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PUBLIC

Volume 3; Part 1 of 2

January 26, 2004

The Honorable Magalie R. Salas
Secretary
Federal Energy Regulatory Commission
888 First Street N.E.
Washington, D.C. 20426

Re: Sound Energy Solutions, Application for Authority To Site, Construct, And Operate LNG Import Terminal Facilities, Docket No. CP04 58 -000

Dear Ms. Salas:

Enclosed for filing pursuant to Section 3 of the Natural Gas Act and Part 153 of the Commission's Regulations thereunder, is an "Application for Authority to Site, Construct, and Operate LNG Import Terminal Facilities" ("Application") by Sound Energy Solutions ("SES").

SES respectfully requests that the Commission issue a final order granting SES all necessary authorizations by October 20, 2004.

The Application consists of the following 10 volumes and additional material:

- Transmittal letter, Application, Form of Notice, and Exhibits A, B, and C required by Section 153.8(a)(1), (2) and (3) of the Commission's regulations, 18 C.F.R. § 153.8(a)(1), (2) and (3). **(PUBLIC)**;

- Volume I (Environmental Report – Resource Report Numbers 1, 2, 3, 4, and 5 and Appendices) **(PUBLIC)**;

- Volume II (Environmental Report – Resource Report Number 6 and Appendices) **(PUBLIC)**;
- Volume III (Environmental Report – Resource Report Numbers 7, 8, 9, 10 and 11 and applicable Appendices for Resource Report Numbers 7, 8, 9, 10 and 11) **(PUBLIC)**;
- Volume IV (Environmental Report – Resource Report Number 9-Appendices only) **(PUBLIC)**;
- Volume V (Environmental Report – Resource Report Numbers 1, 4, 5, 6, 8, 9, 10, and 11) **(NON-INTERNET PUBLIC)**;
- Volume VI (Environmental Report – Resource Report Number 13, Appendix 13-1 Drawings) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume VII (Environmental Report – Resource Report Number 13, Appendix 13-2, Specifications and Data Sheets) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume VIII (Environmental Report – Resource Report Number 13, Appendix 13-3.1, Manufacturer Data) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume IX (Environmental Report – Resource Report Number 13, Appendix 13.3-2, Manufacturer Data) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Volume X (Environmental Report – Resource Report Number 13, Appendices 13.4.1, and 13.4.2 Dispersion, Release, and Threat Analyses) **(CRITICAL ENERGY INFRASTRUCTURE INFORMATION)**;
- Envelope (Environmental Report Resource Report Number 4, Cultural Resource Figures) **(PRIVILEGED AND CONFIDENTIAL)**

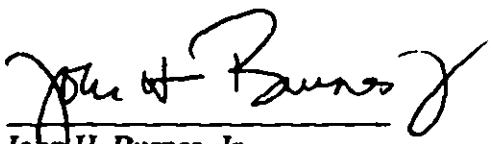
Pursuant to Rule 388.112 of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 388.112, SES submits an original and seven (7) copies of the Transmittal letter and the body of the Application, including Exhibits A, B, and C; and Volumes Nos. I. II, III, and IV, each of which has been marked **PUBLIC**. SES is also submitting an original and seven (7) copies of Volume No. V which is marked **NON-INTERNET PUBLIC**. Volume Nos. VI, VII, VIII, IX, and X contain information which is sensitive, protected critical energy infrastructure information ("CEII") as defined in 18 C.F.R. § 388.113(c). Accordingly, SES is filing an original and two (2) copies of Volume Nos.

VI, VII, VIII, IX, and X, each of which is marked in bold print **CONTAINS CRITICAL ENERGY INFRASTRUCTURE INFORMATION – DO NOT RELEASE**. Finally, SES is submitting a separate envelope which contains location, character, and ownership information about cultural resources. The envelope is marked in bold print, **"CONTAINS PRIVILEGED AND CONFIDENTIAL INFORMATION – DO NOT RELEASE"**.

SES is also submitting one Compact Disc containing Volumes I-V, labeled "FERC Application, Resource Reports 1 through 12"; Two Separate Compact Discs are provided containing the body of the Application and a Form of Notice suitable for the Federal Register, and are labeled "FERC Application" and "Form of Notice", respectively. All Compact Discs are formatted in MS Word.

In accordance with Rule 2011(c)(5) of the Commission's Rules of Practice and Procedure, 18 C.F.R. § 385.2011(c)(5), the undersigned states that the paper copies of this filing contain the same information as the electronic medium, and that, to the best of his information, knowledge, and belief, the contents as stated in the paper copies and the electronic medium are true.

Respectfully submitted,



John H. Burnes, Jr.
Attorney for
Sound Energy Solutions

cc: Michael Boyle – 1 copy of Volumes I-X, Application, and Cultural Resources
Confidential Material
3 copies of Volumes VI-X

Sound Energy Solutions

Long Beach LNG Import Project

Resource Report 7 – Soils

FERC Requirements:	Addressed in:
List, by milepost, the soil associations that would be crossed and describe the erosion potential, fertility, and drainage characteristics of each association.	Sections 7.1 and 7.2
If an aboveground facility site is greater than 5 acres: (i) list the soil series within the property and the percentage of the property comprised of each series; (ii) list the percentage of each series which would be permanently disturbed (iii) describe the characteristics of each soil series; and (iv) indicated which are classified as prime or unique farmland by the the U.S. Department of Agriculture, Natural Resources Conservation Service.	Section 7.1
Identify, by milepost, potential impact from: soil erosion due to water, wind, or loss of vegetation; and soil compaction and damage to soil structure resulting from movement of construction vehicles; wet soils and soils with poor drainage that are especially prone to structural damage, damage to drainage tile systems due to movement of construction vehicles and trenching activities, and interference with the operation of agricultural equipment due to the probability of large stones or blasted rock occurring on or near the surface as a result of construction.	Section 7.2
Identify, by milepost, cropland and residential areas where loss of soil fertility due to to trenching and backfilling could occur.	NA; Section 7.1
Describe proposed mitigation measures to reduce the potential for adverse impact to soils or agricultural productivity. Compare proposed mitigation measures with the staff's current "Upland Erosion Control, Revegetation, and Maintenance Plan" which is available from the Commission Internet home page or from the Commission staff, and explain how proposed mitigation measures provide equivalent or greater protections to the environment.	Section 7.1; Appendix H of SWPPP

CEQA Requirements:	Addressed in:
Would the project result in substantial soil erosion or the loss of topsoil?	Section 7.1
Would the project 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?	Section 7.2
Would the project 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?	Section 7.1
Would the project 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?	NA ; Section 7.1

RESOURCE REPORT 7
SOILS
CONTENTS

ACRONYMS

CDMG	California Division of Mines and Geology, now California Geological Survey
DTSC	Department of Toxic Substances
ECD	Environmental Compliance Department
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
EPP	Environment Protection Plan
FERC	Federal Energy Regulatory Commission
IR	Installation Remediation
LNG	Liquefied Natural Gas
Plan	Upland Erosion Control, Revegetation, and Maintenance Plan
POLB or Port	Port of Long Beach
SES	Sound Energy Solutions
SoCal Edison	Southern California Edison
SoCal Gas	Southern California Gas Company
SWPPP	Storm Water Pollution Prevention Plan
UST	Underground Storage Tank

RESOURCE REPORT 7
SOILS

7 INTRODUCTION

Sound Energy Solutions (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

Purpose of Report

The purpose of this report is to describe the existing soil resources and conditions at the LNG terminal site and along the proposed pipeline route and to assess the potential impacts to soil resources resulting from construction and operation of the proposed project.

Agency Communications

No specific meetings have been held with soil resource agencies due to the highly industrial characteristics of the LNG terminal site and pipeline route.

Report Organization

The report is organized in four sections. Section 7.1 discusses soil types known to be present beneath the site and routes for the send-out pipeline and electric distribution line. Sections 7.2 and 7.3 address soil limitations and potential environmental consequences of proposed construction with respect to site soils. Section 7.4 is a list of reference sources used to prepare this report.

7.1 SOIL TYPES

The surface of the site is covered by asphalt, concrete, and an existing building (Building 303). Subsurface conditions were observed and interpreted during a site investigation conducted by URS Corporation (URS) in June 2003 (Appendix 6-1 of Resource Report 6, URS, 2003b). The pipeline route crosses areas of deep fill, beneath a ship channel (Cerritos Channel), then across an industrialized area to the existing SoCal Gas pipeline. There are no hydric soils or prime farmland soils on the site, nor along the pipeline route.

Most of Terminal Island, on which the LNG terminal site is located, was man-made during the various reclamation projects since the early 1900s. Most of the early fill was placed by hydraulic methods. Fills placed after a period of subsidence from oil field operations in the 1940s and 1950s consisted predominantly of land-based materials placed by mechanical methods. As a result, the artificial fills are highly variable, ranging from loose sands to soft, compressible silts and clays with varying degrees of in-situ strength.

Fill soils were encountered in all borings, ranging in thickness from 45 to 55 feet. The fills consist of loose to medium dense sands and silty sands with interbedded layers of sandy silts, plastic silts, clayey silts, and silty clays. In the southern portion of the site, the upper 20 to 25 feet of fill materials are predominantly fine-grained, consisting of sandy to clayey silts and silty clay, some of which are of very soft to soft consistency. Shallow fill soils in the northern portion of the site consist predominantly of sands and silty sands, which are loose to medium dense. Below a depth of about 25 feet, the fill material beneath the entire site area consists of loose to medium dense sands and silty sands, with layers of medium stiff to stiff clays and silts (URS, 2003b).

Estuarine deposits, consisting of soft to stiff clayey silts, elastic silts, and silty clays with interbedded layers of loose to medium dense silty sands and sandy silts, were encountered below the fill materials between about 50 to 100 feet below present ground surface. Marine sands and ancient stream deposits were encountered at greater depths.

Except for the northerly 0.2 mile of the pipeline route, soil types are similar to those beneath the LNG terminal site. The northernmost 0.2 mile of the pipeline route has been mapped as Holocene alluvium, consisting of soft clay, silt, silty sand and sand of distal fan deposits associated with the active Los Angeles River system (CDMG, 1998).

7.2 SOIL LIMITATIONS

Soils at the terminal site were evaluated for limitations that could affect construction and operation. According to the Maps of Seismic Hazard Zones prepared by the California Geological Survey, formerly known as the Division of Mines and Geology (CDMG), the Project site is located within a liquefaction hazard zone (CDMG, 1998).

