.15	33.89	9.54	18.19	10.03	5.97	1.12	1.27	7.28	105.44
Total	30.57	36.86	10.61	18.66	11.17	19.08	8.08	2.24	10.33	147.6

1. Source: The Keith Companies April 2001.
2. Land-use designations are from the Orange County Hydrology Manual. Commercial land use is defined as an area consisting of 80-100 percent impervious area. Under this definition, roadways and parking lot areas are included under commercial land-use designation.


AREA F
AREA B3
AREA B2
AREA B1
AREA A
AREA C
AREA D
AREA E
SELVA ROAD
PACIFIC COAST HIGHWAY
PROPOSED STORM DRAIN
PROPOSED STORM DRAIN
SEA PORT AVENUE
SEA PORT AVENUE
SEA PORT AVENUE

Of the nine identified watersheds, only one, Watershed A, drains directly into Dana Point Harbor. Watershed A encompasses approximately 30.57 acres, of which approximately 13 acres are associated with the Project Site. Storm-water runoff from Watershed A generally flows in a southwest direction through an existing storm drain system to Dana Point Harbor. Existing land uses within Watershed A include commercial, parking and roadways, residential, and vacant lands. Approximately 35.4 percent of Watershed Area A is covered with impervious surfaces due to existing development (TKC, 2001).

Watersheds C, D, and E sheet flow to the coastal bluffs and ultimately to the Pacific Ocean. These combined watersheds comprise about 40.98 acres of land. Storm-water runoff from these three watershed areas are predominately undeveloped vacant land with minor residential development. The estimated amount of impervious area due to development in these three watersheds ranges from 2.3 percent for Watershed D to 7.6 percent for Watershed C (TKC, 2001).

Watersheds B, F, G, H, and I discharge onto Strand Beach and ultimately to the Pacific Ocean. These watersheds drain about 76.59 acres of land. An abandoned mobile-home park is located along the beachfront and includes a deteriorated storm drain system. Due to deterioration and clogging, the storm drain system has become ineffective, and in several areas storm water from these five watershed areas discharges as surface flow onto Strand Beach. Land uses within these watersheds include commercial, residential (an abandoned mobile-home park, apartments, and condominiums), roadways, and vacant lands. The estimated amount of impervious area due to development in these five watersheds ranges from 6.6 percent for Watershed B to 64.6 percent for Watershed G (TKC, 2001).

2.2 Developed Watershed Conditions

Under the proposed developed conditions, TKC identified eight watershed areas (A through F) within the Project Site. Watershed B is further divided into three smaller drainage areas identified as B1, B2, and B3. Due to development activities such as grading and installation of drainage conveyance systems, the boundaries of the pre- and post-development watershed areas will change. TKC estimated the area associated with each of the proposed post-construction land uses for each of the eight watershed areas. The percent of impervious land associated with each of these land uses was also estimated by TKC. This information is discussed below and summarized in Table 2. The eight post-development watershed boundaries are shown on Figure 4.

Under developed conditions, Watershed A will be approximately 29.3 acres in size. Approximately 11.5 acres of this watershed area include the Project Site. The onsite project area and the majority of this watershed will drain to Dana Point Harbor via the existing and an improved storm drain system. New catch basins will be constructed on Scenic Drive and within the Seaside Inn site, a new storm drain in Cove Road will connect to an existing offsite storm drain, and structural BMPs, including diversion of low-flow nuisance water and a sand filter system, will be implemented.

The sand filter system includes a sedimentation chamber and will be installed to improve water quality in Dana Point Harbor. Developed land uses within Watershed A will include commercial, residential, vacant lands, parking lots, and park/landscaped areas. Approximately 48.4 percent of the watershed surface will be covered with impervious surfaces after development is complete (TKC, 2001).

Only minor changes will occur to the watersheds that discharge runoff along the coastal bluffs (Watershed Areas C, D, and E) under developed conditions. Overall, the total land area of the watersheds discharging onto the coastal bluffs will decrease by approximately three acres under developed conditions. Modifications to these watersheds include removing the pavement from Marguerita Avenue and regarding this area to natural contours and the realignment of Scenic Drive. These modifications will decrease runoff discharge over the bluffs. Except for the addition of small visitor facilities for the park, land use in these watersheds will not change from the existing uses described above. The estimated amount of impervious area due to development in these watersheds ranges from 1.2 percent for Watershed D to 6.5 percent for Watershed C (TKC, 2001).

In the developed condition, Drainage Areas B1, B2, B3, and F will discharge to Strand Beach. Included in Drainage Area B1 is the proposed, 1.6-acre commercial area at SR-1 and A Street. As proposed, drainage from the commercial site has been diverted away from Dana Point Harbor to lessen the potential for water quality impacts to this receiving water body and to reduce overall flows to the harbor.

The new storm drain system for the proposed project has been sized to serve the Project Site and offsite tributary areas. Three new storm drain outfalls to Strand Beach will replace the five existing outfalls. The storm drain improvements will include a "smart box" diversion structure that will divert stormwater flows away from the more biologically sensitive cove area at the south end of the beach. Diversion of nuisance flows to the sanitary sewer for treatment will also occur. Three sand filters will be the primary structural BMP for maintaining water quality. Additional storm drain improvements include new catch basins and storm drain lines and energy dissipation structures upstream of the outfalls, which will effectively reduce stormwater velocities to minimize the potential for beach erosion (TKC, 2001).

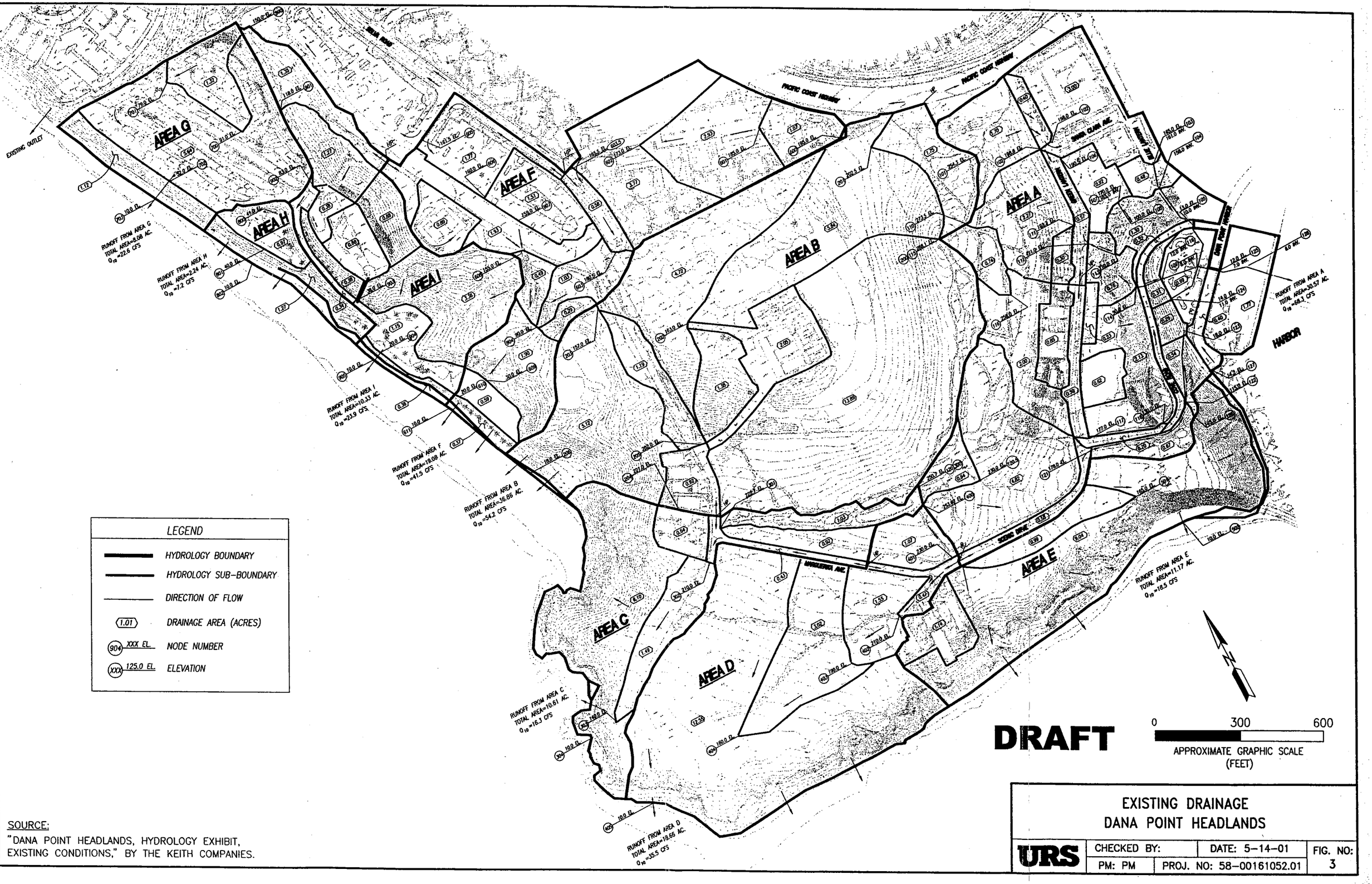
Existing and proposed land uses in the watershed areas that drain to Strand Beach include commercial, residential, roadways, vacant lands, parks, and landscaped areas. The estimated amount of impervious area due to development in these watersheds ranges from 31.9 percent for Watershed F to 44.8 percent for Watershed B3 (TKC, 2001).

Table 2
LAND USE AREAS FOR THE HEADLANDS WATERSHEDS - DEVELOPED CONDITIONS

	Watershed Areas[1]								
Land Use[2]	A	B1	B2	B3	C	D	E	F	Total
Commercial	14.53	2.47	0	3.68	0.25	0.24	0	1.46	22.84
Residential	1.38	35.06	4.71	0	0.64	0	1.14	15.44	58.37
Vacant/Undeveloped	13.39	4.83	5.47	1.66	8.97	17.12	9.04	6.6	66.87
Total	29.3	42.36	10.18	5.34	9.86	17.36	10.18	23.5	148.08[3]

Notes:

1. Source: The Keith Companies April 2001.
2. Land-use designations are from the Orange County Hydrology Manual. Commercial land use is defined as an area consisting of 80-100 percent impervious area. Under this definition, roadways and parking lot areas are included under commercial land-use designation.
3. The total watershed area increased by 0.46 acres in the developed condition as a result of minor watershed boundary changes in the northern portion of the site.



DRAFT

SOURCE:
"DANA POINT HEADLANDS, HYDROLOGY EXHIBIT, EXISTING CONDITIONS," BY THE KEITH COMPANIES.

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EXISTING DRAINAGE
DANA POINT HEADLANDS

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3.0 BEST MANAGEMENT PRACTICE SELECTION

As part of the project development, source control and treatment BMPs are proposed so that runoff and runoff constituents from the Project Site and adjacent tributary areas will be reduced to the maximum extent practicable and will not cause or contribute to exceedences of receiving water quality objectives. The BMP selection process included an evaluation of the site conditions (surface water, groundwater, soils, geology, and terrain), the proposed land uses, and applicable regulatory guidelines. The regulatory guidelines and sizing criteria presented in the San Diego Municipal Storm Water Permit (Storm Water Permit), revised by the San Diego Regional Water Quality Control Board (SDRWQCB) in February 2001, was used as guidance in BMP selection and design.

The Project Site is located on relatively steep coastal property that is underlain by beach sand, San Onofre Breccia, Monterey Formation, marine terrace deposits, slope wash, artificial fill, and landslide material. The San Onofre Breccia is well cemented and acts as a barrier to water infiltration, as does the Monterey Formation, leading to the potential for perched groundwater. The depth to groundwater beneath the project site ranges from approximately 20 to over 50 feet below the ground surface. Uncontrolled groundwater levels/flow beneath the Project Site could result in seepage or slope instability according to the project geotechnical engineer (AMEC, 2001).

Based on these site conditions, structural BMPs that rely on infiltration (e.g., grassy swales, porous pavement, infiltration basins, etc.) were not considered viable treatment controls. Given the sensitive nature of the receiving waters in the project area (Dana Point Harbor, Dana Point Marine Life Refuge, and Niguel Marine Life Refuge), it was critical to identify treatment control BMPs with well-documented runoff contaminant-reduction capabilities. Many newer-technology storm-water BMPs are available on the market. Some of these BMPs include storm drain inlet inserts, which utilize a variety of absorbent materials and continuous deflection separation (CDS) units. However, limited information is available regarding the effectiveness of these systems at removing bacteria, nutrients, and metals under different climatic conditions. Therefore, these newer-technology storm drain inlet inserts and CDS units were not considered appropriate for this application.

Sand filters are a common structural storm-water treatment control that has been widely utilized. The sand filter systems for this project will be designed by TKC to treat the water quality volume associated with the 85th percentile storm event. The effectiveness of storm-water runoff contaminant reduction by sand filters is well documented (EPA, 1999; Barrett and Borroum, 2001). Sand filters can be installed beneath parking lots and streets, and therefore can be incorporated easily into new or existing developments. A portion of the sand filter area is designed as a retention basin, where sediment removal and runoff detention occurs. Additional detention occurs within the sand filter chamber prior to treatment. This design attenuates storm-water discharge into the receiving waters and reduces peak flows discharging from the watershed. Additionally, the size of the sand filters will be designed to meet the volume sizing criteria stipulated in the San Diego

Municipal Storm Water Permit. Based on these factors, sand filters were identified as the most appropriate primary treatment control BMP for the project.

Development will include curbs, gutters, and roadways that will build up and store contaminants, litter, and sediment originating from roadway use and that have blown in from adjacent areas. Removal of these constituents through street sweeping can reduce constituent concentrations in storm-water runoff. The City of Dana Point maintains a modern vacuum street sweeper that will be available to the Headlands. Therefore, weekly street sweeping is another proposed BMP that will reduce buildup of sediment and other contaminants in the proposed development. Use of a modern street sweeper is currently a vital BMP for many U.S. cities needing to address storm-water quality (Partland, 2001). Further discussion of street sweeping is presented in Section 4.0.

Additional proposed BMPs include diversion of low-flow nuisance water to the sanitary sewer, public education, and improved landscape practices (e.g., pesticide/herbicide selection and application, irrigation practices, etc.). The benefits of nonstructural BMPs can be significant but difficult to calculate. The Headlands Water Quality Technical Report Part 1 provides a complete description of proposed structural and nonstructural BMPs.

4.0 WATER QUALITY MODELING BACKGROUND AND METHODOLOGY

URS utilized the PCSWMM 2000 (PCSWMM) model to evaluate the relative water quality impacts from storm-water runoff under three site conditions, including existing watershed conditions, developed watershed conditions, and developed watershed conditions with sand filters and street-sweeping BMPs. PCSWMM is a water quality modeling program developed by Computational Hydraulics International (CHI) at the University of Guelph, Ontario, Canada, that utilizes the U.S. EPA Storm Water Management Model (SWMM) version 4.4GU. SWMM was originally developed in the early 1970s and updated periodically, including the most recent update in 1999 (version 4.4GU).

PCSWMM was used on the Headlands project to predict water quality concentrations in storm-water runoff for 12 water quality constituents under various land-use conditions. The two BMPs evaluated in the model were street sweeping and sand filters. Additional water quality benefits will be derived from other proposed BMPs, such as nuisance flow diversions and public education. However, these other proposed BMPs were not evaluated because of limited information regarding specific constituent removal rates. As identified earlier, Tables 1 and 2 provide a breakdown of the specific land uses for existing and developed watershed conditions, respectively.

Water quality constituents were modeled using a build-up/wash-off procedure in the model, which allows various constituents to increase or build up in the watershed prior to a storm event. Use of the build-up/wash-off method in the model allowed site-specific information to be input into the model, such as the average number of antecedent dry days before a storm and specific land-use build-up rates. Another benefit of using the build-up/wash-off

option for water quality constituents was the ability to include BMPs in the model to assess their effectiveness.

Build-up rates were obtained from published information and example models developed by CHI (James, 2000). The build-up rates were further adjusted to correlate the model output flow-weighted concentrations with published event mean concentrations (EMCs) for the San Diego and Los Angeles areas. There is currently no published EMC data for Orange County available for comparison. The EMCs for Los Angeles and San Diego are presented in Table 3. Although model results under this setup supplied only a relative comparison for future conditions, model results were found to be comparable with the EMCs (Table 3) and to baseline storm-water quality data obtained by Dr. Ford (Water Quality Technical Report, Part 1) for the corresponding watersheds. The number of antecedent dry days (eight days) used within the model under the design storm conditions was the average of antecedent dry days for monitored storms in the Los Angeles area (LADPW, 2000).

Developed conditions were modeled by inputting the land-use characteristics for the developed conditions as presented in TKC's report titled "Drainage Study for the Headlands" (TKC, 2001). Some of the characteristics that were incorporated in the model include the slope of land, percent imperviousness, and the fractional distribution of land uses. The proposed developed condition will result in a reconfiguration of the size and number of modeled watersheds from nine to eight. Modifications to the drainage areas will direct runoff from developed watersheds within the project area to discharge through a sand filter system prior to entering the receiving waters, and will also reduce the total storm flow discharging to Dana Point Harbor (TKC, 2001).

The performance of street sweeping as a BMP was evaluated within the built-in options of PCSWMM. Street sweeping will be performed within the Headlands development approximately once a week. The removal efficiency of street sweeping was assessed for each constituent modeled by proportioning the surface area of streets and parking lots within a watershed with its associated impervious area. Street sweeping was modeled for one-day and six-day antecedent conditions (days prior to the modeled storm event) to identify the differences in total constituent removal related to street sweeping. Many of the removal efficiencies for specific constituents used for street sweeping date back to the 1970s, when street sweepers were less efficient (Table 5; James, 2000). The use of advanced vacuum sweeping devices in the Dana Point area have greater sweeping efficiencies and likely have improved the constituent-removal efficiencies from those used in the model.

Constituent removal associated with sand filters was assessed using the model results from the developed watershed conditions, including street sweeping. Removal rates for particular constituents were obtained from "A Preliminary Assessment of the Cost, Maintenance Requirements and Performance of Sand Filters" by Barrett and Borroum (2001) and "Preliminary Data Summary of Urban Storm Water Best Management Practices" by the United States Environmental Protection Agency (1999). Constituent removals are presented as percent removal based on water quality monitoring performed in

the Los Angeles and San Diego watersheds (Table 4). Due to the limited information available for the other proposed BMPs for the project, the predicted effluent concentrations include the constituent removal associated with sand filters and street sweeping.

Table 3
LOS ANGELES AND SAN DIEGO EVENT MEAN CONCENTRATIONS

		Los Angeles EMCs for Selected Constiuents[1]			San Diego EMCs for Selected Constiuents[2]		
		Land Use			Land Use		
Constituent	Units	VAC	COMM	RES	VAC	COMM	RES
TSS	mg/L	165	67	73	70	111	196
TDS	mg/L	--	--	--	30	108	163
BOD5	mg/L	--	--	--	--	--	--
COD	mg/L	--	--	--	--	--	--
Nitrate-N	mg/L	1.11	0.58	1.16	0.54	1.05	1.12
TKN	mg/L	0.81	3.37	2.45	0.97	2.11	2.17
Total P	mg/L	0.11	0.41	0.28	0.12	0.52	0.41
Dissolved P	mg/L	0.06	0.30	0.22	0.03	0.30	0.31
Total Cd	µg/L	--	0.7	--	0.38	0.75	0.67
Total Cu	µg/L	9.12	35	15	29	27	34
Total Zn	µg/L	38.81	239	133	195	254	276
Total Pb	µg/L	--	12	8	23	16	23

Notes:

1 - LA County Public Works (1999)

2 – City of San Diego (1999)

-- indicate that no data were available

VAC - Vacant/Undeveloped Land Use

COMM - Commercial Land Use

RES - Residential Land Use

TSS - Total Suspended Solids

TDS - Total Dissolved Solids

BOD5 - 5-day Biochemical Oxygen Demand

COD - Chemical Oxygen Demand

Nitrate-N - Nitrate as Nitrogen

TKN - Total Kjeldahl Nitrogen

Total P - Total Phosphorous

Dissolved P - Dissolved Phosphorous

Total Cd - Total Cadmium

Total Cu - Total Copper

Total Zn - Total Zinc

Total Pb - Total Lead

µg/L – Micrograms per liter

mg/L – Milligrams per liter

Table 4
REMOVAL EFFICIENCIES FOR SAND FILTERS
(EPA, 1999; BARRETT AND BORROUM, 2001)

Constituent Modeled	Percent Removal
TSS	85%
TDS	NA
BOD5	70%
COD	NA
Nitrate-N	-40%
TKN	45%
Total P	35%
Dissolved P	-31%
Total Cd	26%
Total Cu	50%
Total Zn	84%
Total Pb	85%

Notes:

NA indicates constituents for which percent removal was not available.

See Table 3 for constituent abbreviations.

Table 5
REMOVAL EFFICIENCIES FROM STREET SWEEPING (JAMES, 2000)

Constituent Modeled	Percent Reduction
TSS	31%
TDS	NA
BOD5	24%
COD	16%
Nitrate-N	NA
TKN	26%
Total P	NA
Dissolved P	8%
Total Cd	23%
Total Cu	30%
Total Zn	34%
Total Pb	40%

Notes:

NA indicates constituents for which were not identified with a removal efficiency was not available.

Constituent removals were modeled for roadways within the watersheds, as described in Section 4.0.

See Table 3 for constituent abbreviations.

4.1 Regulatory Criteria Applicable to PCSWMM 2000 Model

Portions of Orange County are located in Region 8 (Santa Ana) and Region 9 (San Diego) of the California Regional Water Quality Control Board (RWQCB). The Project Site is located in the southern portion of Orange County, within the jurisdiction of the San Diego RWQCB (SDRWQCB). On February 21, 2001, the SDRWQCB issued Order No. 2001-01, a revised San Diego Municipal Storm Water Permit (Storm Water Permit). The Storm Water Permit outlines waste discharge requirements for discharges of urban runoff from municipal separate storm sewer systems (MS4s), draining the watersheds of the County of San Diego, the incorporated cities of San Diego County, and the San Diego Unified Port District. The City of Dana Point is currently not one of the Municipal Co-permittees identified in the Storm Water Permit. However, it is anticipated that because it is located within Region 9 of the RWQCB, ultimately the requirements outlined in this permit will apply to this area. Therefore, the applicable regulatory criteria outlined in this permit and described below were incorporated into the project water quality design and PCSWMM model.

Headlands Water Quality Technical Report,
Part 2 –Water Quality Modeling Results

Item F.1.b. of the Storm Water Permit requires the implementation of BMP control measures (both source control and treatment control) that ensure contaminants in runoff from new developments will be reduced to the maximum extent practicable and will not cause or contribute to an exceedance of receiving water quality objectives. Standard Urban Storm Water Mitigation Plans (SUSMPs) will be required for all new developments and redevelopment projects falling under the priority project categories. These categories include, but are not limited to, the creation or addition of at least 5,000 square feet of impervious surfaces on an already developed site, home subdivisions of 100 housing units or more, restaurants or paved areas where the area of land development is over 5,000 square feet, and areas that are adjacent to or discharge directly to an environmentally sensitive area (such as Clean Water Act Section 303[d] impaired water bodies). Based on these criteria, the Project Site would be considered a priority project.

The SUSMP requires that the proposed structural BMPs for a project be located so as to infiltrate, filter, or treat the required runoff volume or flow prior to its discharge to any receiving waterbody supporting beneficial uses. The design storm used was 0.2-inch-per-hour rainfall intensity for one hour as determined by the Orange County Hydrology Manual. This design storm is in accordance with Item F.1.b.(2)(c) of the storm water permit. PCSWMM results included flow-weighted constituent concentrations (EMCs) for existing and developed conditions and also for developed conditions with the sand filter and street-sweeping BMPs to evaluate the effectiveness of the two BMPs in contaminant reduction under these rainfall conditions.

A parameter that was not modeled was fecal or total coliform. Under the modeling limitations of a design storm with an established build-up rate, modeling total or fecal coliform is difficult. Because of the bacteriological growth associated with coliform, an impact cannot be addressed within the modeling time frame of one to eight days. If continuous modeling was performed for a longer period of time (e.g., one year), perhaps a comparable coliform prediction could be observed.

It should be noted that other bacterial sources, other than urban runoff, have been found to increase bacterial (enterococci) concentrations in receiving waters (Grant et al., 2001). Grant et al. found that wildlife in Talbert Marsh (Huntington Beach, California) directly contributed increased concentrations of enterococci to the surf zone. In order to minimize the effects of urban runoff on receiving waters, the City of Huntington Beach diverted nuisance water runoff to the sanitary sewer. The Headlands project also plans to divert nuisance water runoff to the sanitary sewer and include other BMPs (e.g., sand filter treatment, public awareness, and street sweeping) that will reduce bacterial concentrations. These BMPs have been shown in several studies to significantly reduce bacterial concentrations. The combination of these BMPs applied at the Headlands is anticipated to not only reduce bacterial concentrations in the developed conditions but also reduce levels below existing bacterial concentrations.

Removal of bacteria from sand filters has been monitored during various pilot studies around the nation. The United States Environmental Protection Agency (U.S. EPA) had

documented a number of these studies and found that the range of bacterial removal is between 37 and 83 percent (U.S. EPA(a), 1999) and found it to be 76 percent in the southeastern states (U.S. EPA(b), 1999).

4.2 Water Quality Modeling Results and Conclusions

PCSWMM output files include information on storm-water runoff volumes and peak flows, as well as constituent loading and flow-weighted concentrations. The flow-weighted concentrations are presented for each watershed associated with the existing watershed conditions (Table 6), developed watershed conditions (Table 7), developed watershed conditions with street sweeping (Tables 8 and 9), and developed watershed conditions with structural BMPs (sand filters and street sweeping; Tables 10 and 11). Tables 10 and 11 are presented for storm-water draining to Dana Point Harbor and Strand Beach, respectively, which incorporate both street sweeping and sand filter BMPs. Drainage in Watersheds C, D, and E sheet flow over the coastal bluffs via natural pathways. Therefore, those areas will not incorporate sand filters for treatment of stormwater. Comparison of the existing and developed watershed conditions on the coastal bluff watersheds is presented in Table 12.

Street sweeping reduces EMCs of constituents that are associated with particulates and surfaces of roads and parking lots. Tables 8 and 9 show modeling results for street sweeping occurring one day and six days, respectively, prior to the design storm. As shown in the tables, sweeping reduced zinc and TKN by four percent for both constituents in Watershed A, and nine percent and eight percent, respectively, in Watershed B3.

As one would expect, reductions from street sweeping are less significant when sweeping is performed six days prior to the storm (Table 9). Although the results for both street-sweeping scenarios (one day and six days) do not show dramatic constituent reductions, the benefit of street sweeping is still apparent. Additional street sweeping benefits include decreased litter loads and airborne dust.

The results shown on Tables 8 and 9 illustrate the benefits of a timely and efficient street-sweeping program. A program that includes sweeping prior to a storm event can be effective in reducing constituent loads.

The PCSWMM model for Headlands was developed using eight days of build-up time prior to sweeping. It is apparent that a constituent build-up period greater than eight days would result in increased EMCs and loads. Subsequently, the plan for street sweeping on a weekly basis would effectively reduce the build-up of constituents on roads and parking lots. Therefore, the potential storm EMCs could be maintained similar to the model results.

Results from the modeling show that all constituents except nitrate-N and dissolved phosphorus, the effluent concentrations from the developed watershed conditions (with BMPs) are lower than those for the existing watershed conditions. These dissolved nutrients will likely increase because of the disassociation of organic or particulate bound nutrients while passing through the sand filter. However, these increases in dissolved phosphorus and

nitrates are a function of total phosphorus and TKN, respectively. Therefore, other nonstructural BMPs implemented to the project that reduce total phosphorus and TKN will assist in the reduction of dissolved nutrients. These nonstructural BMPs include controls on the types, timing, and amounts of fertilizers applied in the project area.

Model results for Strand Beach (Table 11) also predicted increases in TDS and COD from the existing watershed conditions to the developed watershed conditions (with BMPs). TDS and COD do not have published removal efficiencies for sand filters and TDS does not have published removal efficiencies for street sweeping. It is anticipated that TDS will be reduced as a result of street sweeping, but that could not be quantified in this analysis. It is also anticipated that COD will have decreased effluent concentrations due to its close relationship with BOD. BOD is a function of COD, therefore a reduction in COD is expected. It should be noted that the removal efficiencies for COD would likely be less than that for BOD.

Table 12 presents the model results for the coastal bluffs. The constituent concentrations remain constant or increase slightly (less than or equal to 2 percent) in the developed watershed conditions (with street sweeping). Minor concentration increases can be attributed to the changes in land use proportions in the watersheds. It is anticipated that the concentrations will decrease when the proposed nonstructural BMPs are implemented.

When the modeled EMCs are compared with the Los Angeles and San Diego EMCs, the runoff concentrations from the developed watershed conditions are equivalent to or below the Los Angeles and San Diego EMC values.

Table 6
HEADLANDS PCSWMM MODEL RESULTS FOR EXISTING CONDITIONS

Headlands Watersheds Model Results for Existing Conditions[1]										
Constituent Modeled[2]	Units	A	B	C	D	E	F	G	H	I
TSS	mg/l	94	59	67	38	52	112	132	88	101
TDS	mg/l	33	27	29	19	21	23	20	34	36
BOD5	mg/l	26	17	18	11	13	22	22	28	25
COD	mg/l	53	38	41	26	30	35	26	57	52
Nitrate-N	mg/l	0.76	0.50	0.55	0.33	0.41	0.69	0.67	0.73	0.76
TKN	mg/l	1.43	0.90	0.99	0.60	0.74	1.30	1.26	1.38	1.41
Total P	mg/l	0.22	0.12	0.13	0.08	0.10	0.22	0.23	0.21	0.21
Dissolved P	mg/l	0.14	0.04	0.05	0.02	0.03	0.17	0.19	0.14	0.11
Total Cd	µg/l	0.51	0.34	0.37	0.23	0.28	0.42	0.37	0.49	0.50
Total Cu	µg/l	38	26	29	17	22	35	36	36	39
Total Zn	µg/l	204	148	162	101	121	169	158	194	212
Total Pb	µg/l	25	20	22	14	17	21	21	24	28

Notes:

1. Constituent concentrations are based on flow-weighted averages modeled with PCSWMM 2000.
2. See Table 3 for constituent abbreviations.

Table 7
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITIONS (without BMPs)

Headlands Watersheds - Developed Conditions (without BMPs)[1]									
Constituent Modeled[2]	Units	A	B1	B2	B3	C	D	E	F
TSS	mg/l	84	70	131	91	67.6	30	55	151
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	25	22	18.5	9.0	14	23
COD	mg/l	46	48	44	40	41.5	21	31	34
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.3	1.0	1.5	1.4	1.0	0.47	0.78	1.56
Total P	mg/l	0.21	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.44	0.38	0.48	0.49	0.37	0.18	0.29	0.48
Total Cu	µg/l	33	29	42	35	28.9	14	23	44
Total Zn	µg/l	172	163	209	181	163	80	127	203
Total Pb	µg/l	20	22	28	20	22.3	11	17	27

Notes:

1. Constituent concentrations are based on flow-weighted averages modeled with PCSWMM 2000.
2. See Table 3 for constituent abbreviations.

Table 8
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITION WITH STREET SWEEPING

Headlands Watersheds - Developed Conditions With Street Sweeping One Day Prior to Storm[1]									
Constituent Modeled[2]	Units	A	B1	B2	B3	C	D	E	F
TSS	mg/l	84	69	125	81	66.1	30	55	144
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	24	20	18.4	9	14	23
COD	mg/l	46	48	44	39	41.5	21	31	33
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.23	1.03	1.43	1.31	0.99	0.47	0.78	1.51
Total P	mg/l	0.20	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.43	0.38	0.47	0.45	0.37	0.18	0.29	0.47
Total Cu	µg/l	31	29	41	32	28.6	14	23	42
Total Zn	µg/l	165	163	203	164	162	80	127	194
Total Pb	µg/l	20	22	27	18	22.0	11	17	26

Notes:

1. Constituent concentrations are based on flow weighted averages modeled through PCSWMM 2000.
2. See Table 3 for constituent abbreviations.

Table 9
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITION WITH STREET SWEEPING

Headlands Watersheds - Developed Conditions With Street Sweeping Six Days Prior to Storm[1]									
Constituent Modeled[2]	Units	A	B1	B2	B3	C	D	E	F
TSS	mg/l	84	70	129	88	67.6	30	55	149
TDS	mg/l	26	33	32	20	29.5	15	22	25
BOD5	mg/l	24	22	25	22	18.5	9	14	23
COD	mg/l	46	48	44	40	41.5	21	31	34
Nitrate-N	mg/l	0.68	0.57	0.79	0.75	.55	0.26	0.43	0.83
TKN	mg/l	1.26	1.03	1.46	1.39	0.99	0.47	0.78	1.54
Total P	mg/l	0.21	0.14	0.23	0.24	.13	0.06	0.10	0.27
Dissolved P	mg/l	0.15	0.06	0.15	0.19	.05	0.01	0.04	0.21
Total Cd	µg/l	0.44	0.38	0.48	0.48	0.37	0.18	0.29	0.48
Total Cu	µg/l	32	29	42	34	28.8	14	23	43
Total Zn	µg/l	170	163	207	176	163	80	127	201
Total Pb	µg/l	20	22	28	19	22.2	11	17	27

Notes:

1. Constituent concentrations are based on flow weighted averages modeled through PCSWMM 2000.
2. See Table 3 for constituent abbreviations.

Table 10
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITIONS WITH SAND FILTER AND STREET SWEEPING BMPS

Headlands Watersheds - Modal Results for Dana Point Harbor[1]						
Constituent Modeled[2]	Units	Existing Watershed Conditions	Developed Watershed Conditions	Developed Watershed Conditions With BMPs[3] (1-day)	Developed Watershed Conditions With BMPs[4] (6-day)	Percent Reduction From Existing to Developed Watershed Conditions
TSS	mg/l	94	84	12	12	87%
TDS	mg/l	33	26	26	26	19%
BOD5	mg/l	26	24	7	7	72%
COD	mg/l	53	46	46	46	13%
Nitrate-N	mg/l	0.76	0.68	0.95	0.95	-24%
TKN	mg/l	1.4	1.3	0.7	0.7	53%
Total P	mg/l	0.22	0.21	0.13	0.14	39%
Dissolved P	mg/l	0.14	0.15	0.19	0.19	-38%
Total Cd	µg/l	0.51	0.44	0.32	0.32	37%
Total Cu	µg/l	38	33	16	16	59%
Total Zn	µg/l	204	172	27	28	87%
Total Pb	µg/l	25	20	3	3	88%

Notes:

1. Watershed A is the only project site watershed that drains to Dana Point Harbor. The location of the Dana Point Harbor sand filter is shown on Figure 4.
2. Constituent concentrations are flow-weighted averages based on total constituent load and cumulative flow for all watersheds draining to the receiving water, as determined by PCSWMM 2000. See Table 3 constituent abbreviations.
3. Developed watershed conditions with street sweeping one day before storm and sand filter treatment prior to discharge into Dana Point Harbor.
4. Developed watershed conditions with street sweeping six days before storm and sand filter treatment prior to discharge into Dana Point Harbor.

Table 11
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITIONS WITH SAND FILTERS AND STREET SWEEPING BMPS

Headlands Watersheds - Modal Results for Strand Beach[1]						
Constituent Modeled[2]	Units	Existing Watershed Conditions	Developed Watershed Conditions	Developed Watershed Conditions With BMPs[3] (1-day)	Developed Watershed Conditions With BMPs[4] (6-day)	Percent Reduction From Existing to Developed Watershed Conditions
TSS	mg/l	109	114	16	17	85%
TDS	mg/l	25	31	31	31	-26%
BOD5	mg/l	22	24	7.0	7.1	68%
COD	mg/l	36	44	44	44	-21%
Nitrate-N	mg/l	0.68	0.74	1.03	1.03	-53%
TKN	mg/l	1.26	1.37	0.73	0.75	42%
Total P	mg/l	0.21	0.22	0.14	0.14	35%
Dissolved P	mg/l	0.16	0.14	0.18	0.18	-15%
Total Cd	µg/l	0.41	0.46	0.33	0.34	19%
Total Cu	µg/l	35	39	18.6	19.1	46%
Total Zn	µg/l	170	195	31	31	82%
Total Pb	µg/l	22	26	3.8	3.9	83%

Notes:

1. Watersheds B1, B2, B3, and F drain to Strand Beach through three outfalls. The locations of the sand filters in these watersheds are shown on Figure 4.
2. Constituent concentrations are flow-weighted averages based on total constituent load and cumulative flow for all watersheds draining to the receiving water, as determined by PCSWMM 2000. See Table 3 constituent abbreviations.
3. Developed watershed conditions with street sweeping one day before storm and sand filter treatment prior to discharge to Strand Beach.
4. Developed watershed conditions with street sweeping six days before storm and sand filter treatment prior to discharge to Strand Beach.