Liquefaction is a phenomenon whereby saturated granular soils undergo significant loss of strength when they are subjected to cyclic ground motions produced by earthquakes. The combination of high seismicity, shallow groundwater conditions and weak hydraulic fills with predominantly sandy and silty soils beneath the site results in a significant potential for liquefaction. Liquefaction-induced hazards at the site include the possibility of large differential settlements, shaking-induced lateral deformations and potential instability of the existing waterfront structures (URS, 2003b).

URS's analyses show that loose to medium dense granular materials in the upper 65 feet below groundwater, i.e. up to 80 feet below ground surface, tend to liquefy during strong earthquake shaking. This includes granular layers in the fill materials and estuarine deposits. URS's evaluation also indicates that post-earthquake settlements at the site could range from 7 to 25 inches (URS, 2003b). Design of the Project facilities will incorporate measures to (1) mitigate liquefaction potential through soil improvement or accommodate it with piles, and (2) meet the stringent static-settlement criteria for the proposed LNG tanks and other major structures (URS, 2003a; URS, 2003b).

Because soil and groundwater conditions beneath the pipeline and electric distribution line route are expected to be similar to those beneath the LNG terminal site, the potential effects of liquefaction will also be incorporated into the design of the pipeline.

There may be areas of soil contamination that underlie the terminal footprint and underlie the pipeline route and electrical distribution line route. Because the area was used for petroleum production for decades, and because the area was also previously a Naval Shipyard, there are multiple sources for possible contamination. Petroleum contamination may be encountered in any location on Pier T (Houston 2003).

The northeast corner of the terminal footprint overlies Installation Remediation (IR) site 13, previously a hazardous waste tank farm when part of the Naval Shipyard (Navy 1998). IR site

12, a sandblast grit disposal area, lies to the north and east of the proposed construction area and will not be affected by construction or operation of the Project. IR site 11, just to the north of the terminal footprint, will underlie the pipeline construction. IR sites 11 and 13 are listed with the recommendation of no further action for soil contamination in the 1998 EIS/EIR for the Disposal and Reuse of the Long Beach Complex (Navy 1998, page 3-79). The current regulatory status for IR 11, 12, and 13 is a recommendation of "institutional controls." The institutional controls that will be recommended are land use restrictions (commercial and industrial uses only) that will run with the land. The Navy will soon be preparing a Proposed Plan for these sites to that effect. No "active" remediation is planned. However, if the POLB or its assigns excavate hazardous substances, such as contaminated soil, thereby turning the soil into a hazardous waste, the material will need to be disposed appropriately and the Navy is not obligated to pay for it. There will be notification requirements to the Department of Toxic Substance Control (DTSC) as well, in that case (Houston 2004).

A underground storage tank (UST) was located in the southwest corner of the pier (Navy 1998). According to the POLB, the Navy removed the tank and cleaned up the site (Houston 2003).

Pier T does not fall within a DTSC-defined Border Zone of a Contaminated Property. Institutional controls, as mentioned above, provide substantially similar controls over present and future land uses as would a Land Use Covenant under DTSC regulations pertaining to Border Properties.

A search of available environmental records was conducted by Environmental Data Resources, Inc. to identify hazardous sites that have been reported within 500 feet of the pipeline route. These sites are listed in Table 8-1, Resource Report 8. None of the sites will be crossed by the pipeline or associated work areas, and none are within 100 feet of the construction work area.

7.3 ENVIRONMENTAL CONSEQUENCES

The Project's Storm Water Pollution Prevention Plan (SWPPP) (see Resource Report 2) incorporates measures for erosion and sediment control that will reduce construction-related impacts to soils to less than significant. Appendix H in the SWPPP is the Sediment Control Plan, which details the provisions of the Federal Energy Regulatory Commission (FERC) staff's current *Upland Erosion Control, Revegetation, and Maintenance Plan (Plan)* and explains how SES's proposed mitigation measures would provide equivalent or greater protection to the

environment. For the provisions that SES considers unnecessary, technically infeasible, or unsuitable due to local conditions, please see Table H-1 in Appendix H of the SWPPP.

Geotechnical analysis has indicated that, without soil improvements, the upper 65 feet of loose to medium dense granular material below groundwater could liquefy during strong earthquake shaking with estimated post-earthquake settlements of as much 25 inches. SES will incorporate into the design of the LNG-related facilities measures to avoid liquefaction-induced damage and to meet the stringent static-settlement criteria for the LNG tanks and other major structures (URS, 2003b). See also Resource Report 6 for further discussion of liquefaction.

7.3.1 Potential Soil Contamination

Because contamination may be encountered, The construction contractor for the SES facilities and the pipeline construction contractor will submit workplans outlining appropriate environmental site investigation and remediation activities to the appropriate regulatory agencies for approval prior to construction activities. The workplan(s) will include a Site-Specific Health and Safety Plan, a Sampling Analysis Plan, Project Contractor Quality Control Plan, and an Environment Protection Plan (EPP) that includes a Waste Management Plan as an Appendix. The EPP will identify all regulatory oversight agencies and their permit authorities including but not limited to the Los Angeles Regional Water Quality Control Board, the DTSC, California Department of Fish and Game, United States Army Corps of Engineers, South Coast Air Quality Management District, and United States Environmental Protection Agency.

If contamination is found, SES affirms its intent as demonstrated in the 2003 Letter of Intent for development of project facilities with the POLB (Appendix 1-2 of Resource Report 1). As stated in that Letter, SES is responsible for working together with POLB to agree on reasonable procedures and methods for remediation efforts. The letter states, "If SES encounters preexisting hazardous substances during construction of the Project, SES will promptly notify POLB. SES, in consultation with POLB, will comply with all applicable environmental statues and regulations." The letter goes on to set financial limits on SES responsibility for remediation, but specifies that the actual remediation will completed by SES.

7.3.2 Worker Safety

Contaminated soils may be encountered during construction. Based on a review of prior environmental assessment, investigation and remediation documents, a Site Specific Health

and Safety Plan (H&S Plan) will be developed for all construction activities to be conducted by SES and pipeline contractors to address potential contaminant exposure concerns applicable to site employees and adjacent ecological receptors. If field conditions change, SES and pipeline contractors may implement equivalent or additional health and safety procedures and practices. If unanticipated hazardous material or contaminated soils are encountered during construction, SES personnel, contractors, and inspectors will follow these steps.

1. Stop work and leave the contaminated area. Leave contaminated equipment and materials within the contaminated area.
2. Notify the Chief Inspector of the contamination.
3. The Chief Inspector will ensure that the area is marked or roped to warn workers to stay clear. The Chief Inspector will also caution workers to avoid downwind locations if there is a potential for hazardous materials to migrate. In certain situations, the Chief Inspector may direct workers to clean and move equipment from the contaminated area.
4. The Chief Inspector will immediately notify the following personnel:
    a. Construction management; and
    b. Environmental/Safety Coordinators.
5. The Chief Inspector will inform Company personnel, contractors, and inspectors when and how they may safely re-enter the contaminated area based on instructions from:
    a. Environmental Compliance Department (ECD);
    b. Environmental Safety Coordinators; and
    c. Construction Management.
6. The Environmental Safety Coordinators will perform the following:
    a. Provide information on required personal protective equipment and safety precautions;
    b. Make required state notifications;
    c. Work with ECD to determine the type of contamination;
    d. Obtain Material Safety Data Sheets or other documentation describing worker safety requirements;
    e. Arrange for a hazardous waste contractor to sample the contamination, as necessary;
    f. Notify the Chief Inspector and Construction Management of sampling results;
    g. Interpret the sample results to determine waste disposal requirements;
    h. Coordinate the waste disposal effort with ECD as described in SES' Spill Prevention and Response Procedure;

i. Communicate safety concerns to the Chief Inspector and Construction Management and ensure that the Chief Inspector informs Company personnel, contractors, and inspectors of any hazards and worker safety requirements.

7. Construction Management will coordinate the activities of all parties to rectify the situation safely and quickly.

7.4 REFERENCES

CDMG See California Division of Mines and Geology

URCDMG, 1998, Seismic Hazard Evaluation of the Long Beach 7.5-Minute Quadrangle, Los Angeles County, California, Calif. Div. Mines Geol. Open-File Report 98-19.

Houston, Christine. 2003. Port of Long Beach Environmental Remediation Specialist. Personal Communication (e-mail) with P. Eckert, SES contractor, November 20, 2003.

Houston, Christine. 2004. Port of Long Beach Environmental Remediation Specialist. Personal Communication, (e-mail) with P. Eckert, SES contractor, January 9, 2004.

Navy, Department of. 1998. Final Environmental Impact Statement (EIS)/ Environmental Impact Report (EIR) for the Disposal and Reuse of the Long Beach Complex, Long Beach, California.

URS, 2003a. Seismic Hazard Analysis for LNG Terminal, Port of Long Beach, California. September 10, 2003. Appendix 6-2 of Resource Report 6.

URS, 2003b. Geotechnical Report Proposed LNG Terminal Development Pier Echo, Terminal Island, Port of Long Beach, California. September 15, 2003. Appendix 6-1 of Resource Report 6.

SOUND ENERGY SOLUTIONS
Long Beach LNG Import Project
RESOURCE REPORT 8
LAND USE, RECREATION, AND AESTHETICS

FERC Requirement	Addressed in
Describe the existing uses of land on, and (where specified) within 0.25 mile of, the proposed project and changes to those land uses that would occur if the project is approved. The report shall discuss proposed mitigation measures, including protection and enhancement of existing land use. Resource Report 8 must: 1) Describe the width and acreage requirements of all construction and permanent rights-of-way and the acreage required for each proposed plant and operational site, including injection or withdrawal wells; (i) list, by milepost, locations where the proposed right-of-way would be adjacent to existing rights-of-way of any kind; (ii) identify, preferably by diagrams, existing rights-of-way that would be used for a portion of the construction or operational right-of-way, the overlap and how much additional width would be required (iii) iIdentify the total amount of land to be purchased or leased for each aboveground facility, the amount of land that would be disturbed for construction and operation of the facility, and the use of remaining land not required for project operation (iv) identify the size of typical staging areas and expanded work areas, such as those at railroad, road, and waterbody crossings, and the size and location of all pipe storage yards and access roads. (§ 380.12(j)(1))	Section 8.1
Identify, by milepost, the existing use of lands crossed by the proposed pipeline, on or adjacent to each proposed plant and operational site. (§ 380.12(j)(2))	Section 8.1.3
Describe planned development on land crossed or within 0.25 mile, the time frame (if available) for such development, and proposed coordination to minimize impacts on land use. Planned development means development which is included in a master plan or is on file with the local planning board or the county. (§ 380.12(j)(3))	Section 8.2
Identify, by milepost and length of crossing, the area of direct effect of each proposed facility and operational site on sugar maple lands, orchards and nurseries, landfills, operating mines, hazardous waste sites, state wild and scenic rivers, state or local designated trails, nature preserves, game management areas, remnant prairie, old-growth forest, national or state forests, parks, golf courses, designated natural, recreational or scenic areas, or registered cultural landmarks, Native American religious sites and traditional cultural properties to the extent they are known to the public at large, and reservations, lands identified under the Special Area Management Plan of the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, and lands owned or controlled by Federal or state agencies or private preservation groups. Also identify if any of those areas are within 0.25 mile of the proposed facility. (§ 380.12(j)(4))	Sections 8.1, 8.4
Identify, by milepost, all residences and buildings within 50 feet of the proposed pipeline construction right-of-way and the distance of the residence or building from the right-of-way. Provide survey drawings or alignment sheets to illustrate the location of the facilities in relation to the buildings. (§ 380.12(j)(5))	Not Applicable

FERC Requirement	Addressed in
Describe any areas crossed by or within 0.25 mile of the proposed pipeline or plant and operational sites which are included in, or are designated for study for inclusion in: The National Wild and Scenic Rivers System (16 U.S.C. 1271); The National Trails System (16 U.S.C. 1241); or a wilderness area designated under the Wilderness Act (16 U.S.C. 1132). (§ 380.12(j)(6))	Not Applicable
For facilities within a designated coastal zone management area, provide a consistency determination or evidence that the applicant has requested a consistency determination from the state's coastal zone management program. (§ 380.12(j)(7))	Section 8.3
Describe the impact the project will have on present uses of the affected area as identified above, including commercial uses, mineral resources, recreational areas, public health and safety, and the aesthetic value of the land and its features. Describe any temporary or permanent restrictions on land use resulting from the project. (§ 380.12(j)(8))	Section 8.1, 8.2, 8.4, 8.5
Describe mitigation measures intended for all special use areas identified under paragraphs (j) (2) through (6) of this section. (§ 380.12(j)(9))	Not Applicable
Describe proposed typical mitigation measures for each residence that is within 50 feet of the edge of the pipeline construction right-of-way, as well as any proposed residence-specific mitigation. Describe how residential property, including for example, fences, driveways, stone walls, sidewalks, water supply, and septic systems, would be restored. Describe compensation plans for temporary and permanent rights-of-way and the eminent domain process for the affected areas. (§ 380.12(j)(10))	Not Applicable
Describe measures proposed to mitigate the aesthetic impact of the facilities especially for aboveground facilities such as compressor or meter stations. (§ 380.12(j)(11))	Section 8.5
Demonstrate that applications for rights-of-way or other proposed land use have been filed or soon will be filed with Federal land-management agencies with jurisdiction over land that would be affected by the project. (§ 380.12(j)(12))	Not Applicable

CEQA Requirements	Addressed in:
Would the project have a substantial adverse effect on a scenic vista?	Section 8.5
Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	Not Applicable
Would the project substantially degrade the existing visual character or quality of the site and its surroundings?	Section 8.5
Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	Section 8.5
Would the project 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?	Not Applicable
Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?	Not Applicable

CEQA Requirements	Addressed in:
Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	Not Applicable
Would the project 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?	Not Applicable
Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	Not Applicable
Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	Resource Report 11
Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	Not Applicable
Would the project 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?	Section 8.1
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?	Not Applicable
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?	Not Applicable
Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	Section 8.2
Would the project physically divide an established community?	Section 8.1
Would the project conflict with any 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?	Sections 8.2 and 8.3
Would the project conflict with any applicable habitat conservation plan or natural community conservation plan?	Section 8.2
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?	Section 8.4
Would the project include recreational facilities or require the construction or expansion of recreational facilities, which might have an adverse physical effect on the environment?	Section 8.4

RESOURCE REPORT 8

LAND USE

CONTENTS

ACRONYMS

CCA	California Coastal Act
Coastal Commission	California Coastal Commission
CZMA	Coastal Zone Management Act
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FERC	Federal Energy Regulatory Commission
Hanjin	Hanjin Shipping Company
HDD	horizontal directional drill
IP District	Port-Related Industrial District
kV	kilovolt
LNG	liquified natural gas
MP	milepost
NFPA	National Fire Protection Association
PD District	Port-Related Planned Development District
PMP	Port Master Plan
POLA	Port of Los Angeles
POLB or Port	Port of Long Beach
Project	Long Beach LNG Import Project
RCPG	Regional Comprehensive Plan and Guide
ROW	right-of-way
SCAG	Southern California Association of Governments
SERRF	Southeast Resource Recovery Facility
SES	Sound Energy Solutions
SoCal Edison	Southern California Edison
SoCal Gas	Southern California Gas Company
USCG	United State Coast Guard

RESOURCE REPORT 8

LAND USE, RECREATION, AND AESTHETICS

8 INTRODUCTION

Sound Energy Solutions (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

Purpose of Report

This report describes the land use environment in the vicinity of the LNG terminal and send-out pipeline route and to assess the potential land use impacts resulting from construction and operation of the Project. Other related topics addressed in this report include residential, recreational and other special land uses and visual resources.

Agency Communications

Agency contacts made in the preparation of this report included visits to the POLB, the Cities of Long Beach and Los Angeles, and telephone conversations with agency representatives concerning planning, development and zoning. Additional sources of information included various agency websites, as listed in the References Section of this report.

Report Organization

This report is organized into six sections. Section 8.1 addresses land use. Section 8.2 addresses existing land use plans, master plans, and zoning and zoning policies and ordinances. Section 8.3 describes the coastal zone policies in California and the Project's consistency with those policies. Section 8.4 identifies and describes recreational and other special uses in the Project vicinity. Section 8.5 describes the existing visual environment in the Project area, sensitive areas with views of the Project site, and potential impacts that may result from construction and operation of the Project. Section 8.6 includes a list of references used in preparing this report.

8.1 LAND USE

The Project is in a highly urbanized area of Los Angeles County, California. All of the land and marine uses immediately adjacent to the LNG terminal site are associated with the industrial activities of the Port of Long Beach and the adjacent Port of Los Angeles. Generalized land uses within 2 miles of the LNG terminal site are a mix of industrial and commercial interspersed with high density residential northwest and northeast of the site in the Cities of Los Angeles and Long Beach, respectively. The nearest residences are in a recreational vehicle park approximately 1.5 miles to the east-northeast, and possibly in live-aboard boats at marinas in the Cerritos Channel of the East Basin approximately 1.3 to 1.5 miles to the northwest. Figure 8-1 shows generalized existing land uses within 2 miles of the Project.

8.1.1 LNG Terminal Site

The LNG terminal site is located adjacent to Berth 126 on Pier T East within the Terminal Island Planning District of the POLB (see Figure 8-2). The site occupies 25 acres of Pier T that comprises a total of approximately 288 acres of land within the boundaries of the Port.

Pier T East is within the former United States Naval Complex, which included the Long Beach Naval Station, Naval Mole, and Naval Shipyard. The Naval Station and Naval Mole were closed in September 1994; the Naval Shipyard was closed about 3 years later. The site is paved with concrete and/or asphalt, and includes an abandoned building (Building 303) that has been used in recent years by the POLB to house firefighting equipment and for other miscellaneous uses. The building and the concrete/asphalt will be demolished and removed by the POLB before construction of the LNG terminal and the fire equipment will be moved to a new fire station on

the west side of the Terminal Island Freeway/Highway 103. The demolition activities were analyzed as part of the final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) prepared for the closing of the Long Beach Naval Shipyard under the Base Realignment and Closure review.[1]

Surrounding land uses on Pier T include the containerized cargo facility of Hanjin Shipping Company (Hanjin) to the west. To the east of the site are the liquid bulk facility of BP ARCO (crude oil and petroleum products), the break bulk facilities of Pacific Coast Recycling Company (metal and steel recycling), and Fremont Forest Group Corporation and Weyerhauser Company (lumber and lumber products). Of these, the largest facility is that of Hanjin that occupies most of Pier T along Ocean Boulevard.

Terminal Island is a man-made island that has been constructed and expanded over the years during various reclamation projects that have taken place since the early 1900s. The site is composed entirely of fill soils that range in thickness from 45 to 55 feet.

Construction of the LNG terminal will take a maximum of approximately 47 months and will require the entire 25-acre site.

The POLB will dredge the berth to a depth of approximately 50 feet mean-lower-low-water. This will require removal and disposal of between 75,000 and 125,000 cubic yards of sediment material and will affect approximately 5.3 acres of water based on dredging an area 1,150 feet long by 200 feet wide. Approximately 3.4 acres of open water would be affected periodically (*e.g.*, during unloading) by operation of the Project assuming a LNG ship that is approximately 950 feet long by 158 feet wide for a typical 145,000 m^3 LNG ship.

8.1.2 LNG Terminal Temporary Laydown Area

Although the 25-acre LNG site is adequate for the operation of the facility, it is not entirely adequate for temporary storage of materials and equipment. Several assumptions were used to determine the land requirements needed for an additional temporary laydown area during construction. First, local concrete suppliers were surveyed to determine their ability to furnish

[1] Final Environmental Impact Statement/Final Environmental Impact Report for the Disposal and Reuse of Long Beach Complex, Long Beach, California. April 1998.

the required concrete quantities from existing nearby ready-mix batching plant locations versus establishing a concrete batch plant in the vicinity of the LNG terminal site. The survey confirmed that the local concrete supply companies can furnish the required concrete volumes and that no separate concrete batch plant will be required near the LNG terminal site. Second, it was assumed that materials and equipment will be stored at the vendor sites until needed, and will be brought into the laydown area just before being moved onto the LNG terminal site.