Table 12
HEADLANDS PCSWMM MODEL RESULTS FOR DEVELOPED CONDITIONS WITH STREET SWEEPING

Headlands Watersheds - Modal Results for the Coastal Bluffs[1]						
Constituent Modeled[2]	Units	Existing Watershed Conditions	Developed Watershed Conditions	Developed Watershed Conditions With BMPs[3] (1-day)	Developed Watershed Conditions With BMPs[4] (6-day)	Percent Reduction From Existing to Developed Watershed Conditions
TSS	mg/l	53	55	54	55	-2%
TDS	mg/l	23	24	24	24	-2%
BOD5	mg/l	15	15	15	15	0%
COD	mg/l	33	33	33	33	0%
Nitrate-N	mg/l	0.44	0.44	0.44	0.44	0%
TKN	mg/l	0.79	0.81	0.80	0.80	-1%
Total P	mg/l	0.10	0.11	0.11	0.11	-2%
Dissolved P	mg/l	0.04	0.04	0.04	0.04	0%
Total Cd	µg/l	0.30	0.30	0.30	0.30	0%
Total Cu	µg/l	23	23	23	23	0%
Total Zn	µg/l	130	132	132	132	-1%
Total Pb	µg/l	18	18	18	18	0%

Notes:

1. Watersheds C, D, and E drain to the coastal bluffs.
2. Constituent concentrations are flow-weighted averages based on total constituent load and cumulative flow for all watersheds draining to the receiving water, as determined by PCSWMM 2000. See Table 3 constituent abbreviations.
3. Developed watershed conditions with street sweeping one day before storm.
4. Developed watershed conditions with street sweeping six days before storm.

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SOUTH COAST WATER DISTRICT

Providing Quality Water and Wastewater Services to the Coastal Communities

April 5, 2001

Mr. Edward Knight
Director of Community Development
City of Dana Point
33282 Golden Lantern
Dana Point, CA 92629

RE: HEADLANDS PROJECT DRY SEASON RUNOFF

Dear Mr. Knight:

The District has had discussions with Kevin Darnall of Headlands Reserve LLC concerning its acceptance of dry season diversions from the Headlands into the sewer collection system. There is sufficient capacity available in both the sewer collection system and at the treatment plant. The District can accept an estimated 10,000 gallons per day of dry weather diversion from the Headlands. As you may be aware, the District recently made a similar accommodation for the Treasure Island project in Laguna Beach.

As you know, the District has been very proactive in addressing water quality issues. We look forward to cooperating with the City of Dana Point on these important matters.

Very truly yours,

SOUTH COAST WATER DISTRICT

Michael P. Dunbar
General Manager

MPD:rb

cc: Mr. Kevin Darnall, Headlands Reserve LLC

Mailing Address: P.O. Box 30205, Laguna Niguel, CA 92607-0205
Street Address: 31592 West Street, Laguna Beach, CA 92651
Fax: (949) 499-4256 Phone: (949) 499-4555

APPENDIX L

MARINE BIOLOGICAL RESOURCES REPORT

MARINE BIOLOGICAL RESOURCES
DANA POINT HEADLANDS
TECHNICAL REPORT

Prepared for:

Headlands Reserve, LLC
24849 Del Prado
Dana Point, CA 92629
Contact: Kevin Darnall

Prepared by:

Applied Ecological Research
1417 Brett Place, #203
San Pedro, CA 90732
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(310) 833-8401

July, 2001

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Introduction

This document addresses the existing conditions and potential project related impacts to coastal marine biological resources associated with the proposed Headlands development. This section details existing conditions, current and past trends, and potential impacts to marine resources, including impacts to habitat and plant and animal populations on and adjacent to the site. The discussion of potential impacts to marine resources also includes an evaluation of recreational activities on the site. Field surveys were conducted in February/March, 2000 (intertidal), March/April, 2000 (subtidal), February, 2000, and July, 2001 (infuana), and July, 2001 (grunion). The evaluation of project related impacts is based on the proposed project description and the results of the field surveys, as well as current studies of water quality conducted by Aquatic Environmental Services (Aquatic Environmental Services, 2001) and geological investigations conducted by AMEC Earth & Environmental, Inc. (AMEC, 2001).

Existing Conditions

The study area for this project extends from within Dana Point Harbor at the southern extent of Baby Beach to the breakwater, north along the rocky intertidal of the Headlands, and continues to the southern boundary of the Niguel Shores community complex (Figure 1). Habitats from the high intertidal (+6 ft Mean Lower Low Water) to the outer edge of offshore kelp beds (approximately –60 ft Mean Lower Low Water) were evaluated in this report. These limits were determined by examination of the limits of proposed construction, the existing oceanographic conditions, and prevailing winds. Based on the long shore currents (which flow predominantly south along the shoreward limits of the project site) and the prevailing winds, material transported off the site would be transported south. This sets the northern limit of the study area at the northern boundary of the project site, to the edge of the Niguel Shores community complex. Material entering the marine environment along Strand Beach would be transported southward into and along the Dana Point Marine Life Refuge. The southern limit of the study area extends to the southern limit of the Dana Point Marine Life Refuge, west of the breakwater. The study area was not extended farther south because the existing currents transport sand along the breakwater and into the harbor. The habitat in and around Baby Beach was also included because the existing outfall from the Green Lantern and Cove Road vicinity exits just to the north of this area.

Marine resources associated with the study area include several different habitat types that occur within two State marine life refuges. Marine resources in this area encompass habitat within the intertidal and subtidal zones, and include both rocky and sandy bottom habitats. Previous surveys of the area were used prior to the field evaluation to determine existing conditions and to develop an initial species list. The coastal resources report completed by CRM (1998) and used in the previous General Plan Amendment Final Program EIR provided initial information and background. Interviews were conducted with several researchers currently working in the area to obtain additional background material and ensure that proposed survey methods were compatible with ongoing research. This was done to allow the current surveys to be compared with previous work and to provide a baseline for any future work. Additional information on the subtidal conditions was gathered from interviews and site visits with Mr. Ed Aikey, a local dive master with 20 years of experience diving in the Headlands area.

Marine biological resources were identified and cataloged during a series of intertidal and subtidal habitat surveys conducted in the study area. Intertidal surveys were completed during January and February of 2000. Subtidal surveys began in January, 2000, and extended into March and April, 2000, due to high surf conditions and low visibility after winter storms.

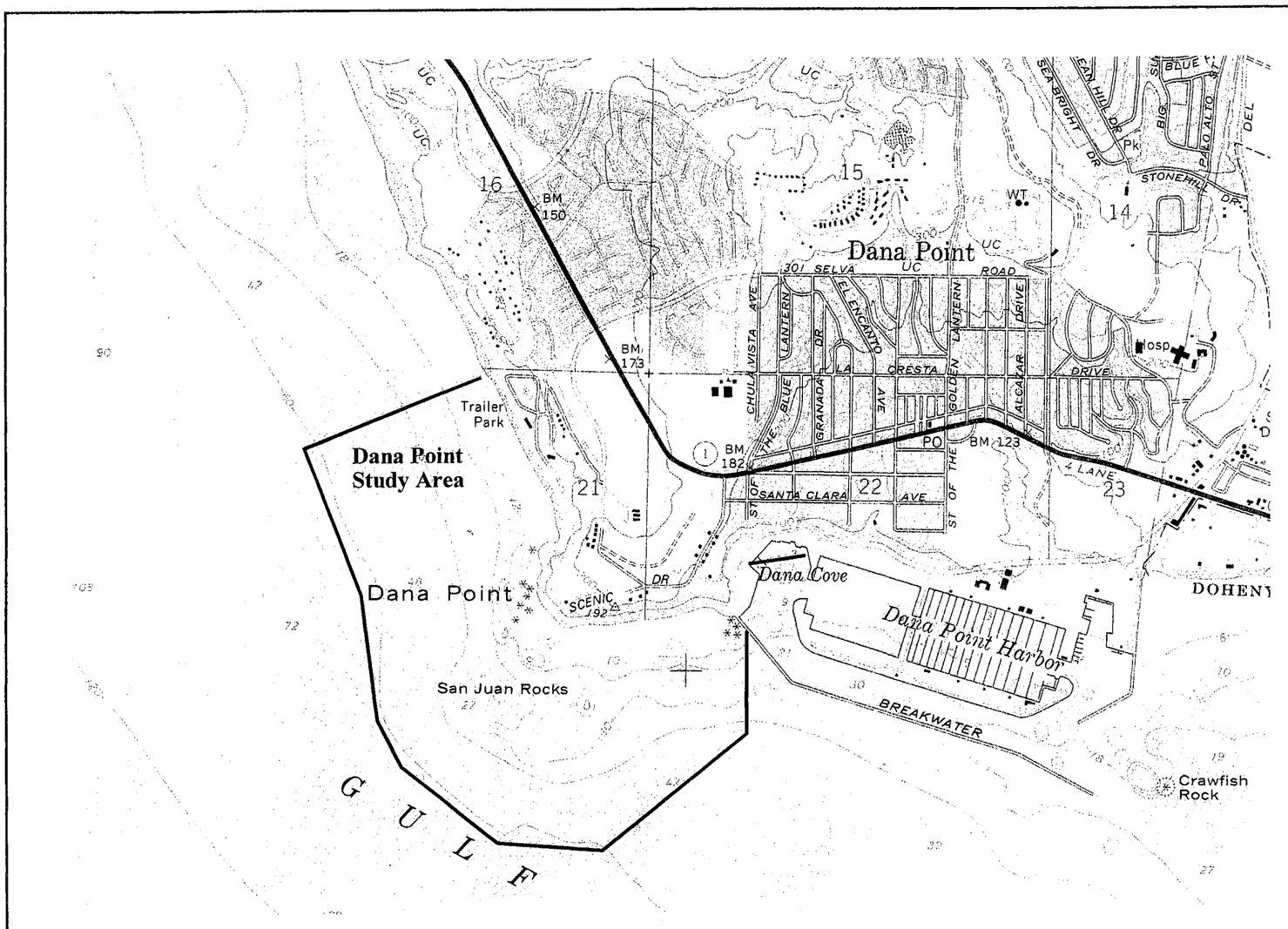


Figure 1. USGS Map of Dana Point Study Area (depth contours in feet).

Physical Conditions

The existing geologic conditions associated with the formation of the Headlands dominate the marine environment. The Headlands were formed by uplift of the coastal range through tectonic activity associated with the San Andreas Fault zone. The Headlands rock escarpment projects into the Pacific Ocean and creates a hard discontinuity along the coast between sand beaches to the north and south. As the rock face weathered and was eroded by waves and wind, boulders and cobbles collected at the base of the bluffs and extended out into the ocean. Prevailing currents flowing from north to south transported sand along Strand Beach where it was intercepted by the Headlands. As the existing pocket beach grew, sand moving offshore in deeper water around the Headlands was deposited in and around the boulders and remnants of the rock face. Remnants of the point extend approximately 2,500 feet to the west along a gently sloping bottom contour. There are several areas where portions of these offshore platform reefs rise above the surface of the water. One such area is known as the "San Juan Rocks" and is located approximately 350 yards from the edge of the bluffs along the south facing rocky beach.

Within the intertidal zone, extensive areas of exposed bedrock, boulders, and cobbles at the base of the bluffs provide excellent rocky habitat for a variety of marine species (Figure 2). Erosion and mass wasting of the bluffs has formed large boulder fields within the rocky intertidal. Boulders and rock platforms provide a hard substrate upon which intertidal organisms can settle. In addition, the rock platforms have formed numerous tide pools where water is retained during low tides. As in the subtidal areas, large waves dominate the habitat, and extensive movement of sand, cobbles, and boulders can occur during storm events. This area has been impacted by existing human use due to the ease of access from the Ocean Institute, which has encouraged school groups to visit the area.

Subtidal habitat within the study area includes a complex of platform reefs, boulder fields, sand patches, and offshore kelp beds. The nearshore movement of sand creates a mosaic of habitat with large boulders and platform reefs remaining exposed while smaller rocks and cobbles are periodically buried and exposed by the moving sand. The lack of protection from storm waves (due to the extension of the point to the west) results in a very high energy environment. Storm waves tend to increase turbidity, reduce visibility, and prevent establishment of giant kelp within shallow (less than 20 feet) areas. However, in deeper water (30 to 60 feet), the reduced storm surge (with resultant decrease in sand movement) and hard bottom provide sufficient areas for kelp establishment and growth. In addition, strong currents (up to three knots) sweep through these areas, increasing sand transport and turbidity. The combination of high waves, reduced visibility, strong currents, and lack of easy points of access has reduced human impacts within the subtidal zone and allowed the marine resources in this area to remain less impacted than other areas along the coast.

Methods

The purpose of project field surveys was to characterize the existing marine biological resources in the intertidal and subtidal zones of the study area. These data were then compared with data from previous surveys to define existing marine resources in this area, both past and present. This complete data set is then used in the Project Impacts Section of this document to identify potential impacts to the marine environment from the proposed project.



Figure 2. Photograph of Rocky Intertidal Habitat within Dana Point Study Area.

Location of Sampling Sites

The research team made several preliminary field visits to identify major habitat zones within the study area in order to ensure representative coverage of the site. These initial field surveys identified four distinct habitat types within the intertidal zone and three primary types within the subtidal zone. Based on this information, stratified random samples were taken within each of the areas identified. Intertidal habitat was divided into four sampling sites representing different habitat types (Table 1). Within each site, two or three vertical transects were randomly placed, extending from approximately +6 feet Mean Lower Low Water (MLLW) to –1.5 feet MLLW. Sampling sites were also established along a proximity gradient to the Ocean Institute, with Site 1 nearest the Institute and Site 4 farthest from it. Subtidal habitat was divided into four sampling sites representative of four different habitat types (Table 2). At least one vertical transect was established within each sampling site, extending from –10 to –25 feet. Whenever possible, intertidal and subtidal survey sites were contiguous to each other to facilitate comparison of habitat across the tidal regime. Sediment cores were taken at exposed beach areas including Baby Beach, the pocket beach near the Ocean Institute, a pocket beach within the rocky intertidal, and along Strand Beach.

TABLE 1. INTERTIDAL SAMPLING SITES IN THE DANA POINT STUDY AREA.

Sampling Site	Habitat Type	Proximity to Ocean Institute
Site 1	Boulder/cobble	Nearest
Site 2	Platform reef/tidepool	|
Site 3	Platform reef/tidepool	|
Site 4	High relief rocky intertidal	Farthest

TABLE 2. SUBTIDAL SAMPLING SITES IN THE DANA POINT STUDY AREA.

Sampling Site	Habitat Type	Proximity to Ocean Institute
Site 1	Surfgrass/sand/boulder-cobble	Nearest
Site 2	Rock/kelp (*Macrocystis*) bed	|
Site 3	Rock/sand/kelp (*Macrocystis*) bed	|
Site 4	Sand/boulder-cobble	Farthest

Intertidal Surveys

Intertidal surveys were conducted at four locations within the rocky intertidal habitats of the study area (Figure 3). At each location two or three transects were randomly established, extending from approximately +6 feet MLLW to –1.5 feet MLLW. Quarter meter square quadrats were deployed every two meters, and point intercept counts of organisms were made. Thirty-six points were counted per quadrat. All study sites and representative quadrats were documented photographically. Visual observations of surfgrass (*Phyllospadix*) epiphyte/epibiont loads were made at each transect. Epiphyte/epibiont loads were scored as: Absent, Low, Medium, or High. Three species of barnacle occur on Orange County rocky shores, *Chthamalus fissus*, *Chthamalus dalli*, and *Balanus glandula*. Both *C. fissus* and *C. dalli* are much more abundant than *B. glandula*, which tends to be confined to depressions and surfaces near crevices at the lower limits of the barnacle zone (Murray et al., 1998). All three

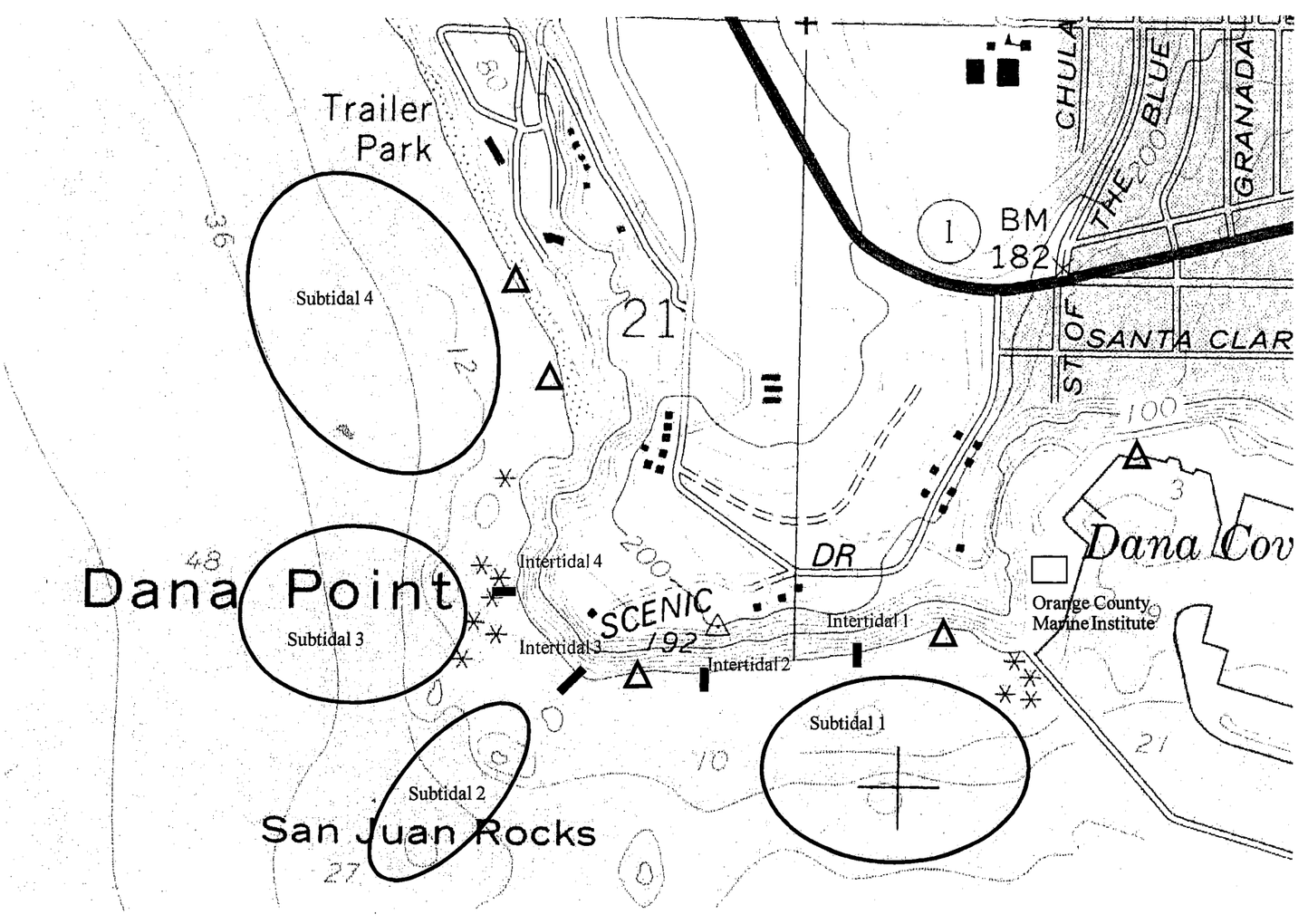


Figure 3. Sampling Stations within Dana Point Study Area

Legend
Intertidal Survey Locations
Subtidal Survey Locations
Sediment Sampling Locations

barnacle species were present in the intertidal and are included on field survey species lists. For the purposes of intertidal percent cover surveys, all three species of barnacle were composited and counted within a general barnacle category. If an algal or surfgrass canopy was present at a quadrat, point intercept counts were first made of the canopy; the canopy layer was then moved aside, and point intercept counts of underlying organisms were taken. Because canopy cover was included in counts, the total number of points scored per quadrat exceeds 36 in some cases. Point intercept data were then converted into percent cover measurements by totaling the number of each species counted, dividing that by the total number of points counted, and multiplying by 100. Percent cover data from all intertidal transects were then summed, and an average taken to obtain mean percent cover estimates for the intertidal habitat of the study area. The same procedure was repeated for subtidal point intercept data.

In addition to transect surveys of the rocky intertidal, sediment cores were taken to quantify benthic infauna within sandy areas of the site: Strand Beach, Baby Beach, and large pockets of sand within the rocky intertidal areas (Figure 3). Hand-held cylindrical corers with 1.0 millimeter (mm) mesh caps were used to remove 980cm^3 cores from a sampling site. Each core was then sifted through the mesh cap and all organisms retained were counted and identified. Three cores were taken at each sediment sampling site. All processing of sediment samples was completed in the field using hand lens and field guides; no organisms were collected or transported from the site. Additional focused surveys were conducted in July, 2001, to confirm species composition; voucher specimens were collected and identified in the laboratory.

Subtidal Surveys

Based on preliminary site evaluations and information from a local divemaster (E. Aikey, pers. comm.), a series of dives was conducted to sample a range of subtidal habitats within the study area. Subtidal habitats surveyed included rocky subtidal, surfgrass (*Phyllospadix*) beds, and kelp (*Macrocystis*) beds. Underwater photographs were taken to document subtidal conditions. Three divers completed a total of 22 dives within the study area boundaries over four days. Subtidal surveys were conducted at four locations within the study area (Figure 3). At each sampling site, one to two transects were randomly established, extending from –10 to –25 feet in depth. Quarter meter square quadrats were deployed every five meters (Figure 4). All mobile organisms within a quadrat were first counted and identified, then point intercept methods were used to identify sessile flora and fauna within the quadrats. Sixteen (16) points were counted per quadrat. Fish counts were conducted at each three locations following a modified Great American Fish Count (California Methodology Variant) method. Two divers positioned themselves mid-transect and descended to the bottom. Depth, local time, visibility, habitat descriptions, and current weather conditions were noted. Divers were separated by approximately 30 meters during the duration of the dive, and their data were considered independent samples of the same general location. Dives extended for a total of 30 minutes, with data collection divided into six 5-minute intervals. During each 5-minute period, each species of fish not before seen at the site was recorded. This metric provides a rough estimate of the commonness of the species. Divers slowly transited the site over the course of the dive, remaining within a 15 m radius of their descent point. Upon completion of the dive, divers score the prevalence of each fish species over the course of the entire 30 minute dive as either "None," "Single Individual," "Few" = 2-10 individuals observed, "Many" = 11-100 individuals observed, or "Abundant" = more than 100 individuals observed.

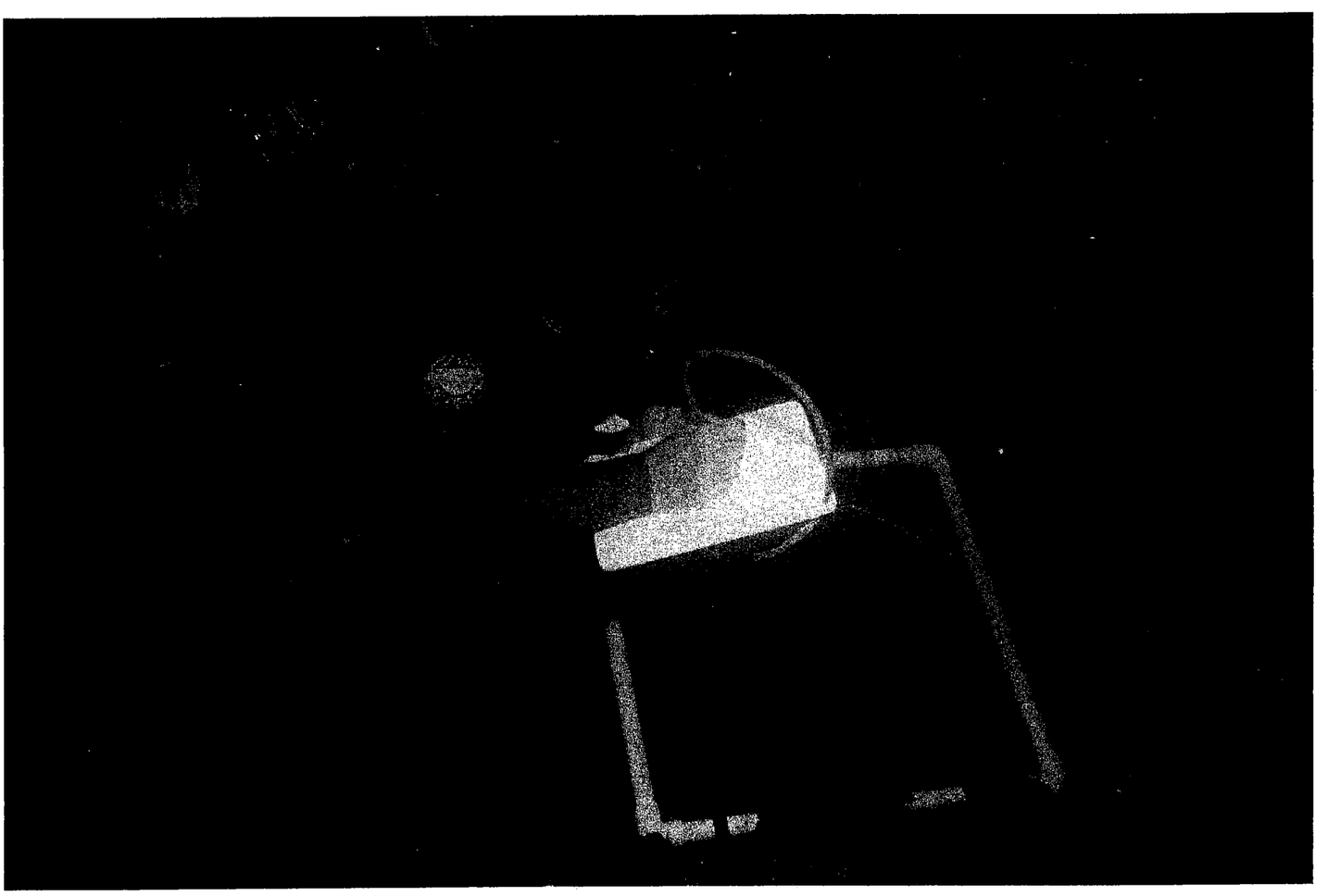


Figure 4. Diver conducting subtidal quadrat survey within Dana Point Study Area.

Sediment Surveys

Sediment cores were collected in the wave zone (area of beachhead continuously bathed by waves) at four locations using two different size corers. Large core samples were collected using a 150 mm diameter clam gun to a maximum depth of 30 cm and sieved immediately through a 1 mm mesh sieve. Organisms were identified, counted, and released. The small core samples were collected with a 7 cm diameter PVC corer to a depth of 5 cm. Sediment samples were stored in an ice chest for later identification. In the afternoon of the same day, organisms were sorted live using a dissecting scope. Organisms were identified to specie, and voucher specimens were collected. All voucher specimens were preserved with 10 percent formalin and later transferred to 70 percent methanol.

Baby Beach: Samples were collected at stations spaced every 15 m across the total length of the exposed beach. Large cores were taken at every station while the smaller cores were collected at every other station. In the large core, sediment collected was limited to a depth of 20 cm, because of the presence of subsurface cobble. A total of five additional stations above the water line and in one foot of standing water was sampled using the large cores only to search for additional species; none were found. The anoxic layer was found 5 cm below the surface throughout the beach.

Pocket Beach near Ocean Institute: Samples were collected at stations spaced every 15 m across the total length of the exposed beach. Large cores were taken at every station while the smaller cores were collected at every other station. In the large core, sediment collected was limited to a depth of 20 cm, because of the presence of subsurface cobble.

Pocket Beach within Rocky Intertidal: Samples were collected at stations spaced every 10 m across the total length of the exposed sandy beach. Large cores were taken at every station while the smaller cores were collected at every other station. In the large core, sediment collected was limited to a depth of 10 cm, because of the presence of subsurface rock.

Strand Beach: Samples were collected at stations spaced every 50 m across the total length of the exposed beach. Large cores were taken at every station while the smaller cores were collected at every other station. In the large core, sediment was collected to a depth of 30 cm. Sampling began approximately 50 m from the rocky area at the southern end of the beach.

Existing Marine Biological Resources

Physical conditions at the site have created a complex pattern of rock, boulder, and sand habitats throughout the study area. Marine habitats within the project area are continuous and interconnected systems that extend from the highest intertidal areas out into the deeper waters offshore. For the purposes of discussion, this report divides the marine habitat into two broad categories, intertidal and subtidal habitat. Intertidal habitat has been further categorized into four types: soft bottom habitat within Dana Point Harbor, boulder/cobble rocky intertidal, high relief rocky intertidal, and sandy beach. Subtidal habitats are categorized into three broad types, including rock/sand/reef complex, surfgrass (*Phyllospadix*) beds, and kelp (*Macrocystis*) beds.

Intertidal Habitat

Intertidal habitats comprise the majority of readily visible marine resources within the study area. They are also the habitat types most accessible to the general public. Access to these intertidal habitats is from the area adjacent to the Orange County Ocean Institute area or the public access points near Salt Creek

beach. Appendix A provides a complete list of all species identified in surveys of rocky intertidal habitats within the study area.

Soft Bottom Habitat

Soft-bottomed habitat in the study area exists within Dana Point Harbor along the edge of "Baby Beach" (Figure 5). This habitat type is characteristic of an enclosed harbor with minimal circulation. Due to limited water motion, primarily fine-grained suspended sediment reaches the inner portion of the harbor near "Baby Beach." The beach within the harbor is a combination of these fine-grained sediments mixed with coarse-grained sand, likely imported to form and sustain the beach. There is little heterogeneity within the substrate and little or no rocky substrate on the beach itself. To the north along the beach area, riprap beach protection has been placed along the entire shore all the way to the breakwater. These small rocks and cobbles line the edges of the bulkhead that extends from the beach to the breakwater.

Organisms that occupy this habitat are predominantly infauna, organisms that live within the sediments. Infaunal species found within Dana Point Harbor at Baby Beach included one species of polychaete. No clams were found within the sediments of Baby Beach. Appendix B lists all species identified in surveys of soft bottom habitats within the study area. The green algae *Enteromorpha intestinalis* was found below the low tide line along the beach. Accumulations of *E. intestinalis* are often indicative of high levels of nutrients in the water (Fong et al., 1987), as expected within enclosed portions of the marina. Sediments become anoxic at sediment depths of 3 to 8 cm below the surface within the limits of Baby Beach. Relatively shallow sediment anoxic layers like this are also associated with nutrient enrichment (eutrophic conditions) in coastal systems (Valiela, 1995). The presence of a shallow anoxic zone within a sand beach of coarse-grained sands severely limits the number and diversity of infaunal marine organisms in this habitat. The sources of increased nutrient loading to the harbor habitat likely include discharges of runoff water from nearby restaurants, irrigation from landscaped turf associated with the harbor, and releases of waste from boats using the harbor.

The small rock and boulder riprap lining along the seawall from the beach to the breakwater has received substantial deposition of fine silts from the harbor. Limited algal species were found, including *Enteromorpha intestinalis* and small patches of *Sargassum muticum.* Striped shore crabs (*Pachygrapsus crassipes*) were present in and under the rocks in this area.

Boulder/Cobble Rocky Intertidal

A large percentage of the intertidal habitat within the study area is composed of boulders and cobbles, which line the edges of the bluffs and extend into the subtidal regime (Figure 6). These boulders and cobbles are a mixture of different types of rocks that have fallen from the bluffs. As these boulders and cobbles are not fixed, they can move significantly during normal and high wave action. The combination of this movement, along with the potential for periodic deposition and scour from sand moving downcoast, creates a physically dynamic environment. When the physical stresses of the tidal cycle (desiccation, temperature stress, and changes in salinity) are added to the physical changes in the substrate and the high wave action, this area is subject to an intense amount of stress on a daily basis.

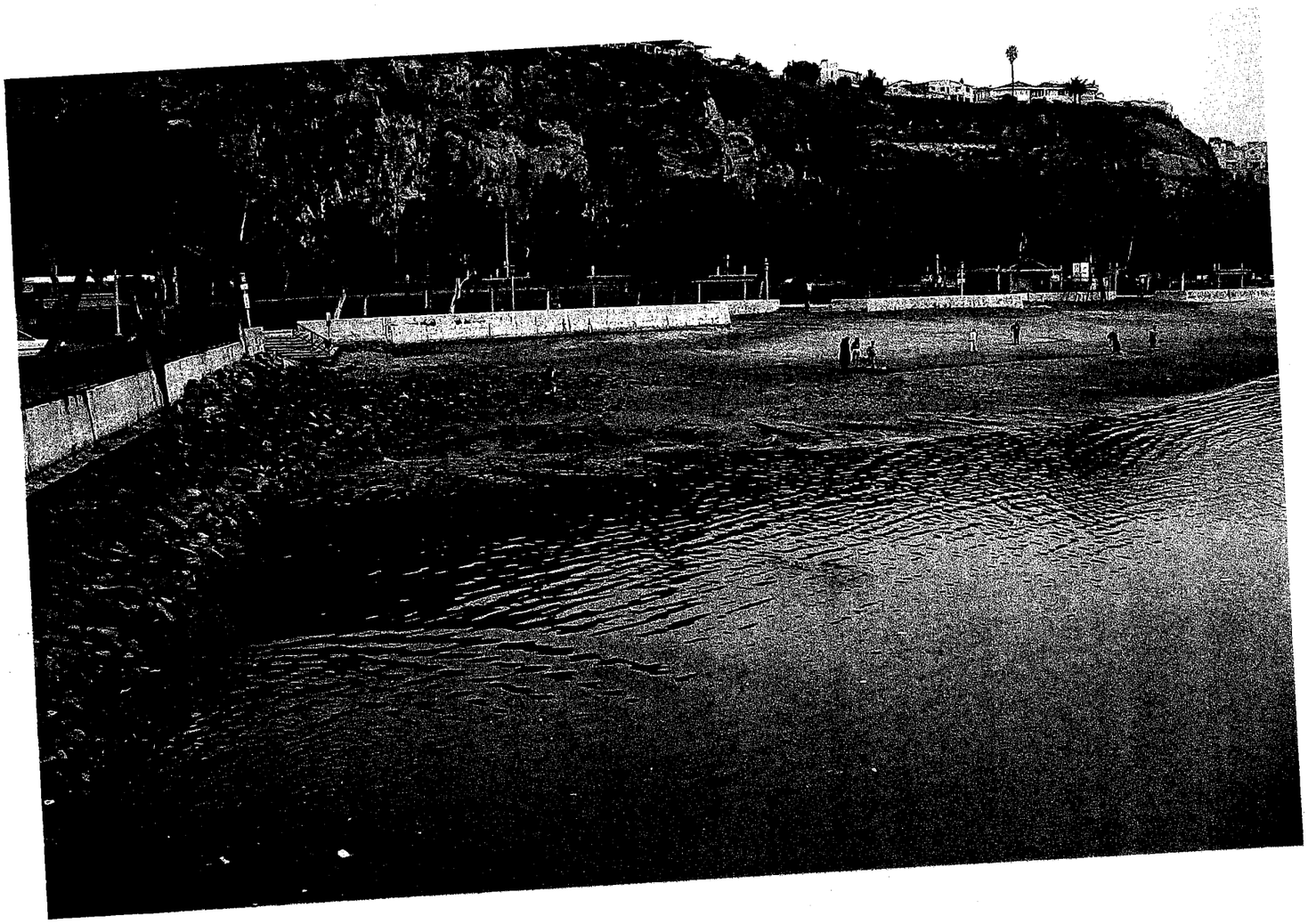


Figure 5. Photograph of Baby Beach within Dana Point Study Area.



Figure 6. Photograph of Boulder/Cobble Intertidal Habitat within Dana Point Study Area.