Based on a preliminary analysis conducted in August 2003, an approximate 16-acre laydown area was identified on the north side of Ocean Boulevard, approximately 1 mile northwest of the LNG terminal site (see Figure 8-2). This laydown area has been used for container storage in the past and is clear of vegetation and graveled. It is fenced along Ocean Boulevard and open along the rail spur on the north border that extends to the LNG terminal site. Although this laydown area is located within the City of Los Angeles, the parcel is owned by the POLB and is currently available for use. If this site is not available at the time that construction of the LNG terminal begins, SES will negotiate with the POLB for another similarly-sized site within the Port of Long Beach.

In addition to the temporary laydown area, construction materials will also be shipped by barge to the LNG terminal site. An estimated 4 to 6 barges with these materials will be moored at Berths 123 to 127 (south and west of the terminal site) at various times during construction of the LNG tanks. The barges will affect approximately 4 acres of water and provide approximately 4 acres of storage. Berth 122 is on the east side of Pier T East in the East Basin and will not be affected by either construction or operation of the Project. There are no berths on the south side of Pier T in the West Basin, although the POLB master plan includes plans for Berths 123 and 124 in this area. Berth 123 will be east of Berth 124, and Berth 124 will be directly south of site. Following its use during construction, future use of Berth 123 for other purposes will not be affected during operation of the Project since all ship traffic in the Port is under pilot and tug control at all times.

The majority of the construction workforce (estimated at approximately 1,036 workers at the peak month of the construction period) will be bused in from remote parking areas, outside of the Port of Long Beach, in locations identified by the craft unions and designated for such

activities. It is anticipated that one or two locations would be used totaling approximately 10 acres.

8.1.3 Send-Out Pipeline

The associated send-out pipeline is approximately 2.3 miles in length and extends north from the LNG terminal site, across the Cerritos Channel, to the interconnection with SoCal Gas. A total of approximately 1.6 miles of the pipeline lie within the POLB (0.9 mile in the Terminal Island Planning District and 0.7 mile in the Northwest Harbor Planning District). The remaining 0.7 mile is under the jurisdiction of the POLB, but within the boundaries of the City of Los Angeles. The entire route for the pipeline is within heavily disturbed, industrialized areas of the Port of Long Beach. All but two parcels of the land crossed by the pipeline is owned by the POLB and leased to tenants. The two parcels that are privately owned are listed below:

- Approximately 1,000 feet within the Long Beach Generating Station (formerly the Edison Power Station); and
- Approximately 2,400 feet lies within or adjacent to SoCal Edison's power transmission line right-of-way (ROW).

A search of available environmental records was conducted by Environmental Data Resources, Inc. to identify hazardous sites that have been reported within 500 feet of the pipeline route. These sites are listed in Table 8-1. None of the sites will be crossed by the pipeline or associated work areas, and none are within 100 feet of the construction work area. However, there may be areas of soil contamination because the pipeline will cross areas that have been historically used for decades for petroleum production and for naval shipyard activities. If unanticipated hazardous material or contaminated soils are encountered during construction, SES personnel, contractors, and inspectors will follow the procedures outlined in Section 7.3 of Resource Report 7. These procedures include: 1) stopping work and leaving contaminated equipment and materials within the contaminated area, 2) notifying appropriate SES personnel of the contamination, 3) marking off the contaminated area to prevent others from entering, 4) making the appropriate state notifications, 5) determining the type of contamination, and 6) arranging for cleanup and disposal before construction activities continue.

Table 8-1 Listed Hazardous Sites within 500 feet of the Send-Out Pipeline

Site No	Location	Database(s)	Chemical	Comments
G35, Sites 1, 2	Long Beach Naval Shipyard	Notify 65		
C14, Site 1	Long Beach Generating Station, 2665 Seaside	Cortese		Reg by: Leaking Underground Storage Tanks (LUST)
C14, Site 2	Long Beach Generating Station, 2665 Seaside	LUST, CHMIRS	Gasoline	
C14, Site 3	Long Beach Pumping & Heating FAC, 2665 W Seaside	CHMIRS, HIST, UST	Hydrocanone	
C14, Site 4	Long Beach Pumping & Heating FAC, 2665 W Seaside	CHMIRS	Unknown product	
C14, Site 5	2665 W Seaside	CHMIRS, EMI	Sodium hydroxide	
C14, Site 6	2665 W Seaside	CHMIRS	Crude oil	
C14, Site 7	2665 W Seaside	CHMIRS, EMI	Sodium Hydroxide	
C14, Site 8	2665 W Seaside	CHMIRS	Crude Oil	
B12, Site 1	2600 Seaside Blvd	CHMIRS	Diesel	
B12, Site 1	US Navy Naval Station Long Beach	CERLIS, RCRIS-SQG, ROD		CERCLIS Classification Data: No site assessment work needed
1	1930 Edison Way	UST		1 tank; no test reported
4	2410 Pier B Street	CHMIRS	Crude oil	
41	Waterman Supply Co., Inc., 2821 East Anaheim Street	CERCLIS, FINDS		CERCLIS Assessment History: Discovery
H42	Apple Auto Dismantling, 2701 E. Anaheim Street	CERCLIS, FINDS		CERCLIS Assessment History: Discovery
P92, Site 1	ACTA South – Chico Auto Wrecking Facility, 914 Farragut	CA SLIC		Post Remediation Monitoring
P92, Site 2	Chico's Auto Wrecking	CERCLIS, FINDS		CERCLIS Assessment History: Discovery
P92, Site 3	ACTA South – Parcel MY-860	CA SLIC		Closure
R98, Site 1	Falcon Refuse Center, 3031 I Street E	HAZNET, LUST, SWF/LF, Cortese	Solvents	
R98, Site 2	Basin By-Products	Cal-Sites, CA Bond Exp. Plan, AWP		Active Site
R98, Site 3	Falcon Refuse Center	SWF/LF, UST		

Source: Environmental Data Resources, Inc., October 2, 2003.

Notes:

CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) contains data on potentially hazardous waste sites that have been reported to the United States Environmental Protection Agency (EPA) by states, municipalities, private companies and private persons, pursuant to Section 103 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

TABLE 8-1 (cont'd)

RCRIS (Resource Conservation and Recovery Information System) includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Small Quantity Generators (SQG) generate between 100 kilogram (kg) and 1,000 kg of hazardous waste per month.
CHMIRS (California Hazardous Material Incident Report System) contains information on reported hazardous material incidents (i.e., accidental releases or spills).
CORTESE: This database identifies public drinking water wells with detectable levels of contamination, hazardous substance sites selected for remedial action, sites with known toxic material identified through the abandoned site assessment program, sites with underground storage tanks (USTs) having a reportable release and all solid waste disposal facilities from which there is known migration.
NOTIFY 65: Notify 65 records contain facility notifications about any release that could impact drinking water and thereby expose the public to a potential health risk. The data come from the Proposition 65 database of the State Water Resources Control Board (SWRCB).
SWF/LF: The Solid Waste Facilities/Landfill Sites records typically contain an inventory of solid waste disposal facilities or landfills in a particular state. The data come from the Solid Waste Information System (SWIS) database of the California Integrated Waste Management Board (CIWMB).
LUST: The Leaking Underground Storage Tank Incident Reports contain an inventory of reported leaking underground storage tank incidents. The data come from the SWRCB Leaking Underground Storage Tank Information System.
BEP: Bond Expenditure Plan comes from the Department of Health Services (DHS).
UST: The Underground Storage Tank database contains registered USTs. USTs are regulated under Subtitle I of RCRA.
FINDS: The Facility Index System contains both facility information and "pointers" to other sources of information that contain more detail.
CA SLIC: SLIC Region comes from the California Regional Water Quality Control Board (RWQCB).
HAZNET: The data is extracted from the copies of hazardous waste manifests received each year by the Department of Toxic Substances Control (DTSC).

Construction of the pipeline is expected to take approximately 6 months and will take place towards the end of the construction period for the LNG terminal. Since the pipeline route is highly industrialized with limited available workspace, the pipeline will be installed using open-cut and stove-pipe construction technique, as well as an approximate 2,720-foot-long horizontal directional drill (HDD) under the Cerritos Channel, and six jack and bores under Ocean Boulevard (460 feet), pipelines along Carrack Street/Edison Way (155 feet), Carrack Street/Edison Way (160 feet), on Pier A Way (220 feet), Pier C Street (900 feet), and the railroad tracks/Anaheim Street/Terminal Island Freeway (450 feet). Construction procedures are described in Section 1.3.4 of Resource Report 1.

Figure 1 in Appendix 1-1 in Resource Report 1 is an alignment sheet showing the planned route for the pipeline. A nominal 50-foot-wide construction ROW will be used for the majority of the route between approximate MPs 0.0 and 0.56 and between MPs 1.51 and 2.3 (1.3 miles, or 58 percent) of the route. The remaining segments will be installed within a nominal 30-foot-wide construction ROW between approximate MPs 1.07 and 1.51 (0.44 mile, or 19 percent) and by HDD between approximate MPs 0.56 and 1.07 (0.51 mile, or 23 percent) (see Figure 2 in Appendix 1-1 in Resource Report 1 for the ROW cross-sections, Figure 8 in Appendix 1-1 in Resource Report 1 for the HDD of the Cerritos Channel, and Table 8-2 below). Where the 30-foot-wide ROW is used along Carrack Street and Pier A Way, a portion of the road will be used to bring in pipe and materials; however, the road will remain open to traffic. The final dimensions of the construction ROW will depend on negotiations with the tenants of the POLB. Section 1.3.4 in Resource Report 1 describes construction procedures as shown in Figures 5 through 7 in Appendix 1-1 of Resource Report 1.

Extra work space will be required for the HDD, comprised of a 0.92 acre area at the HDD entry location and a 0.23 acre area at the HDD exit location. None of the bores will require additional workspace and will be installed using the identified ROW configurations. Two aboveground facilities will be installed: a pig launcher facility at the beginning of the pipeline (milepost [MP] 0.0) and a pig receiver at the end of the pipeline (MP 2.3). Each will occupy a 75 by 150 foot (0.26 acre) site. Half of the launcher site (0.13) at the beginning of the pipeline will be installed within the 25-acre LNG terminal site.

In general, the entire pipeline route will be adjacent to existing utility ROWs or within road ROWs as shown on Figure 1 in Appendix 1-1 in Resource Report 1. Because all underground pipelines within the Port have a operational ROW of 1 foot above and beyond the diameter of the pipeline, the construction ROW for this non-jurisdictional pipeline will not overlap any adjacent pipeline operational ROWs for safety reasons.