Consequently, the habitat supports a different assemblage of organisms than is found on the stable rock outcrops. The result is an extremely heterogeneous species assemblage with a variety of microhabitats present. Small cobbles, which are frequently overturned, may support only highly tolerant species such as crustose coralline algae or blue green algae, while larger boulders that are only intermittently disturbed support a higher diversity of species, which may include anemones, chitons, mussels, and fleshy macroalgae. The flat areas between the larger rocks support more mobile species such as striped shore crabs and hermit crabs. The surfaces of the larger, more stable rocks in the upper intertidal zone support large numbers of buckshot barnacles and intertidal snails (*Littorina* sp.).

Within this boulder/cobble matrix are several rocky benches forming hard, immobile substrate. These benches support a slightly different assemblage of organisms including higher densities of barnacles and mussels. Irregularities in the rock benches allow water to persist throughout low tides forming tide pools, which support aquatic organisms during periods when these habitats would otherwise be exposed. High densities of green anemone (*Anthopleura elegantissima*) line any crevices within the rock benches.

The standard zonation pattern found in most intertidal habitats is present in this area. Zonation is the result of the variation in physical conditions between different intertidal elevations, as well as competition between species with different tolerances for these physical extremes. At the highest elevations, which are immersed only during the highest tides, the predominant organism is the periwinkle *Littorina*, a small gastropod snail that feeds on microalgae. Relatively few *Littorina* were found in this area, likely due to the high wave action and boulder movement. Below the splash zone is the upper intertidal, where water covers the substrate generally at least once per day. This zone is dominated by barnacles (*Chthamalus dalli/fissus and Balanus glandula*), which occur in extremely high densities, reaching near 80 percent cover in many areas.

Just below the higher intertidal areas is a zone of mixed algal species. The rockweed *Pelvetia compressa* occurs in localized areas, but the majority of the cover is a mixed algal turf composed of several species of small brown and red algae. *Pelvetia* plays an important role in this habitat, forming a canopy over rocks during periods of immersion, under which many species of invertebrates and algae are able to shelter to avoid desiccation. *Pelvetia* was found only in sparse patches on the surface of larger boulders and rock faces, above the mean low tide line.

The lowest intertidal zone at these transects supported dense stands of surfgrass (*Phyllospadix torreyi*; up to 23.4 percent cover), coralline algae (up to 13.7 percent cover), and large brown algae, predominantly *Egregia menziesii* and *Eisenia arborea* (up to 6 percent cover).

High Relief Rocky Intertidal

The high relief rocky intertidal habitat within the study area is located in the zone between the rocky intertidal and the sandy beach (Figure 7). In contrast to the soft-bottomed habitat within the harbor, the high relief intertidal habitat near the north end of the Dana Point Marine Life Refuge exhibits some of the least impacted intertidal habitat found in the study area. This area is the remains of the point that has been eroded over time through wave action. Remnants of the bedrock extend from the edge of the bluffs and form large rock platforms that jut out into the ocean. These platforms are discontinuous and form independent masses that have large crevasses between them. This area faces directly west and is exposed to high energy surf during most of the year. There are a number of nearly vertical rock faces and large boulders interspersed with small sand pockets in sheltered areas. Sea caves have formed in several areas and more erodable parts of the bluffs are carved out by the high wave action. Substantial amounts of

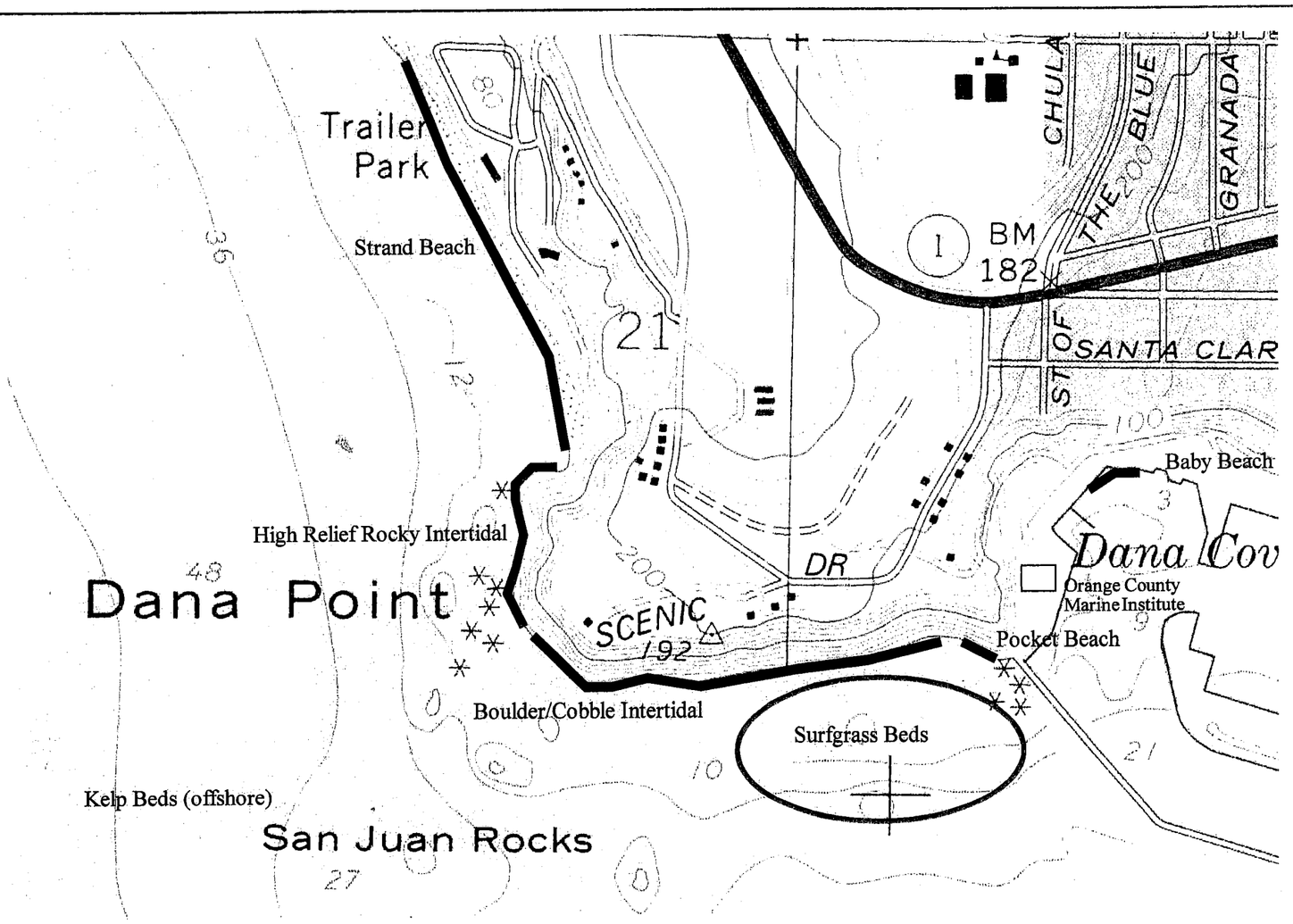


Figure 7. Habitat Zones within Dana Point Study Area

cobbles are found between the bedrock outcrops. The stable bedrock surfaces provide excellent habitat for colonization by marine organisms.

A slightly different zonation pattern was found in this area. As in the rocky intertidal, the splash zone was colonized by low densities of *Littorina.* Below the splash zone is the upper intertidal, where water covers the substrate generally at least once per day. This zone is dominated by buckshot barnacles (*Chthamalus dalli/fissus*), which occur in extremely high densities, reaching near 70 percent cover in many areas. *Pelvetia* occurs in greater density in this area, likely due to the decreased trampling impacts from reduced human traffic. The director of the Dana Point Marine Life Refuge, Mr. Harry Helling (also Vice President of the Orange County Ocean Institute) confirms that the high relief intertidal at the northern end of the reserve is subject to lower levels of human visitation than other reserve areas. An ongoing study by Gibson and Murray (unpublished data referenced in Murray, 1998) indicates that greater levels of visitor trampling resulted in greater levels of damage to southern California *Pelvetia compressa* populations. Results of intertidal surveys undertaken for this report support these findings. Under the canopy of *Pelvetia*, there were high densities of several species of red coralline articulated algae (*Corallina, Bosiella*) and turban snails.

The mid-intertidal zone in high relief rocky areas (Figure 8) was characterized by dense assemblages, up to 12 percent cover, of the California mussel (*Mytilus californianus*) as well as chitons (*Lepidozona* sp.) and several species of limpet: owl limpet (*Lottia gigantea*), finger limpets (*Lottia limatula*), and rough limpets (*Lottia scabra*). The lowest intertidal zone at this transect supported dense stands of surfgrass (*Phyllospadix torreyi*; 15.7 percent cover), coralline algae (3.4 percent cover), and large brown algae, predominantly *Egregia menziesii* and *Eisenia arborea* (5.8 percent cover).

The northernmost region of high relief rocky intertidal showed the highest diversity of all areas surveyed (sampling station 4, Figure 3). This is hypothesized to be the result of reduced human intrusion due to the rugged nature of the rock outcrops and high energy wave regime, which serves to discourage most visitors. In comparison to the area just north of the Ocean Institute, which receives the majority of human visitors, significantly more *Pelvetia* and associated underlying species were present in this region of the Headlands. In addition, more large, mobile invertebrates were present, such as sea hares (*Aplysia californica*), giant keyhole limpets (*Megathura crenulata*), sea stars (*Pisaster ochraceous* and *Asterina miniata*), and striped shore crabs (*Pachygrapsus crassipes*). Percent cover data for major plant and animal species censused in rocky intertidal surveys are presented in Table 3.

Sand Beach

Sand beach habitat exists within the Dana Point Marine Life Refuge at two pocket beaches and the Niguel Marine Life Refuge along Strand Beach at the northwest end of the project site (Figure 9). Formation of the sand beach is the result of the extension of Dana Point, which traps sand carried south by the longshore currents, and Salt Creek, which supplies sand to the coast. This pocket beach forms a band of sandy bottom habitat that extends northward from the edge of the rocky intertidal habitat at Dana Point (Figure 10). The landward side of Strand Beach includes a riprap revetment that serves to minimize wave erosion on the slopes that rise from the beach.

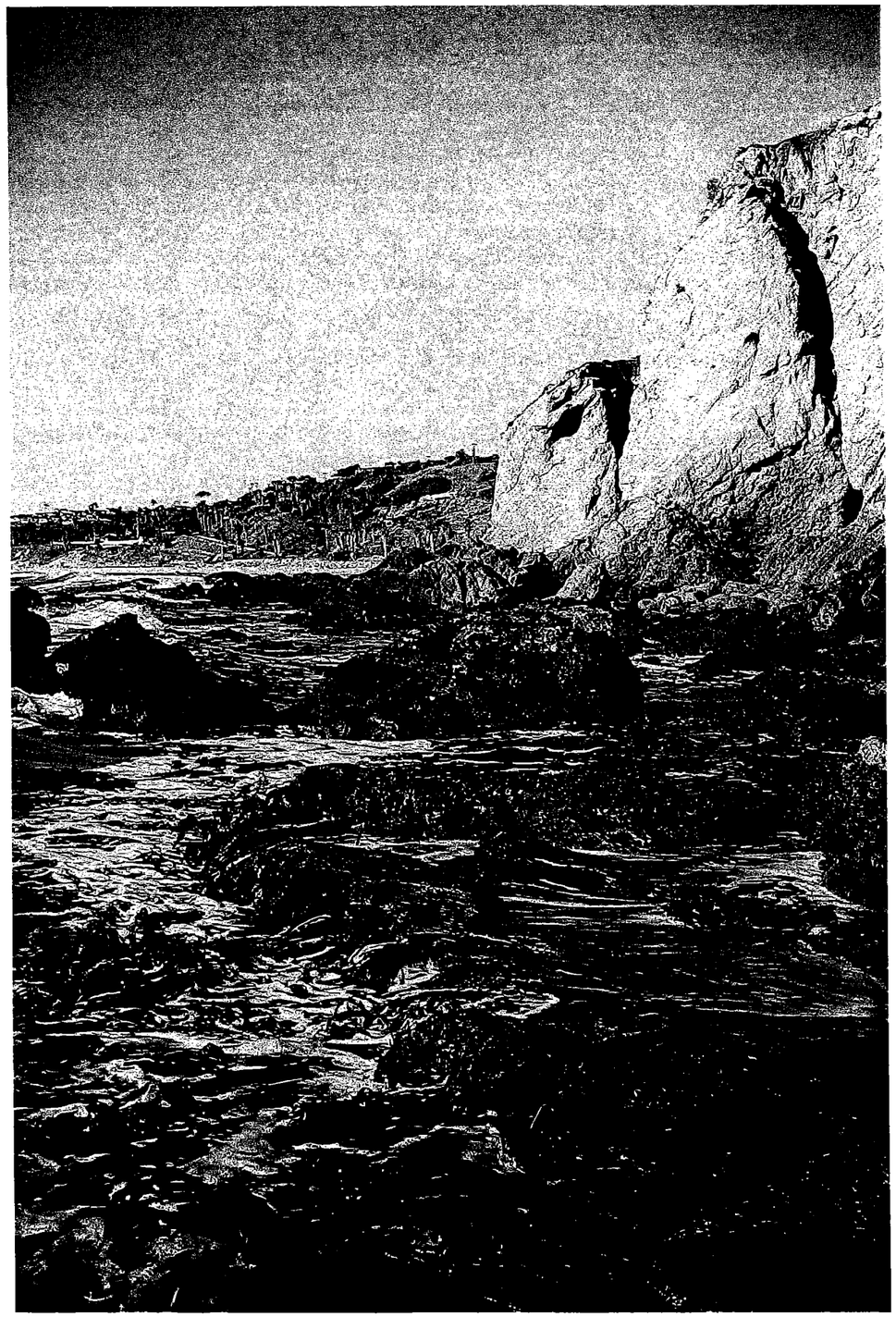


Figure 8. Photograph of High Relief Rocky Intertidal Habitat within Dana Point Study Area.

TABLE 3. MEAN* PERCENT COVER OF MAJOR ANIMAL AND PLANT SPECIES OBSERVED DURING INTERTIDAL SURVEYS OF THE HEADLANDS MARINE RESOURCES STUDY AREA, DANA POINT, CA. JANUARY - FEBRUARY 2000

Species/Substrate	Percent Cover	Species/Substrate	Percent Cover
Rock	20.07	*Tetraclita rubescens*	0.50
Phyllospadix torreyi (surfgrass)	12.76	*Pagurus samuelis*	0.49
Chthamalus fissus/dalli (acorn barnacle)	7.49	Serpulidae sp.	0.48
Sand	6.99	*Colpomenia sinuosa*	0.37
Mytilus californianus (mussel)	6.91	*Lottia digitalis*	0.34
Articulated corraline algae	6.37	*Lottia scabra*	0.33
Brown algal turf	4.87	*Tegula eiseni*	0.30
Pelvetia compressa	4.51	*Jania* sp.	0.26
Mixed algal turf	3.73	*Dictyota*	0.24
Ulva sp.	3.33	*Sargassum muticum*	0.24
Eisenia arborea	3.32	*Lottia gigantea*	0.15
Corallina sp.	2.94	*Pollicipes polymerus*	0.13
Gelidium sp.	2.45	*Chama arcana*	0.11
Red algal turf	2.21	Encrusting red algae	0.07
Anthopleura elegantisima	2.07	*Nuttalina fluxa* (Chiton)	0.07
Ralfsia	1.35	*Strongylocentrotus purpuratus*	0.03
Egregia menziesii	1.29	*Octopus bimaculatus*	0.02
Plocamium	0.92	*Aplysia californica*	0.02
Phragmatopoma californica	0.81	*Dictyota*	0.01
Bossiella sp.	0.79	*Pachygrapsus crassipes*	0.01
Lithothaminion (encrusting coralline algae)	0.64	*Littorina scutulata*	0.01

Mean of all transects at all of the four locations sampled in the study area.

Source: Applied Ecological Research, 2000

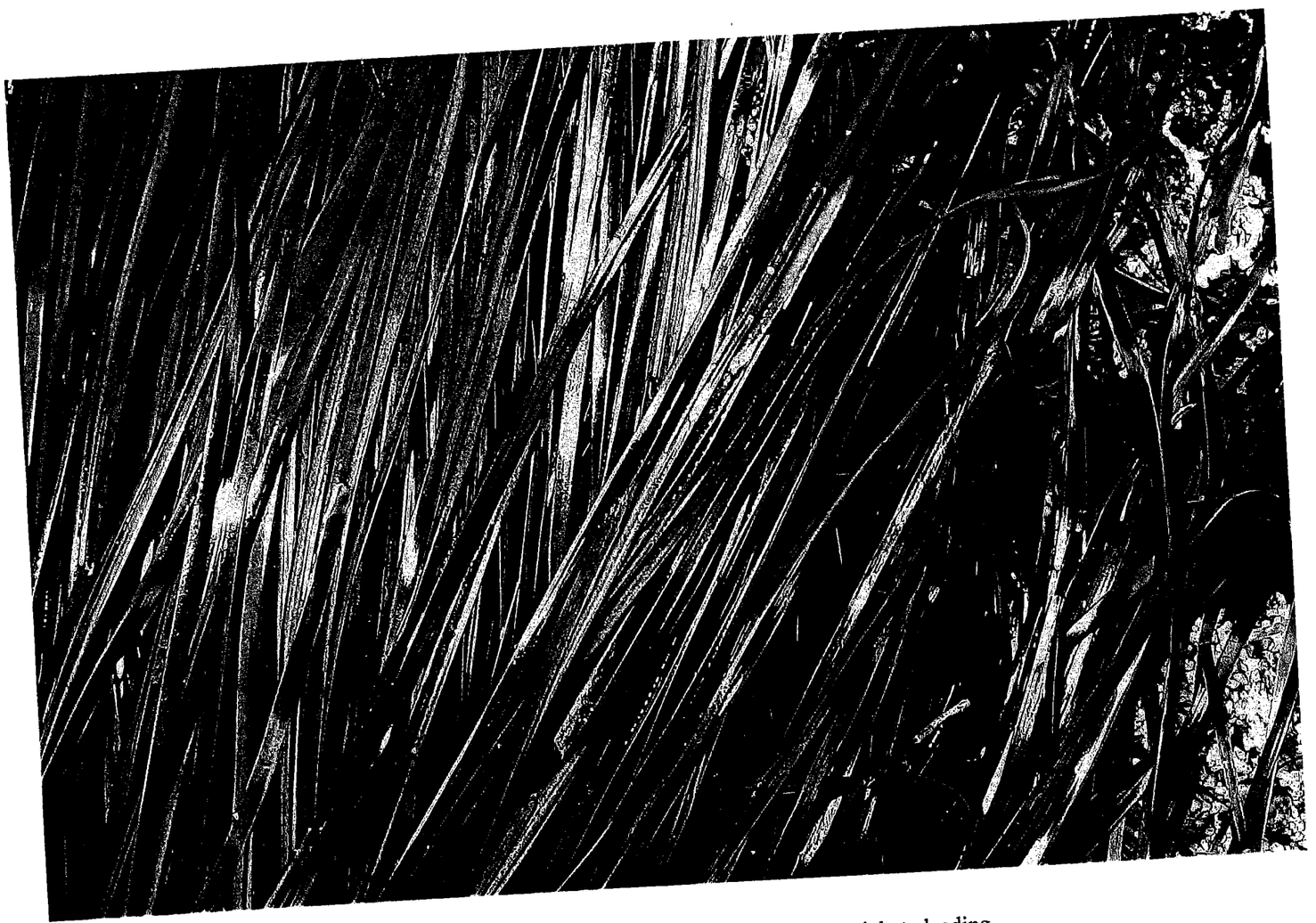


Fig 9. Macro Photograph of Surf Grass within Dana Point Study Area. Note lack of epiphyte loading.



Figure 10. Photograph of Strand Beach south to High Relief Rocky Intertidal within Dana Point Study Area.

The sand beach areas provide habitat for various interstitial organisms. Previous studies (Patterson, 1974) of the beach at Dana Strand identified 12 species, which included crustaceans, insect larva, and polychaete worms. The majority of these infaunal species reside in the medium to fine grained beach sand. Focused infaunal and beach surveys identified a similar group of species within the sand beach area (Appendix B). Within the upper intertidal area, most common species included beach hoppers (*Orchestoidea* sp.), isopods (*Exocirolina* sp.), and sand crabs (*Emerita analoga*). Within the mid and low intertidal areas, polychaete worms (primarily *Scolelepis* sp. and *Nephtys californiensis*) were more prevalent, while sand crabs extended throughout the beach profile. These species are important prey items for many shore birds and inshore fishes. Strand Beach is also important as a spawning site for the California grunion (*Leuestheus tenuis*). This small, slender fish (approximately four to six inches in length) spawns in large groups on specific beaches during spring tides (maximal tidal range that occurs when gravitational forces of the sun and the moon are aligned) between March and September. Beaches must have appropriate sediment types (fine to medium sand) with gently sloping beach profiles. The females lay eggs in the sand, which are fertilized by the males as they encircle the females with their bodies.

The California Department of Fish and Game (CDFG) considers the California grunion a managed marine fisheries resource. Despite local concentrations at specific spawning beaches, grunion are not abundant. The critical problem facing the grunion resource is the loss of spawning habitat caused by beach erosion, harbor construction, and pollution (CDFG, 2000). Under current CDFG regulations, a fishing license is required for persons 16 years and older to capture grunion using only their hands. There is no limit to the take of grunion in this manner. With these regulations in place, CDFG has determined that the resource appears to be maintaining itself at a fairly constant level. While the population size is not known, all research points to a rather restricted resource that is appropriately harvested under existing law (CDFG, 2000). Focused surveys identified grunion spawning along Strand Beach in July, 2001.

Subtidal Habitat

The subtidal habitat surveyed extends from the low intertidal zone (-2 feet MLLW) to a depth of 60 feet within the kelp beds. The subtidal area has been divided into three major zones, the subtidal rocky reef complex, surfgrass beds, and the offshore kelp beds. A complete list of subtidal species identified through field sampling is provided in Appendix C.

Subtidal Rocky Reef Complex

The subtidal area offshore of the proposed project site is dominated by the geologic structures and wave action that formed Dana Point. The offshore habitat is a mixture of rocky platform reefs that are extensions of the Headlands, patches of open sand between these rock platforms, and boulder fields within the more shallow subtidal areas. The rock reefs and outcrops extend 2-3 m above the sand substrate. Sand movement is very dynamic and dependent on currents and storms. Significant amounts of sand are transported through the subtidal area off Dana Point annually (USACE, 1959). As a result, many of the rocky features on the seafloor that are not of high relief may be seasonally impacted or buried by moving sand. Extensive areas of rock within the shallower depths (above –20 MLLW) have been colonized by surfgrass. These broad expanses of surfgrass provide excellent habitat and food for a number of marine organisms. In deeper waters (30 to 60 feet), giant kelp forests line the offshore edge of the reef complex, further increasing the value of the habitat. The combination of these physical parameters along with the variety of habitat types results in a valuable and vital marine community.

Direct surveys of the subtidal habitat off Dana Point had not been conducted previously. Focused surveys of the subtidal areas offshore of the study area conducted for this report revealed productive and diverse subtidal communities. Shallow portions of the subtidal zone were dominated by extensive surfgrass beds, which provide habitat and food for many organisms. Large numbers of spiny lobsters (*Panuliris interruptus*) were observed in the surfgrass beds along with several species of fish. On the rock platforms and boulder areas, many common and several rare species were seen, including four species of urchin (*Strongylocentrotus purpuratus, Strongylocentrotus franciscanus, Lytchinus anamensis,* and *Centrostephanus coronatus*), two species of sea fans (*Muricea californica* and *M. fruticosa*), and many whelks (*Kelletia kelletii*) and snails (*Lithopoma undosa* and *Norrisia norrisii*). Large stands of brown algae, including *Laminaria farlowii* and *Egregia menziesii*, were interspersed with the surfgrass beds. These species had large, robust holdfasts that correlate with the observed high energy wave action. Numerous fish were also observed, including the Barred sand bass (*Paralabrax nebulifer*), Kelp bass (*Paralabrax clathratus*), Opaleye (*Girella nigricans*), Garibaldi (*Hypsypops rubicunda*), and California Sheephead (*Semicossyphus pulcher*). The presence of several large, male Sheephead indicates a community that is relatively free from intense fishing and underwater hunting pressure.

A total of 86 species was identified during our subtidal surveys within the Dana Point study area. A 1998 subtidal survey of the nearby Treasure Island site identified 64 subtidal species (CRM 1998); however, direct comparisons between that survey and this study cannot be made because the survey methods, number of dives, and time spent underwater differ greatly between the two. The 1998 CRM report recorded qualitative observations made by two biologists spending approximately 90 minutes each underwater. Survey data presented in this report were collected with quantitative sampling techniques employed by three divers during 22 dives over a four day period.

The Strand Beach site was characterized by open expanses of sand interspersed with frequent low relief rock benches. These benches were frequently covered with large Egregia individuals. While these kelps did not form a surface canopy until several hundreds of meters offshore, 1-2 m tall individuals were common much closer to shore than the surface canopy bed suggested. The sizes of several *Cystoseira-Halidrys* and *Zonaria* individuals suggest that at least some of these rock benches are sand-free for at least one year. The low relief of these rock benches suggests that increased local sedimentation could well eliminate this rock substrate habitat (at least during winter months) for colonization by algae or sessile animals. Organisms observed in this area, but not sampled by our quadrat surveys, included several lobsters and occasional *Aplysia*. Algae deeper than approximately 20 feet were commonly fouled with bright orange/white tunicates near their holdfasts; *Macrocystis* individuals began appearing below approximately 20 feet.

Subtidal habitat at the Pocket Beach site was open expanses of sand interspersed with often high relief rock boulders and small reefs. These rocks sometimes extended 2 or 3 m above the sand. Generally these rocks were covered with *Phyllospadix* and kelps, primarily *Egregia* and *Eisneia*. By the most seaward extent of the transect, *Plumularia* sp. were becoming common. Several quadrats had large *Balanus* sp. in them; *Anthroplura elegantissima* and the tunicate *Clavelina huntsmani* were also observed. Other organisms observed in this area but not sampled by our quadrat surveys included numerous lobsters, Kellet's Whelks, *Egregia*, *Eisenia*, *Phyllospadix*, *Cystosiera/Halidrys*, a Round Stingray and a Barred Sand Bass, *Norrisia norrisii,* a Spanish shawl nudibranch, kelp bass, and opaleye.

The Bench 2 site was composed of roughly half sandy areas and half mini-rock reefs. These rock reefs frequently extended 2 or 3 m above the sand. Generally these rocks were covered with *Phyllospadix*, kelps (primarily *Egregia* and *Eisneia*,), other brown algae, and articulated coralline red algae. Lobsters were very common with many having carapace lengths >15cm. By the end of the transect, the habitat

was almost continual expanses of sand with few rocks. Other organisms observed in this area but not sampled by quadrat surveys included numerous lobsters, *Lithopoma* (mostly juvenile), Giant Keyhole Limpets, highly clumped aggregations of various urchin species (red, black, purple), and black surfperch.

The Bench 3 transect area consisted of sand commonly interspersed with boulder reef (>2 m relief) supporting surfgrass, *Egregia*, and *Eisenia.* Giant keyhole limpets, lobster, and various urchins (red, black, purple) were numerous.

The kelp bed site was subtidal reef composed of hard bottom bench covered with cobble and small boulders interspersed with higher (>1m) relief areas. Giant kelp was common but not abundant, and a surface canopy was present. Gorgonians were common. Large individuals of both Barred Sand Bass and Sheephead were common. Batstars were frequently observed.

Marine mammals known to occur in the study area include the California Sea Lion (*Zalophus californianus*) and the Pacific Harbor Seal (*Phoca vitulina*). No pinnipeds, porpoises, dolphins, or whales were seen within the study area during the survey periods; however, focused mammal surveys were not performed.

Giant kelp (*Macrocystis pyrifera*) beds:

Stands of giant kelp (*Macrocystis pyrifera*) are productive and diverse subtidal habitats. Kelp beds create a vertically structured habitat throughout the water column, which provides protective cover, nursery, and feeding functions for a variety of organisms. Primary production generated by kelp beds is also exported to other marine communities where it serves as an important source of energy and habitat features. Drift kelp rafted into the intertidal provides food to intertidal invertebrates and ultimately for shore birds (Yaninek 1980, North 1971b), while drift kelp translocated to benthic offshore communities provides food (North 1971b, Harrold et al. 1998) and habitat (Cailliet and Lea 1977) for deep-water organisms inhabiting regions that lack sufficient light to support photosynthetic primary productivity. Kelp rafts that remain on the surface offshore provide habitat for juvenile and adult fishes (Mitchell and Hunter 1970). Gerard's (1976) study of the Point Cabrillo kelp forest indicated that 50 percent of the drift kelp generated in that system was exported, and thus potentially available as an energy source to other marine communities.

A variety of factors influences the occurrence and persistence of *Macrocystis pyrifera* populations. Important abiotic factors include the presence of a hard substratum allowing attachment of the holdfast, sedimentation or sand movement, which can inhibit kelp attachment and survivorship, and water motion, which affects nutrient availability and uptake and, when extreme, can lead to plant loss. Light, nutrient availability, and water temperature also affect the growth and fertility of *Macrocystis*. Certain contaminants such as pesticides, heavy metals, and hydrocarbons have been shown to adversely impact growth and fertility of *Macrocystis* (Burnett, 1971; Smith, 1979). Biotic factors that affect the establishment and persistence of *Macrocystis* include competition, primarily for space and light, with other species. Grazing by fish, sea urchins, isopods, and other invertebrates is another important limiting factor of kelp biomass. Predators that include fish and sea stars affect grazer populations. Kelp populations can also be limited by disease, which may affect the *Macrocystis* directly or indirectly by impacting either grazers or their predators.

Kelp beds are present in a nearly continuous band offshore within the study area where the water depth is between 30 and 60 feet and there is sufficient hard substrate for attachment. Reef composition within the kelp beds is cobble and small boulders interspersed with high relief rock areas. Kelp beds within the

study area are subject to intense wave action and strong currents, which can cause high variation in annual coverage and mortality rates. During subtidal surveys of the kelp forest conducted for this report, the existing biomass was significant, and the kelp appeared healthy and strongly attached. *Macrocystis* densities were determined to be in excess of 5 stipes/M^2 within the survey area. Other brown algae identified in large numbers were *Eisenia arborea* and *Egregia laeviagata*.

The existing kelp beds within the study area support large numbers of fish and marine invertebrates. During dedicated fish count surveys, Black surfperch were found to be abundant (greater than 100 individuals counted) and kelp bass, sheephead, barred sand bass, and Blacksmith were determined to be "many" (between 11 and 100 individuals). The invertebrate community within the kelp beds was similar to that within the rocky subtidal regions, but the numbers of individuals were more numerous. In addition, there were three species of nudibranchs seen in relatively large numbers (the opalescent nudibranch, the elegant eolid, and an unidentified Dorid).

Surfgrass Beds

Surfgrass (*Phyllospadix* spp.) is considered ecologically valuable because it is used by many invertebrate and fish species as nursery habitat and as a refuge from predation. Areas of surfgrass are present throughout the Dana Point Marine Life Refuge throughout the low intertidal zone and extending offshore to depths of approximately 20 feet. Few, isolated stands of surfgrass were present in the subtidal habitat west of Stand Beach. Surfgrass beds are considered a sensitive marine habitat by CDFG because of their value to marine organisms and the fact that *Phyllospadix* is a very slow growing species. Revegetation occurs very gradually through initial seeding and eventually the spreading of roots and rhizomes over rock surfaces. Any damage to surfgrass beds results in a significant period of repair and/or regeneration.

The most extensive surfgrass beds within the study area are generally located north of the San Juan Rocks. The beds are located within the shallow subtidal region from approximately –1.0 MLLW to depths of less than 20 feet MLLW (Figure 7). The interspersion of the surfgrass beds in and around rocky intertidal habitat increases the value of both. Numerous California spiny lobsters were seen on the surfgrass beds during daylight surveys. The first bottom living stage of this species becomes established in the *Phyllospadix* habitat. Large numbers of fish were identified within the beds and included kelp bass, black croaker, sheephead, opaleye, and garibaldi. Density data for mobile species observed in subtidal surveys of the study area are presented in Table 4. Table 5 presents mean proportional cover estimates for major plant and animal species censused in subtidal surveys.

Surfgrass blades in survey areas were examined and photographed to document epiphyte and animal epibiont loads. Epiphytes are species of algae and epibionts are small invertebrates that may establish themselves on seagrass blades. In areas of poor water quality, large amounts of epiphytic algae may grow on seagrass blades, ultimately impairing the health and survival of the seagrass (Wear et al., 1999; Lapointe et al., 1994). Visual observations of both intertidal and subtidal blades found minimal levels of epiphytes (Figure 9). Low epiphyte loads are usually indicators of good water quality without excessive nutrient inputs (approximately 30 µmol/kg nitrate or lower).

TABLE 4. MOBILE SPECIES DENSITIES OBSERVED DURING SUBTIDAL SURVEYS OF THE HEADLANDS MARINE RESOURCES STUDY AREA, DANA POINT, CA. JANUARY - FEBRUARY 2000

Species	Density (Number/Meter^2)
Olivella biplicata	0.02
Megathura crenulata	0.01
Mytilus galloprovincialis	0.02
Kelleti kelletii	0.01
Lithopoma undosa	0.01
Norrisia norrisi	0.00
Tegula eiseni	0.08
Tegula aureotincta	0.01
Dendraster excentricus	0.01
Lytechinus anamesus	0.05
Strongylocentrotus franciscanus	0.01
Strongylocentrotus purpuratus	0.03
Herbstia parvifrons	0.01
Pagurus spp.	0.01
Pachycerianthus fimbriatus	0.01

Source: Applied Ecological Research, 2000

TABLE 5. MEAN PROPORTIONAL COVER ESTIMATES FOR SPECIES SAMPLED DURING SUBTIDAL SURVEYS OF THE HEADLANDS MARINE RESOURCES STUDY AREA, DANA POINT, CA. JANUARY - FEBRUARY 2000

Species	**Mean Proportional Cover (per m^2)**
Sand	0.541
Rock	0.095
Encrusting Coralline	0.080
Articulated Coralline	0.075
Cobble	0.069
Phyllospadix	0.028
Egregia laevigata	0.014
Muricea californica	0.011
Pterocladia spp.	0.010
Filamentous Brown algae	0.008
Phragmatopoma californica	0.008
Rhodymenia spp.	0.005
Plocamium cartilagineum	0.004
Plumularia sp.	0.004
Clavelina huntsmani	0.004
Macrocystis pyrifera	0.003
Dictyota flabellata	0.003
Cystoseira osmundacea-setchelli complex	0.003
Crustose Brown	0.003
Unidentified brown macroalgae	0.003
Porphyra spp.	0.003
Balanophyllia elegans	0.003
Eisenia arborea	0.001
Zonaria farlowii	0.001
Aplidium californicum	0.001
Haliclona sp.	0.001
Hinnites giganteus	0.001
Mytilus galloprovincialis	0.001

Source: Applied Ecological Research, 2001

Sensitive Marine Ecological Resources

For purposes of this report, sensitive habitats include all intertidal and subtidal areas included within the two State of California designated marine life refuges, the Dana Point Marine Life Refuge and the Niguel Marine Life Refuge (Figures 11 and 12). Designation of the marine habitat within the study area as a Marine Life Refuge indicates a high degree of sensitivity and a diverse assemblage of species that may be easily disturbed by human activities. While the taking or possessing of most species is illegal in these refuges, abalone, lobsters, and many species of fish can be taken under the authority of a sportfishing license. In addition, the project team observed commercial lobster fisherman and urchin collectors working in the subtidal areas within the Dana Point Marine Life Refuge. In the evaluation of potential impacts to marine resources within the designated marine life refuges, any nonpermitted impacts that could potentially harm habitat or species were critically analyzed.

Within the marine life refuges are several species that would be considered sensitive receptors and worthy of additional review and analysis. These species include the California Grunion, the brown pelican, and the California Gray whale. There are also two specific habitat types occurring within the marine life refuges that are associated with single dominant species: giant kelp (*Macrocystis pyrifera*) and surfgrass (*Phyllospadix torreyi*) beds. Within the analysis of potential impacts, these species are discussed in detail. A brief description of each species follows.

California Grunion

The California grunion (*Leuresthes tenuis*) is not a formally listed species, but is considered sensitive because it uses the high intertidal zone of sandy beaches to spawn and consequently has the potential to be adversely impacted by beach disturbances. Grunion spawn during the highest spring tides, beginning in late February or early March and continuing until early September (Walker 1952). Their eggs are buried in moist sand and hatch when the next spring tide occurs. Strand Beach has been used regularly as a grunion spawning habitat (H. Helling, pers. comm.), and surveys of the beach conducted on July 7, 2001, confirmed this fact. Grunion were directly observed spawning at numerous locations along Strand Beach.

Brown Pelican

The California brown pelican is a federally listed endangered species that occurs along the Southern California coastline for most of the year. Brown pelicans utilize the rocky shores of the study area for roosting and forage in the nearshore waters. The species nests primarily on the Channel Islands; no breeding habitat occurs on the mainland.

Gray Whale

The California gray whale is a federally listed threatened species. Gray whales pass by Dana Point during their seasonal migration from their summer arctic feeding grounds to their winter calving and nursery lagoons in Baja California. The southbound leg of this migration takes place between late December and late February, and the return trip to the north occurs between late February and late March. The return trip occurs in two pulses, with adults and juveniles beginning the migration first, followed by

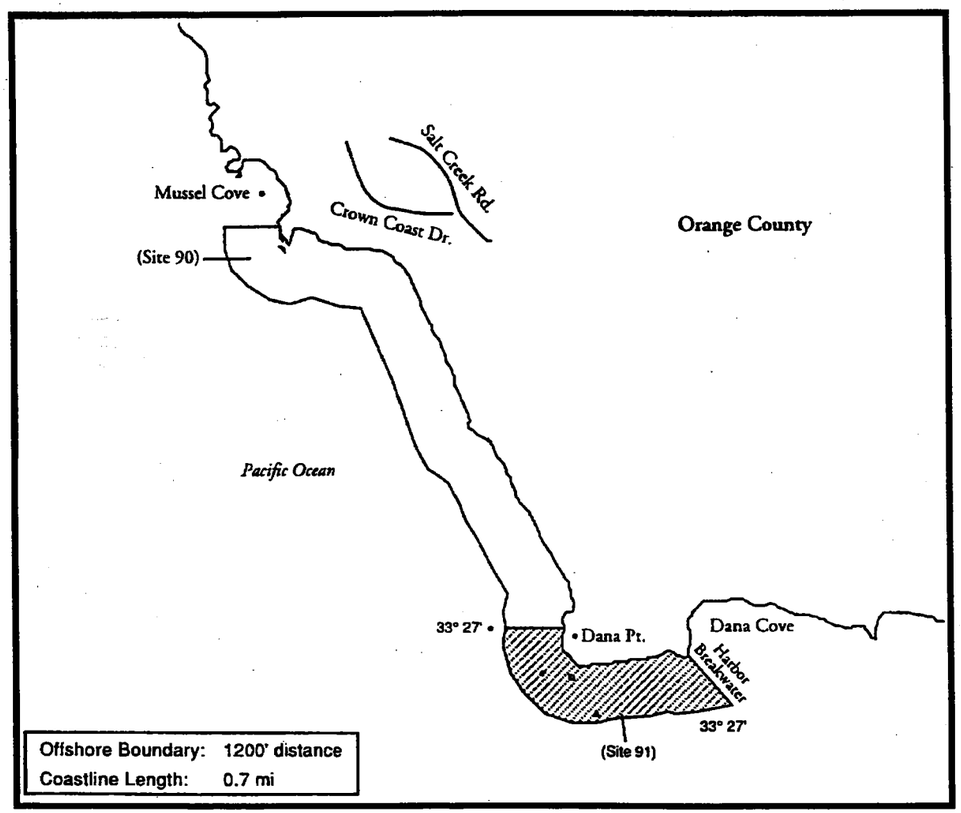


Figure 11. Location and Boundaries of the Dana Point Marine Life Refuge (Source: CRM, 1998)

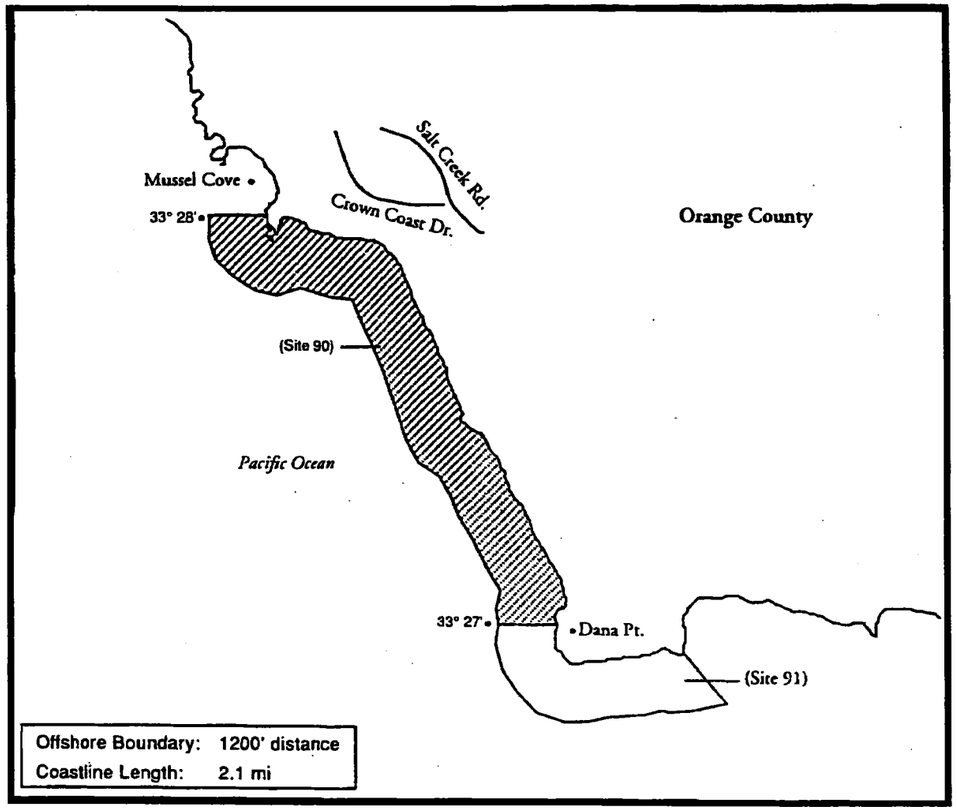


Figure 12. Location and Boundaries of the Niguel Marine Life Refuge (Source: CRM, 1998).

TABLE 6. FISH ABUNDANCES RECORDED DURING SUBTIDAL SURVEYS OF THE HEADLANDS MARINE RESOURCES STUDY AREA, DANA POINT, CA. JANUARY - FEBRUARY 2000.

Location	Species	Common name	Abundance	Score
Pocket Beach	*Paralabrax nebulifer*	Barred sand bass	Few	6
Pocket Beach	*Paralabrax clathratus*	Kelp bass	Few	6
Pocket Beach	*Girella nigricans*	Opaleye	Few	6
Pocket Beach	*Semicossyphus pulcher*	Sheephead	Single	3
Pocket Beach	*Hypsypops rubicunda*	Garibaldi	Single	2
Pocket Beach	unknown	surfperch	Many	5
Pocket Beach	*Urolophus halleri*	Round Stingray	Single	2
Pocket Beach	*Triakis semifasciata*	Leopard shark	Single	
Dana Strand	*Paralabrax clathratus*	Kelp bass	Single	5
Dana Strand	*Oxylebius pictus*	Painted greenling	Single	4
Second Bench	*Semicossyphus pulcher*	Sheephead	Single	6
Second Bench	*Girella nigricans*	Opaleye	Common	6
Second Bench	*Phanerodon furcatus*	White seaperch	Single	6
Second Bench	*Heterostichus rostratus*	Giant kelpfish	Single	6
Second Bench	*Embiotoca jacksoni*	Black surfperch	Some	6
Second Bench	*Paralabrax clathratus*	Kelp bass	Single	5
Second Bench	*Cheilotrema saturnum*	Black croaker	Many	5
Second Bench	*Hyperprosopon argenteum*	Walleye surfperch	Single	4
Pocket Beach	*Hypsypops rubicunda*	Garibaldi	***	***
Pocket Beach	*Urolophus halleri*	Round Stingray	***	***
Pocket Beach	*Paralabrax nebulifer*	Barred sand bass	***	***
Third Bench	*Oxyjulis californica*	Senorita	Many	6
Third Bench	*Paralabrax clathratus*	Kelp bass	Few	6
Third Bench	*Halichoeres semicinctus*	Rock wrasse	Few	6
Third Bench	*Embiotoca jacksoni*	Black surfperch	Many	6
Third Bench	*Scorpaena guttata*	Scorpionfish	Single	6
Third Bench	*Semicossyphus pulcher*	Sheephead	Few	6
Third Bench	*Hypsypops rubicunda*	Garibaldi	Few	6
Third Bench	*Paralabrax nebulifer*	Barred sand bass	Few	4
Third Bench	*Anisotremus davidsoni*	Sargo	Single	4
Third Bench	unknown	juvenile flatfish	Few	
Third Bench	*Gibbonsia* sp.	Kelpfish	***	***
Third Bench	*Semicossyphus pulcher*	Sheephead	Few	6
Third Bench	*Hypsypops rubicunda*	Garibaldi	Many	6
Third Bench	*Embiotoca jacksoni*	Black surfperch	Abundant	6
Third Bench	*Paralabrax clathratus*	Kelp bass	Many	6
Third Bench	*Paralabrax nebulifer*	Barred sand bass	Many	6
Third Bench	*Cheilotrema saturnum*	Black croaker	Abundant	6
Third Bench	*Oxyjulis californica*	Senorita	Many	5
Third Bench	*Heterostichus rostratus*	Giant kelpfish	Few	5
Third Bench	unknown	surfperch	Few	4
Third Bench	*Girella nigricans*	Opaleye	Many	3
Third Bench	*Anisotremus davidsoni*	Sargo	Few	1
Dana Strand Kelp Bed	*Chromis punctipinnis*	Blacksmith	Many	6
Dana Strand Kelp Bed	*Semicossyphus pulcher*	Sheephead	Many	6

TABLE 6 (continued). FISH ABUNDANCES RECORDED DURING SUBTIDAL SURVEYS OF THE HEADLANDS MARINE RESOURCES STUDY AREA, DANA POINT, CA. JANUARY - FEBRUARY 2000.

Location	Species	Common name	Abundance	Score
Dana Strand Kelp Bed	*Anisotremus davidsoni*	Sargo	Few	6
Dana Strand Kelp Bed	*Paralabrax clathratus*	Kelp bass	Many	6
Dana Strand Kelp Bed	*Embiotoca jacksoni*	Black surfperch	Many	6
Dana Strand Kelp Bed	*Paralabrax nebulifer*	Barred sand bass	Many	5
Dana Strand Kelp Bed	*Rhacochilus toxotes*	Rubberlip surfperch	Many	6
Dana Strand Kelp Bed	*Embiotoca jacksoni*	Black surfperch	Abundant	6
Dana Strand Kelp Bed	*Paralabrax clathratus*	Kelp bass	Many	6
Dana Strand Kelp Bed	*Halichoeres semicinctus*	Rock wrasse	Few	6
Dana Strand Kelp Bed	*Semicossyphus pulcher*	Sheephead	Many	6
Dana Strand Kelp Bed	*Paralabrax nebulifer*	Barred sand bass	Many	5
Dana Strand Kelp Bed	*Oxyjulis californica*	Senorita	Few	5
Dana Strand Kelp Bed	*Hypsypops rubicunda*	Garibaldi	Few	4
Dana Strand Kelp Bed	*unknown*	surfperch	Few	2
Dana Strand Kelp Bed	*Coryphopterus nicholsii*	Blackeye goby	***	***

Score: 6=species cited in first 5 minute interval, 5=species cited in second 5 minute interval, 4=species cited in third 5 minute interval, etc.

Abundance: Single=one individual observed, Few=2-10 individuals observed, Many=11-100 individuals observed, Abundant=>100 individuals observed

*** = Fish were observed during the benthic cover transect rather during than the fish count.

Source: Applied Ecological Research, 2000

cows and their young-of-the-year calves between late March and early May. Cows and their young usually travel relatively close to shore, sometimes within an eighth of a mile of the shore (Dohl et al., 1981). Many whales pass close to shore near Dana Point, and whale watching from the Headlands or from vessels outside the harbor entrance is a common activity.

Giant kelp (*Macrocystis pyrifera*) beds

Giant kelp beds consist of large numbers of individual *Macrocystis pyrifera* plants, which reach from the sea floor to the surface, generally in 30 to 60 feet of water. This species is limited to this depth range by a number of physical factors. Within shallow water, less than 30 feet, this species of kelp may be limited by high wave and swell action, which can cause significant breakage of the stipes and failure of the holdfast. In deeper water, the turbidity of the water can preclude establishment of the young kelp plants by reducing the available light. The depth restriction and water clarity required to establish giant kelp beds make them susceptible to impacts from increased wave action or increased water turbidity. Elevated levels of sedimentation (Devinny and Volse, 1978; North, 1971; Dean et al., 1983) and/or water contaminants such as pesticides (Burnett, 1971), heavy metals (Smith, 1979), and hydrocarbons (Foster et al., 1971) have been documented to interfere with the growth and reproduction of *Macrocystis*.

Surfgrass Beds

Surfgrass is a perennial vascular plant adapted to survive the physical stresses of the shallow intertidal zone. Surfgrass beds are similar to giant kelp forests in that they are also restricted to a specific depth range based on light availability. While the species is adapted to seasonal turbidity and burial by sand during winter storms, long-term water column turbidity can cause mortality. Seagrass species can be adversely affected by poor water quality when excess nutrients lead to increased epiphyte loads (Lapointe et al. 1994, Lapointe and Matzie, 1996). Surfgrass epiphytes typically show a seasonal increase during summer periods; however, the extremely high densities of epiphytes that may occur during eutrophic conditions can result in surfgrass mortality by blocking photosynthetic surfaces of the blades and by creating increased drag, which may cause blades to be damaged by water motion.

Potential Impact Assessment

Impact Significance Criteria

The following discussion examines the potential impacts on sensitive marine biological resources that may occur as a result of implementation of the proposed Headlands development. The impacts relative to marine biological resources are assessed using scientific judgement and significance criteria that mirror the policy statement contained in CEQA at Section 21001(c) of the Public Resources Code to "Prevent the elimination of fish or wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self perpetuating levels, and preserve for future generations representations of all plant and animal communities. . . ." The following definitions would apply to the significance criteria for the marine biological resources at the Headlands project site:

1. "Endangered" means that the species is listed as endangered under State or federal law.

2. "Threatened" means that the species is listed as threatened under State or federal law. (Note: The CEQA Guidelines use the term "rare" instead of threatened.)

3. "Region" refers to the area within the Los Angeles, Orange, and San Diego counties that is within the range of an individual species.

4. "Sensitive habitat" refers to habitat for plants and animals (1) that plays a special role in perpetuating species that utilize the habitat on the project site, and (2) without which there would be substantial danger that the population of that species would drop below self-perpetuating levels. Sensitive habitat also includes State or federally designated reserves and marine life refuges.

5. "Substantial effect" means significant loss or harm of a magnitude which, based on current scientific data and knowledge, (1) would cause a species or a native plant or animal community to drop below self-perpetuating levels on a statewide or regional basis or (2) would cause a species to become threatened or endangered.

Impacts to marine biological resources are considered significant for this report if one or more of the following conditions would result from implementation of the proposed project:

1. Direct loss of individuals of a State or federally listed threatened or endangered species.

2. Substantial effect on a rare, threatened, endangered, or candidate species, or the habitat for that species.

3. Substantial diminishment or degradation of the natural ecological functions of marine habitat within a designated marine preserve or refuge.

4. Substantial effect on a critical, yet limited, resource utilized by State or federal listed threatened or endangered species.

5. Substantial effect on the movement of any resident or migratory fish or wildlife species.

6. Substantial effect on Environmentally Sensitive Habitat Areas (ESHA) as defined by the California Coastal Commission.

Also, the determination of impacts has been made according to the federal definition of "take." The ESA prohibits the "taking" of a member of an endangered or threatened wildlife species or removing, damaging, or destroying a listed plant species by any person (including private individuals and private or governmental entities). The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect" an endangered or threatened species, or to attempt to engage in these activities.[1] *"Harm" includes such actions as significant habitat modification or degradation that would result in death or injury to a species by significantly disrupting essential behavior patterns.*

Project Impacts and Proposed Mitigation

Existing marine resources within the study area may be subject to adverse impacts from the proposed project. The potential impacts to marine resources can be classified based on the type and occurrence of the impact. Temporary impacts are those associated with project construction and could include both

[1] *50 C.F.R. §17.3.*

direct and indirect impacts. Permanent impacts are those associated with the proposed project once it has been completed and include long-term direct and indirect impacts.

Construction and Potential Temporary Impacts

All temporary impacts associated with this project would be related to construction activities. These impacts, while temporary, could be significant depending on the severity and magnitude of the alteration. Standard Best Management Practices (BMPs) in place during construction activities would substantially reduce the likelihood of any significant impacts to marine resources, but effects on the quality of the habitat require a detailed evaluation of any potential impacts.

1. Dust deposition within intertidal and subtidal zone

Construction activities on the project site may result in the production of dust as trucks and other heavy equipment operate on and grade the site. The amount of dust produced at the site would be dependent on the type of sediments exposed during grading, the amount of water in these sediments, and the strength and direction of the local winds at the project site. Dust production would be greatest during periods of construction in hot, dry conditions with high velocity winds. In these instances, production of dust may be locally heavy and could result in significant deposition based on wind direction and velocity. If high velocity, offshore winds occur during periods of heavy, uncontrolled dust production, this material could be transported into the marine habitat and result in a temporary, localized increase in turbidity in specific nearshore areas. The increase in turbidity would be proportional to the amount and type of dust produced, as well as the distance the dust is transported from the source. In addition, deposition of large amounts of dust within the marine environment could result in impacts to algae and sedentary marine organisms. Large amounts of sediment could affect the photosynthetic capacity of marine plants, especially surfgrass. However, this would be a very short-term impact as currents, tides, and wave action would tend to remove and disperse the material. The potential impact areas would be limited to the site of dust deposition and within a short distance down coast (dependent on the current, the amount and type of deposition, and the time of year).

The magnitude of the potential impacts from dust deposition is dependent on the concentration of dust within the marine environment at the point where the dust enters the ocean. The amount of dust at this point would be dependent on the type of material, the wind speed, the distance traveled from the source to the receptor location, and the height of the source above the receptor location. The type of material on the site is important as finer material can be entrained by the wind and moved off the site. On the Headlands project site, the predominant material is sand, which tends to be more resistant to wind erosion. The speed of the wind plays an important role in the amount of deposition. The higher the wind speed, the more erosion occurs and even coarse material can be entrained by very high winds (entrainment speed is dependent on the grain size of the material). The distance that the material travels also affects the amount and severity of the deposition. As material is transported by the wind, the cloud of material tends to disperse as the distance from the source increases. Deposition occurs over a wider area but with less material being deposited within a specified area. One additional factor that can affect erosion and deposition involves the height of the source in relation to the receptor location. If the source is higher in elevation, the material eroded by winds tends to be transported in a wide area, or dispersed, below the source resulting in much less concentration. If winds are high, the elevation difference may reduce the deposition in nearby locations as the winds tend to transport material some distance from the source.

Impacts from the erosion of material from the project site by wind could be potentially significant without control. Given the sensitive nature of the marine resources within the Marine Life Refuges directly adjacent to the project, any clearly measurable deposition of material that can be attributable to the construction site would be considered a significant impact due to the potential detrimental effects on surfgrass beds, marine algae, and sessile organisms. In order to reduce the potential for erosion and subsequent deposition of material from the construction site, the project will include standard dust reduction measures during all periods of construction as required by the South Coast Air Quality Management District (SCAQMD). These measures will include the use of water trucks to wet dirt piles and work areas, avoidance of grading that produces dust during high velocity wind events (Santa Ana conditions), and covering trucks that transport earth on or off site.

Specific measures required by existing regulations include compliance with AQMD Rules 402 and 403.

SCAQMD Rule 403 requires that fugitive dust be controlled with best available control measures so that the presence of such dust does not remain visible in the atmosphere beyond the property line of the emission source. In addition, SCAQMD Rule 402 requires implementation of dust suppression techniques to prevent fugitive dust from creating a nuisance off site. These dust suppression techniques are summarized below. Implementation of these dust suppression techniques as required by the SCAQMD can reduce the fugitive dust generation (and thus the PM_{10} component) by 50 to 75 percent. Implementation of the following measures will reduce short-term fugitive dust impacts on nearby sensitive receptors:

- All active portions of the construction site shall be watered to prevent excessive amounts of dust.
- On-site vehicle speed shall be limited to 15 mph.
- All on-site roads shall be paved as soon as feasible or watered periodically or chemically stabilized.
- All material excavated or graded shall be sufficiently watered to prevent excessive amounts of dust. Watering, with complete coverage, shall occur at least twice daily, preferably in the late morning and after work is done for the day.
- If dust is visibly generated that travels beyond the site boundaries, clearing, grading, earth moving, or excavation activities that are generating dust shall cease during periods of high winds (i.e., greater than 25 mph averaged over one hour) or during Stage 1 or Stage 2 episodes.

All material transported off site in trucks shall be either sufficiently watered or securely covered to prevent excessive amounts of dust.

These measures will be implemented as part of the Grading Plan prepared for the project. Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.

2. Erosion of materials from construction site during storm events

Transport of sediment and other material from the site during storm events has the potential to be one of the major impacts associated with this project. Construction sites typically have large

areas of graded surfaces exposed to the elements. If a storm occurs while these areas are exposed, debris and sediment from the site could be quickly transported onto the beach and rocky intertidal through direct runoff if uncontrolled. Depending on the severity of the storm and the amount of runoff, there could be a minor to moderate amount of material transported to the marine environment. Because this would occur during a storm event, most of the material deposited in the marine environment would be removed through storm wave action resulting in a small increase in turbidity and eventual deposition at a site down coast. As the material enters the marine environment, it could result in some deposition on the leaves and fronds of aquatic vegetation leading to a decreased photosynthetic capacity.

The majority of the project site is composed of sandy material within the erodable mantle. As a result, the majority of the material that may be transported from the site would be native sand. However, during construction, other types of material, including finer materials, could be exposed or utilized on the project site. Stormwater runoff carrying these materials from the site would enter the ocean at three major locations. Approximately 60 percent of the site drains onto Strand Beach, approximately ten percent of the site drains into Dana Point Harbor, and the remaining area drains as sheet flow across and over the bluff top. The majority of the proposed construction area (approximately 95 percent) drains to Strand Beach or Dana Point Harbor. On Strand Beach, there are five discharge points that would supply sediment to the beach during storm events leading to smaller, localized impacts as compared to the potential impacts from one, large discharge point. There is only one discharge point at Baby Beach. This assessment will address potential impacts to habitat adjacent to Strand Beach and within Dana Point Harbor at Baby Beach.

Significant erosion of material from the construction site during storms onto the sandy beach could have a negative impact on the California grunion. This fish breeds within the intertidal area on sandy beaches during the spring and summer. The grunion will breed only on beaches where the sands are clean and well sorted (CRM, 1998), allowing the females to deposit their eggs within the sand. Deposition of material from upland sources during the wet season could change the sediment characteristic of the beach and potentially affect grunion spawning on the sandy beach area.

Additional potential impacts associated with stormwater transport of sediment could involve reduction in photosynthetic capacity of surfgrass and marine algae. This impact is associated with deposition of material on the photosynthetic structures on these plants. The potential for this impact to occur is very slight given the sandy nature of the material, the discharge of material onto the beach during a storm event, and the distance from the discharge point to the surfgrass and kelp beds. The location of the discharge points on Strand Beach and at Baby Beach reduces the potential for this material to reach the offshore kelp beds or be transported down coast to the surfgrass beds.

The limited grading near the bluff top for the proposed project could result in transport of material from the bluff tops and into the rocky intertidal habitat within the Dana Point Marine Life Refuge.

The erosion of material other than the predominant sandy terrace material from the construction site during storm events has the potential to be a significant impact without mitigation. The transportation and deposition of nonsandy material from the uplands into the marine environmental may cause impacts to grunion spawning areas, may result in a reduction in

photosynthetic capacity in surfgrass and marine algae, and may result in increased deposition of material into the Dana Point Marine Life Refuge.

Specific control measures to minimize erosion and protect water quality are detailed in Aquatic Environmental Services (2001) and AMEC (2001).

Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these control measures.

3. Increased noise and vibration from construction activities

The use of heavy earth moving machinery and related construction machinery may cause elevated levels of noise and vibration within the immediate upland habitat. A portion of this noise could propagate into the marine environment if the ambient physical conditions within the study area were suitable. While the additional noise and vibration would be nearly completely masked by the background wave and ocean noise, extensive vibrations and noise could radiate from the construction site into adjacent offshore waters. However, the physical constraints of the site, distance of grading and construction activities from the marine resource area and the characteristics of the anticipated sound sources would combine to reduce potential noise levels and consequently the level of potential impact.

Sound produced on the shore tends not to propagate into the surrounding marine environment because the air-water interface generally reflects sound from the shore. Any sound that does enter the water tends to be hard to detect because the existing noise from the surf zone adds significant levels of background noise. In addition, the noise generated by boat traffic from Dana Point Harbor would also increase background noise levels, making it difficult to detect potential construction noise. High frequency sound attenuates very rapidly within water and would not be a potential problem for the project. Low frequency sound, which could be generated by construction equipment, can propagate long distances in deeper waters but tends to be refracted and reflected in shallow waters, which reduces the strength of the noise and decreases distance over which it can be heard. Potential low frequency sound and vibration produced by the project would be on the shore above the water, not directly in the water, which would also reduce the initial sound levels. Construction equipment working on the site above the study area would generate elevated levels of noise within the terrestrial area, but this sound would be attenuated rapidly in the shallow subtidal zone.

Increased noise from construction would not have significant impacts on sensitive resources within the marine environment. However, marine mammals and birds that may move into shallow water habitats directly adjacent to the construction area could experience very slightly elevated noise levels. Based on the level of boat traffic from the harbor and the noise generated by the surf zone within the study area, this increase in noise would be negligible and would likely not be detectable. It is very unlikely that construction noise would cause any interference with normal animal behaviors in the study area.

4. Trash and debris from construction site entering intertidal and subtidal areas

Generation and improper disposal of trash at a construction site can be a major problem. If trash capable of blowing away is allowed to accumulate on the site, offshore winds could transport material from the site into the marine environment. Plastics are especially of concern as they do

not readily degrade, and pose ingestion and entanglement hazards to a variety of marine species. While trash can be a significant problem on unregulated construction sites, standard BMPs (already required) and an aggressive trash removal program can eliminate this potential impact.

Specific control measures shall include the following:

- At the end of each construction day, all trash shall be picked up and placed into containers for removal. If these trash bins contain food or food wrappers, these containers shall be covered to prevent animal intrusion. Trash containers shall be emptied at regular intervals to ensure bins have adequate capacity.
- All construction personnel shall be briefed on the problems with trash and potential hazards for marine life.
- If trash moves toward the shoreline, personnel will be dispatched to attempt to capture this material before it reaches the marine environment.
- The site shall be monitored prior to and following storm events to ensure that the measures designed to reduce potential trash impacts are successful.

Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these control measures.

5. Potential spill of hydrocarbons from construction equipment into intertidal areas

The presence of construction equipment on the site would result in a low percentage chance of an accidental spill or leak of oil, grease, or other hydrocarbons. While most spills are minor and do not migrate off the site, the proximity of the site to the marine environment makes even the remote possibility a concern. A construction accident and the spill of several gallons of fuel directly adjacent to the beach or intertidal area could result in a potentially significant impact to the marine environment. It is recommended that controls beyond required BMPs be in place prior to the start of construction to prevent the accidental discharge of hydrocarbons and that a spill response plan be prepared.

Specific measures shall include the following:

- A fuel and hazardous materials spill recovery plan shall be developed before the initiation of construction on the site. All employees, including vehicle maintenance contractors, shall be required to read the plan and be responsible for plan implementation of their respective responsibilities.
- Prior to issuance of a grading permit, a vehicle maintenance area shall be designated in an area where any potential runoff can be diverted into a temporary on-site basin. The objective of this measure is to attempt to have all routine maintenance occur within an area that can be easily monitored and to have the ability to contain any accidental spills that may occur. While maintenance of damaged or inoperable machinery may occur outside of this area, all attempts should be made to get the equipment to the maintenance area before extensive repairs are accomplished. The construction supervisor shall be responsible for monitoring maintenance activities and ensuring that hydrocarbon and other hazardous materials spills are minimized reported and that contaminated soil removed (if they occur). The construction supervisor shall be responsible for implementation of the spill recovery plan and for

ensuring that employees on the site are familiar with their respective responsibilities under the plan.

The project NPDES construction permit will include these measures to protect water quality.Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.

6. Impacts to Strand Beach from reconstruction of rock revetment

The proposed project includes reconstruction of an existing rock revetment that is located at the upper edge of the beach along Strand Beach. The existing rock revetment was originally constructed in the 1950s and has been repaired and extended over the years. The revetment was severely damaged during the 1983 El Niño and an emergency repair was performed. The General Plan Amendment (GPA) required the applicant to have the revetment analyzed by a registered geotechnical engineer and a registered marine/coastal engineer to determine the stability of the structure and incorporate design features that would further stabilize the site to ensure public safety, limit erosion, and enhance public access. The GPA also required that the reconstruction of the revetment may not encroach seaward of the toe of the existing revetment at bedrock, unless additional improvements are necessary to create or enhance new public access or maintain public safety. Because the existing revetment will be reconstructed essentially in place and with existing materials, this impact has been considered a temporary construction impact, as there will be no additional structures within the marine environment.

The project proponent has conducted an analysis of the existing revetment, and the geotechnical engineer has determined that the revetment is underdesigned and that most of the existing structure is underengineered. The marine/coastal engineer has completed proposed plans for reconstruction of the revetment that would include removal of the existing rock riprap and reconstruction using the existing rock augmented by larger rocks placed directly on bedrock. A bedding layer of filter fabric would be placed between the slope face and the rock layer. The previously excavated sand will be used to backfill over the reconstructed revetment returning the beach to its preconstruction profile. Excavation of the sand and existing rocks would occur from the landward side of the existing revetment and the material stockpiled within the uplands behind the beach. All work will be completed within the footprint of the existing revetment.

The proposed reconstruction of the revetment may result in potentially significant impacts to marine resources and specifically to spawning areas for the California grunion without proposed mitigation. While the proposed limits of excavation are within the limits of the existing revetment, the work may be within 50 feet of the mean higher high water line on the beach. Stabilization of the excavation (which may be to a depth of approximately seven feet below the existing beach surface) may involve additional temporary impacts beyond the toe of the existing revetment.

The proposed limits of excavation would involve temporary impacts to sand beach well above the mean high tide line on Strand Beach. The area of the revetment itself is above the high tide splash zone and is populated primarily by terrestrial animals and plants. Below the revetment, the upper portion of the beach is above the high tide line and is inundated only during storm surge and high wave action. This area is populated by beach hoppers and isopods. Temporary impacts to these species would occur during excavation and reconstruction activities. While the proposed construction would be well above the mean higher high water line and BMPs are

required to be practiced during construction, uncontrolled grading activities seaward of the toe of the existing revetment may have impacts on the grunion and its spawning grounds.

Specific control measures shall include the following:

- The limits of grading for excavation of the existing revetment and placement of rocks shall be clearly delimited to prevent discharge of any material seaward of the construction limit.
- Reconstruction of the revetment shall occur during the summer months when the beach is widest to prevent impacts below the mean higher high water line. If the limits of construction are within 50 feet of the mean higher high water (MHHW) line, construction shall be suspended in those areas for three days prior to the start of and during grunion spawning nights (as predicted by the California Department of Fish and Game). All construction activities on the beach shall be limited, to the maximum extent possible, to the shoreline above the MHHW mark. Construction activity on the beach that is required below that mark between the months of February and July shall include the participation of a biological monitor to determine the shoreward extent of grunion spawning activity and egg-laying.

Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these.

The measures are summarized in Table 7.

Project Impacts after Construction

1. Increased stormwater runoff from the project onto Strand Beach.

The existing conditions at the Strand Beach include the unregulated discharge of stormwater from the County of Orange Strand Beach parking lot, Selva Road, a portion of Niguel Terrace condominium project, the greenhouses and storage areas on site, the existing multifamily residential enclave, and the abandoned development onto the beach at several locations (Aquatic Environmental Services, 2001). Currently, stormwater enters the beach at several locations along the existing riprap berm. Stormwater flows across the sand beach and enters the ocean where the material is mixed and transported down coast.

The proposed project would increase the stormwater first flush discharge to the beach by approximately 51 percent through an increase in impervious surfaces (Keith Companies, 2001). Stormwater from the project would be discharged onto the beach at three locations. However, the proposed stormwater discharge system would involve the use of sand filters within an upstream diversion box to filter the "first flush" of pollutants within a storm. In addition, dry season urban runoff from the proposed development would be directed into the sanitary sewer system for treatment. By removing dry season urban runoff and filtering the first flush stormwater runoff, it is projected that the stormwater entering the marine environment after project implementation will have higher water quality than the existing condition (Aquatic Environmental Services, 2001).

TABLE 7. SUMMARY OF CONSTRUCTION IMPACTS (TEMPORARY IMPACTS)

Projected Impact	Level of Significance	Control Measures and Design Features
1. Dust production from the construction site.	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Water trucks, covering for all trucks transporting earth to and from the site, and sediment piles would be kept covered or wetted to prevent the production of dust . In addition, no grading would occur during periods of Santa Ana conditions.
2. Erosion of materials from construction site during storm events.	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Development of an Erosion Control Plan including standard Best Management Practices (BMPs) for grading and related construction activities on-site. Monitoring of the construction site will be required.
3. Increased noise and vibration from construction activities	Increased noise from construction would not have significant impacts on sensitive resources within the marine environment.	No measures necessary
4. Trash and debris from construction site entering intertidal and subtidal areas	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Development of BMPs for site clean up. Regular monitoring of site is required.
5. Potential spill of hydrocarbons from construction equipment into intertidal areas	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Development of BMPs, a spill recovery plan, and designation of a vehicle maintenance area. Monitoring requirements for the construction supervisor.
6. Temporary impacts to Strand Beach from reconstruction of rock revetment	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Development of BMPs, clear designation of the construction zone. Construction activity shall not be allowed on the beach in excess of that required for revetment modification. All construction activities on the beach shall be limited, to the maximum extent possible, to the shoreline above the mean higher high water (MHHW) mark. Construction activity on the beach that is required below that mark between the months of February and July shall include the participation of a biological monitor to determine the shoreward extent of grunion spawning activity and egg-laying. Construction activities shall be restricted to above that extent line during anticipated grunion spawning periods. If the limits of construction are within 50 feet of the mean higher high water (MHHW) line, construction shall be suspended in those areas for three days prior to the start of and during grunion spawning nights

Source: Applied Ecological Research, 2001

The proposed development would result in a greater percentage area of impervious surfaces within the project area, resulting in a potentially greater volume of runoff entering the beach during storm events. However, while the amount of stormwater runoff may increase, the projected stormwater discharge rates for the proposed project would be slightly lower than the discharge rates that occur under existing conditions (Aquatic Environmental Services, 2001). Also, by filtering the first flush from the storms, the contaminants entering the marine environment are projected to be less than present levels.

There are several potential impacts associated with placement of outfall structures onto the revetment along the edge of the beach. First, placement of these structures will result in the continued discharge of floodwaters over the beach. As compared to discharge from the existing land on the site, stormwater from the proposed development, after sand filter treatment, would be relatively free of suspended particles (Aquatic Environmental Services, 2001). As this water exits the pipe and crosses the beach without the presence of energy dissipaters, there would be some amount of erosion of beach sand. This sand could be transported into the surf zone and moved down coast with the existing littoral drift. The result could be localized areas of erosion that may or may not be detectable during periods of winter storms (with associated high wave action). With the inclusion of energy dissipaters and similar floodwater discharge rates, potential impacts to existing interstitial organisms and the current populations of spawning grunion would be minimized.

Second, the discharge of stormwater onto the beach could result in decreased water quality in the water near the beach. The discharge of stormwater with the usual constituents (excess nutrients, hydrocarbons, and heavy metals) could temporally reduce water quality in the nearshore area and be swept down coast into the rocky intertidal by the existing currents. With the proposed project's removal of the first flush of the stormwater and through the use of sand filters, this impact is reduced significantly, and the proposed project is projected to reduce total pollutant loading into the marine environment.