With the exception of ruderal vegetation at the HDD entry and exit sites, and at the pig receiver site at the end of the pipeline, the pipeline route is either in pavement or dirt. All asphalt removed during trenching operations will be hauled off and disposed of at approved landfills outside of the Port of Long Beach. All areas disturbed for construction will be restored to pre-construction conditions and either reseeded with appropriate grasses or repaved. Areas within the launcher-receiver sites will be graveled. To protect the pipeline, the trench will be backfilled with a granular fill or slurry composed of earth removed from the trench or with other fill material hauled to the site.

Because of the limited space available, the operational ROW will be approximately 4 feet wide and will extend 1 foot beyond the 36-inch-diameter pipeline. Table 8-2 below summarizes land requirements for the pipeline.

Table 8-2 Land Requirements for the Send-Out Pipeline

MP	Description	Dimensions (feet)	Construction (acres)	Operation (acres)
0.0	Launcher [1]	75 x 150	0.13	0.13
0.0 to 0.56	Construction ROW [2]	50 x 2,940	3.37	0.27
0.56	HDD entry workspace	200 x 200	0.92	0.0
0.56 to 1.07	HDD	2,700	0.0	0.25
1.07	HDD exit workspace	100 x 100	0.23	0.0
1.07 to 1.51	Construction ROW [3]	30 x 2,340	1.61	0.21
1.51 to 2.25	Construction ROW [2]	50 x 3,920	4.50	0.36
2.25	Receiver	75 x 150	0.26	0.26
	TOTAL:	**11,900**	**11.02**	**1.48**

[1] Approximately half of the launcher facility (0.13 acre) will be installed within the 25-acre site for the LNG terminal facility and is not included.
[2] Construction ROW is 50 feet wide; operation ROW is 4 feet wide.
[2] Construction ROW is 30 feet wide; operation ROW is 4 feet wide.

SES does not plan to construct, own or operate this associated send-out pipeline. When it becomes available, SES will file information on the owner/builder/operator of the pipeline with the Federal Energy Regulatory Commission (FERC) Secretary.

8.1.4 Powerline

SoCal Edison will install a new 66 kilovolt (kV) interconnection facility to provide 66 kV service to a new Sound Substation that will be located within the 25-acre LNG terminal site in Pier T East. The substation will be located on 0.2 acre (103 feet by 80 feet) and will be equipped with one 66 kV structure and four circuit breakers arranged in a ring-bus configuration. Two incoming SoCal Edison 66 kV Lines will serve the two SES transformers. The 66 kV two-line service to the new station will be provided by reconfiguring the existing APL – Dock – Long Beach 66 kV Line to create the two new APL – Long Beach – Sound and Dock – Sound 66 kV Lines (see Figures 9 and 10 in Appendix 1-1 in Resource Report 1).

Construction procedures are described in Section 1.3.4 of Resource Report 1. Based on these procedures and assuming that installation of each new steel pole and any upgrades of existing poles will require approximately 2,500 square feet (0.06 acre), land requirements for construction of the electric distribution facility are estimated to total approximately 1.02 acre as follows:

- Installation of approximately 830 circuit feet of overhead conductor on three tubular steel poles, and one new pole switch, to connect the APL Substation tap along Pier T Avenue to the new Sound Substation – 0.18 acre;
- Installation of approximately 3,330 circuit feet of overhead conductor on seven tubular steel poles, and one new pole switch, to connect along the Dock Substation tap along Seaside/Ocean Boulevard to the new Sound Substation – 0.42 acre;
- Replacement of 2,100 circuit feet of existing conductor with new conductor and re-framing of five wood poles along Pier T Avenue to the Sound Substation tap point – 0.3 acre;

- Relocation of one existing pole-mounted switch to an existing wood pole before the Sound Substation tap point – 0.06 acre;

- Re-framing of one additional wood pole in the APL Substation leg to accommodate the relocated pole-mounted switch – 0.06 acre.

8.1.5 Project Impacts

No significant impacts on existing or future land uses will occur as a result of construction and operation of the Project facilities. All of the surrounding land is currently used for industrial purposes, and there are no residences or other sensitive land uses within 1 mile of the LNG terminal site. Thus, the Project will be compatible with the use and development of adjacent and nearby property. Moreover, there will be no conversion of land from other purposes to industrial use as a result of operation of the Project facilities. As summarized in Table 8-3 below, construction of all of the Project facilities will affect approximately 63 acres of land and 9.3 acres of water, and operation will affect 26.5 acres of land and 3.4 acres of water.

Table 8-3 Total Acres of Land Affected by Construction and Operation

Facility	Construction (ac)		Operation (ac)	
	Land	Water	Land	Water
LNG terminal site	25.0	0.0	25.0	0.0
Laydown Area	16.0	0.0	0.0	0.0
Construction worker parking (off Port)	10.0	0.0	0.0	0.0
4 to 6 barges moored along site	0.0	4.0	0.0	0.0
Dredging	0.0	5.3	0.0	0.0
LNG ship berthing (temporary)	0.0	0.0	0.0	3.4
Sub-total	51.0	9.3	25.0	3.4
Pipeline				
Right-of-way	9.5	0.0	1.1	0.0
Additional temporary work areas	1.1	0.0	0.0	0.0
Aboveground facilities	0.4	0.0	0.4	0.0
Sub-total	11.0	0.0	1.5	0.0
Electric Distribution Lines	1.0	0.0	NA	0.0
TOTAL	63.0	9.3	26.5	3.4

Notes: Does not include aboveground facilities located within the 25-acre LNG site (e.g. half of the launcher facility and the Sound Substation).

8.2 CONSISTENCY WITH EXISTING LAND USE PLANS, POLICIES AND ZONING

The Long Beach LNG Import Project is located in Los Angeles County, California. The LNG terminal site and electric distribution lines are within the boundaries of the City of Long Beach;

the associated send-out pipeline is within the boundaries of the Cities of Long Beach and Los Angeles (see Figure 8-2). These facilities are also within the jurisdiction of the POLB, a department within the City of Long Beach. The POLB has its own master plan for the city port under its jurisdiction as required by the California Coastal Act of 1976 (CCA) (see Section 8.3).

8.2.1 City of Long Beach and Long Beach Municipal Code

The LNG terminal site, the electric distribution lines, and all but the northernmost 0.7-mile-long segment of the sendout pipeline are within boundaries of the City of Long Beach. This area is included in the *Long Beach General Plan* (1997) and the *Long Beach Municipal Code* (1982). The *Long Beach General Plan* provides for delegation of responsibilities for planning within the legal boundaries of the POLB to the POLB Board of Harbor Commissioners. The *Long Beach Municipal Code* establishes the zoning within the jurisdiction of the POLB as IP – Port-Related Industrial District and PD – Planned Development District. The IP district is characterized by Port-related or water-dependent uses and includes all of the Project facilities within the POLB. The PD District (or Queensway Bay Planning District) includes portions of the east side of the POLB and was created in 1987 to provide a flexible planning mechanism for the phased recreation-commercial development of the Queen Mary Hotel and adjacent shorelands.

8.2.2 POLB Port Master Plan

The POLB Port Master Plan (PMP) is prepared by the POLB and is subject to the approval of the California Coastal Commission (Coastal Commission) pursuant to the requirements of the CCA (California Code Regs., Title 14, § 13001 et seq.) (see Section 8.3). The purpose of the PMP is to provide long-range planning goals and objectives for developing policies involving current and future POLB activities within the Port of Long Beach in compliance with the goals of the CCA. It is updated periodically to incorporate changes in land and water use.

The POLB has divided the Port into ten districts or "geographical areas, defined by physical constraints and configurations of land and water areas" (POLB, PMP, July 1999). The boundaries of these districts were established to serve functional purposes by consolidating similar land and water uses, maximizing efficient use of Port facilities, and separating hazardous cargo from other areas of the Port. The goals for each district serve as guidelines for long-term development within each district.

The LNG terminal site, 0.9 mile of the send-out pipeline, and all of the 0.8 mile of the electric distribution lines are located within the Terminal Island Planning District 4 (see Figure 8-2). This District primarily consists of property that was originally occupied by the United States Naval complex. Current uses include the privately owned Long Beach Generating Station and the Southeast Resource Recovery Facility (SERRF), as well as Hanjin container terminal facilities that are in operation on Pier T and are under development on Pier S on the south side of Cerritos Channel. Permitted uses include primary Port facilities, hazardous cargo facilities, Port-related uses, navigation, ancillary Port facilities, federal uses, oil production, and utilities. Primary Port facilities are those primarily dependent on access to water frontage such as shipping/unloading facilities. The LNG terminal is both water dependant and a hazardous cargo facility. Except as discussed in Section 8.3, both the terminal site and pipeline are permitted uses within the Terminal Island Planning District.

Approximately 0.7 mile of the send-out pipeline is located within the Northwest Harbor Planning District 3 (see Figure 8-2). The boundaries of this relatively small District include Cerritos Channel on the south and Carrack Avenue on the east. Current use is primarily the container terminal cargo facilities on Pier A. Permitted uses are oil production, primarily Port facilities, utilities, and ancillary Port activities. The pipeline is a permitted use within this District.

8.2.3 City of Los Angeles and Los Angeles Municipal Code

The northernmost 0.7 mile of the send-out pipeline is within the boundaries of the City of Los Angeles. It is also within the jurisdiction of the POLB. The *General Plan of the City of Los Angeles* (2002) is a "comprehensive long-range declaration of purposes, policies, and programs for the development of the City of Los Angeles," and is comprised of eleven elements that apply citywide. The Land Use Element is divided into 35 local area plans known as Community Plans, the Port of Los Angeles (POLA) PMP, and the Los Angeles World Airport Plan. The send-out pipeline is within the jurisdiction of the Wilmington-Harbor City Community Plan of the City of Los Angeles, and will be on land that is currently used for industry.

The applicable zoning ordinances for the vicinity of the send-out pipeline are detailed in the *Los Angeles Municipal Code* (1989). The *Los Angeles Municipal Code* codified the regulatory and penal ordinances of the City of Los Angeles. Chapter 1, Articles 2 and 3 provide specific planning and zoning information for the City (1989). The natural gas pipeline, within the

jurisdiction of the *Los Angeles Municipal Code*, crosses lands that are zoned M3, "Heavy Industrial" (City of Los Angeles, 2003).