Third, trash and other larger elements in stormwater could be discharged onto the beach. Stormwater flowing through streets and gutters tends to transport those items of trash that have been left in the street and the storm drains during the summer and deposit these items on the beach or into the surf zone. However, as previously stated, the filtering of the first flush would tend to remove trash from stormwater.

As proposed, the project would control these potential impacts through the incorporation of several design features and BMPs designed to decrease the amount of potential contaminants within stormwater Specifically, these include the following:

- Dry season and nonstorm event urban runoff from the proposed development shall be diverted into the sanitary sewer system for treatment. This would reduce potential contaminants within the storm drains that would normally be flushed from the system into the ocean during nonstorm events or during the first rains of the year.
- The first flush of the winter rains would pass through an underground smart box to a sand filter (Aquatic Environmental Services, 2001). The underground smart box also diverts first flush runoff away from the south end of the beach near the high relief rocky intertidal habitat.

- Trash racks would be installed in all storm drain inlets and cleaned annually prior to the start of the storm season (October 15). These racks would be checked after each major winter storm and cleaned if necessary.
- Grease traps are proposed to be installed within storm drain inlets at each large parking lot to capture grease and oils.
- Velocity control structures are designed and installed at the outlet of each storm drain along the beach to prevent beach erosion.
- Nonstructural BMPs for the development include the following:

1. The developer, business owners, and the Home Owners Associations for the residential communities will establish and maintain a public education and participation program to involve project residents and business people in helping to maintain high water quality. This should be done by employing the specific approaches described in the Municipal and Industrial Best Management Practice Handbooks (Stormwater Quality Task Force, 1993; vol. 1) referred to hereinafter as BMP Handbooks.

2. The developer, business owners, and Home Owners Associations involved shall establish and maintain good housekeeping practices as they relate to on-site control of runoff constituents affecting water quality. This will be done by employing the specific suggestions and information provided the BMP Handbooks (Stormwater Quality Task Force, 1993; vols. 1 and 2).

3. The groups identified in 1 and 2 above will establish guidelines and regulations to promote the use of alternative products (e.g., fertilizers, pesticides, cleaning solutions, and automotive and paint products) that are less harmful to water quality, as described in BMP Handbooks (Stormwater Quality Task Force, 1993, vol. 1).

4. The groups identified in 1 and 2 above will establish and enforce guidelines and regulations for proper storage and control of materials that degrade water quality, using the approaches described in BMP Handbooks (Stormwater Quality Task Force, 1993; vol. 1).

5. The groups identified in 1 and 2 above shall establish and maintain a program of stenciling inlets to the storm drain systems to discourage illegal disposal of materials harmful to water quality, using the specific approaches described in BMP Handbooks (Stormwater Quality Task Force, 1993; vol. 1).

6. The groups identified in 1 and 2 above shall establish and maintain a program for special collection of hazardous household wastes (HHW), and the recycling of used motor oil, as defined by BMP Handbooks (Stormwater Quality Task Force, 1993, vol. 1) and by using the approaches suggested in that document.

7. The groups identified in 1 and 2 above shall establish and maintain a street and parking lot cleaning program, as described in BMP Handbooks (Stormwater Quality Task Force, 1993; vol. 1). This program shall employ an air

regenerative vacuum sweeper, with sweeping of all street and parking lot surfaces conducted at least once per week.

8. The groups identified in 1 and 2 above shall undertake and maintain a program that encourages cooperation by the HOAs of off-site residential areas and officials responsible for the Orange County Strand Beach Parking Lot to improve their control of pollutants entrained by runoff water that flows through the project site.

9. The City of Dana Point shall establish and maintain programs for regular cleaning and maintenance of storm drain structures.

10. The Developer and the Home Owners Associations involved shall implement a program to promote water-efficient landscaping in order to reduce irrigation and maintenance requirements in both residential and public/common areas.

11. Interior and exterior water conservation measures shall be implemented within all planning areas. These measures shall include, but are not limited to, low flush toilets, low flow faucets, water conserving appliances, use of reclaimed water for irrigation, and the use of efficient, electronically controlled irrigation systems to minimize runoff and evaporation.

12. In commercial areas such as the Seaside Inn and the Pacific Coast Highway, trash receptacles of all sizes shall be kept in a fully covered space to prevent rainwater from entering them.

13. In commercial areas such as those noted in 12, regulations shall ensure that all restaurant and food service establishments have a wash-down area that drains directly to the sanitary sewer system for treatment and disposal.

Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.

2. Increased stormwater runoff into Dana Point Harbor at Baby Beach

An existing 24 inch pipe carries stormwater and other runoff from approximately ten percent of the project area as well as off-site areas including Green Lantern, Cove Road, the Blue Lantern and Santa Clara Avenue vicinity, and nearby parking areas that discharge onto the area west of Baby Beach. During storm events, water flow at approximately 30 cubic feet per second (cfs) discharges from this pipe into the harbor near Baby Beach (Keith Companies, 2001). Correspondence with the County of Orange (T. Rossmiller, pers. comm.) determined that runoff from this pipe has been found to cause potential water quality problems within the harbor and on the adjacent beach. The County closes off this pipe during the summer months and pumps the urban runoff into the sewer system. This prevents further contamination of the beach area during the summer months.

Stormwater discharge into the harbor during the winter months could result in two different effects on the habitat within the harbor. First, stormwater runoff from urban areas is usually high

in nutrients, usually contains hydrocarbons from automobiles, and may also contain harmful bacteria, pesticides, and heavy metals. The rainwater entrains these constituents as it flows over streets, driveways, and other surfaces within the urban environment. A "first flush" effect occurs in which the initial pulse of a rainfall event entrains the majority of these constituents from surfaces and transports them into storm drains. These constituents would be discharged in Dana Point Harbor and potentially onto Baby Beach during a storm event. This discharge could cause a localized decrease in water quality. This reduction may last longer than expected due to the position of the discharge (at the back of the harbor) and the reduced circulation of the enclosed harbor. This lack of flushing would tend to increase the residence time of stormwater pulses in this area and consequently has the potential to increase their adverse effects on marine biota.

Another impact associated with stormwater runoff is the presence of suspended sediment. This is usually not a significant amount in areas that have been developed. However, there may be areas where road construction and/or modifications to structures would leave exposed soils that could be eroded and transported to the harbor. Discharge of sediment onto the beach and into the harbor could exacerbate an existing problem. Currently, Dana Point Harbor requires regular dredging due to sand deposition within the harbor.

The proposed project would not significantly change the existing flow of stormwater onto Baby Beach. The project has been designed such that there would actually be less stormwater runoff from the project after construction. Specific project proposed control measures to reduce flows and improve water quality include the following:

- Dry season and nonstorm event urban runoff from the proposed development shall be diverted into the sanitary sewer system for treatment. This would reduce the potential contaminants within the storm drains that would normally be flushed from the system into the ocean during nonstorm events or during the first rains of the year.
- The first flush of the winter rains would pass through an underground smart box to a sand filter (Aquatic Environmental Services, 2001). The underground smart box also diverts first flush runoff away from the south end of the beach near the high relief rocky intertidal habitat.
- Trash racks would be installed in all storm drain inlets and cleaned annually prior to the start of the storm season (October 15). These racks would be checked after each major winter storm and cleaned if necessary.
- Grease traps shall be installed within storm drain inlets at each large parking lot to capture grease and oils.
- Velocity control structures shall be designed and installed at the outlet of each storm drain along the beach to prevent beach erosion.
- Nonstructural BMPs for the development described in the discussion of project impacts after construction, above.

By diverting urban runoff and diverting the first flush of the stormwater through sand filters, the actual amount of contaminants would be reduced as compared to existing conditions. Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these design measures.

3. Dry season urban runoff (nuisance water) discharge into the marine environment

Runoff from urban areas is generally composed of excess water generated from a variety of sources associated with residential and commercial development. Excess water from irrigation, washing cars and boats, and cleaning of streets and driveways, flows over yards and streets picking up a wide variety of substances. This runoff may contain elevated levels of nutrients due to fertilizer use, bacteria such as *E. coli*, pesticides, heavy metals, and hydrocarbons. These nuisance flows from urban areas may contain very high concentrations of these substances during summer months due to the relatively lower volume of flows, and thus less dilution during the dry season. When these flows enter a water body, the receiving waters dilute the high concentrations. However, locally high concentrations can quickly occur due to variations in flow rates and currents in the water body. In some cases, these constituents can be transported relatively long distances only to be concentrated at another location (Ashley et al., 1999; Lapointe and Matzie, 1996).

Currently, there is little to no dry season urban runoff into the marine environment seaward of Strand Beach due to the lack of occupied residential housing. There is a small amount of runoff from the existing homes above Strand Beach overlooking the rocky intertidal habitat. Additional dry season urban runoff is generated by the developed areas on Green Lantern, Cove Road, Blue Lantern, Santa Clara Avenue, and a portion of the harbor parking that is directed into the harbor near Baby Beach. During the summer season, this runoff is directed into the sanitary sewer system.

The proposed project would maintain the existing conditions on the site by directing all dry season and nonstorm event urban runoff into the sanitary sewer system for treatment. In addition, the first flush of stormwater runoff would be diverted into a sand filter prior to discharge. By directing the flows into the sewer, the project would not allow any of these pollutants to enter the surf zone on Strand Beach. In addition, the project would reduce pollutant flow into the harbor at Baby Beach by directing the majority of the dry season and nonstorm event urban flows into the sewer system.

The incorporation of the design feature to direct all dry season and non storm event urban runoff into the sewer system, along with the nonstructural BMPs identified above, would result in no significant impacts to marine sensitive resources and the marine life refuges.

4. Potential increase of runoff to blufftop

One potential concern regarding this project is the movement of groundwater from development on the project site through the soils and out into the area near the rocky intertidal. Currently, there is almost no development on the bluffs, and most water infiltrating is rainfall derived. The existing residential development uses septic systems, which provide an additional source of infiltration. At present there are three or four areas along the rocky intertidal within the Dana Point Marine Life Refuge that show evidence of water seeping out of the bottom of the bluff face. These areas appear to be seasonal and the flows generally wet only the soils on the bluffs; water exits the bluff only during periods of sustained heavy rains.

If homes and other structures are placed near the bluff tops, additional water from irrigation and other residential sources that is not captured by the drainage system could infiltrate into the groundwater. This water may contain nutrients, pesticides, and other contaminants. If this water percolates through the soils and exits on the bluff face or at the bottom, this higher nutrient water could have significant local impacts on the habitat. Additional water could support the

introduction of nonnative plant species, such as ice plant, into upland habitats at the base of the bluffs, which would normally be inhabited by native species adapted to the current conditions. In addition, if the water is able to enter the intertidal areas along the rocky shore, this could cause localized changes in water quality that may effect species diversity. These potential impacts are considered significant if not mitigated. This could also be a potential problem if stormwater or urban runoff is detained or stored on site and allowed to infiltrate.

The proposed project has been designed to avoid placement of houses near the edge of the bluff. Along the point of the bluffs, the natural habitat would be preserved with only a trail allowing visitors access to the area. Water use in these areas would be strictly controlled to prevent the potential for excess water seeping into the bluff face and potentially exiting into the rocky intertidal. Specific control measures included in the project as proposed reduce potential impacts; these include the following:

- Dry season and nonstorm event urban runoff would be diverted into the sewer system during the dry season. This would reduce the amount of water allowed to infiltrate into the bluff face.
- Low flow type irrigation systems for landscaped areas would be linked to soil moisture monitors to ensure that these areas are not overwatered leading to excess water moving into the bluff face.
- Where possible, native plants and/or drought tolerant plants would be used for landscaping to reduce the amount of irrigation necessary to maintain the foliage.
- Irrigation systems would be monitored by maintenance crews to ensure that leaks, line breaks, and system failures do not result in significant amounts of water entering the bluff face. Shut off valves and system fail safe measures would be installed to ensure that failures do not result in large discharges of water onto the bluff face before the failure is discovered.
- A comprehensive pesticide/herbicide management plan would be prepared to ensure that only minimal amounts of these chemicals are used on the site. All maintenance supervisors shall be briefed on this plan and be responsible for the correct application of these chemicals.
- Grading for streets and parking lots to serve the project would drain away from the blufftop.

The incorporation of these measures in the design of the project to control excess water entering the bluff tops would result in no significant impacts to sensitive marine resources and the marine life refuges.

5. Increased visitors to intertidal areas

Currently, the rocky intertidal habitat within the Dana Point Marine Life Refuge is under intense pressure from large numbers of visitors, including organized school trips. Total visitors to the Refuge number in excess of 250,000 people each year. Intertidal visits (tidepooling) are a major activity within the Dana Point area. Organized educational field trips brought 12,204 visitors to the Refuge during 1996. Mr. Harry Helling of the Orange County Ocean Institute recorded up to 1,443 visitors present in the Refuge during a three hour period of November, 1993. These organized field trips are supplemented by general public use of the area and frequent collecting of intertidal organisms for food and bait, despite this area's designation as a Marine Life Refuge. The high intensity of human visitation and collecting at Dana Point has resulted in significant

adverse impacts to intertidal habitat in this area, including decreased organism abundance, altered population size structures, and reduced reproductive success (Murray et al., 1999).

The impact of human intrusion into the rocky intertidal zone can be seen in the change in species and their density. Transects taken along the rocky intertidal habitats documented a change in species diversity and density as distance increased from the access point near the Ocean Institute. Within the rocky intertidal along high traffic areas, there is lower cover of the macroalgae *Pelvetia*, likely due to trampling of the algae by the numerous visitors. With the cover of *Pelvetia* gone, the coralline red algae and other species living under *Pelvetia* within the mid and high intertidal zone are also impacted and found in lower densities. Within the high relief rocky intertidal areas (less human impact due to the distance from the access point), the percent cover of *Pelvetia* increases along with the percent cover of coralline algae. Percent cover of mussels was also observed to be reduced at locations nearer the Ocean Institute, and increased significantly at transects farthest from the Ocean Institute that receive the fewest human visitors. Collecting pressure has also resulted in reduced numbers of larger, more conspicuous species including sea stars, sea hares, crabs, and large limpets at areas receiving higher numbers of visitors.

The construction of homes and an inn on the Headlands 200 feet above the rocky intertidal may result in a slight increase in human use and impact on the intertidal areas. Direct visitor use would be restricted because the proposed home and the inn would have no direct access to the rocky intertidal areas. All access to these areas must occur through the harbor, typically by vehicles traveling Cove Road. Vehicular access to the residential areas on the project must be routed to Pacific Coast Highway. While this increase may be relatively small, the cumulative impact of any additional visitors could result in a small, incremental increase in visitor use impacts to the intertidal habitat within the Dana Point Marine Life Refuge.

The project proposes to construct a nature interpretive center and a Maritime/Historical center on site to provide information and educational opportunities for visitors to the Headlands. Information regarding the sensitivity of the rocky intertidal habitat within the Dana Point Marine Life Refuge would be provided at these centers and will include: an education program involving the rocky intertidal habitat initiated in cooperation with the Orange County Harbors, Beaches, and Parks Department. The informational materials would be available to members of the public, including project residents and guests of the Inn who visit the interpretive centers on the Headlands.

The incorporation of this program into the project to educate the general public and potential visitors to the Dana Point Marine Life Refuge will reduce cumulative impacts to the rocky intertidal habitat from both residents of the proposed project and visitors to the interpretive center and result in no significant impacts to the marine environment.

6. Indirect Impacts from Proposed Housing adjacent to Strand Beach

Indirect impacts from the additional homes overlooking the Strand Beach would include street and home lighting where there is none today, increased noise after occupation, and significantly higher use of the beach than at present. In addition, the presence of 75 homes close to the beach could result in increased trash and other debris being deposited in the marine environment. These indirect impacts would potentially impact habitat on the Strand Beach and the high relief

rocky intertidal just south of the end of the beach. These potential indirect impacts may have negative effects on the spawning population of grunion that use this beach.

Increased noise generated by residents of the proposed project should not result in any significant impacts to the marine environment. Sound produced on the shore tends not to propagate into the surrounding marine environment because the air-water interface generally reflects sound entering the water from the shore. Any sound that does enter the water tends to be hard to detect because the existing noise from the surf zone adds significant levels of background noise. High frequency sound attenuates very rapidly within water and would not be a potential problem for the project. Low frequency sound, which could be generated by construction or heavy equipment, can propagate long distances in deeper waters but tends to be refracted and reflected in shallow waters, which reduces the strength of the noise and decreases distance over which it can be heard.

Proposed project controls to minimize these potential impacts include the following:

- A comprehensive education program would be initiated with Orange County Harbors Beaches and Parks Department and the California Department of Fish and Game to educate residents about the sensitivity of marine habitat. The primary measure to reduce impacts from any increased visitor usage of the beach associated with the proposed development would be education. Educational materials would be designed to inform residents about the sensitivity of the Marine Preserves and the grunion, to discourage continual intrusion, and to remind residents about the Fish and Game protection of the species. In addition to information regarding the California grunion, the materials would include information on potential impacts from direct light, excessive noise, and trash on the marine environment. The education program would involve the production and distribution of informational materials for homeowners and visitors to the interpretive centers.
- In areas that have the potential to cast light on the beach or intertidal zone, only low intensity and/or indirect outdoor lighting may be utilized. Where necessary, shielding of the lights will be used. This requirement will be mandatory for both streetlights and residences to reduce and/or eliminate the impacts from street and house lighting. Residents within this zone would be restricted to specific types of lights that could be installed in outside areas, specifically the row of homes that would be directly adjacent to the beach.
- The developer would fund a monitoring program to assess the impacts of the project on biological indicators in the marine environment and the success of the design features to protect the marine environment. The program could be instituted six months to one year prior to the start of construction, and monitoring would occur for three years. Monitoring protocols developed by the resource agencies would be used, and annual reports would be submitted to the California Department of Fish and Game as well as the Regional Water Quality Control Board.

Potential indirect impacts to sensitive resources and the marine life refuges would not be significant with implementation of these project features. The measures are summarized in Table 8.

TABLE 8. SUMMARY OF OPERATION IMPACTS

Projected Impact	Level of Significance	Control Measures and Design Features
1. Increased stormwater runoff from the project onto Strand Beach.	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Dry season and nonstorm event urban runoff from the proposed development shall be diverted into the sanitary sewer system for treatment. First flush of the winter rains would pass through an underground smart box to a sand filter. Installation of trash racks, grease traps, and velocity control structures. Nonstructural BMPs will be developed for the project.
2. Increased stormwater runoff into Dana Point Harbor at Baby Beach	Potential impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Same measures as in Item 1 above.
3. Dry season urban runoff (nuisance water) discharge into the marine environment	Incorporation of the measures to direct all dry season and nonstorm event urban runoff into the sewer system, along with nonstructural BMPs, would result in no significant impacts to marine sensitive resources and the marine life refuges.	Measures to direct all dry season and nonstorm event urban runoff into the sewer system, along with the nonstructural BMPs.
4. Potential increase of runoff to blufftop	The incorporation of these measures to control excess water entering the bluff tops would result in no significant impacts to sensitive marine resources and the marine life refuges.	Dry season and nonstorm event urban runoff would be diverted into the sewer system. Use of low flow irrigation systems and native plants to limit excess water. Grading for streets and parking lots to serve the project would drain away from the blufftop..
5. Increased visitors to intertidal areas	The incorporation of mitigation measures to educate the general public and potential visitors to the Dana Point Marine Life Refuge will reduce cumulative impacts to the rocky intertidal habitat from both residents of the proposed project and visitors to the interpretive center and result in no significant impacts to the marine environment.	Development of an education program on rocky intertidal habitat would be initiated. Informational materials would be available to members of the public, project residents, and guests of the Inn who visit the interpretive centers on the Headlands.
6. Indirect impacts from proposed housing adjacent to Strand Beach	Potential indirect impacts to sensitive resources and the marine life refuges would not be significant with implementation of these measures.	Establishment of an education program on the marine habitat, use of low intensity lighting, and development of a monitoring program.

Source: Applied Ecological Research, 2001

Cumulative Impacts of the Project on the Marine Environment

Potential cumulative impacts on the marine environment would be associated with increased residents living within the coastal zone overlooking the marine environment. The increased usage of the marine environment, the potential for discharge of pollutants into the ocean, and increased trash generation all have the potential to impact the habitat within the Dana Point and Niguel Marine Life Refuges. The specific project design features, project program features, and use of nonstructural BMPs reduce the potential direct and indirect impacts of the project and additional residents and guests associated with the project to a level that would not be significant. In addition, the proposed monitoring of the marine habitat would confirm the success of these project features. The goal of the educational programs would be to reduce the impact of all visitors on the marine environment through changes in visitor and resident behavior and cooperative efforts with the regulatory authorities. By reducing the incremental impact of each resident and visitor, the cumulative impact of all visitors would be decreased, which would allow the habitat to be maintained without restricting visitor usage.

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Appendix A. SPECIES OBSERVED DURING INTERTIDAL SURVEYS OF THE HEADLANDS RESERVE MARINE RESOURCES STUDY AREA, DANA POINT, CA JANUARY - FEBRUARY 2000

Scientific Name	**Common Name**
PLANTS:	
CHLOROPHYTA (Green Algae)	
Codium fragile	dead man's fingers
Ulva sp.	sea lettuce
RHODOPHYTA (Red Algae)	
Corallina sp.	articulated coralline
Endocladia muricata	
Gelidium coulteri	
Laurencia sp.	
Lithothamnion sp.	crustose coralline
Plocamium sp.	
PHAEOPHYTA (Brown Algae)	
Colpomenia sinuosa	
Dictyota flabellata	
Egregia menziesii	feather boa kelp
Eisenia arborea	southern sea palm
Laminaria sp. juvenile	unidentified juvenile laminarians
Pelvetia compressa	rockweed
Ralfsia sp.	crustose brown algae
Sargassum muticum	Sargassum seaweed
Zonaria farlowii	
SPERMATOPHYTA (Seagrass)	
Phyllospadix torreyi	surfgrass
ANIMALS:	
PORIFERA: sponges	
Ophlitaspongia pennata var. *californiana*	orange crustose sponge
CNIDARIA; anemones, hydroids, and gorgonians	
Anthopleura elegantissima	green sea anemone
ANNELIDA: segmented worms	
Phragmatopoma californica	reef-building polychaete
Serpulidae sp.	serpulid tube worms

ARTHROPODA: crustaceans	
Tetraclita rubescens	red barnacle
Chthamalus fissus / dalli	buckshot barnacle
Balanus glandula	common barnacle
Pollicipes polymerus	gooseneck barnacle
Pagurus samuelis	hermit crab
Pagurus hirsutiusculus	hermit crab
Pachygrapsus crassipes	striped shore crab
MOLLUSCA: snails, nudibranchs, clams, and octopus	
Aplysia californica	California brown sea hare
Kelletia kelletii	Kellet's whelk
Megathura crenulata	giant keyhole limpet
Lottia digitalis	ribbed limpet
Lottia scabra	rough limpet
Lottia pelta	shield limpet
Lottia gigantea	owl limpet
Tegula eiseni	banded turban snail
Tegula aureotincta	gilded turban snail
Littorina sp.	periwinkle
Serpulorbis squamigerus	scaled worm snail
Norrisia norrisii	Norris's top snail
Acanthina spirata	angular unicorn
Mytilus californianus	California mussel
Chama arcana	chama shell
Nuttallina fluxa	chiton
Octopus bimaculatus	two-spotted octopus
Add mytilus galloprovincialis?	
ECHINODERMATA: urchins, sea stars, brittle stars	
Asterina miniata	bat star
Pisaster ochraceous	knobby sea star
Strongylocentrotus purpuratus	purple sea urchin
Ophiopteris papillosa	brittle star
Strongylocentrotus franciscanus	red sea urchin
VERTEBRATA: Birds, fishes	
Ardea herodias	Great blue heron
Egretta thula	Snowy egret
Larus californicus	California gull
Pelecanus occidentalis	Brown pelican
Family Clinidae	blenny
Oligocottus maculosus	tidepool sculpin

Source: Applied Ecological Research, 2000

Appendix B. MAJOR INFAUNAL ANIMAL SPECIES IDENTIFIED IN SEDIMENT CORES AT THE HEADLANDS RESERVE MARINE RESOURCES STUDY AREA, DANA POINT, CA. JULY, 2000

Scientific Name	**Common Name**
ANIMALS:	
ANNELIDA: segmented worms	
Euzonus mucronata	polychaete
Nerinides acuta	polychaete
Nephtys californiesis	polychaete
Pygispio californica	polychaete
MOLLUSCA: snails, nudibranchs, clams, and octopus	
Littorina sp.	periwinkle
Olivella biplicata	purple olive snail
ARTHROPODA: crustaceans	
Orchestoidea spp.	beach hoppers
Exocirolina spp.	isopods
Emeritia analoga	sand crab
Blepharipoda occidentalis	spiny sand crab

Source: Applied Ecological Research, 2000

Appendix C. SPECIES OBSERVED DURING SUBTIDAL SURVEYS OF THE HEADLANDS RESERVE MARINE RESOURCES STUDY AREA, DANA POINT, CA JANUARY - APRIL 2000

Scientific Name	**Common Name**
PLANTS:	
CHLOROPHYTA (Green Algae)	
Codium fragile	dead man's fingers
Ulva sp.	sea lettuce
RHODOPHYTA (Red Algae)	
Bossiella sp.	Articulated coralline
Corallina sp.	Articulated coralline
Asparagopsis taxiformis	
Gelidium coulteri	
Plocamium cartilagineum	
Lithothamnion sp.	crustose coralline
Porphyra sp.	Porphyra
Pterocladia sp.	
Rhodymenia sp.	
PHAEOPHYTA (Brown Algae)	
Macrocystis pyrifera	giant kelp
Dictyota flabellata	
Egregia menziesii	feather boa kelp
Eisenia arborea	southern sea palm
Laminaria sp. juvenile	unidentified juvenile laminarians
Desmerestia sp.	
Cystoseira osmundacea-setchelli complex	
Zonaria farlowii	
SPERMATOPHYTA (Seagrass)	
Phyllospadix torreyi	surfgrass
ANIMALS:	
PORIFERA: sponges	
Ophlitaspongia pennata var. *californiana*	orange crustose sponge
CNIDARIA; anemones, hydroids, and gorgonians	
Anthopleura elegantissima	aggregating anemone
Anthopleura xanthogrammica	giant green anemone
Balanophylla elegans	orange cup coral
Pachycerianthus fimbriatus	tube anemone

Plumaris sp.	plumaria
Muricea sp.	sea fan

ANNELIDA: segmented worms

Phragmatopoma californica	reef-building tube worm
Spirorbis sp.	tube worms

TUNICATES

Apelidium californicum	encrusting tunicate
Clavelina huntsmanni	light-bulb tunicate

ARTHROPODA: crustaceans

Chthamalus sp.	barnacle
Herbstia parvifrons	spider Crab
Pagurus samuelis	hermit crab
Pagurus hirsutiusculus	hermit crab
Panularis interruptus	California spiny lobster
Pugettia sp.	kelp crab

MOLLUSCA: snails, nudibranchs, clams, and octopus

Aplysia californica	California brown sea hare
Flabellinopsis crassicornia	elegant eolid
Hermissenda crassicornis	opalescent nudibranch
Navanax inermis	Navanax
Kelletia kelletii	Kellet's whelk
Lithopoma undosa	wavy turban
Maxwellia gemma	gem murex
Megathura crenulata	giant keyhole limpet
Tegula eiseni	banded turban snail
Tegula aureotincta	gilded turban snail
Norrisia norrisii	Norris's top snail
Mytilus edulis	blue mussel
Hinnites giganteus	giant rock scallop
Octopus bimaculatus	two-spotted octopus

ECHINODERMATA: urchins, sea stars, brittle stars,

Asterina miniata	bat star
Pisaster ochraceous	knobby sea star
Pisaster giganteus	giant sea star
Astropecten armatus	armored sea star
Strongylocentrotus purpuratus	purple sea urchin
Strongylocentrotus franciscanus	red sea urchin
Centrostephanus coronatus	sea urchin
Lytechinus anamesus	white sea urchin
Dendraster excentricus	sand dollar
Parastichopus parvimensis	California sea cucumber
Ophiopteris papillosa	brittle star

VETEBRATA: Fish

Paralabrax nebulifer	barred sand bass
Paralabrax clathratus	kelp bass
Girella nigricans	opaleye
Semicossyphus pulcher	sheephead
Hypsypops rubicunda	garibaldi
Urolophus halleri	round stingray
Triakis semifasciata	leopard shark
Oxylebius pictus	painted greenling
Phanerodon furcatus	white seaperch
Heterostichus rostratus	giant kelpfish
Embiotoca jacksoni	black surfperch
Hyperprosopon argenteum	walleye surfperch
Oxyjulis californica	senorita
Halichoeres semicinctus	rock wrasse
Embiotoca jacksoni	black surfperch
Scorpaena guttata	scorpionfish
Anisotremus davidsoni	sargo
Gibbonsia sp.	kelpfish
Cheilotrema saturnum	black croaker
Chromis punctipinnis	blacksmith
Rhacochilus toxotes	rubberlip surfperch
Coryphopterus nicholsii	blackeye goby

Source: Applied Ecological Research, 2000

APPENDIX M

RESUMES AND QUALIFICATIONS OF PREPARES

LIST OF PREPARERS

10.1 CITY OF DANA POINT

Edward M. Knight, Director of Community Development
Peter Vanek, Hogle Ireland, Inc.

10.2 LSA ASSOCIATES, INC.

Rob Balen, Principal-in-Charge – Project Manager
Steven D. Ross, Project Manager
David Connally, Project Manager – Geology and Soils, Hazards, Marine Biology
Lisa Williams, Assistant Project Manager – Water Quality, Hydrology
Deborah Pracilio, Principal – Transportation Analysis
Art Homrighausen, Principal – Biological Resources
Tony Petros, Principal – Transportation Analysis
Tung-Chen (Tony) Chung, Ph.D., Associate – Air Quality/Noise Analysis
Keith Lay, Assistant Engineer – Air Quality/Noise Analysis
Steve Conkling, Principal – Cultural Resources
Richard Erickson, Wildlife Biologist – Wildlife Surveys
Jim Harrison, Botanist – Botanical Surveys
Julie Cho, Project Manager, Environmental Document Coordination, Aesthetics
Andrea Zullo, Environmental Analyst – Recreation, Public Services, Utilities and Services
Jeff Gunderson, Environmental Analyst

10.3 URS CORPORATION

Pat Mock, Ph.D., Senior Project Manager – Wildlife Biology
Nathan Jacobson, Engineer – Water Quality
Jerry Pitt, Engineer – Water Quality
Richard D. Friesen, Ph.D., Senior Biologist – Wildlife Biology
Carol Forrest, Vice President – Water Biology
Theresa Weber, Staff Biologist

10.4 AQUATIC ENVIRONMENTAL SERVICES

Richard F. Ford, Ph.D. – Water Quality, Marine Biology

10.5 RK ENGINEERING GROUP, INC.

Robert Kahn, P.E., Principal – Traffic Engineering
Ann Cadavona, Senior Transportation Planner – Traffic Engineering

10.6 AMEC EARTH & ENVIRONMENTAL, INC.

Scott T. Kerwin, C.E.G., Geologist – Geotechnical
Douglas Dahncke, Senior Engineer - Geotechnical

10.7 THE KEITH COMPANIES

Paul Carey, Project Manager – Hydrology
Todd Pitner, Junior Engineer - Hydrology
Steve Novak, Designer – Grading Design

10.8 NOBLE AND ASSOCIATES

Ronald M. Noble, President – Marine Engineering
Chia-chi Lu, Ph.D., Senior Engineer – Marine Engineering

10.9 APPLIED ECOLOGICAL RESEARCH

Mark F. Sudol – Environmental Science and Engineering –Marine Biology

10.10 SWA GROUP

Jim Maloney, Associate – Landscape Architecture
Monica Simpson, Principal

10.11 GLEN LUKOS ASSOCIATES, INC.

Tony Bomkamp, Senior Biologist – Waters of the U.S.

10.12 FIRESAFE PLANNING SOLUTIONS

David Oatis – Fuel Modification

10.13 RBF CONSULTING

Richard Johnson, Digital Preview – Visual Simulations

10.14 OTHER CONSULTANTS

Scott A. Jenkins, Ph.D., Senior Engineer – Coastal Processes

ROBERT W. BALEN

PRINCIPAL

EXPERTISE

Environmental Planning/Environmental Impact Reports
Community Planning
Development Processing
Site Planning, Constraints Analysis, and Siting Studies

EDUCATION

University of Texas at Austin, Master of Science in Community and Regional Planning, 1978.

California State University Fullerton, Bachelor of Arts, Political Science, 1976.

University of California, Irvine and AICP Training Services, Post-Graduate Studies in Planning Management, Urban Affairs and Economic Development.

PROFESSIONAL EXPERIENCE

Principal, LSA Associates, Inc., environmental, planning, and traffic engineering consultants, Irvine, 1986-present. Senior Project Manager for development entitlements, environmental reviews and community planning.

Senior Planner, City of Santa Ana, Community Development, Housing and Planning Agency, Santa Ana, CA, 1980-1986. Managed current planning, environmental and advance planning sections.

Associate Planner, County of Riverside, Planning Department subdivision and community planning divisions, Riverside, CA, 1978-1980.

Program Evaluation Specialist, Texas Welfare Department, statewide information management system and social services evaluation, Austin, Texas, 1977-1978.

Planner, City of Austin Planning Department, Austin, Texas, 1977.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Mr. Balen manages the Environmental Planning, GIS, and Noise and Air Quality Divisions of LSA's Irvine office. Mr. Balen oversees a number of diverse projects including Environmental Impact Reports (EIRs), review of EIRs, planning documents, and development project processing.

Mr. Balen has been Project Manager for neighborhood and community plans, specific plans, redevelopment strategy plans, housing elements and major General Plan revision programs. In addition, he has prepared annexation studies and a statewide information management program.

Mr. Balen has successfully managed several EIRs for large-scale projects that have been very controversial. Mr. Balen had primary responsibility for the Walt Disney Studios Expansion EIR in Burbank, Tyler Mall Expansion EIR in Riverside, Murrieta Springs Mall EIR in Riverside County, Southwest Riverside County Jail and Courts Complex EIR in Temecula, Laguna Laurel EIR in the County of Orange, San Diego Pipeline EIR (City of Tustin), the Waterfront Resort and Residential Complex in Huntington Beach, and the Burbank Empire Center/Lockheed B-1-Site Redevelopment Project.

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

Elected Member - Santa Ana Unified School District Board of Trustees (1989 through 1998)
Member-Santa Ana Redevelopment Commission (1987 to 1988)
Member-Board of Directors, Discovery Museum of Orange County (1990 to present)
President, Founding Officer, Santa Ana Education Foundation (1994 to 1998)
American Planning Association - Charter Member

CERTIFICATIONS

California Certified Mediation Consultant

STEVEN D. ROSS, AICP

PROJECT MANAGER

EXPERTISE

Environmental Analysis
Community and Land Planning
Development Processing
Urban Design

EDUCATION

California State Polytechnic University, Pomona. Master of Urban and Regional Planning, 1995.

University of California, San Diego. Bachelor of Arts, Urban Studies and Planning, 1988.

PROFESSIONAL EXPERIENCE

Project Manager, Environmental Division, LSA Associates, Inc., Irvine, California, June 1998-present

Community Planner, City of Long Beach, Community and Environmental Planning Division, Long Beach, California, 1996-1998.

Associate Planner, Willdan Associates, Contract Planner to the City of Santa Monica, City Planning Division, Santa Monica, California, 1995-1996.

Assistant Planner, Rancho Cucamonga Planning Division, Rancho Cucamonga, California, 1989-1995.

Planning Consultant, South Coast Plaza Parking Study, Costa Mesa, California, 1995.

Lead Graduate Assistant, Cal Poly Pomona Foundation, Inc., Northridge Earthquake Transportation Study for the U.S. Department of Transportation, 1994.

Planning Aide, Community Development Department, Encinitas, California, 1988-1989

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

As a Project Manager for the Environmental Planning Division at LSA, Mr. Ross' primary responsibilities include managing a number of diverse projects including Environmental Impact Reports (EIRs), Initial Studies, and Negative Declarations.

Over 12 years of experience in the planning profession have given Mr. Ross a diverse background in environmental planning. His expertise includes project management, development processing, environmental impact assessment, land use planning and urban design, and public participation. Since joining LSA, Mr. Ross has prepared environmental analyses for a variety of projects, including public school construction, hotel and recreation facilities, and water facilities infrastructure projects. His expertise in environmental analysis includes land use compatibility, parking and transportation, and aesthetics. Mr. Ross' background in public participation includes organizing and facilitating public meetings, designing public outreach strategies, and working with community groups, politicians, and local governments. His background in project management includes overseeing the preparation of Environmental Impact Reports, Initial Studies, and related technical studies prepared by various environmental disciplines. His expertise in land planning and urban design includes several years of site plan and design review analysis for municipalities. Prior to joining LSA, Mr. Ross spent over nine years working in municipal planning departments for large and small jurisdictions throughout Southern California, including five years in Rancho Cucamonga, a master planned community with comprehensive design review processes.

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

Member, American Institute of Certified Planners
Member, American Planning Association
Member, Association of Environmental Professionals

DAVID W. CONNALLY

PROJECT MANAGER

EXPERTISE

Environmental Impact Assessment
NEPA
CEQA
Water Quality
Water Supply

EDUCATION

M.S., Oceanography, Florida State University, Tallahassee, Florida, April, 1978.
B.S., Oceanography, Lamar University, Beaumont, Texas, May, 1973.

PROFESSIONAL EXPERIENCE

Senior Project Manager, Parsons Engineering Science, Inc., 1987–2001. Responsible for coordinating data collection and analysis for primarily water related projects and issues, including input to permit applications, environmental compliance documents (including NEPA/CEQA), and water resources development projects.

Senior Scientist, RSI Environmental and Systems Analysts, Villa Park, California, 1986-1987.

Research Associate, Texas A&M University, Environmental Engineering Division, Galveston, Texas, 1984-1986.

Project Scientist, MBC Applied Environmental Sciences, Costa Mesa, California, 1978-1984.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Extensive experience in environmental impact analysis and assessment in a wide range of water supply, water quality, and biological areas. Management and implementation of environmental planning and program/project environmental compliance activities for complex multidisciplinary research projects and environmental assessments in support of regulatory requirements. Coordination of and technical contributions to environmental documents and permit applications in compliance with NEPA, CEQA, and other environmental regulations. Design and implementation of corporatewide training for improvement of internal and external service and product quality. Participated as principal to develop strategic goals; trained subordinates in field, data, and reporting techniques; developed innovative ideas on sampling, field, and laboratory procedures, report preparation, and quality control.

Experience includes assessments of the effects on freshwater, estuarine, and marine ecosystems of many types of pollutant discharges, including thermal effluents, brine, treated and untreated wastewater, drilling muds, dredged materials, crude oils, stormwater runoff, and acid deposition. Analyses conducted for these assessments were related to water resources, fisheries, permit compliance, nutrient and toxic materials loading, fate of pollutants in food chains, threatened and endangered species, and effects of development activities on water supply, water quality, and biological communities. Studies included assessment of marine biological communities and water quality in project areas, hydrographic surveys, composition and quality of bottom sediments, evaluation of material disposal sites, and potential impacts on water quality.

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

Invited Member: (Endangered) Southwestern Willow Flycatcher Recovery Team, Implementation Subcommittee, Albuquerque Region - Sponsored by U.S. Fish & Wildlife Service (1998-present)

Member: National Association of Environmental Professionals (1999-present)

Member: California Association of Environmental Professionals, Orange County Chapter (2000-present)

Member: Orange County Water Association (1993-1997; 2000-present)

REGISTRATIONS

Registered Environmental Assessor (California); Class I, No. 06925; California Environmental Protection Agency, Office of Environmental Health Hazard Assessment; 1997

Certified Environmental Professional (Environmental Documentation); No. 0381; Academy of Board Certified Environmental Professionals; 1999

SECURITY CLEARANCES

Clearance Level: Secret (June, 1996)

LISA D. WILLIAMS

ASSISTANT PROJECT MANAGER

EXPERTISE

Environmental Site Assessments
Water Quality/Regulatory Compliance

EDUCATION

California State University, Fullerton, M.S., Environmental Studies, in progress.

University of California, Irvine, Extension, Certificate in Environmental Site Assessment and Remediation, 1996.

University of California, Irvine, B.S., Biological Sciences, 1983.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Ms. Williams is primarily involved in projects dealing with hazardous waste and water quality issues. In addition, she contributes to the preparation of environmental documents including Environmental Impact Reports (EIRs), Environmental Impact Statements (EISs), Environmental Assessments, Initial Studies and Negative Declarations. Responsibilities include coordination/organization of report preparation with Client and LSA staff and research and compilation of data for environmental reports.

Specific project experience includes several Preliminary Environmental Site Assessment (Phase I) reports, Soil and Water Investigations (Phase II), Hazardous Waste Initial Site Assessments (ISAs), and National Pollutant Discharge Elimination System (NPDES) Permit Compliance for industrial facilities and municipalities.

PROFESSIONAL EXPERIENCE

Evaluation of NPDES and local stormwater permit issues for the Marine Corps Air Station El Toro Stables.

Compliance management of the Los Angeles County Municipal NPDES permit for the Cities of Palos Verdes Estates and Hidden Hills. Assisted with the development of the Watershed Area Management Plan, the new municipal permit; and analysis and recommendations concerning the new Standard Urban Stormwater Management Plan and the Trash TMDL for the Los Angeles River. Responsible for ongoing staff education, public outreach and City Council presentations.

Compliance management of AB 939 source reduction, recycling, and waste disposal services for the Cities of Palos Verdes Estates and Hidden Hills. Duties included review and approval of new specifications for waste disposal contract; implementation of new green waste recycling program, and calculation of diversion percentage for the annual report. Responsible for ongoing staff education, public outreach, and City Council presentations.

Section 404 and 401 permit applications, and a streambed alteration agreement for storm drain maintenance in a wetland for the City of Laguna Niguel. Coordination with the U.S. Army Corps of Engineers and the California Department of Fish and Game to establish an annual maintenance plan.

NEPA Environmental Assessment, U.S. Army Corps of Engineers Habitat Mitigation Plan, a public education pamphlet, and associated permits for storm drain construction in a wetland for the Department of Veterans Affairs. Project involved the fill of 1.5 acres of low quality wetlands with the restoration and creation of three acres of wetlands.

Public health inspections of food facilities and single and multifamily dwellings throughout Los Angeles County. Duties included Task Force inspections, District Attorney hearings, and court case preparation.

Phase I and II environmental assessments of petroleum hydrocarbon and solvent impacted sites throughout Los Angeles County. Associated soil and groundwater sampling and site characterization. Project sites included gasoline service stations, dry cleaners, automobile dealerships, and manufacturers.

Air monitoring, soil sampling, and associated closure reports for removal of underground storage tanks at various locations throughout Los Angeles County.

Asbestos and lead based paint surveys and removal projects throughout Oahu, Hawaii. Project sites included schools, government buildings and retail centers.

Indoor Air Quality Studies for the Public Library System, Oahu, Hawaii.

Respirator use, hazardous material handling, and MSDS trainer for the U.S.S. Safeguard (ARS-50).

EMPLOYMENT HISTORY

Assistant Project Manager, LSA Associates, Inc., Irvine, California, 2000-present.

Environmental Scientist, Charles Abbott Associates, Inc., Torrance, California, 2000.

Environmental Health Specialist, Los Angeles County Department of Health Services, San Pedro, California, 1996-1999.

Environmental Scientist, Bryant Palmer Soto, Inc., Torrance, California, 1994-1996.

Industrial Hygiene Technician, Muranaka Environmental Consultants, Inc., Honolulu, Hawaii, 1993.

Diving and Salvage Officer, U.S. Navy, 1988-1992.

PROFESSIONAL MEMBERSHIPS

Association of Environmental Professionals

Society for Ecological Restoration

California Environmental Health Association

REGISTRATIONS

Registered Environmental Health Specialist, California #6541

Registered Environmental Assessor I, California #06116

DEBORAH L. PRACILIO

PRINCIPAL

EXPERTISE

Environmental Impact Assessment
Caltrans/FHWA Policy
Air Quality Management Policy

EDUCATION

University of California, Irvine, Bachelor of Arts in Social Ecology, Irvine, California, June, 1986.

PROFESSIONAL EXPERIENCE

Principal, LSA Associates, Inc., environmental planning consultants, Irvine, 1986-present.

Policy Research Consultant, The Irvine Company, land developer, Newport Beach, California, 1985-86.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Ms. Pracilio is responsible for preparation and project management of CEQA and NEPA mandated environmental documents, entitlement research, visual analysis, demographic analysis and coordination of Caltrans processing for various local agencies. She is an expert in Caltrans' processing requirements for environmental documents, project design, and compliance with federal criteria, and has direct experience with State and federal requirements for biological and cultural resources and noise and air quality analysis.

Ms. Pracilio is responsible for determining consistency with air quality management regulations and controls under the jurisdiction of the South Coast Air Management District (SCAQMD) and Southern California Association of Governments (SCAG), and she interfaces with the SCAQMD and SCAG in determining whether a project meets the goals and objectives of both of these agencies.

Relevant Project Experience

Route 710 Extension FEIS. As Project Manager for on-call professional assistance, Ms. Pracilio was responsible for the compilation of comments received on the FEIS and subsequent documentation for this controversial project, which has been under consideration since the 1960s. Once all comments were compiled, she was responsible for coordinating preparation of responses by either LSA or Caltrans/FHWA staff and development of a matrix incorporating the responses to

comments. The result of this effort was a five volume responses to comments document, which will be attached to the Record of Decision documenting FHWA's extensive consideration of public input.

Ms. Pracilio was responsible for the compilation and indexing of both the CEQA and NEPA Administrative Records for the Route 710 project. This task entailed reviewing 40 years of FHWA and Caltrans files, copying appropriate documentation, and cataloging each document in a database system for future use by Caltrans and FHWA staff. The Administrative Record includes documentation of the transportation planning process that has been undertaken over the past four decades.

San Joaquin Hills Transportation Corridor (SR-73) EIR and EIS. Ms. Pracilio prepared the Section 4(f) evaluation that analyzed the proposed roadway's effect on a total of 21 properties protected under Section (4). In addition, she conducted the visual impact analysis, which included development of visual analysis criteria utilized to determine the proposed project's aesthetic effect. She played a key role in the organization, cataloging, and preparation of responses to over 2,000 comment letters and comments at eight public meetings and assembling the administrative record. As part of this effort, she developed a system for cataloging and distributing comments to appropriate team members for preparation of responses and was responsible for monitoring completion and compilation of these responses for team review.

State Route 58 Mojave Freeway. Ms. Pracilio served as Assistant Project Manager for the Tier I and Tier II EISs for this nine mile bypass east of the town of Mojave. She was responsible for the preparation of environmental documentation, coordination of technical studies, and their incorporation into the EIS, distribution of the document, and participation in public meetings.

Eastern Transportation Corridor (ETC). As staff assistance to the Transportation Corridor Agencies (TCA) for the ETC, Ms. Pracilio functioned as Acting Environmental Project Manager for the ETC, a 23 mile toll facility with an estimated design/build cost of approximately $700 million, and the Ford Road extension and realignment. While assisting the TCA, she was responsible for the daily management of environmental clearance, including coordination with TCA's consultant and legal counsel, FHWA, and resource agency staff during completion of the Final EIS and environmental permitting for the ETC.

Additional responsibilities included 1) participation in the design/build selection process for the ETC through preparation of responses to comments from potential contractors bidding on the project; 2) review of an Addendum EIR, prepared by the TCA's consultant, assessing potential effects of adjustments to the facility's alignment and processing revisions to the 1601 Agreement through the California Department of Fish and Game for these refinements; 3) facilitation of an MOU and MOA between the TCA and the Cities of Tustin and Irvine regarding design and implementation timing for local improvements, south of the ETC's East Leg; and 4) preparation of staff reports for the endowment fund for Limestone Canyon Mitigation Area and Addendum EIR.

For both the ETC and Ford Road projects, Ms. Pracilio was responsible for mitigation implementation and verification consistent with the Mitigation Monitoring Program (MMP). Specifically for Ford Road, Ms. Pracilio oversaw compilation and submittal of the HABS/HAER

documentation for the Buffalo Ranch to the National Park Service and distribution to The Irvine Company, City of Irvine, and Irvine Historical Society.

State Route 125 South. As Project Manager for the State Route 125 South in San Diego County, Ms. Pracilio was responsible for preparation of the Final EIR/EIS for this 11.2 mile tollway project and preparation of a Supplemental DEIR/EIS addressing new significant impacts to the Quino checkerspot butterfly. She also managed completion of responses to comments for this controversial project, and incorporation of the revisions into the Final EIR/EIS. Key issues addressed in the Final EIR/EIS included endangered species permitting, Section 4(f) resource consultation, and compatibility with adjacent rural residential land uses.

PROFESSIONAL MEMBERSHIPS

Association of Environmental Professionals (AEP)
Past Vice President, AEP (1990-1992)
American Planning Association
Women in Transportation Seminar

ARTHUR HOMRIGHAUSEN

PRINCIPAL, BIOLOGIST

EXPERTISE

Biological Assessment
Mitigation Planning and Design
Regulatory Analysis and Permitting

EDUCATION

California State University, Fullerton, M.S. in Environmental Studies, 1981.

University of California, Irvine, B.S. in Biology, 1973.

PROFESSIONAL EXPERIENCE

Principal, LSA Associates, Inc., environmental planning and engineering consultants, offices in Berkeley, Irvine, Pt. Richmond, Riverside, and Sacramento, California, 1988 to present.

Project Manager, Bright and Associates, regulatory issues, environmental research and planning, Placentia, California, 1984-1988.

Naturalist, Tucker Wildlife Sanctuary, natural history research and environmental education, Modjeska Canyon, California, 1979-1981.

Commissioner, City of Yorba Linda Parks and Recreation Commission, parks and open space planning and decision making, Yorba Linda, California, 1982 to 1989.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

As manager of the Natural Resources unit in LSA's Irvine office, Mr. Homrighausen directs a variety of biological studies and preparation of reports, including impact assessments, vegetation and wildlife surveys, riparian and coastal wetlands analyses, endangered species analyses, and mitigation planning. He also works extensively with planning and regulatory agencies to secure various approvals and permits, including subdivision approvals, Conditional Use Permits, 1601-1603 and 404 Authorizations, endangered species authorizations, and Coastal Development Permits.

Mr. Homrighausen has extensive knowledge and experience in ecological studies, surveys, wetlands analysis, mitigation planning, and CEQA/NEPA documentation. He has completed or directed several hundred biota surveys and impact analyses in Kern, Los Angeles, Orange, San Bernardino, Riverside, San Diego, and Ventura counties. Mr. Homrighausen is on the certified list of consultants

for San Diego County and Significant Ecological Areas of Los Angeles County. In addition to general biological surveys, Mr. Homrighausen has conducted wetlands/riparian analysis in San Luis Obispo, Los Angeles, Orange, Riverside, Ventura, and San Diego counties. He has participated in open space and habitat restoration planning for more than 100 public works, residential, commercial, and recreation projects throughout Southern California. Mr. Homrighausen successfully processed Section 7 Consultations or Section 4(d) authorizations (pursuant to the Federal Endangered Species Act) for the threatened California gnatcatcher on dozens of projects in Southern California.

Mr. Homrighausen's recent project experience includes:

Laguna Canyon Road. As principal biologist on this project, Mr. Homrighausen performed or directly supervised LSA's biological and wetlands work on this four mile highway realignment and widening project in Laguna Canyon, which is sponsored by the County of Orange, Caltrans, and the Federal Highway Administration. Due to the federal funding, this project is subject to the NEPA/404 Integration Process. The major tasks involving Mr. Homrighausen include: a Natural Environment Study Report, per Caltrans' standards; a wetlands jurisdictional delineation, per Corps of Engineers standards; alternatives analysis; the biological section of the Environmental Assessment; Section 7 consultation under the federal Endangered Species Act; and preparation of a wetlands mitigation plan. The project traverses a sensitive canyon bottom with wetlands and endangered species impacts, and has been in the planning stages for over ten years. Prior to the most recent federal environmental process, LSA coordinated extensively with local stakeholders, which included two cities, Orange County, local environmental groups, and Laguna Coast Wilderness Park planners.

San Joaquin Marsh. Mr. Homrighausen served as the principal biologist on several aspects of LSA's work on the San Joaquin Marsh, including: habitat mapping; the biological analysis for the EIR on the San Joaquin Marsh Enhancement Plan; coordination of Corps Section 404 and Department of Fish and Game Section 1601 authorizations for the construction of the 104 acre duck pond enhancement area; construction monitoring of the duck pond enhancement area; preparation of a mitigation plan for the unavoidable riparian impacts during the enhancement activities; and preparation of a restoration plan for the establishment of a wetland mitigation bank.

Bolsa Chica Mesa. Preparation of a conservation and management plan for a designated environmentally sensitive habitat area (ESHA) and analysis of project effects on coastal zone resources. Work included discussions with California Department of Fish and Game and Coastal Commission staff regarding project design and enhancement features.

Waterfront Project (Huntington Beach). Preparation of a wetland delineation and mitigation plan that were approved by the California Coastal Commission, California Department of Fish and Game, and U.S. Army Corps of Engineers.

Mr. Homrighausen also served as the Principal Biologist for the following additional major projects:

- CEQA documentation, 1603/404 permitting, Endangered Species Act authorizations and Coastal Development Permits for major Newport Coast development areas, coastal Orange County, California. This work has included biological and wetlands assessment,

construction monitoring for Newport Coast road construction and residential projects, and mitigation monitoring/maintenance for the Newport Coast Drive wetlands mitigation sites.

- Pacific Bell Mobile Services NEPA Compliance: Biological and cultural resource analysis and documentation for several hundred cellular communication sites in San Luis Obispo, Santa Barbara, Los Angeles, Riverside, San Bernardino, and Orange counties.
- Preparation of Natural Environmental Study Report, NEPA/404 coordination, Wetlands Delineation and Wetlands Mitigation Plan for Laguna Canyon Road (SR-133). LSA is performing this work under contract to the County of Orange, in cooperation with Caltrans and FHWA, as part of the funding arrangements.
- SR-73/San Joaquin Hills Transportation Corridor: 1601 Agreement/Section 404 Permit, wetlands mitigation plan, Biological Assessment, and Section 7 Consultation for least Bell's Vireo, California gnatcatcher, and cactus wren, and conservation plan for California gnatcatcher and cactus wren, coastal Orange County, California.
- Construction monitoring for Newport Coast road construction projects and mitigation monitoring/maintenance for Newport Coast Drive wetlands mitigation site, coastal Orange County, California.

ANTHONY L. PETROS

PRINCIPAL

EXPERTISE

Transportation Planning and Impact Analysis
Parking Analysis

EDUCATION

Cornell University, candidate Master of Regional Planning, June 1985.

University of California, Irvine, Bachelor of Arts, Social Ecology, June 1983.

University of California, Irvine, Bachelor of Science, Biological Sciences, June 1982.

PROFESSIONAL EXPERIENCE

LSA Associates, Inc., environmental planning and engineering consultants, offices in Northern and Southern California, 1984-present.

Intern, Special Assistant to Chairman, City of Irvine Planning Commission 1981-1982.

Research Assistant, California State Department of Health Services, Hazardous Waste Management Branch, Abandoned Sites Project 1980-1981.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Primary responsibilities include the management and supervision of the transportation function of LSA Associates, Inc. This role includes the preparation and review of comprehensive traffic and parking studies, operational analyses, Environmental Impact Reports and Environmental Assessments. Emphasis is placed on the coordination of transportation projects with municipal and agency administrators and real estate interests.

Mr. Petros has prepared and/or supervised a variety of transportation projects, including the Santa Ana River Mouth Local Coastal Program project for the County of Orange, the Hollister Hills Off-Road Vehicle Park Master Plan traffic analysis for the State of California, the Peninsula Gateway mixed use project in the City of Daly City, and the MCAS Iwakuni and Yokota Air Base Master Plans in Japan.

While at LSA, Mr. Petros has also been involved in many General Plan work efforts, including the development of the General Plan Circulation Elements of the cities of Garden Grove, Buena Park,

Calabasas, Arcadia, and Laguna Hills and Calaveras County. Mr. Petros has overseen the preparation of neighborhood traffic analyses in the cities of Tustin, Whittier, Lakewood, and San Clemente and in the Del Monte Forest. His range of experience covers large-scale land development projects and small-scale detailed operational analyses.

PROFESSIONAL MEMBERSHIPS

Institute of Transportation Engineers, Member
Orange County Traffic Engineers Council
City of Costa Mesa Chamber of Commerce, Past President
City of Costa Mesa Residential Rehabilitation and Redevelopment Commission
Past Chairman, Organization of Cornell Planners

TUNG-CHEN CHUNG, PH.D.

ASSOCIATE/
DIRECTOR OF ACOUSTICAL AND AIR QUALITY SERVICES

EXPERTISE

Community and Transportation Noise Studies
Room Acoustics Design and Analysis
Interior Noise and Vibration Isolation Studies
Air Quality Studies
Expert Witness Testimony

EDUCATION

University of California, Los Angeles, Ph.D., Mechanical Engineering, 1991.

University of California, Los Angeles, Engineer Degree in Mechanical Engineering, 1985.

University of Mississippi, Oxford, M.S., Mechanical Engineering, 1981.

National Tsing-Hua University, Taiwan., B.S., Mechanical Engineering, 1978.

University of California, Irvine, Business Development Techniques for High Value Contracts, 1994.

University of California, Irvine, UAM Regional Air Quality Modeling, 1992.

University of Louisville, Kentucky, FHWA Highway Noise Analysis Certificate, 1990.

BBN/San Francisco, Noise Control for Building and Manufacturing Plants Certificate, 1987.

PROFESSIONAL REGISTRATIONS/AFFILIATIONS

Institute of Noise Control Engineering, Board Certified Member
Certified Acoustical Consultant, County of Orange
Certified Acoustical Consultant, County of San Diego
American Physics Society
Acoustical Society of America
S.C. Chinese-American Environmental Protection Association

PROFESSIONAL EXPERIENCE

Director of Acoustical and Air Quality Services, LSA Associates, Inc., Environmental Planning and Traffic Engineering, Irvine, California, 1997-present.

Director of Technical Services, The Planning Center, Planning and Environmental Impact Report Consultants, Newport Beach, California, 1995-1997.

Section Manager, MBA, Environmental and Planning Consultants, Santa Ana/Irvine, California, 1989-1995. Manager for acoustic and air quality analysis.

Acoustical Specialist, County of Orange Environmental Management Agency, 1989.

Smith, Fause & Associates, Inc., Acoustical Consulting, Project Manager, 1986-1989.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Dr. Chung performed more than 350 CEQA/NEPA related and stand-alone noise studies for community and transportation noise analyses, including field measurement, modeling, and data analysis. Typical noise analysis includes construction, vehicular traffic, and long-term stationary source operations. Others include rail, airport, and shooting range noise impact analysis.

Dr. Chung performed more than 150 air quality studies for projects such as transportation facilities, landfills, office buildings, and ocean bay enhancement/sediment management projects.

Dr. Chung performed the design and analysis of architectural room acoustics (interior configuration and absorption required for proper room use) for more than 20 theaters, studios, workshop places, and convention centers.

Dr. Chung performed more than 50 acoustical analyses on building interior sound and vibration isolation for hospitals, apartment complexes, office buildings, performing arts centers, schools, etc., throughout the United States.

PUBLICATIONS/PRESENTATIONS

Noise Standards, Control, and Market Outlook, Chinese American Professional Society Technical Conference, Environmental Forum, September 7, 1996.

Noise Impacts on People and Wildlife, and Governmental Regulations. University of Southern California Environmental Engineering Seminar Guest Speaker, January 31, 1994.

Noise and the Environment - Impacts and Regulations, Chinese American Professional Society Annual Conference, Environmental Forum, June 23, 1993.

Defect the Kolmogorov Power Laws for Turbulence Using the Wiener-Hermite Expansion, Ph.D. dissertation, December, 1991.

Defect of the Five-Thirds Law Using the Wiener-Hermite Expansion, Journal of Statistical Physics, Volume 55, June, 1989.

KEITH ANDREW LAY

ASSISTANT ENGINEER

EXPERTISE

Noise Analysis

EDUCATION

University of Manitoba, B.S., Civil Engineering (Transportation and Environmental Engineering emphasis), 1998.

PROFESSIONAL EXPERIENCE

Assistant Engineer, LSA Associates, Inc., May, 2000–present.

Technical Officer, National Research Council of Canada, 1999–2000.

Intern, National Research Council of Canada, 1998–1999.

Technical Officer, Manitoba Government Services, 1997.

Summer Student, Manitoba Government Services, 1995, 1996.

RECENT PROJECT EXPERIENCE

Mr. Lay was Technical Officer for the IBANA (Insulating Building Against Noise from Aircrafts) project to update the Canadian Building Code to reflect the changes in aircraft noise and to develop a computer model to determine the noise attenuation of building constructions. He conducted field testing at Ottawa, Toronto, and Vancouver International Airports to determine the noise spectra of modern aircraft, determined noise attenuation of modern construction techniques when exposed to aircraft noise, and compared noise attenuations of field tests with theoretical models and lab measurements.

For the Public Works/National Research Council of Canada Joint Open Plan Office Project to evaluate the acoustical privacy and noise attenuation of current open plan offices, Mr. Lay conducted field testing in existing open plan offices in order to determine ambient background noise levels, effects of masking noises, noise attenuation between office spaces, noise attenuation within office spaces, and average human speech levels.

As Technical Officer for Manitoba Government Services, Mr. Lay set up a recycling program for approximately 30 government buildings and performed energy audits on four buildings to determine

the cost-effectiveness of energy efficient lighting systems. Energy audits were performed using FASER 2000.

STEVEN W. CONKLING

DIRECTOR, CULTURAL AND PALEONTOLOGICAL RESOURCES
PRINCIPAL

EXPERTISE

Cultural Resource Mitigation
Paleontology Resource Assessment/Mitigation
Fossil Identification
Specimen Curation

EDUCATION

M.A. in Systematics and Ecology (Vertebrate Paleontology), University of Kansas at Lawrence, 1993
B.A. in Biological Sciences, North Texas State University, Denton, 1985

ACCREDITATION

County of Orange, Certified Paleontologist, 1989

PROFESSIONAL RESPONSIBILITIES

Mr. Conkling has 20 years of cultural resources experience, beginning as a Field Worker for the Smithsonian Institute's Lewisville Early Man Site in 1981. He progressed through several curatorial and laboratory positions at Southern Methodist University, North Texas State University, Texas A&M University, and the University of Kansas and several consulting stints before becoming the Director of the Clark Interpretive Center for the County of Orange. Mr. Conkling joined LSA in 1993.

As Director of the Cultural Resource Mitigation Group for LSA, Mr. Conkling's responsibilities include directing archaeological field activities, overseeing budgets, and coordinating Section 106 compliance with the U.S. Army Corps of Engineers. He reviews all cultural resources reports. Additionally, he conducts paleontological resource evaluation for Environmental Impact Reports, including field surveys, literature reviews, and mitigation measures; directing field monitoring and salvage operations; collecting geologic data; fossil analyses; and report preparation.

His teaching experience includes seminars in various aspects of paleontology and anthropology at UCLA, Saddleback College, Irvine Valley College, and California State University (Long Beach, Los Angeles and Fullerton). Mr. Conkling instituted educational programs at the Clark Interpretive Center and from 1986 through 1993, conducted tours for over 150,000 students, from kindergarten through college level.

PUBLICATIONS AND REPORTS (selected, from 1995 to present)

Vertebrate Remains from CA-SDI-10156/12599/H, MCAS Camp Pendleton, San Diego County, California, Abstract, Society for California Archaeology, 30th Annual Meeting Program, 1996.

Report on Continuing Investigations of the Sespe Formation (Oligocene/Miocene: Terrestrial) in the San Joaquin Hills of Orange County, California, Abstract, San Bernardino County Museum Association Quarterly, 43(2), 1996.

Use of Global Positioning Systems (GPS) and Global Information Systems (GIS) in Cultural and Paleontological Resource Mitigation, with J. Staight, Abstract, San Bernardino County Museum Association Quarterly, 43(2), 1996.

Vertebrate Remains from CA-ORA-196/H, Michelson Bridge Widening, City of Irvine, Orange County, California, 1996.

Paleontological Resource Impact Mitigation Program - Playa Vista (Phase I) Project, Los Angeles County, California, 1996.

Paleontology Assessment Report for Parcel Number 4687, in the Moorpark Area, Ventura County, California, 1996.

Cultural Resources Assessment for Amargosa Creek Improvement Project, Los Angeles County, California, with D. McLean, B. Sturm, and I. Strudwick, 1996.

Results of Archaeological Significance Testing at Sites CA-ORA-478 (Locus C), ORA-1453 and ORA-1454, Hicks and East Hicks Canyons, Orange County, California, with D. McLean, B. Sturm, W. McCawley, and I. Strudwick, 1996.

Results of Archaeological Significance Testing at Site CA-SDI-10156/12599/H MCAS Camp Pendleton, San Diego County, California, with D. McLean, B. Sturm, W. McCawley, D. Taylor and I. Strudwick, 1996.

Scientific Resource Assessment - Ryan Oil Properties, Riverside County, California, with B. Smith, 1995.

National Register of Historic Places Evaluation for the Proposed Mount San Antonio Historic Mining District, Angeles National Forest, Los Angeles County, California, with B. Sturm, 1995.

Scientific Resources Assessment for an APE extension of the San Joaquin Hills Transportation Corridor Between Stations 900+00 and 910+00, Orange County, California, 1995.

PROFESSIONAL MEMBERSHIPS/AFFILIATIONS

Society for California Archaeology
Sigma Xi, Scientific Research Society
Society of Vertebrate Paleontology
Society of Economic Paleontology and Mineralogy
Southern California Academy of Science
American Association of Mammalogists
Buena Park Rotary Club, President 1989-90
Newport-Irvine Rotary Club, 1998-Present

RICHARD A. ERICKSON

ASSOCIATE, BIOLOGIST

EXPERTISE

Ornithology
Sensitive Species Assessments
Biological Assessments

EDUCATION

California State University, Hayward, M.S, Biology, Hayward, CA, 1985. Thesis: Ecological characteristics of least tern colony sites in California.

Humboldt State University, Arcata, B.A., Zoology, Arcata, CA, 1975.

PROFESSIONAL EXPERIENCE

Biologist/Associate, LSA Associates, Inc. February, 1997 to present.

Biologist/Project Manager, LSA Associates, Inc., August, 1993 to February, 1997.

Biologist/Assistant Project Manager, LSA Associates, Inc., May, 1990 to August, 1993.

Consulting Biologist, with jobs involving seven government agencies and four consulting firms. 1978-1990.

Vertebrate Biology Teacher, College of the Redwoods, Crescent City, CA, March, 1981 to July, 1982.

Wildlife Biologist, Redwood National Park, August, 1981 to April, 1982.

Research Assistant, U.C. Berkeley and California State University, Hayward, 1976-1978.

OTHER PROFESSIONAL EXPERIENCE

Member of the Technical Advisory Committee overseeing the revision of California Bird Species of Special Concern, an official planning and regulatory publication of the California Department of Fish and Game.

Director (1997-1999), Western Field Ornithologists; Chairman (1997-2000) and/or Member (1976-2000), Western Field Ornithologists' California Bird Records Committee; and editorial board member (since 1978) for *Western Birds*.

Member, Pacific Seabird Group's Marbled Murrelet Technical Committee (since 1990).

Editorial board member (1992 to 1996) for *The Euphonia*, a quarterly journal of Mexican ornithology.

Regional Coeditor and regular contributor (since 2000) for the Baja California Peninsula region of *North American Birds*.

Regional Coeditor (1976 to 1990) and regular contributor (since 1968) for the Northern California region of *North American Birds*.

Field Observations Editor/Coeditor for *The Sandpiper* (Redwood Region Audubon Society), 1972 to 1975, and 1989 to 1990.

Reviewer: maps for the EPA Habitat/Biodiversity Project, Birds of California (in prep.); *A.O.U. Check-list of North American Birds*, Seventh Ed. (1998); *A Birder's Guide to Southern California* (1998); maps for *A Field Guide to Warblers of North America* (1997); *Birds of Orange County, California: Status and Distribution* (1996); *California Birds: Their Status and Distribution* (1994); *Birds of Southern California* (1981); *Birds of Santa Barbara and Ventura Counties, California* (1980); *Birds of Sonoma County, California* (1978); *Birds of Yosemite Sierra* (1977); several government publications (e.g., *California's Wildlife, vol. 2, Birds* - 1990, *Distribution of California Birds* - 1983, *Catalog of California Seabird Colonies* - 1980, *Bird Species of Special Concern in California* - 1978); and numerous papers submitted to ornithological journals (i.e., Auk, Condor, Western Birds, Journal of Field Ornithology, Birding).

Contributor: updating of *California Bird Species of Special Concern* and *California Mammalian Species of Special Concern*, sponsored by the California Department of Fish and Game; California and Blue-gray gnatcatcher accounts in *Identification Guide to North American Birds* (1997); *Atlas of Breeding Birds, Orange County, California* (1997); Pacific Pocket Mouse account in *Life on the Edge, A Guide to California's Endangered Natural Resources* (1994); California chapter in *A Guide to Bird Finding West of the Mississippi*, Second Ed. (1981).

PRINCIPAL PROFESSIONAL QUALIFICATIONS

Mr. Erickson serves as wildlife specialist on numerous projects. Recently, he has surveyed for numerous sensitive species throughout Southern California. This has involved frequent interaction with the Ecological Services and Endangered Species Unit of the U.S. Fish & Wildlife Service in Carlsbad, CA. More specifically, he had a large role in preparing the biological resources section of the EIS for the proposed San Joaquin Hills Transportation Corridor (in compliance with NEPA), was primarily responsible for writing the Biological Assessments for the endangered least Bell's vireo, threatened coastal California gnatcatcher and candidate endangered coastal cactus wren on the

Corridor, and had a large part in preparing the Conservation Plan for gnatcatchers and wrens on the Corridor (in compliance with ESA).

Prior to joining LSA full-time, Mr. Erickson worked as an independent biological consultant and for several government agencies. Employment in California and Alaska involved the design and execution of numerous biological studies. Surveys of terrestrial vertebrates were emphasized, with much consideration of rare and endangered species. Mr. Erickson's master's thesis, *Ecological characteristics of least tern colony sites in California*, was based on a study of this endangered species conducted in association with the California Department of Fish & Game and the U.S. Fish & Wildlife Service. He later coauthored the historical status review of the endangered mar bled murrelet in California and authored a summary paper on the status ofone of California's most endangered mammals (Pacific pocket mouse *Perognathus longimembris pacificus*) for publication in a book on endangered rodents to be published by the International Union for the Conservation of Nature and Natural Resources (IUCN). He has conducted habitat evaluation studies, including directed searches for sensitive habitats. General and technical reports for both public and private clients have been prepared, and research ranging from baseline data studies and data compilation from existing literature sources to focused field studies has been conducted.

Mr. Erickson is a recognized expert on birds of western North America, especially their status and distribution in California. He has extensive experience in the field and in the literature, and has published and edited widely, most notably coauthoring *Birds of Northern California, an Annotated Checklist*. He is an active member of the American Ornithologists' Union, Cooper Ornithological Society, Wilson Ornithological Society, and Western Field Ornithologists (member, Board of Directors). He serves on the editorial board for *Western Birds* (and formerly *The Euphonia, A Quarterly Journal of Mexican Ornithology*), and is Chairman of the Western Field Ornithologists' California Bird Records Committee.

PACIFIC POCKET MOUSE EXPERIENCE

Since 1990, Mr. Erickson has focused much attention on this animal. During this period, he has trapped for rodents throughout Southern California (approximately 92,000 trap nights); much of that effort has been directed toward the Pacific pocket mouse (including trapping at all of the currently known occupied sites). In March, 1992, he was asked to prepare a status review on the subspecies for inclusion in a joint American Society of Mammalogists/International Union for the Conservation of Nature and Natural Resources (IUCN) publication on endangered rodents of the world (see Patten et al. 1998 below). This status review was presented at a workshop on the biology and management of rodents in Southern California, held at the San Bernardino County Museum of Natural History in June, 1993 (Erickson 1993 below), and later served as the foundation for the emergency listing rule published by the U.S. Fish & Wildlife Service in 1994. In July, 1993, Mr. Erickson was trapping with Phil Brylski when the Dana Point population was rediscovered. In 1995-1996, as a subconsultant to Michael Brandman Associates, Mr. Erickson was the Principal Investigator on the Pacific pocket mouse survey associated with the Foothill Transportation Corridor - South through the northern end of Camp Pendleton. This survey involved up to 19 trappers and assistants responsible for nearly 68,000 trap nights of effort, and resulted in the discovery of the San Mateo North population, and preliminary monitoring there and at San Mateo South. Follow-up surveys were

conducted in 1999. In 1996, Mr. Erickson was also one of four Principal Investigators on the team directed by Ogden Environmental and Energy Services for extensive Pacific pocket mouse surveys in the remaining coastal portions of Camp Pendleton.