8.2.4 Southern California Association of Governments

The Southern California Association of Governments (SCAG) is a metropolitan planning organization for the six-county southern California region (e.g., Ventura, Los Angeles, Orange, San Bernardino, Riverside, and Imperial Counties) that was established under California Government Code 6502 et. seq. SCAG is a designated Council of Governments, a Regional Transportation Planning Agency, and a Metropolitan Planning Organization. Its responsibilities include development of solutions to the region's common problems with regard to transportation management, growth, land use, housing, air quality, waste management, and other regional issues. SCAG also acts as an information clearinghouse for providing the cities and counties with data on demographics, forecasting, mapping, and other regional statistics. SCAG has developed a Regional Comprehensive Plan and Guide (RCPG) and a Regional Transportation Plan. Included within these plans are individual plans that address specific issues such as growth management, regional housing needs, regional mobility, water quality, and air quality.

The Project will employ a peak construction workforce of 1,036 and an operations staff of 60 workers. The majority of these workers are expected to be hired from within the metropolitan areas of Los Angeles and Long Beach. Because the Project will not generate significant population migration into the area or create new demand for housing units, it is consistent with the growth management chapter of the RCPG. While the Project will generate air emissions during construction and operation, SES will employ all practical and reasonable mitigation. In addition, since the Project will provide a new stable source of LNG fuel to facilitate vehicle conversion to LNG and other natural gas-based clean fuels in the Los Angeles area, the Project can help to reduce air pollution in the Los Angeles area, which is consistent with air quality chapter of the RCPG. The Project will not use a water vaporization system that would require seawater withdrawal from Long Beach Harbor. Therefore, the Project minimizes water requirements and will be consistent with the water quality chapter of the RCPG.

Table 8-4 describes Project compliance with RCPG policies identified by the SCAG in its comment letter on the Project.

Table 8.4 Project Compliance with Identified RCPG Policies

Policy	Project
Consistency with RCPG Policies	
3.03 The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.	The Project will be in service in late 2008 and will be privately financed. The Project will not significantly affect regional growth because it will employ a relatively small full-time operational workforce of 60 workers (see Section 8.2.4 and Resource Report 5).
GMC Policies Related to the RCPG Goal to Improve the Regional Standard of Living	
3.05 Encourage patterns of urban development and land use, which reduce costs on infrastructure construction and make better use of existing facilities.	The Project will be constructed in the Port of Long Beach on an industrial parcel that is designated for facilities of this type (e.g., Terminal Island Planning District, see Section 8.2.2).
3.09 Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of services.	The Project will require minimal new infrastructure and will not interfere with local jurisdictions' efforts to provide public service. In addition, the Project will provide a new source of tax revenues (see Section 8.2.4 and Resource Report 5).
3.10 Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.	SES supports this policy and is working with local jurisdictions (see Resource Report 1).
GMC Policies Related To The RCPG Goal To Improve The Regional Quality Of Life	
3.18 Encourage planned development in locations least likely to cause environmental impact.	The Project will be constructed on an industrial parcel in the Port of Long Beach (see Section 8.2).
3.20 Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.	The Project site has no wetlands, groundwater recharge areas, woodlands, production areas, or land containing unique and endangered plants and animals (see Resource Reports 2 and 3).
3.21 Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.	The Project will not affect any known recorded cultural resources or archaeological sites. SES has developed an Unanticipated Discovery Plan in the event that sites are found during construction (see Resource Report 4).
3.22 Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.	The Project site has no steep slopes or high fire natural areas. The Project has been designed to withstand flood, tsunamis, and seismic hazards (see Resource Report 6).
3.23 Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and response and recovery plans.	The Project will not result in excessive noise and will have minimal impact on biological and ecological resources (see Resource Report 9, and Resource Reports 2 and 3). The Project has been designed for seismic conditions in the area (see Resource Report 6). SES is working with local emergency groups to develop emergency response plans (see Resource Reports 5 and 11).
GMC Policies Related To The RCPG Goal To Provide Social, Political, And Cultural Equity	
3.27 Support local jurisdictions and other service providers in their efforts to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection.	The Project will not interfere with efforts to develop sustainable communities and will provide a new source of tax revenues to the City of Long Beach (see Resource Report 5).

Table 8.4 Project Compliance with Identified RCPG Policies

Policy	Project
Air Quality Chapter Core Actions	
5.07 Determine specific programs and associated actions needed (e.g., indirect source rules, enhanced use of telecommunications, provision of community based shuttle services, provision of demand management based programs, or vehicle-miles-traveled/emission fees) so that options to command and control regulations can be assessed.	The Project will comply with the requirements of all permits (see Resource Report 1).
5.11 Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts.	Environmental review of the Project will be completed in the joint EIS/EIR that will be prepared jointly by the FERC and the POLB (see Resource Report 1).
Water Quality Chapter Recommendation And Policy Option	
11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.	To the extent practicable, the Project will minimize reliance on imported water and wastewater discharges (see Resource Report 2).

8.3 COASTAL ZONE MANAGEMENT ACT CONSISTENCY

The federal Coastal Zone Management Act (CZMA) requires that all federal agencies with activities directly affecting the coastal zone, or with development projects within that zone, comply with state coastal acts. Therefore, regulations implementing the CZMA require that an applicant for a FERC certificate obtain a certification that the proposed project complies with, and will be conducted in a manner consistent with, state coastal management programs. In California, the coastal zone extends from 3 miles at sea to an inland boundary that varies from a few blocks in urban areas to several miles in less developed regions. The Project is within the South Coast Area that encompasses coastal areas in Los Angeles and Orange Counties.

The CCA established the California coastal protection program. Chapter 3 of the CCA lists the six coastal resources planning and management policies that are used to evaluate a proposed project's consistency with the CCA: 1) maximizing access to California's coast; 2) protecting water-oriented recreational activities; 3) maintaining, enhancing, and restoring California's marine environment, 4) protecting sensitive habitats and agricultural uses; 5) minimizing

environmental and aesthetic impacts of new development; and 6) locating coastal-dependent industrial facilities within existing sites whenever possible. Chapter 8 of the CCA recognized California ports, including the POLB, as primary economic and coastal resources and as essential elements of the national maritime industry. However, each port was required to prepare a PMP for approval by the Coastal Commission that outlines how the port will comply with the general policies of the CCA.

The POLB submitted its PMP in June 1978; the Coastal Commission certified the PMP in October 1978, subject to submission of a revised plan for recertification within 5 years and a risk management plan for assessing hazardous risks. Since that time, there have been a total of 18 amendments to the PMP that have been submitted to and approved by the Coastal Commission. Projects that are approved by the POLB under its PMP are explicitly considered to be consistent with the CCA for federal permitting purposes under a special clause of the California Code (§30719).

The Project is located within the POLB's Terminal Island Planning District 4. Consistent with the CCA, the POLB's PMP addresses environmental, recreational, economic, and cargo-related concerns within the Port and has been certified by the Coastal Commission. Expressly permitted uses within the POLB District 4 include "hazardous cargo facilities" that are defined as "operations and terminals engaged in the loading/unloading, storage and transfer of crude, and bulk refined petroleum products and chemicals with a National Fire Protection Association (NFPA) rating of 2 or greater" (POLB PMP, page IV-1). Although LNG likely falls within the general term of "chemicals" and has a NFPA rating greater than 2, it is not classified as a "bulk refined petroleum product". Accordingly, the POLB has stated that it will submit a PMP amendment for the Project to the Coastal Commission for review and certification.

8.4 RECREATIONAL RESOURCES

San Pedro Bay, and limited areas of the Port of Long Beach, are used for a variety of onshore and offshore recreational activities. Offshore recreational activities are primarily associated with widespread use of the Long Beach Harbor and San Pedro Bay waters by local residents and tourists on charter fishing and sightseeing boats. Onshore recreational facilities are primarily located at the Long Beach Shoreline Marina, and Rainbow Harbor, which are located approximately 1 mile east of the LNG terminal site (see Figure 8-3).

Recreational boating is the major water-related recreational activity within 2 miles of the Project. San Pedro Bay is a very heavily trafficked area, and pleasure craft and small ships, such as harbor excursion ships, are predominant within and around Queensway Bay. There are two marinas within the Project vicinity: Long Beach Shoreline Marina and Rainbow Harbor/Rainbow Marina. Long Beach Shoreline Marina has 1,844 slips for recreational boaters. Rainbow Harbor has twelve 150-foot docks for commercial vessels, which predominantly provide charter services for fishing, whale-watching, and sightseeing. There are also a number of vendors who rent boats and personal watercraft from Rainbow Harbor. Rainbow Marina has 103 slips for commercial and recreational vessels and a 200-foot-long dock for day guests. The West Basin, where the LNG ships will berth, is a restricted area with entry regulated by POLB and the U.S. Navy. The United States Coast Guard (USCG) has also requested that recreational uses be barred from the West Basin.

Onshore recreation within the Project vicinity is located approximately 1.5 miles east of the LNG terminal site in the City of Long Beach. The most notable recreational facilities include the Queen Mary, Long Beach Aquarium of the Pacific, Shoreline Village, Shoreline Park, Rainbow Harbor Esplanade, Long Beach Shoreline Marina, and the Long Beach Convention Center and Entertainment Center. There are also a number of community and neighborhood parks in the City of Long Beach within an approximate 2-mile radius of the Project as listed in Table 8-5. There are no community or neighborhood parks in the Port of Long Beach.