PUBLICATIONS

Erickson, R.A. and R.A. Hamilton. in prep. Report of the California Bird Records Committee: 1998 records. *Western Birds.*

Erickson, R.A. and S.N.G. Howell, editors. in review. (expected in 2001). Birds of the Baja California: Status, distribution, and taxonomy (including works by ten Mexican and American authors). *Monographs in Field Ornithology* No. 3, American Birding Association, Colorado Springs, CO.

Erickson, R.A., R.A. Hamilton, and S.N.G. Howell. in review. New information on migrant birds in northern and central Baja California, including species new to Mexico. *in* Erickson and Howell (above).

Garrison, B.A., M.D. Parisi, R.G. Burg, R.A. Erickson, and M.A. Patten. in review. Prediction accuracy of bird occurrences from wildlife models: Ecological and taxonomic patterns. *Journal of Wildlife Management.*

Hamilton, R.A. and R.A. Erickson. in review. Noteworthy breeding bird records from the Vizcaíno Desert, Baja California. *in* Erickson and Howell (above).

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Garrison, B.A., R.A. Erickson, M.A. Patten, and I.C. Timossi. 2000. Accuracy of wildlife model predictions for bird species occurrences in California counties. *Wildlife Society Bulletin*: in press.

Patten, M.A. and R.A. Erickson. 2000. Population fluctuations of the Harris's Hawk (*Parabuteo unicinctus*) and its reappearance in California. *Journal of Raptor Research*: 34:187-195..

Erickson, R.A. and M.A. Patten. 1999. Identification and distribution of spiny pocket mice (*Chaetodipus*) in cismontane southern California. *Bulletin of the Southern California Academy of Sciences* 98:57-65.

Garrison, B.A., R.A. Erickson, M.A. Patten, and I.C. Timossi. 1999. California Wildlife Habitat Relationships System: effects of county attributes on prediction accuracy for bird species. *California Fish and Game* 85:87-101.

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Erickson, R.A. and K.L. Miner. 1998. Six years of synchronous California Gnatcatcher population fluctuations at two locations in coastal Orange County, California. *Western Birds* 29:333-339.

Erickson, R.A. and T.E Wurster. 1998. Confirmation of nesting in Mexico for four bird species from the Sierra San Pedro Mártir, Baja California. *Wilson Bulletin* 110:118-120.

Harrison, J.E., R.A. Erickson, and F.M. Roberts, Jr. 1998. Noteworthy collection: *Quercus engelmannii* (Engelmann Oak) in coastal Orange County, California. *Madroño* 45:85.

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Erickson, R.A. and S.B. Terrill. 1996. Nineteenth report of the California Bird Records Committee: 1993 records. *Western Birds* 27:93-126.

Patten, M.A. and R.A Erickson. 1996. Subspecies of the Least Tern in Mexico. *Condor* 98:888-890.

Bontrager, D.R., R.A. Erickson, and R.A. Hamilton. 1995. Impacts of the October 1993 Laguna Canyon Fire on California gnatcatchers and cactus wrens. Pages 69-76 *in* J.E. Keeley and T. Scott (editors). Brushfires in California: Ecology and Resource Management. International Association of Wildland Fire, Fairfield, Washington.

Erickson, R.A. and R.A. Hamilton. 1995. Geographic distribution: *Lampropeltis getula californiae* (California Kingsnake), Baja California Sur. *Herpetological Review* 26:210.

Erickson, R.A., R.A. Hamilton, S.N.G. Howell, P. Pyle, and M.A. Patten. 1995. First record of Marbled Murrelet and third record of Ancient Murrelet for Mexico. *Western Birds* 26:39-45.

Patten, M.A., P. Unitt, R.A. Erickson, and K.F. Campbell. 1995. Fifty years since Grinnell and Miller: Where is California ornithology headed? *Western Birds* 26:54-64.

Erickson, R.A. 1994. Western Gull in Acapulco: First record for the Mexican state of Guerrero. *Euphonia* 3:55-58.

Erickson, R.A., A.D. Barron, and T.E. Wurster. 1994. Northern Saw-whet Owl in the Sierra San Pedro Mártir: First Baja California record. *Western Birds* 25:66-68.

Patten, M.A. and R.A. Erickson. 1994. Fifteenth report of the California Bird Records Committee. *Western Birds* 25:1-34.

Erickson, R.A. 1993. Pacific pocket mouse (*Perognathus longimembris pacificus*). Pages 37-43 *in* P. Brylski (editor). Biology and Management of Rodents in Southern California. Workshop proceedings, San Bernardino County Museum, June 26, 1993.

Erickson, R.A. and R.A. Hamilton. 1993. Summer bird records for southern Mexico. *Euphonia* 2:81-91.

Carter, H.R. and R.A. Erickson. 1992. Status and conservation of the Marbled Murrelet in California, 1892 to 1987. *Proceedings of the Western Foundation of Vertebrate Zoology* 5:92-108. (abridged version of an unpublished 1988 report to the California Department of Fish and Game).

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Erickson, R.A. 1990. Checklist of Birds of the East Bay Region, California, (Alameda and Contra Costa Counties) second ed. (first ed. 1982). Golden Gate Audubon Society, Berkeley.

Erickson, R.A., J. Morlan, and D. Roberson. 1989. First record of the White-collared Swift in California. *Western Birds* 20:25-31.

Morlan, J. and R. Erickson. 1988. Supplement to the Birds of Northern California, 1988. Golden Gate Audubon Society, Berkeley.

Erickson, R.A., G.S. Lester, and G.J. Strachan. 1984. Birds of Redwood National Park. Coastal Parks Association, Point Reyes, California.

Morlan, J. and R.A. Erickson. 1983. A Eurasian Skylark at Point Reyes, California, with notes on skylark identification and systematics. *Western Birds* 14:113-126.

Erickson, R.A. 1982. Review: Rare Birds of the West Coast of North America (1980) by Don Roberson. *Auk* 99:389-390.

Remsen, J.V., Jr., K.L. Garrett and R.A. Erickson. 1982. Vocal copying in Lawrence's and Lesser Goldfinches. *Western Birds* 13:29-33.

McCaskie, G., P. De Benedictis, R. Erickson and J. Morlan. 1979. Birds of Northern California, an Annotated Field List, Second Ed. Golden Gate Audubon Society, Berkeley. 86 pages.

Myers, J.P., R.A. Erickson, and F.A. Pitelka. 1978. Forty-first breeding bird census: Wet coastal plain tundra I. *American Birds* 32:116-117.

Erickson, R. 1977. First record of the Knot (*Calidris canutus*), and other records from Belize (British Honduras). *Bulletin of the British Ornithologists' Club* 97:78-81.

Erickson, R. 1976. Birds of Berkeley. Pages 97-106 *in* A. Meyer (editor). The Berkeley Almanac. Cranberry Press, Berkeley, California.

about 20 additional titles in *American Birds*, 1976 to 1990.

JIM HARRISON

PROJECT MANAGER, BIOLOGIST

EXPERTISE

Biological Assessments
Botanical Resources Surveys
Regulatory Permitting
Wetland/Jurisdictional Determinations

EDUCATION

California State University, Fullerton, B.A. in Biological Sciences, 1990.

Continuing Education

Jepson Herbarium Workshops: Vernal Pools (April, 1996); Fagaceae (October, 1996); Flora of Santa Cruz Island (April, 1997).

California Native Grass Association, 3rd Annual Plant Identification Workshop, Rancho Santa Ana Botanic Garden. May, 1995.

Plant Taxonomy, California State University, Fullerton. Spring, 1994.

Arboriculture, Fullerton Community College. Fall, 1993.

Wetland Permitting Seminar, Association of Environmental Professionals, University of California, Riverside. September, 1991.

PROFESSIONAL EXPERIENCE

Biologist/Project Manager, LSA Associates, Inc., October, 1999, to present

Biologist/Assistant Project Manager, LSA Associates, Inc., November, 1997, to October, 1999.

Biologist/Environmental Analyst, LSA Associates, Inc., August, 1994, to November, 1997.

Biologist, LG&E Power Inc., Environmental Services Division, Irvine, CA, August, 1990, to May, 1994.

Environmental Intern, Ultrasystems Engineers & Constructors, Inc., Environmental Services Division, Irvine, CA, February, 1990, to August, 1990.

PRINCIPAL PROFESSIONAL QUALIFICATIONS

As a Project Manager in LSA's Irvine office, Mr. Harrison is primarily responsible for botanical assessments, including floristic inventories, rare plant surveys, vegetation/habitat classification and mapping, impact analyses, and mitigation planning. He has been with LSA since August, 1994. His botanical expertise has involved a wide variety of plant species and communities throughout Southern California. Experience with LSA has included relocation of the intermediate mariposa lily population; extensive rare plant surveys throughout the San Joaquin Hills of Orange County; springtime botanical surveys of Planning Area 22 (Shady Canyon) in Irvine; a floristic inventory for a highway improvement project in the Cajon Pass region of San Bernardino County; rare plant surveys and plant community mapping of the Los Cerritos Wetlands of Bixby Ranch; botanical constraints analysis of Hill Canyon in Ventura County; rare plant surveys of the Treasure Island development site in Laguna Beach; vegetation mapping of Newport Back Bay; focused rare plant surveys at Lake Isabella Hot Springs in Kern County; and vernal pool/rare plant surveys on Redonda Mesa in southwestern Riverside County. Currently, Mr. Harrison serves on the Board of Directors for the Southern California Botanists.

As a wetlands specialist, Mr. Harrison's chief responsibilities and experience pertaining to regulatory permitting include: 1) identification and delineation (both routine and comprehensive) of wetlands subject to Section 404 of the Clean Water Act; 2) jurisdictional determinations and preparation of notification packages for Streambed Alteration Agreements under Sections 1601/1603 of the California Fish and Game Code; 3) processing of application packages for various regulatory permits, such as Section 404 Individual Permits, Nationwide Permits, and Section 401 water quality certifications/waivers; and 4) preparation of habitat mitigation and monitoring plans according to guidelines established by the U.S. Army Corps of Engineers.

In addition to the disciplines described above, Mr. Harrison provides assistance in various monitoring tasks. Specific experience with LSA has included: construction and implementation monitoring for the Newport Coast Drive Extension project both on site and at Bommer Canyon mitigation sites; construction and implementation monitoring at Pelican Hill on the Newport Coast, including many-stemmed dudleya relocation and oversight of coastal sage scrub topsoil recovery; and construction monitoring of a pipeline repair project at Sand Canyon Creek for the Irvine Ranch Water District.

JULIE A. CHO

PROJECT MANAGER

EXPERTISE

Environmental Planning and Assessment
Environmental Impact Reports

EDUCATION

University of California, Irvine. Master's Degree in Business Administration, June, 2000.

University of California, Irvine. Master of Urban and Regional Planning, June, 1995.

University of California, Irvine. Bachelor of Arts, Program in Social Ecology, Concentration in Environmental Analysis and Design, and Criminology, Law and Society, June, 1993.

PROFESSIONAL EXPERIENCE

Project Manager, LSA Associates, Inc., Environmental Planning Consultants, Irvine, California, March, 1994 - present.

Community Planning and Development Intern, City of Costa Mesa, Costa Mesa, California, January, 1993 - March, 1993.

Field Study Intern, County of Orange, County Administrative Office, Forecast and Analysis Center, Santa Ana, California, January, 1993 - March, 1993.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Ms. Cho has over six years of experience in environmental planning and environmental impact analysis. Ms. Cho has researched and written technical sections in environmental documents, including Environmental Impact Reports, Initial Studies, and Negative Declarations. Her expertise in technical sections includes: land use consistency, socioeconomics, and public services and utilities. Ms. Cho has worked on projects undertaken for both public agency clients and private sector clients. Ms. Cho also has experience in permit processing with city and county agencies and preparing environmental documents for school districts.

Ms. Cho has been involved in the following large-scale projects while affiliated with LSA:

- Laguna Canyon Road Environmental Assessment, Orange County

- Route 30 Environmental Reevaluation, San Bernardino/Los Angeles counties
- Burbank Empire Center Project, Burbank
- Yorba Linda Heights Planned Residential Development, Yorba Linda
- Lakeside Residential Project, Buena Park
- City of Arcadia General Plan Update, Arcadia
- Poinsettia Bridge Widening, Carlsbad
- Huntington Beach Redevelopment Project, Huntington Beach
- Bixby Ridge Specific Plan, Signal Hill
- Anaheim City School District Initial Study/Negative Declaration
- Rialto Unified School District Initial Study/Negative Declaration

PROFESSIONAL MEMBERSHIPS

American Planning Association
Secretary, Association of Environmental Professionals, Orange County Chapter

ANDREA M. ZULLO

ENVIRONMENTAL ANALYST

EXPERTISE

Environmental Planning and Assessment
Specific Plans
Environmental Impact Reports/Statements

EDUCATION

University of California, Irvine. Land Use and Environmental Planning Certification, currently attending.

California State Polytechnic University, Pomona. Bachelor of Science in Geography-Anthropology, Pomona, California, June, 1993.

PROFESSIONAL EXPERIENCE

Environmental Analyst, LSA Associates, Inc., Environmental Planning Consultants, Irvine, California, July, 1998-present

Administrator, Infinium Software, Inc., Irvine, California, 1995-1998.

English Teacher, Korean Foreign Language Institute, South Korea, 1994-1995.

English Recording Specialist, V-Tel, Kangnam, Seoul, South Korea, 1994-1995.

Administrator, Sigma-Internet, Inc., Diamond Bar, California, 1991-1993.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

As an Environmental Analyst at LSA, Ms. Zullo's primary responsibility is to work with project managers on the organization and preparation of documents, including Environmental Impact Reports, Environmental Impact Statements, Initial Studies, Specific Plans, and interdisciplinary projects.

Ms. Zullo is currently involved in the following large-scale projects at LSA:

- El Toro Airport System Master Plan EIR
- Orange County CenterLine

CERTIFICATES AND AFFILIATIONS

CBEST Certification, 1997
Board of Directors for Parent Help, Mothers & Others Against Child Abuse, 1997
Delegate for the National Model United Nations Program in NYC, 1992
Cal Poly Anthropological-Geographical Society Member, 1986-90

PROFESSIONAL MEMBERSHIPS AND AFFILIATIONS

American Planning Association (APA)
Association of Environmental Professionals (AEP)

JEFF GUNDERSON

ENVIRONMENTAL ANALYST

EXPERTISE

Environmental Impact Reports
Environmental Planning and Assessment

EDUCATION

Colorado School of Mines, Golden, Colorado, M.S., Environmental Science and Engineering, December, 1997.

University of Oregon, Eugene, Oregon, B.S., General Science, minor in Chemistry, June, 1994.

PROFESSIONAL EXPERIENCE

Environmental Analyst, LSA Associates, Inc., Irvine, California, 2001, to present.

Environmental Scientist, Denise Duffy & Associates, Monterey, California, July, 1999, to June, 2000.

Environmental Analyst, Waterstone Consultants, Boulder, Colorado, June, 1998, to July, 1999.

Assistant Director, Honey Creek Environmental Education Center, Waverly, Georgia, September, 1995, to June, 1996.

Program Instructor, Desert Sun Science Center, Idyllwild, California, October, 1994, to June, 1995.

PRINCIPAL PROFESSIONAL RESPONSIBILITIES

Mr. Gunderson has over three years of experience in environmental planning and environmental impact analysis and three years of instruction on environmental education. Mr. Gunderson has researched and written technical sections in environmental documents, including Environmental Impact Reports, Initial Studies, and Negative Declarations. Mr. Gunderson has also worked on projects undertaken for both public agency clients and private sector clients.

His specializations include hydrology, geology, soils, water quality and biological resource issues. He has direct experience with mitigation monitoring and compliance on several projects in Northern California. In addition, Mr. Gunderson prepared an environmental systems analysis of The Needles and Islands in the Sky District of Canyon Lands Nation Park in Utah. He also examined and delineated two wetland systems of the Grand Staircase-Escalante National Monument in Utah.

Dr. Patrick Mock has over 21 years of professional experience as a wildlife biologist and environmental consultant. Dr. Mock has extensive national experience in habitat conservation planning and assessment of impacts on biological resources. His specific area of expertise is in the ecology, conservation planning, management, and monitoring of vertebrate populations. He has conducted ecological investigations, biological assessments, and habitat conservation planning programs for several sensitive species, including least Bell's vireo, southwestern willow flycatcher, California gnatcatcher, coastal cactus wren, least tern, brown pelican, Palos Verdes blue butterfly, San Diego fairy shrimp, California red-legged frog, California tiger salamander, arroyo southwestern toad, bighorn sheep, and Stephens' kangaroo rat.

Dr. Mock was the principal wildlife biologist for the San Diego MSCP program in which he oversaw landscape-scale habitat evaluations using GIS modeling, development of alternative preserve designs, population viability analyses (PVA) of California gnatcatcher and coastal cactus wren populations, wildlife corridor assessment, and formulation of the biological monitoring program during plan implementation. He has had key technical roles in several state/federal habitat conservation plan (HCP) processes (ESA Section 10(a), NCCP Act). He is currently involved in the development of a PVA and HCP for the Florida Key deer and NCCP/HCP subarea plans for the Rancho Palos Verdes (Los Angeles Co.) and San Marcos (San Diego Co.). Major CEQA/NEPA/Coastal Act related assessments include Otay Ranch and East Otay Mesa for the County of San Diego, San Elijo Hills and San Marcos Highlands for the City of San Marcos, Calavera Hills for the City of Carlsbad, Mission Bay Resource Management Plan and Mission Bay X-Games for the City of San Diego, San Diego Bay Aircraft Carrier Homeporting, and BRAC actions at Camp Pendleton and Miramar for the U.S. Navy.

Dr. Mock is certified as a Senior Ecologist by the Ecological Society of America and as a Wildlife Biologist by The Wildlife Society. Dr. Mock has published in peer-reviewed journals - most recently, several symposium papers on the ecology and conservation of the California gnatcatcher. He has frequently presented the results of his research and planning projects at professional meetings, agency-sponsored workshops, and technical symposia. He is currently serving as the Southern California representative for the Pacific Seabird Group. He has also served as a Lecturer at the University of San Diego and the University of California, San Diego, where he has taught courses on biological assessment, principles of ecology, and wildlife management. Dr. Mock's educational background includes a B.S. in Wildlife Biology from University of California, Davis and a Ph.D. in Biology (with an emphasis in Vertebrate Ecology and Physiological Ecology) from UCLA.

Relevant Publications and Reports by Dr. Mock

Energetic constraints to the distribution and abundance of the California gnatcatcher. Western Birds 29:413-420. 1998.

California gnatcatcher territorial behavior. Western Birds 29:242-257. 1998. K. Preston, M. Grishaver, E. Bailey, and D. King co-authors.

California gnatcatcher vocalization behavior. Western Birds 29:258-268. 1998. K. Preston and M. Grishaver co-authors.

Dispersal capabilities of the coastal California gnatcatcher: a landscape analysis of distribution data. Western Birds 29:351-360. 1998. E. Bailey co-author.

Is the California gnatcatcher a good umbrella species for habitat reserve design? Western Birds 29:453-467. 1998. S. Fleury and J. O'Leary co-authors.

Breeding behavior of the California gnatcatcher in the vicinity of Rancho San Diego, California. Western Birds 299-322. 1998. M. Grishaver and K. Preston, co-authors.

Ecology of the California Gnatcatcher at Rancho San Diego. 1994. D. Bolger, co-author. Ogden Environmental report prepared for Home Capital Corporation. 58 pp.

Population Viability Analysis for the California Gnatcatcher in the MSCP Study Area. Ogden Environmental report prepared for the City of San Diego. 40 pp.

Dr. Richard Friesen has over 25 years of professional national and international experience as an environmental scientist and wildlife biologist, writing environmental assessments; planning environmental conservation reserves; and directing field investigations of sensitive, rare, threatened, and endangered plant and animal species. He has produced biological assessments for various development projects throughout California in compliance with various government regulations, including the California Environmental Quality Act, National Environmental Protection Act, state and federal Endangered Species Acts. He has coordinated and prepared biological assessments for Section 7 and Section 10 Consultations with the U.S. Fish and Wildlife and for 2081 Permits with the California Department of Fish and Game pursuant to the national and state Endangered Species Acts. He has coordinated more than 250 biological resources inventories, impact and mitigation analyses, monitoring plans, and conservation plans for biological reserve areas. He is an expert in heteromyid rodent ecology.

Dr Friesen received his Ph.D. in biology from University of Southern California. He serves as an appointed advisor to several regional habitat conservation planning projects in southern California. He taught as Assistant Professor of Biology and Instructor at the University of Redlands; University of Southern California; California State University at Northridge; University of California, Los Angeles, Extension Program; and Point Loma College. Field-oriented courses included vertebrate natural history, field biology, botany, and principles of ecology, naturalists at work, mammalian speciation, and invertebrate zoology.

AREAS OF EXPERTISE

- Hydraulic, Watershed Based Hydrologic Analyses
- BMP design and Implementation
- Storm Water Monitoring
- Contaminate Fate and Transport Modeling
- Ground Water Flow Characterization and Analysis of Aquifer Contamination.

EDUCATION

California Polytechnic State University San Luis Obispo, California. M.S., Civil and Environmental Engineering, 1998

Colorado State University, Fort Collins, Colorado. B.S., Watershed Science, 1996

PROFESSIONAL HISTORY

URS Corporation, Engineer, 1999 to present

Regional Water Quality Control Board, Engineering Graduate Student Assistant, 1997 – 1998

Treatment Technology, Water/Wastewater Operator, 1991 - 1997

REPRESENTATIVE EXPERIENCE

Mr. Jacobsen is an engineer in the water resources division with specific experience in hydrology and hydraulics, water quality analysis and sampling, and waste management. Representative experience includes the following:

- **Color Spot Nursery Water Management Design, Fallbrook, CA** Completed an assessment of Color Spot's current water management design to determine the BMPs necessary to control irrigation runoff from entering a nearby tributary of the San Luis Rey River. Coordinated with the Regional Water Quality Control Board during the design process to ensure that the new water management design met with the regulatory requirements. Created design plans to identify the specific locations where BMPs were required for regulatory compliance and ensure that Color Spot was not overburdened by maintenance requirements.
- **City of San Diego Arroyo Sorrento Place Project, San Diego, CA** Designed storm water conveyance channels to reduce sediment loads on down stream receiving waters. Areas were identified where storm water BMPs were needed and input onto construction drawings.
- **Huntington Beach Urban Runoff Investigation, Huntington Beach, CA** Due to elevated bacteriological indicators, portions of Huntington State Beach and Huntington Beach (operated by the City) were closed during the summer of 1999. As part of the bacterial source identification activities, sanitary surveys specifically designed to identify bacterial water quality of urban runoff was developed for the Huntington Beach watershed. Mr. Jacobsen assisted in the development of the sanitary survey and lead field crews during a sampling effort that included more than 200 bacteria samples from watershed. Defined the watershed boundaries through analysis of storm drain and topographic maps. Analyzed the bacterial water quality data to assess the logarithmic averages to water quality standards and identify possible trends. Assisted in the conceptual designs of mitigation measures to remedy bacterial effects in the surf zone.

AFFILIATIONS

Registered Engineer in Training

American Society of Civil Engineers Member

International Erosion Control Association Member

- **Huntington Beach Surf Zone Water Quality Investigation, Huntington Beach, CA** Assisted in the design of a surf zone monitoring plan, which included continuous water quality sampling at various locations of State and City owned Beaches. Led a field crew of 15 URS employees to conduct the 24-hour surf zone sampling for two weeks. Assisted in the identification and coordination with the analytical laboratory to analyze a large number of samples.
- **Caltrans Public Education Litter Management Study (PELMS), Fresno, CA** Caltrans District 6, Fresno, is currently in the first monitoring season to assess the effects of public education as a BMP to reduce highway litter loads. Prior to the start of the monitoring, project duties included design hydrology and hydraulics, selection of monitorable outfalls, review of "as-built" drawings, field verification of watershed areas and outfall configurations, and site construction management. During the monitoring season, project duties include analyzing downloaded data from on-site American Sigma flow monitoring equipment and creating hydrographs and hyetographs. Data is also analyzed for anomalies to assess possible problems in the field and mitigate the problems prior to the next monitored storm event.
- **Engineering Graduate Student Assistant, Regional Water Quality Control Board (RWQCB) — Central Coast Region, San Luis Obispo, California.** Duties included drafting waste discharge requirements, reviewing ground water and gas monitoring data, ensure landfill operators submit complete monitoring reports, reviewed landfill liner and closure documentation to assess their technical validity and assist in deciphering the proper regulations to apply to dischargers. Assisted in the regulation of Casmalia Hazardous Waste Management Facility (Class I) by reviewing final cover documentation, construction plans, performing a historical data review, and liquid management reports. Performed field inspections on various landfills to assess compliance with current permit regulations and observe day to day gas monitoring and general operations. Assisted in the San Luis Obispo County inactive metal mine study, which analyzed the effects of mining to adjacent streams and water bodies.

- **Urban Spill Response Plan, Kinder Morgan Energy Partners, L.P., Orange, CA.** Co-authored an Urban Spill Response Plan for a petroleum pipeline from Carson to Norwalk, CA. The Plan included emergency response procedures, fate and transport model results, emergency contacts, sensitive receptor inventory, and various spill response scenarios.
- **El Sobrante Landfill Expansion, Riverside County, CA.** Performed hydrologic calculations to estimate discharges volumes from surrounding watersheds to evaluate the possible run-on issues associated with landfill lateral expansion.
- **Phase II Investigation, B.F. Goodrich Aerospace Chula Vista Facility.** Performed field activities to obtain soil and water samples as a part of a Phase II Environmental Investigation aimed at identifying possible sources of contamination. Assisted with attaining water/soil samples and data analysis including determination of contaminate sources and lateral and vertical influence of a saltwater wedge.
- **Water and Wastewater Operator/Technician, Treatment Technology, Evergreen, Colorado.** Responsible for operations and maintenance of water and wastewater treatment facilities to ensure maximum efficiency. As part of the efficiency, a project was conducted to find infiltration of groundwater into the wastewater system at Saint Mary's Glacier, Colorado. In all aspects of the company, problem solving was a tool used on a daily basis.
- **Hydrologic Technician, USDA Forest Service, Fremont National Forest, Bly, Oregon.** Performed a Level II riparian survey on the South Fork of the Sprague River. The Level II riparian survey aimed to take inventory of the existing riparian vegetation and identify potential natural vegetation as well as identify existing and past beaver habitats. Trained to identify indicator riparian plant species and indicate the condition of the existing stream channel reaches along specified transect within the Sprague River's drainage system. Was trained to and fought forest fires on and off district.

AREAS OF EXPERTISE

- Watershed Management and Monitoring
- NPDES Stormwater Permitting
- Pollutant Fate and Transport

EDUCATION

PROFESSIONAL HISTORY

Project Assistant, San Diego State University, and University of California at San Diego, Summer 1997

Environmental Engineer, U. S. Environmental Protection Agency (EPA) Region VII, May 1988 – May 1997.

Natural Resources Committee Chair, Partners of the Americas, Missouri, Fall 1987 – 1993.

Research Assistant, University of Missouri-Rolla, Fall 1986 - 1987

AFFLIATIONS

Water Environment

REPRESENTATIVE EXPERIENCE

Mr. Pitt offers technical and regulatory assistance in industrial and municipal pollution control, watershed management, monitoring, and fate and transport of chemical pollutants; involvement in international environmental projects and programs. Recent experience includes:

- Participated in San Diego State University project in monitoring and modeling stormwater impacts within the Tijuana River Watershed.
- Participated in Borderlink-97 involving the collection and reporting of available water quality data within the Tijuana River Watershed.
- Provided technical assistance for EPA Region VII Water Quality Standards, Wasteload Allocation (WLA), and Total Maximum Daily Load (TMDL) activities.
- Regional coordinator for implementation of Reach File 3, an EPA supported computer file of digitized U.S. waterbodies; the Waterbody System, software designed to store and track water quality assessment information; and volunteer stream/lake monitoring activities involving training, guidance and community outreach.
- Developed, reviewed and provided training on procedures for WLA/TMDL modeling and water quality assessment for EPA Region VII states involving application of PC and mainframe water quality models and Geographic Information Systems (ArcInfo, ArcView).
- Utilized PC software (dBase, Lotus, Excel, Word, WordPerfect, and Harvard Graphics) and several EPA distributed PC models and mainframe databases (QUAL2, SMPTOX, MINTEQ, STORET, and PCS) as a tool to base water quality and watershed management decisions.
- Managed TMDL mini-grants and reviewed grant proposals and projects under Construction Grants, NPDES State Assistance, Environmental Justice, and Environmental Education.
- Participation in outreach activities involving academic and community education regarding water quality and watershed protection; demonstration of a watershed model, and volunteer monitoring techniques.
- Performed or participated in several stream surveys/studies in order to determine WLA limits using water quality monitoring and modeling.

Federation

International Association on Water Quality

AWARDS

Blasker Fellowship, San Diego State University, 1997.

- Developed specific applications for examining metal speciation concerning toxicity, bioavailability, speciation modeling, and NPDES limits.

- Demonstrated BASINS, an ArcView application for TMDL development at EPA in-house training, Kansas University water quality class, and the National Biological Survey speaker forum.

PUBLICATIONS AND PRESENTATIONS

"Use of a Biological Meander Treatment System for Lead Mine/Mill Wastes in Southeast Missouri, USA." Proceedings of the 43rd Annual Purdue Industrial Waste Conference, May 1998.

"Evaluating Toxicity of Speciated Metals from Metal Discharging Industries." Proceedings of the 45th Purdue Industrial Waste Conference, May 1990.

"Interpretating Bioavailable Toxic Metal Concentrations Utilizing Laboratory Procedurs and a Metal Specification Model." Proceedings of the 1990 ASCE Specialty Conference on Environmental Engineering, July 1990.

"Analysis of Toxic Species of Lead, Cadmium and Zinc for Application to Wasteload Allocations," presented at 63rd Annual Water Pollution Control Federation Conference, October 1990.

"In-Stream Bilogical Indicators for Metal Contaminants Under Variable Geochemical Conditions," poster at the 116th Biennial Conference and Exposition of the International Association on Water Pollution and Control, May 1992.

"Predicting Aqueous Metal Species in a Stream Impacted by Mining Activity, presented at the Toxic Substances in Water Environments: Assessment and Control (WEF Specialty Conference), May 1995.

PROFESSIONAL RESUME OF DR. RICHARD F. FORD

Dr. Ford received his B.A. in Zoology from Pomona College in 1956, emphasizing marine ecology and chemistry, and his M.A. in Biology from Stanford University in 1959, where he specialized in the biology of fishes. In 1965 he completed his Ph.D. in Oceanography at the Scripps Institution of Oceanography, specializing in the fields of marine ecology and coastal oceanography. From 1964-1997 he was a Professor of Biology at San Diego State University, dividing his time equally among teaching, working with graduate students, and conducting marine ecological research. Dr. Ford has directed the research of 60 Ph.D and Master's degree students. Since 1997, he has continued his active affiliation as a Professor Emeritus at SDSU, primarily in conducting research. Part of this work also is conducted at the non-profit Hubbs-Sea World Research Institute, where he is a Research Associate. He has published 73 scientific papers on this research in refereed journals. His research is supported primarily by the National Science Foundation, the Sea Grant Program, the California Water Resources Control Board, the U.S. Navy Facilities Engineering Command, the San Diego Unified Port District, and the California Department of Fish and Game. His primary areas of expertise are in water quality, habitat disturbance, and related effects on marine organisms and in the population ecology of bottom-living marine invertebrates and fishes. Current research includes stock enhancement studies of the white seabass, effects of habitat disturbance and pollution in San Diego Bay, and effects of water quality in storm runoff water to the ocean from coastal watersheds. The latter storm water studies include previous work (1987-1997) on Phase I of the Newport Coast Planned Community, responsibility for conducting the ongoing, very extensive water quality and ecological monitoring studies for the Crystal Cove Development Project, as well as similar storm water studies at Long Point and other developments in Rancho Palos Verdes, CA and in the Headlands Project at Dana Point, CA.

Since 1968 Dr. Ford has served regularly as a water quality and ecological consultant to more than 27 companies and agencies, including the San Diego Unified Port District, the San Diego Regional Water Quality Control Board, the San Diego Gas & Electric Company, Long Point Associates, Headlands Reserve LLC, and The Irvine Company. This work is described in more than 240 technical reports he has prepared. During the 1980's, he conducted research on ocean discharges from wastewater treatment outfalls in the San Diego region. This work, which included an evaluation of the EPA ODES computer system, was supported by the California State Water Resources Control Board and the U.S. Environmental Protection Agency. During the period 1968-1985, Dr. Ford conducted extensive water quality and biological studies for the San Diego Gas & Electric Co., the Southern California Edison Company, and Sea Grant Program concerning ecological effects of discharging heated effluent from electrical generating stations. He was also the principal marine ecologist in studies and planning efforts for habitat restoration in San Diego Bay, sponsored by the San Diego Unified Port District and the Coastal Conservancy. In addition, he served as the consulting marine ecologist to the Port District and the U.S. Navy in developing the recently completed San Diego Bay Integrated Natural Resources Management Plan, which will serve as the primary focus of future scientific studies and environmental management for the Bay. He wrote most of the ecological sections of that plan.

Dr. Ford has had considerable experience in U.S.-Mexico cooperative studies. He served as a Visiting Professor at the Mexican National University's Marine Laboratory in Puerto Morelos, Quintana Roo, where he offered graduate courses and conducted marine ecological studies with Mexican colleagues. He now serves as a faculty member at Centro de Investigaciones Biologicas del Noroeste, S.C. (CIBNOR), a marine research institution in La Paz, Baja California Sur. In addition he has been involved in cooperative fisheries research with Instituto Nationale de la Pesca of Mexico in both Ensenada and La Paz, Baja California.

Robert Kahn, P.E.
Principal

AREAS OF EXPERTISE

- Traffic Engineering
- Transportation Planning
- Transportation Solutions
- Traffic Impact Analysis
- Circulation Systems for Planned Communities
- Traffic Control Device Warrants
- Traffic Calming
- Traffic Safety Studies
- Parking Demand Studies
- Traffic Signal, Signing and Striping Plans
- Traffic Control Plans
- Parking Lot Design
- Acoustical Engineering
- Noise Impact Studies

EDUCATION

University of California, Berkeley, M.S., Civil Engineering, 1968

University of California, Berkeley, B.S., Civil Engineering, 1967

University of California, Los Angeles, Graduate Courses in Transportation Systems, 1970

REPRESENTATIVE EXPERIENCE

Robert Kahn, P.E., has worked professionally in traffic engineering and transportation planning since 1968. He received his master of science degree in civil engineering from the University of California, Berkeley, Institute of Transportation and Traffic Engineering. Mr. Kahn received his bachelors degree in Civil Engineering from the University of California, Berkley.

Mr. Kahn started his career in California Division of Highways (Caltrans) and developed the first computerized surveillance and control system for the Los Angeles area. Mr. Kahn developed the California Incident Detection Logic which is utilized throughout California for the detection of traffic incidents on the freeway system.

Mr. Kahn has worked for a major land development company preparing Master Plans for infrastructure. He also has worked eleven years with a multi-disciplined consulting engineering firm in charge of the Engineering Planning Department. This included all facets of preliminary design, tentative map preparation, transportation and environmental engineering, and public agency coordination.

Mr. Kahn has provided traffic and transportation services to major planned communities including Aliso Viejo, Coto De Caza, Foothill Ranch, Highlands Ranch in Denver, Colorado, Mission Viejo, Talega Planned Community in San Clemente, and Wolf Valley Ranch in Temecula. He has also provided contract traffic engineering services to the Cities of Irvine, Norwalk, Perris and San Jacinto in Riverside County, California.

Mr. Kahn has prepared traffic impact studies for numerous communities throughout Southern California, Nevada and in Colorado. Major traffic impact studies include the Aliso Viejo Town Center, the Summit Development, the Shops at Mission Viejo, Kaleidoscope, Dana Point Headlands, Foothill Ranch, Talega, Majestic Spectrum, and Centre Pointe in the City of Chino.

His work in the area of parking demand studies and parking lot design has been extensive. Shared parking studies for the Aliso Viejo Town Center, Foothill Ranch Towne Centre, Trabuco Plaza and numerous commercial sites have been completed to accurately determine the peak parking demand for mixed use projects. Mr. Kahn has been able to make the most efficient utilization of parking lots by maximizing efficient and safe systems.

PROFESSIONAL HISTORY

RK engineering group, inc., 2001-present

RKJK & Associates, Inc., Principal, 1990-2000

Robert Kahn and Associates, Inc., Principal, 1988-1990

Jack G. Raub Company, Vice President Engineering Planning, 1977-1988

The Irvine Company, Program Engineer, 1972-1977

Caltrans California Division of Highways, Assistant Engineer, 1968-1972

AFFILIATIONS

Institute of Transportation Engineers (ITE)

American Society of Civil Engineers (ASCE)

American of Public Works Association (APWA)

Consulting Engineers and Land Surveyors (CELSOC)

Orange County Traffic Engineers Council (OCTEC)

Mr. Kahn has been an innovator in developing and implementing traffic calming techniques. Over twenty years ago, Mr. Kahn refined the design and implementation standards for speed humps for use in local neighborhoods. Most recently, he has been involved in the development of modern roundabouts in lieu of traffic signals or other traffic control devices at intersections. Mr. Kahn recently presented the use of traffic calming devices in newly developing communities to the Institute of Transportation Engineers Traffic Calming Conference in Monterey, California.

Mr. Kahn has been involved in the design of traffic signal systems, signing and striping plans on hundreds of projects for both the public and private sector. Most recently, he has completed the design of several traffic signals which will serve the renovated Shops at Mission Viejo Mall. Mr. Kahn was in charge of a major ITS project for the City of Irvine, which provided fiberoptic interconnect and closed circuit TV along Barranca Parkway, Alton Parkway and Lake Forest Drive.

Mr. Kahn has been involved in acoustical engineering since 1978. He was in responsible charge of the Aliso Viejo Noise Monitoring Program which redefined the 65 CNEL noise contours for MCAS El Toro. He has also developed computer applications of the FHWA Noise Model.

Mr. Kahn has prepared numerous noise impact reports in the Aliso Viejo, Mission Viejo, Foothill Ranch, Santa Margarita, Ladare and Talega Planned Communities. Noise impacts from stationery sources including car washes, loading docks, air conditioning compressors, drive-thru speakers and other sources have been evaluated in the Aliso Viejo Auto Retail Center Noise Study, Albertsons Store 606 Noise Study-Rancho Cucamonga, Pro Source Distribution Building Final Noise Study in Ontario. Major specific plan and zone change noise studies have been prepared for the Summit Heights Specific Plan in Fontana, Lytle Creek Land and Resources Property in Rialto, Tamarack Square in Carlsbad, California, International Trade and Transportation Center in Kern County, California, and Sun City/Palm Springs.

Mr. Kahn founded the firm of Robert Kahn and Associates in 1988, which was the predecessor to RKJK & Associates, Inc. in 1990. He has made presentations to the ITE and the California Public Works Conference.

Ann Cadavona
Senior Transportation Planner

AREAS OF COMPETENCE

- Traffic Impact Analyses
- Parking Studies
- Transportation Planning and Problem Solving

EDUCATION

University of California, Irvine: B.S., Mathematics, 1990

PROFESSIONAL HISTORY

RK engineering group, inc., 2001-present

RKJK & Associates, Inc., Transportation Planner, January 1999-2000

Linscott Law & Greenspan Engineers
Transportation Planner II
June 1998 to December 1998

Oahu Metropolitan Planning Organization
Transportation Planner
July 1993 to May 1998

Austin-Foust Associates Inc.,
Transportation Analyst
June 1991 to June 1993

Parson Brinckerhoff Quade & Douglas Inc.
Engineering Aide II
February 1990 to March 1991

AFFILIATIONS

Institute of Transportation Engineers (ITE)

REPRESENTATIVE EXPERIENCE

Ann Cadavona has worked professionally in transportation planning and traffic engineering since 1990.

Ms. Cadavona received a Bachelor Degree in Mathematics from University of California, Irvine and has both public and private sector experience. While working for the Oahu Metropolitan Planning Organization (OMPO) in Hawaii, she served on the Hawaii Section of Institute of Transportation Engineer as a Treasurer from 1996-1997, a Secretary from 1997-1998, and was nominated to the section's Vice President position 1998. She also served as the Vice President for Hawaii Council of Engineering Society from 1997-1998.

While working in Hawaii, she assisted in the preparation of transportation planning studies, which included the Oahu Regional Transportation Plan and the Oahu Transportation Improvement Program. In addition, she had prepared the OMPO Public Involvement Program. She was also involved in the development of the Oahu Travel Forecasting Model.

Ms. Cadavona was also involved in various modeling projects while working at Austin-Foust Associates Inc. (AFA). These included projects in Anaheim, Northeast County, Ventura County, and Ontario County. During her years at AFA, she also utilized AutoCAD extensively in project development.

Her work on traffic impact studies and traffic analyses include projects in cities of San Clemente, Mission Viejo, Chino Hills, Thousand Oaks, Pasadena, Inglewood, Panorama City, Malibu, Los Angeles, and Fontana. On parking studies, she has performed studies in Chino, Mission Viejo, Thousand Oaks, and Santa Monica.

DOUGLAS DAHNCKE
AMEC Earth & Environmental, Inc.

EDUCATION - California State University, Long Beach, M.S. Geotechnical Engineering, 1991
California State Polytechnic, Pomona, B.S. Civil Engineering, 1988

REGISTRATION- California Registered Civil Engineer No. 47187
California Geotechnical Engineer No. GE2279

AFFILIATION MEMBERSHIPS - American Society of Civil Engineers
Chi Epsilon

SELECTED PROJECT EXPERIENCE

Mr. Dahncke has been involved with the geotechnical engineering of numerous projects involving heavy civil construction, commercial and industrial development, roadways, landfills, bridges, pipelines, and hydraulic structures. His work has included detailed settlement analysis, development of recommendations for shallow and deep foundation systems, slope stability, seismic evaluation, and retaining wall and shoring recommendations. Many of these projects have been performed for, or reviewed by, Caltrans, County and municipal agencies, California Coastal Commission, and CDMG. A representative sample of these projects are listed below:

- San Joaquin Hills Transportation Corridor (Route 73) - Orange County, California: Design/Build for Route 73. Reviewed by Caltrans, County of Orange, and CDMG.
- Humana Hospital - Westminster, California: Detailed seismic evaluation reviewed by California Division of Mines and Geology (CDMG).
- Beach erosion - San Clemente, California: Remediation recommendations for County of Orange reviewed by the California Coastal Commission and CDMG.
- Fire Station No. 22 - County of Orange, California: Worked performed for, and reviewed by the County of Orange.
- Frank R. Bowerman Landfill - Orange County, California: Geotechnical Study performed for the County of Orange and reviewed by the State of California.
- La Paz Road Widening - Laguna Niguel, California: Geotechnical Study for the County of Orange for the widening of this roadway.
- NSS-S73 Connector Bridge - Costa Mesa, California: Bridge study for the City of Costa Mesa and reviewed by Caltrans.
- Newport Coast Development - Orange County, California: Development of 97 residential structures and reviewed by the County of Orange and the State of California.
- Cabot Road Extension - Laguna Niguel, California: Roadway extension study performed for the County of Orange.

SCOTT T. KERWIN
AMEC Earth & Environmental, Inc.

EDUCATION - University of California at Los Angeles, B.Sc. in Geology, 1971

CALIFORNIA REGISTRATION- Registered Geologist No. 3980; Certified Engineering Geologist No. 1267

AFFILIATION MEMBERSHIPS- Association of Engineering Geologists (AEG); American Society of Civil Engineers (ASCE)

SELECTED PROJECT EXPERIENCE

King Harbor Marina, Liquefaction Failure and Remediation Redondo Beach, California, for City of Redondo Beach,

Cove Road Slope Restoration, Dana Point, California, for Orange County Environmental Management Agency.

Ancient Landslide Investigations - Portuguese Bend, Rancho Palos Verdes, California, for Transamerica Development Co., Palos Verdes Properties, City of Rancho Palos Verdes, etc.

Tank Site Stability In Open Pit Mine, Boron, California, for U.S. Borax and Chemical Corporation.

Santiago Landslide Litigation, Anaheim Hills, California, for Rutan & Tucker/City of Anaheim.

Proposed Residential Development of Livingstone Quarry, Rancho Palos Verdes, California, for Palos Verdes Properties, Palos Verdes Land Holdings Co. and J. M. Peters Co.

Treasure Island Resort Community, Laguna Beach, California, for Treasure Island Associates/Merrill Lynch and The Athens Group.

Hydrogeologic Assessment Reports, U.S. Borax Mine and Processing Facility, Boron, California, for U.S. Borax and Chemical Corporation.

Huntington Beach Pier, Geotechnical Services, Design and Reconstruction, Huntington Beach, California, for City of Huntington Beach,

Dana Point Harbor, Revetment Panel Distress Investigation and Remedial Design, Dana Point, California for Orange County Environmental Management Agency.

Bluff Drive (J00P02) Storm Drain And Beach Access, Geotechnical Services For Design and Construction, Laguna Beach, California for Laguna Sur Associates.

PUBLICATIONS

Kerwin, Scott T. and James J. Stone (1997). **"Liquefaction Failure and Remediation: King Harbor, Redondo Beach, California"**; presented at ASCE National Convention, San Diego, California (October, 1995); *ASCE Journal of Geotechnical and Geoenvironmental Engineering*, Vol. 123, No. 8, August 1997.

Kerwin, Scott T. (1992). **"Geotechnical Constraints: Reconstruction of the Huntington Beach Pier."** *Engineering Geology Field Trips: Orange County, Santa Monica Mountains and Malibu - Guidebook and Volume: 35th Annual Meeting of the Association of Engineering Geologists, Long Beach, California*, 1992.

Kerwin, Scott T. (1987). **"Sea Cliff Stabilization Using Long Rock Anchors - A Case History."** *Rock Mechanics: Proceedings of the 28th U.S. Symposium*, University of Arizona, Tucson, 1987.

Kerwin, Scott T., D.W. Clark, J.T. Eagen (1984). **"Restoration of the Cove Road Landslide, Dana Point, California."** *Ground Failure, National Research Council, Committee on Ground Failure Hazards*, No. 1, Winter, 1984-85.

Kerwin, Scott T. (1982). **"Land Stability in the Klondike Canyon Area."** *Landslides and Landslide Abatement, Palos Verdes Peninsula, Southern California, Volume and Guidebook for the 78th Annual Meeting of the Geologic Society of America, Cordilleran Section*, April, 1982.

PAUL CAREY, P.E.
PROJECT MANAGER

Education: BS/1980/Civil and Environmental Engineering

Registration: 1986/Professional Civil Engineer/California #C41370
1984/Professional Civil Engineer/Montana #8423E

Qualifications: Mr. Carey brings over 21 years of civil engineering experience, 15 of which have been in southern California. He has been responsible for performing master development studies; coordinating the alternative design standards for features such as traffic circles and variable width medians; performing investigations of offsite improvements; and preparing Project Study Reports and Project Reports. Additionally, he has prepared final plans, specifications, and estimates for streets, grading, storm drain, sewer, and water improvements.

Ladera Ranch Development; South Orange County, California
Rancho Mission Viejo Company
Project Manager for a 3,000-acre development in South Orange County. The preliminary work included preparing the Master Plan of Drainage and the Urban Runoff Management Plan; coordinating the alternative design standards for features such as traffic circles and variable width medians; and performing investigations of offsite improvements for mitigation of traffic impacts. The scope of services also included the preparation of a Project Report for the County of Orange analyzing a proposed bridge crossing of Arroyo Trabuco Creek on Crown Valley Parkway.

Bolsa Chica Development; Huntington Beach, California
Signal/Bolsa Corporation
Project Manager responsible for performing the master plan studies for this 1,600-acre site in Huntington Beach. He produced extensive documentation for the previously approved Local Coastal Program and Environmental Impact Report that provides entitlement to construct 3,300 residential units on 500 acres of the site, and to restore 1,100 acres of severely degraded wetlands. Additionally, he prepared the Vesting Tentative Tract Map for the "mesa" portion of the site. After several revisions in processing through the California Coastal Commission, the 230-acre mesa has been entitled for 1,250 mixed residential units.

Treasure Island Development; Laguna Beach, California
The Athens Group
Project Manager responsible for performing development studies for an existing 30-acre mobile home park in the City of Laguna Beach. In response to City of Laguna Beach and California Coastal Commission concerns, he investigated several alternative levels of development. He was responsible for processing the Tentative Tract Map for a 250-key luxury hotel, 14 custom home sites, and 14 townhomes, as well as final construction drawings for this site. Processing of the plans entailed obtaining an encroachment permit from Caltrans for widening of Pacific Coast Highway adjacent to the project.

South Laguna Stairway and Drainage System (Facility J00P02); Laguna Beach, California
Hon Development
Project Engineer for the preparation of final plans, specifications and estimates for this storm drain and stairway located in the City of Laguna Beach. The scope of services included developing an innovative design for energy dissipating structure at the outlet on the beach. The project received the California Council of Civil Engineers and Land Surveyors Engineering Award of Excellence in 1991.

Smithcliffs Development; Laguna Beach, California
Brinderson Real Estate
Project Engineer responsible for the preparation of final grading, street improvement and storm drain plans for construction of a 10-acre residential subdivision in the city of Laguna Beach. The drainage design included an oil/water separator and a 60-foot near vertical outlet drainage pipe cutting through a bluff face outletting to the ocean. The utility design involved an on-site private sewage lift station, public water system, and coordination with dry utilities to avoid conflicts. Processing of the plans entailed obtaining an encroachment permit from Caltrans for widening of Pacific Coast Highway adjacent to the project.

STEPHEN M. NOVAK
DESIGNER

Education: AS/1975/Building Technology

Qualifications: Mr. Novak offers over twenty years of experience in the fields of civil, environmental, and geotechnical engineering. His expertise is also in preparing grading plans and studies, land use studies, street design, water, sanitary sewer, and storm drain plans. In addition, Mr. Novak has experience working with the Department of Defense, Army Corps of Engineers, and various municipal water agencies while also providing client/agency coordination services. He is also familiar with and proficient at using such software applications as AutoCAD 14, AutoCAD 2000, Softdesk, and Land Development Desktop.

Liberty; Lake Elsinore, California
TMC America
Designer responsible for providing design support services for Liberty which is a mixed-use major residential and commercial subdivision occupying 3,000 acres of land adjacent to Lake Elsinore and with plans for over 6,500 residential units and several commercial sites. Mr. Novak was responsible for preparing all street plans and profiles as well as coordinating with the Army Corps of Engineers. This particular development posed some challenges in that much of the acreage is part of a flood basin generating the need for FEMA map revisions, flood routing studies, and a massive effort in grading design.

Lincoln Mercury World Headquarters; Irvine, California
LPA, Inc.
Designer responsible for providing design support services for the development of this four-office structure project located on 19.5 acres in Irvine, California. Mr. Novak was responsible for preparing the site layout and precise grading plans.

Chino Basin Ground Water Management Program; San Bernardino County, California
Chino Basin Watermaster
Designer responsible for providing engineering support for this 160,000-acre basin containing 5-6 million acre-feet of water located in southwest San Bernardino County. This basin acts as the primary municipal water supply. Mr. Novak researched water quality and groundwater levels of aquifers. In addition, he was responsible for providing support of the ground water monitoring and modeling of the basin.

MX Missile (Deep Basing); Redlands and Long Beach, California
Department of Defense
Project draftsman responsible for the analysis of the Department of Defense's MX Missile siting strategies. Mr. Novak was responsible for analyzing a number of geographically diverse regions in the western United States to determine those that would be geotechnically suitable to accommodate the siting of the MX missile on or within the site. In addition, Mr. Novak drafted studies of analysis and alternatives in support of this effort.

Treasure Island Development; Laguna Beach, California
The Athens Group
Designer responsible for preparing the precise and rough grading plans and street plans for the residential portion of this project for the City of Laguna Beach. The initial development proposal included converting the mobile home park into a 300-key luxury hotel, 268 mixed residential units, dedication of public beach areas, and providing public access (including handicap access) to the beach. Mr. Novak was responsible for conceptual design of the ramp structure that eliminated mass grading and allowed for greater usable acreage and preservation of the existing bluff.

TODD L. PITNER, P.E.
DESIGN ENGINEER

Education: BS/1995/Civil Engineering

Registration: 1998/Professional Engineer/California #C58606

Qualifications: Mr. Pitner offers six years of experience in the design and preparation of improvement plans including street, grading, sewer, water and storm drain for various public and private clients. His expertise is often utilized in hydrology and hydraulic analysis and evaluating job sites for environmental pollutants and making recommendations for structural Best Management Practices (BMP) to integrate into the design. He has worked closely with a variety of cities and counties and has experience coordinating with agencies such as Caltrans and the Army Corp of Engineers. In addition, he is familiar with and proficient at using such software applications as AutoCAD 14, Softdesk, WSPG, Civil Tools, TR-55, HEC-1, HEC-RAS, Flow Master, and Civil Design-Rational Method/Hydrographs/Flood Routing.

Bolsa Chica; Huntington Beach, California
Hearthside Homes
Design Engineer responsible for preparing the hydrology and BMP studies and providing the street capacity analysis for this property located in the City of Huntington Beach, California. In addition, he was responsible for assisting in the development of a Storm Water Pollution Prevention Plan (SWPPP) and monitoring program plan that was prepared to avoid such occurrences as excessive erosion, off site contamination, and non-storm water discharges from the construction site. This project also required Mr. Pitner to work closely with the coastal commission throughout the approval process.

CFD-9; Chino Hills, California
City of Chino Hills
Assistant Project Manager responsible for working closely with the City of Chino Hills and coordinating with Caltrans for encroachment permits. In addition, he was responsible for the hydraulic analysis and preparing all of the grading and improvement plans for this community facility district located in Chino Hills.

Treasure Island; Laguna Beach, California
The Athens Group
Design Engineer responsible for preparing the hydrology study, designing the storm drain system, and providing the BMP analysis and design for this 30-acre project located adjacent to the intersection of Pacific Coast Highway (PCH) and Wesley Drive in Laguna Beach. This proposed development includes plans for a 100-key resort hotel on four acres in the southerly portion of the site and 97 resort villas on 19 acres between PCH and the top of the surrounding bluffs.

Mirada Estates; Rancho Mirage, California
M.C.O. Properties, Inc.
Design Engineer responsible for preparing the storm drain study and the hydrology design for this residential development located in the city of Rancho Mirage in Riverside, California. The project included the construction of approximately 63 residential lots on approximately 93 acres of property.

Olinda Heights; Brea, California
PLC Land Company
Design Engineer responsible for preparing the storm drain plans and the hydrology analysis and design for this 274-acre residential project in Brea, California. Located on a hillside setting, the project is comprised of 850 dwelling units that included single-family, multi-family, and senior housing and incorporated wilderness trails that extend through the Carbon Canyon Regional Park. In addition, he was responsible for coordinating with the Army Corp of Engineers to relocate the easement for the project.

RONALD M. NOBLE
PRINCIPAL ENGINEER

EDUCATION

University of California at Berkeley, M.S., 1969
Civil/Coastal Engineering

San Jose State University, B.S., 1968
Civil Engineering

REGISTRATION

California, Civil Engineer, 1973, RCE 23436

NAUI Scuba Diver

EXPERTISE

Mr. Noble has over 35 years experience in the design of coastal/waterfront facilities, in oceanographic/coastal engineering investigations and analyses, in hydrologic engineering analysis and design, and in performing construction management and inspection services for projects located throughout the world. He has been equally involved in the planning, permitting, design and construction management phases for these coastal, estuarine, or riverine projects.

EXPERIENCE

- California Coastal Commission-Third Party Independent Review of Hydrologic, Sediment Yield and Coastal Processes Results and Conclusions for Newport Coast Phases IV-3 and IV-4 Appeal
- California Department of Boating and Waterways-California Shoreline Erosion Site Surveys
- California State Coastal Conservancy-Site Analysis for Public Access, Malibu
- U.S. Army Corps of Engineers-Orange County Coast of California Strom and Tidal Wave Study
- U.S. Army Corps of Engineers-National Shoreline Study, California Regional Inventory
- U.S. Army Corps of Engineers-Zone of Siting Feasibility and Expanded Plan of Action for LA-2/LA-3 Offshore Sediment Disposal Site
- U.S. Army Corps of Engineers-Field Investigation at LA-2/LA-3 Offshore Sediment Disposal Sites
- B.E.A.C.O.N. (Beach Erosion Authority for Control Operations and Nourishment)-Comprehensive Coastal Sand Management Plan Santa Barbara/Ventura County Coastline
- SANDAG (San Diego Association of Governments)- Final Design, Survey and Construction Management for the San Diego Regional Beach Sand Project
- County of Orange-Newport Harbor Patrol Headquarters Bulkhead Design
- Country of Orange- Unit III Upper Newport Bay Sediment Control and Enhancement Dredging Project
- County of Orange-Laguna Lakes Restoration
- County of Orange-Dana Point Harbor Maintenance Dredging
- County of Orange-Sunset Harbor Maintenance Dredging
- County of Orange-Constructablilty Review of Upper Newport Bay Dredging and Dredge Filling Operation for Dump Scow "Lummi Island", and Design of Low Flow (Summer) Diversion System from Aliso Creek to Sewer Line
- City of Newport Beach-Newport and Balboa Ocean Piers Rehabilitation Design

PROFESSIONAL AFFILIATIONS

- American Society of Civil Engineers
- Consulting Engineers Association of California
- American Shore and Beach Preservation Association
- California Shore and Beach Preservation Association
- California Marine Parks and Harbor Association
- Permanent International Association of Navigation Congresses
- American Nuclear Society

PROFESSIONAL RECOGNITION

- Member, Coastal Engineering Research Council
- Director, American Shore and Beach Preservation Association
- Director, World Marina Conference, Inc. that sponsored World Marina Conference, Long Beach, California, April 29 - May 2, 1991
- Chairman, American Nuclear Society Committee that developed an American National Standard on Design Basis Flooding at Power Reactor Sites
- U.S. Expert Representative on the International Atomic Energy Agency Committee for Development of an
- International Standard on Design Basis Floods for Nuclear Power Plants on Coastal Sites
- General Chairman, National Shoreline symposium, "Shoreline Forum '79", held in Los Angeles, California
- Member, ANS Committee on Site Evaluation of Power Reactor Sites

CHIA-CHI LU
SENIOR ENGINEER

EDUCATION

University of Miami/RSMAS, Ph.D., 1984
Applied Marine Physics
Cheng Kung University, Taiwan, M.S., 1977
Hydraulic Engineering

University of Miami/RSMAS, M.S., 1981
Ocean Engineering
Cheng Kung University, Taiwan, B.S., 1975
Hydraulic Engineering

REGISTRATION

California Civil Engineer, 1994, RCE 52521

EXPERTISE

Dr. Lu specializes in the fields of coastal engineering, hydraulic engineering and has extensive experience in the development of numerical simulation on related engineering problems by using various numerical techniques such as finite difference method, finite element method and boundary element method.

EXPERIENCE

Prepared a coastal process assessment for the EIR/EIS of the proposed Bolsa Chica Wetlands Restoration Project. A tidal inlet to improve the fresh and salt water exchange between the ocean and wetlands was proposed by the project design team. The potential impacts on adjacent beaches were evaluated including beach loss, alteration of nearshore wave characteristics, inlet interruption to the alongshore littoral transport, and potential sediment deposit within the wetland basins. Detailed review comments and constructive suggestions were made to the project design team for the re-analysis of the design features. Potential mitigation measures to minimize the adverse impacts were addressed.

Prepared an oceanographic assessment of a Draft EIR/EA for the BEACON beach nourishment demonstration project. The fate of the disposed dredged material as well as its potential impacts to the coastal processes was characterized via a series of comprehensive computer simulation programs developed by Water Resource Support Center, Waterways Experiment Station, and Corps of Engineers. Potential adverse impacts of nearshore wave characteristics and regional coastal processes were addressed.

Prepared a coastal engineering assessment of the draft environmental impact report (DEIR) for Treasure Island Destination Resort Community. Project impacts related to the coastal processes such as cross-shore and alongshore sediment transports were addressed. Impacts associated with removal of deteriorated coastal structures and public beach access facilities were also assessed.

Performed a numerical simulation of transformed wave patterns to characterize the nearshore wave climate within the Orange County coastal area as part of the Coast of California Storm and Tidal Waves Study. Wave Characteristics in deep water, corresponding to the categorized weather patterns, were computed and then transferred to the nearshore water areas via a spectral back-refraction transformation model. A Monte Carlo simulation technique was applied to generate a synoptic atlas of the nearshore wave climate in this region.

PROFESSIONAL AFFILIATIONS

American Society of Civil Engineering

MARK F. SUDOL, D. ENV.

Education

University of California Los Angeles, Los Angeles, CA. Doctorate in Environmental Science and Engineering, December 1996. Dissertation research involved determination of functional success (HGM) of compensatory wetland and riparian mitigation for impacts from permits issued under Section 404 of the Clean Water Act.

University of California Los Angeles, Los Angeles, CA. Master of Arts degree in Biology, March 1990. Area of specialization: Marine ecology and coastal geomorphology.

University of Rochester, Rochester, N.Y. Bachelor of Arts degree in Biology May 1980. Area of specialization: Terrestrial and aquatic ecology of eastern deciduous forests.

Employment History

Chief, Regulatory Branch U.S. Army Corps of Engineers, Los Angeles District. 1/01 to Present.

Principal Wetland Ecologist, Environmental and Regulatory Specialists, Inc. Los Angeles California. 12/99 to 1/01. Founder and Principal Wetland Ecologist.

Senior Marine Ecologist/Regulatory Specialist LEC Environmental Consultants, Massachusetts. 9/99 to 11/99.

Senior Ecologist/Regulatory Specialist Planning Consultants Research (PCR) 11/97 to 9/99. Responsible for managing the Wetlands Branch of the Biological Services Group at PCR, a private consulting firm.

Project Manager, GS-11 Biologist U.S. ACOE, Regulatory Branch, Los Angeles District 1/97 - 11/97.

Cooperative Student Trainee GS-11 Ecologist U.S. ACOE, Regulatory Branch, Los Angeles District 11/93 - 1/97.

Assistant Team Leader and Team Leader, Emergency Operations Center Los Angeles District, 6/95 to 11/97.

Cooperative Student Trainee GS-9 Ecologist U.S. ACOE, Regulatory Branch, Los Angeles District 6/92 - 11/93.

Graduate Researcher UCLA 9/88 - 8/92. Department of Biology and Environmental Science and Engineering.

Naval Flight Instructor United States Navy, Air Antisubmarine Squadron Forty-One, 1/86 - 8/88. Responsible for the development and training of anti-submarine tactics as well as NATOPS Weapons Systems Model Manager for all S-3A aircraft within the U.S. Navy.

Naval Flight Officer. U. S. Navy, Air Antisubmarine Squadron Thirty, 12/85 - 6/82. Led 120 enlisted personnel, five Chief Petty officers, and four junior officers in the maintenance and repair of squadron aircraft. Logged over 1400 flight hours and 198 carrier landings.

James M. Maloney, Associate

SWA Group

Education

Master of Landscape Architecture, 1985, Harvard University Graduate School of Design

Bachelor of Science, cum laude, 1982, Natural Resources, University of Massachusetts

Registration

Registered Landscape Architect, State of Florida, #1281

Professional Affiliations

Member, American Society of Landscape Architects (ASLA)

Member, American Planning Association (APA)

Project Experience

Mr. Maloney is a planner/landscape architect with extensive experience in planning, urban design and landscape architecture for both private and public sector clients. He is adept in managing the planning and design process while solving complex problems with innovative and implementable solutions. His portfolio includes urban design, neighborhood/downtown revitalization, planned communities, parks, campuses and landscape architecture.

Project Experience

Mr. Maloney's professional experience includes:

- University of California, San Diego School of Medicine, San Diego, California;
- Southwestern University, Georgetown, Texas;
- University of North Texas, Denton, Texas;
- East Texas State University at Texarkana, Texarkana, Texas;
- Southwest Texas State University, San Marcos, Texas;
- Stanford University Medical Center, Stanford, California;
- University of Missouri - St. Louis, St. Louis, Missouri;
- Lowry Higher Education Center, Denver, Colorado;

- Florida Atlantic University Research Park, Boca Raton, Florida;
- Fellowship of Las Colinas, Grapevine, Texas; and,
- Southside Medical District Strategic Plan, Fort Worth, Texas.

Monica Simpson, Principal

SWA

Education

Bachelor of Science, cum laude, 1980, California State Polytechnic University, Pomona, California, Landscape Architecture

Registration

Licensed Landscape Architect, State of California, #3835

Professional Affiliations

American Planning Association (APA)
American Society of Landscape Architects (ASLA)

Ms. Simpson is a landscape architect and planner in the Laguna Beach office with professional experience in large scale land planning, park and recreation planning, site planning and landscape design. Ms. Simpson's experience in physical design, site planning and landscape architectural design have given her a valuable understanding of the complexities involved in large scale land planning and project master planning.

Since joining the SWA Group, Ms. Simpson has been involved in the master planning and design for numerous projects. Ms. Simpson was an Associate in the firm's Houston office for six years and a Principal in the Washington D.C. area office for two years.

Project Experience

Ms. Simpson's professional experience includes:

- Planning and landscape design for the Shady Canyon residential project within the City of Irvine, California;
- Master planning and project management for Soka University of America in Aliso Viejo, California;
- Master planning, project management and public processing for Porta Bella, a 960-acre new community in Santa Clarita, California;
- Master planning and design for the Tejon Ranch and the I-5 corridor in Lebec, California;

Monica Simpson, Principal

- Master planning and project management for 800-acres involving seven property owners in North San Diego County, California;
- Preparation of Master Landscape Guidelines for 200 acres of redevelopment area for the Anaheim Redevelopment Agency; and
- Preparation of an Aesthetic theme and guidelines for the I-5 north corridor in Anaheim, California.

TONY BOMKAMP
SENIOR BIOLOGIST

Mr. Bomkamp is a field botanist and wetlands ecologist with an extensive background in environmental studies. As a botanist, Mr. Bomkamp has diverse field experience extending back over 20 years in all of the major vegetation communities in Southern California. He is a recognized expert in the Southern California flora and is currently President of the Orange County Chapter of the California Native Plant Society (CNPS). Mr. Bomkamp has also conducted numerous wetland delineations throughout southern California along with functions and values assessments for a number of aquatic systems in southern Orange County including Horno Creek, San Juan Creek, Trabuco Creek, Chiquita Canyon Creek, and Canada Gobernadora Creek. In addition to his duties as a biological consultant Mr. Bomkamp also serves as part-time faculty at California State University, Fullerton, for the graduate Environmental Studies Program, teaching courses on wetlands and endangered habitats.

EDUCATION

M.S., Environmental Studies, California State University, Fullerton
B.A., Biology, California State University, Fullerton

PROFESSIONAL HISTORY

Glenn Lukos Associates - Biologist/Wetlands Specialist
California State University, Fullerton - Instructor, Environmental Studies Program
Michael Brandman Associates - Botanist/Wetlands Specialist
Glenn Lukos Associates - Botanist/Regulatory Specialist
California State University, Fullerton - Graduate Assistant for Field Botany

SELECTED PROFESSIONAL EXPERIENCE

- Task manager for wetland delineation pursuant to Section 404 of the Clean Water Act and Section 1601 of the California Fish and Game Code for the 16,000-acre study area of the Foothill Transportation Corridor. Duties include performance of wetland delineation, direction of five-member wetland delineation team in performance of wetland delineation and provision of regulatory services required to obtain Section 404 and 401 permits.

- Project Biologist for Ladera Ranch. Duties include wetland delineation, Section 404 and 1603 wetland permitting, focused surveys for the coastal California gnatcatcher, Riverside fairy shrimp, San Diego fairy shrimp, and biological monitoring to ensure compliance with 404, 1603 and 4(d) authorizations.

Richard Johnston
Consultant, Visual Simulations

PROJECT TEAM RESUME

Years of Experience: 25+

Education:

The Kansas City Art Institute, Kansas City, Missouri

The Harry Fredman Studios, Kansas City, Missouri

RELEVANT EXPERIENCE:

Mr Johnston has over 25 years of varied experience in the Architectural and Engineering industries, including engineering and architectural drafting, field surveying, land planning and illustrating. This diverse knowledge enables him to understand all aspects of the Visual Analysis process. Having begun his specialization in Visual Analysis 10 years ago he as been on the leading edge of this emerging field and has pioneered some of the techniques used in the industry today. All this works together to create extremely real and accurate work projects.

Mr. Johnston began his career as a Civil Engineering Draftsman for Shaffer Cline and Warren. He was responsible for translating field data into topographic maps, loan survey drawings, subdivision and land planning, street and sewer designs and drafting under the supervision of licensed surveyors and engineers. His duties also included zoning and planning meeting presentations and renderings.

He served as a Survey Party Chief for Western Survey Company, were his responsibilities included boundary surveys, topographic and loan surveys, construction staking for streets, storm and sanitary sewers, rough and precise grading, and subdivision lot surveys.

Mr. Johnston continued his career as and Architectural Draftsman for Green and Burns Chartered. He produced working drawings for single family and multi family residential homes and commercial buildings. He also expanded his capabilities as an illustrator and freelanced these services for other architects and engineers.

In 1980 Mr. Johnston had relocated to California where he founded Threshold Designs, Inc., a new homes sales office display company. Mr. Johnston has directed Threshold Designs in the design, fabrication and installation of displays, furnishing and signs for such southern California builders as Standard Pacific, Bren, Fieldstone, Lusk, watt Industries, Bramalea, and California Pacific Homes to name a few.

He presided as president of Threshold Designs until 1992 when he began shifting the focus of the company to full time digital imaging. He ultimately changed the name of the company to Digital Preview to more closely identify with the visual analysis consulting he preforms today.

RBF CONSULTING

SCOTT A. JENKINS

EDUCATION

Ph. D., Physical Oceanography, Scripps Institution of Oceanography, 1980
B. S., Chemistry/Physics, Yale University, 1972

PROFESSIONAL SUMMARY

Dr. Scott A. Jenkins has held positions as research oceanographer, lecturer, research engineer, and senior engineer at Scripps Institution of Oceanography. He has conducted research in nearshore physical oceanography and coastal engineering with experience in both field measurements, experimental design, and theoretical modeling. Dr. Jenkins has worked on a broad range of problems in coastal processes, including estuarine and littoral sediment transport, beach and shoreline erosion, wave/structure interaction, hydrodynamic and hydraulic modeling of estuarine and harbor circulation, pollution dispersion modeling, climate effects on watershed sediment yield, and the development of sedimentation control techniques. He has also taught graduate level courses in Coastal Processes and the Physics of Sediment Transport.

EXPERIENCE

Dr. Jenkins began his research and engineering career as a Principal Investigator of a series of field measurement programs for the Office of Naval Research and the Naval Facilities Engineering Command, investigating sedimentation and circulation in strategic U. S. Navy harbors and waterways. He developed a number of novel approaches for controlling sedimentation which have earned four United States patent, the 1985 Inventor of the Year Award from the Patent Law Association, and the 1988 Best Special Projects Award from the American Council of Consulting Engineers for the design of the $3 million Grays Harbor Jet Array System. Dr. Jenkins has published 54 research and engineering papers and received over $5.5 million in research grants. Dr. Jenkins has provided consulting services in coastal processes, hydrodynamic modeling, and field monitoring to 22 clients in government and industry. These clients include federal, state and local government agencies, port authorities, engineering firms, energy companies and real estate developers. He has provided technical studies for EIR/EIS preparation and has worked with resource agencies including: U.S. Fish and Wildlife Service, U.S. Army Corps of Engineers, National Marine Fisheries Service, California Coastal Commission, California Department of Fish and Game, California Department of Transportation, California Department of Boating and Waterways, California State Lands Commission, and a number of the Regional Water Quality Control Boards of the State of California. Dr. Jenkins recently was on the team of consultants which secured full permitting for the Newport Coast Planned Community of The Irvine Company.