Table 8-5 Recreational Areas within an Approximate 2-Mile Radius of the Project

Name Of Facility	Type Of Facility	Address	Distance From Project Site (Miles)
Catalina Landing	Cruise Terminal	320 Golden Shore Blvd. Long Beach, CA	1.5
Cesar E. Chavez Park	Community Park	401 Golden Ave. Long Beach, CA	1.7
Downtown Marina	Recreational Marina	450 E. Shoreline Dr. Long Beach, CA	2.1
Drake Park	Neighborhood Park	951 Maine Ave. Long Beach, CA	1.8
Lincoln Park	Civic Center	Pacific & Broadway Long Beach, CA	1.8
Long Beach Convention Center and Entertainment Center	Convention Center	300 E. Ocean Blvd. Long Beach, CA	2.0
Los Angeles River Bikeway (LARIO)	Bike Path	East of LA County Flood Control Channel Long Beach, CA	1.2

Table 8-5 Recreational Areas within an Approximate 2-Mile Radius of the Project

Name Of Facility	Type Of Facility	Address	Distance From Project Site (Miles)
Queen Mary	Hotel/Restaurants/Museum	1126 Queens Hwy. Long Beach, CA	2.0
Rainbow Harbor	Commercial Marina and Public Dock	429 N. Shoreline Dr. Long Beach, CA	2.1
Rainbow Harbor Esplanade	Shopping/Restaurants	429 N. Shoreline Dr. Long Beach, CA	2.1
Rainbow Lagoon Park	Community Park	Pine & Shoreline Ave. Long Beach, CA	2.1
Shoreline Park	Community Park	Aquarium Way and Shoreline Dr. Long Beach, CA	1.5
Shoreline Village/Marina	Shopping/Restaurants	429 Shoreline Village Dr. Long Beach, CA	1.9
Victory Park	Green Space	Ocean Blvd. (Alamitos to Magnolia) Long Beach, CA	1.6

Although recreation opportunities are plentiful within the Project vicinity, the actual Project area (*i.e.*, LNG terminal site and send-out pipeline) does not provide an opportunity for recreation due to the industrial nature of the Port activities. Construction and operation of the Project will not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use. The USCG has advised that it would most likely enforce a moving security zone of 1,000 yards ahead and 500 yards on either side and astern of arriving LNG ships. Minor delays to recreational boats could occur on days when the arriving LNG ships pass by, or from 102 to a maximum of 146 days of the year. Vessel traffic associated with the Project will use established commercial shipping lanes; therefore, no new impacts to recreational use within the Port of Long Beach will result. Construction activities will be separated from onshore recreational sites by the Los Angeles County Flood Control Channel and Queensway Bay. No impacts to onshore recreation will result from construction or operation of the LNG terminal facility. The Long Beach Harbor currently hosts numerous small charter ships that provide sightseeing tours of the Port of Long Beach. The new LNG terminal would merely become another sight on the tour. Operation of the LNG terminal and natural gas pipeline would not threaten the viability of a recreational resource, prohibit access to recreational resources, or cause termination of a recreational use.

8.5 VISUAL RESOURCES

8.5.1 Project Site

As shown on Figure 8-3, the LNG terminal site is located at the eastern end of Pier T. The site is unoccupied, except for one abandoned building that will be demolished as part of the naval base decommissioning activities prior to construction of the LNG tanks and associated facilities. To the south and east, the West and East Basins border the site, respectively. East of the site is a bulk break lumber storage area and the BP petroleum unloading terminal; to the north and west of the site are the Hanjin container cargo facility and Ocean Boulevard. The LNG terminal site is in the approximate center of the Port of Long Beach, which abuts the east side of the Port of Los Angeles.

8.5.2 Project Vicinity

In the immediate vicinity of the LNG terminal site, there are numerous container cargo facilities and associated cranes, piers, storage tanks, a waste-to-energy plant, mole pier and sea launch, the Long Beach Generating Station, and other Port facilities. A similar mix of industrial land uses and waterways are found in the next 1-mile radius around the site. In addition to the Port infrastructure, the area from 1 to 2 miles from the plant site also includes a part of the community of Long Beach and its downtown area with commercial, recreation, and tourist facilities.

Beyond the 2-mile and out to a 5-mile radius are the communities of the San Pedro, Wilmington and the City of Long Beach with high-density residential, commercial and industrial land use. Topography in the Project area is generally flat to gently sloping with little vegetation. Topography rises from essentially sea level to elevations in excess of 400 feet in San Pedro and in the vicinity of Signal Hill.

8.5.3 Visual Assessment Methodology

To assess the potential visual impact of the LNG terminal, representative viewing points were identified to a distance of approximately 5 miles from the site. These points include highways, recreation areas, tourist attractions, and other locations to characterize the visibility of the LNG facility and its impact on potential viewers and the landscape in which it will be constructed and operated.

From each of the points, the potential visibility of the LNG terminal, the number of viewers, and the landscape quality were assessed. Appendix 8-1 includes the details of the study approach.

- Visibility was assessed by determining how much of the two LNG storage tanks and other facilities could be potentially viewed, the distance of the viewer from the tanks, and other features in the landscape. The LNG tanks, which will be the tallest of the terminal facilities, will be approximately 255 feet wide and 176 feet high.

- Viewers were considered by selecting assessment points with concentrations of viewers or locations that may be visually sensitive. The type of viewer, numbers of viewers, competing tasks (such as driving), and viewing experiences were all included in the assessment of impact to viewers.

- Landscape quality from each view was evaluated in terms of landform, vegetation, water, man-made features and adjacent scenery.

8.5.4 Visual Impact Assessment

Because the LNG terminal site is centrally located in the highly developed ports of Long Beach and Los Angeles, views from many locations are blocked by the numerous container cargo storage areas, buildings, cranes, ships, elevated highways, and other facilities (power plant, waste-to-energy plant, oil storage tanks etc.). Visibility is primarily from elevated locations such as bridges, taller buildings, and distant hillside residential areas. Views from recreation and other similar potential viewing areas such as the Long Beach marinas occur at more than 1 mile from the LNG tanks.

Although there are a substantial number of potential mobile and stationary viewers and visibility is high in some locations (e.g., Ocean Boulevard and recreational boaters in the vicinity of the Project), the existing Port facilities screen, back drop, and otherwise minimize the overall visual impact of the LNG tanks. The LNG tanks and associated facilities blend well with the extensive industrial landscape, thus minimizing contrast and the potential for significant visual impact. The Project would not damage any scenic vista, and would not degrade the existing visual character or quality of the site or its surroundings.

High-pressure sodium lighting will be installed at all outdoor locations, including the process unit, tanks, truck loading, ship unloading, building exteriors, and roadways. To the extent practical, high-mast lighting will be used with supplemental lighting as required to alleviate shadows. All fixtures will be approved for the area classification in which they are installed. The Project would not create a new source of substantial light or glare that would adversely affect day or nighttime views in the area. Most of the facilities in the ports of Long Beach and Los Angeles light their facilities at night for safety and these lights form part of the visual character of views from the City of Long Beach. Further, since there are no residences within 1 mile of the LNG terminal, these lights are seen in the distance (e.g., middleground or background view).

Table 8-6 summarizes the visual impact from several locations surrounding the location of the LNG terminal site. The overall visual impact of the LNG facility was rated Moderate to Low.

Table 8-6 Visual Impact Summary

Reference Point Figure 8-3	Key Observation Point Location	Viewer Rating	Visibility Rating	Landscape Quality Rating	Overall Rating
26	Queensway Bridge	M	M-H	L	M
6	Queen Mary	H	L	M	L
4a	Shoreline Park Sitting Area	M	L	M	M
4b	Shoreline Park northwest of Queensway Bridge	L	M	M	M-L
27	Vincent Thomas Bridge	M	M-L	L	M-L
30	Cabrillo Point	M-H	L	M	L
31	Belmont Shore	M-H	L	M-H	L
29	Ken Mallory Harbor Regional Park	M-L	L	M	L
33	Fire station/Mole Entrance	M	H	M-L	M
35a	Ocean Boulevard	M	M	L	M-L
H = High, M = Moderate, L = Low					

8.6 REFERENCES

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NON-INTERNET PUBLIC

FIGURE 8-1

Generalized Land Uses within 2 Miles

NON-INTERNET PUBLIC

FIGURE 8-2

Jurisdictions and Land Use Plans in the Project Area

NON-INTERNET PUBLIC

FIGURE 8-3

Recreation, Public and Scenic Resources

Appendix 8-1

Visual Assessment

Contents

ACRONYMS

LNG	liquefied natural gas
POLB	Port of Long Beach
SES	Sound Energy Solutions
SoCal Edison	Southern California Edison
SoCal Gas	Southern California Gas Company

Appendix 8-1

Visual Assessment

1.0 INTRODUCTION

Sound Energy Solutions, Inc. (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

2.0 APPROACH

The visual assessment is based on establishing representative viewing points surrounding the site and qualitatively and quantitatively assessing the visual impact of the LNG facility as seen from each assessment point

2.1 Visual Assessment Points

Visual impacts relate not only to the landscape that is affected, but also to the visibility of the LNG facility and the people who would experience the impact. Thus, selection of points from which to evaluate such impacts is essential to accurately assessing the potential visual impact of the LNG facility.

Visual assessment points are specific locations from which the LNG facility may be viewed and which are evaluated in detail to assess potential visual impact. These points can be of several types: actual point locations representing the view from a location such as a recreation area; a

series of points representing similar views which might occur along a stretch of highway; or a point representing views that might occur from an area such as several homes in a subdivision.

To identify visual assessment points, an area within 5 miles of the LNG terminal was identified. Within this study area, visual assessment points were determined using readily available information, including aerial photography, published literature and field reconnaissance. The types of assessment points included:

- Concentrations of viewers such as on major roadways or in housing developments;
- Visually sensitive land uses such as parks and recreation areas;
- Culturally sensitive locations such as historic sites or areas to which citizens may have an emotional attachment; and
- Places designated as having scenic importance such as highways and overlooks.

2.2 Analysis From Assessment Points

At each of the selected assessment points, three analyses were performed: a Landscape Quality Analysis, a Viewer Analysis, and a Visibility Analysis. The purpose of these analyses was to make qualitative and, where possible, quantitative descriptions of potential visual impacts. The results of each assessment point analysis were later aggregated into an overall description of the visual impact.

Landscape Quality Analysis involved the determination of the quality of the landscape that might be impacted by the LNG facilities. The landscape in the study area was evaluated in terms of landform, vegetation, water and man-made modifications. From this understanding of the study area, a matrix (Table A8-1) was constructed which describes the range of elements that add or detract from landscape quality in the study area.

Table A8-1 Landscape Quality Matrix

Landscape Quality Matrix			
	Distinctive (H)	**Common (M)**	**Minimal (L)**
Landform	Rugged hills and steep slopes; highest elevations providing distinct panoramic views	Rolling to moderately steep sloped hills	Relatively flat; detailed relief features few or lacking
Water	Clear and clean appearing large body of still water; coastline feature; a dominant factor in the landscape.	Occasional view of water feature, but not a dominant feature	Water elements few, lacking, intermittent or not noticeable
Vegetation	Rich variety of forest cover exhibiting interesting patterns of form and texture; unique or outstanding specimens	Generally equal mix of open and forested area with some variety of vegetation types	Uniform stands of only one vegetation type; large cleared areas; spotty regenerative growth
Man-made modifications	Man's activity adds favorably to visual variety; or when seen, does not appear discordant with surrounding landscape; reservoirs, protected historic sites, or buildings	Scattered, moderate sized development which is noticeable, but not dominant; housing, farm outbuildings, light industry or commercial	Extensive urbanized industrial development dominant in landscape.

Those landscapes with distinctive elements tend to have a high quality, whereas minimal landscape elements usually indicate low visual quality. For this analysis, landscape quality is described as having:

- *Distinctive Elements* containing unusual or outstanding high visual quality;
- *Common Elements* containing some variety in form, line, color and texture, but which tend to be common and not outstanding (moderate) in visual quality; and
- *Minimal Elements* containing little change in form, line, color or texture and result in low visual quality.

An awareness of the landscape quality of the study area makes it possible to judge the relative quality of landscape as seen from assessment points with respect to their place on a continuum ranging from distinctive to minimal.

In addition to these four elements, an additional element, adjacent scenery, is part of the field assessment. Adjacent scenery is a judgment as to whether the landscape quality of adjacent areas enhances, detracts from, or has no influence on the view.

Utilizing the landscape matrix (see Table 1) and field analysis sheet, the view from each visual impact assessment point was described and rated in terms of landform, water, vegetation and man-made modifications. Consideration was then given to adjacent scenery and the interaction of elements.

Viewer Analysis considers the degree of visual impact as influenced by the type of viewers, number of viewers and viewing experiences. Both stationary and mobile viewers were considered in this analysis. Stationary viewers include those who view from a specific viewing point (i.e. historic sites, parks, roadside rest areas) as well as viewing areas such as residential developments. Mobile viewers are usually roadway travelers.

Viewing experience is affected by the cultural or emotional significance attached to a landscape. For example, a viewer may recognize the scene for its historic significance and attach a high emotional value to it even though it is a quite common landscape. In another example, the viewer may recognize the scene as the setting for an annual community activity. Although of little importance to most viewers and again a common landscape, a higher significance may be given to it by local citizens than by the casual observer.

Viewer experience is also affected by competing tasks and competing visual information. Competing tasks, such as driving, require some concentration. As more tasks are required, less time exists to concentrate on objects in the viewed landscape. The following conditions result in more competing tasks for the driver and, to a lesser extent, passengers.

- Horizontal curves;
- Substandard roads (narrow lanes, no shoulders, sharp curves); and
- High speeds.

Various objects in a scene may also reduce viewing potential by providing competing visual information. Four types of objects are:

- Structures (buildings, stores, houses, industrial facilities, etc.);
- Planned attention-getters (billboards, traffic signs, directional signs, etc.);

- Transportation elements (moving traffic, parked cars, curb cuts, turn-offs, intersections, etc.); and
- Human activities (pedestrians, bicyclists, playing children, etc.).

Visibility Analysis included an evaluation of the degree to which the LNG terminal is visible, the distance at which it is viewed, and its location in the viewed landscape. For each of these three evaluations a number of factors were considered in determining an overall visibility rating at each assessment point.

The degree to which a facility is visible depends on the amount of the structure that is seen. In estimating the amount of the structure seen, local reference points, drawn sections or simulations are used to locate the LNG facility in the view. The more of the structure that is visible, the higher the potential visual impact.

Visibility also is relative to distance from the viewers. As the distance between viewers and the subject increases, discernible detail decreases.

Close-up views where the viewer can observe details of the facilities are most dominant. In the area between 0.25 and 0.5 mile from an object (foreground), one can perceive details. Moving away from the object (middleground and background), perceivable detail decreases and, except for highlighted landscape features such as a dwelling, the eye sees distant landscapes as textures and masses. Landscapes are described as composed of foreground, middleground, and background views.

- Foreground includes the detailed landscapes found within 0 to 0.25 to 0.5 mile from the viewer;
- Middleground occupies the space between the foreground and the background in a landscape, and includes the area located from 0.25 to 0.5 to 3 to 5 miles from the viewer; and
- Background is the distant part of a landscape located 3 to 5 miles to infinity from the viewer.

Facility visibility is also increased if silhouette or inappropriate scale conditions occur as a result of its location in the landscape.

- A silhouette of a structure occurs when it is partially or totally seen with a sky background; and
- An inappropriate scale of a structure compared to surrounding landscape elements can increase adverse impact. For instance, large structures may dwarf nearby houses.

2.3 Visual Impact Ratings

The results of the field assessment at each point including an evaluation and rating were recorded on field sheets. Each visual assessment point analysis and summary sheet indicates a High, Moderate or Low potential for visual impact in terms of landscape quality, viewers and visibility.

Landscape Quality Rating – High means the landscape being viewed contains elements of landform, vegetation, water and/or man-made modifications which are distinctive within the 5 mile radius. LNG facilities located in high quality landscapes are generally regarded as having potential for more adverse visual impact. Low quality landscape ratings imply the potential for less visual impact.

Viewer Rating – High means many viewers would see the LNG facilities in the scene and there is a high cultural or emotional feeling attached to it. Low indicates few viewers would see the LNG facilities and little or no sensitivity is attached to it.

Visibility Rating – High means more visibility factors are affected and results in more visibility. Low indicates few visibility factors are affected and results in less visibility.

The final step after conducting Landscape Quality, Viewer and Visibility Analysis for each assessment point was the preparation of a summary of the overall visual impact. The summary describes the scope of the assessment, the number of assessment points evaluated, significant aspects of each analysis contributing to the LNG facility visual impact rating, and other information which may be required to adequately describe visual impact. The end product of the impact summary is one sheet that describes potential visual impacts.

3.0 RESULTS OF VISUAL ASSESSMENT

The following paragraphs summarize the visual assessment ratings from the ten locations surrounding the site of the LNG terminal facilities.

Queensway Bridge [Figure A8-1]

Viewers – Potential viewers include motorists and pedestrians using the walkway on the east side of bridge. Much of the traffic is comprised of commercial vehicles proceeding to and from Piers F, G, and J as well as visitors to the berth of the Queen Mary. Rating: Moderate.

Visibility – The Project is about 1.3 miles west of the bridge and because it is elevated most of the facilities would be visible. Rating: Moderate to High.

Landscape Quality – From this location, the view toward the LNG Facility is dominated by other Port facilities including cranes, buildings, silos, and containers. Rating: Low.

Overall Rating – Moderate

Queen Mary [Figure A8-2]

Viewers – The Queen Mary is a key attraction in the Long Beach area. Viewers are attracted to the features of this historic passenger liner, as well as views of the surrounding landscape from the various decks. A high rating was assigned due to the number of viewers and the viewer sensitivity. Rating: High.

Visibility – The Project is 1.8 miles west of the Queen Mary. Intervening buildings result in the LNG tanks being almost undetectable. Rating: Low.

Landscape Quality – The Queen Mary is a unique resource in the landscape. However, views from the Queen Mary toward the Project include landscaping, parking lots, and industrial facilities. Rating: Moderate.

Overall Rating – Low

Shoreline Park [Figure A8-3]

At this location, the visual impact of the LNG facility was assessed from two locations, the lighthouse sitting area and a second place just northwest of the Queensway Bridge.

Viewers – Visitors include fishermen and visitors to the park and other local attractions. From the parking lot, visitors proceed southeast from the parking lot to a sitting area with views to San Pedro Bay and tourist and recreation areas like Shoreline Village and the Downtown Marina. It appears the second assessment location northwest of the bridge would have significantly fewer visitors/potential viewers. Rating: Sitting Area: Moderate. Location northwest of bridge: Low.

Visibility – From the location on the walkway just northwest of the Queensway Bridge, much of the LNG tanks would be viewed; however, from the landscaped portion of the park, including the lighthouse sitting area, much of the facility would be screened by the Queensway Bridge, trees, and Port facilities. The Project is located approximately 1.6 miles from the sitting area and about 1.4 miles from the location northwest of the Queensway Bridge. Rating: Low from the sitting area increasing to Moderate at the second location.

Landscape Quality – From the sitting area, views toward the LNG facility are dominated by trees, grass, walkways and the river in foreground and then by Queensway Bridge and Port facilities in the middle and background. From the location just beyond the bridge, the view is dominated by Port facilities as viewed across the Los Angeles River. Rating: Moderate at the sitting area and northwest of the Queensway Bridge. It should be noted that it appears visitors come not for the view toward the Port, but for views to the south and east toward San Pedro Bay.

Overall Rating – Sitting area: Moderate. Location northwest of Bridge – Moderate to Low

Vincent Thomas Bridge [Figure A8-4]

Viewers – The Vincent Thomas Bridge has a large amount of traffic comprised of large trucks and other commercial vehicles serving the various Port facilities. Rating: Moderate.

Visibility – Traveling east across this bridge, the LNG facility would be screened or seen in conjunction with numerous Port facilities at a distance of 2.5 miles or more. Rating: Moderate to Low.

Landscape Quality – Drivers proceeding east see an array of cranes, containers, industrial buildings, a power plant, waste-to-energy plant and other industrial facilities. Rating: Low.

Overall Rating – Moderate to Low

Cabrillo Point

Viewers – Viewers at this state park include numerous mobile and stationary viewers. Rating: Moderate to High.

Visibility – The Project is located about 5 miles northeast of this location and is at least partially screened by existing cranes, buildings and other Port facilities. Rating: Low (possibly not seen).

Landscape Quality – The view from this location essentially is comprised of Los Angeles Outer Harbor with Port facilities stretched across the middle ground and background. Rating: Moderate.

Overall Rating – Low

Belmont Shore

Viewers – Viewers include motorists on Ocean Boulevard, local residents, and recreationists on the beach. Rating: Moderate to High.

Visibility – The LNG facility would be about 4.5 miles from this location. Little if any of the LNG facility would be viewed from this location. Rating: Low (possibly not seen).

Landscape Quality – View across beach and San Pedro Bay to the vicinity of the Project. Rating: Moderate to High.

Overall Rating – Low

Ken Malloy Harbor Regional Park

Viewers – Viewers include motorists driving through and recreationers enjoying the park. Rating: Moderate to Low.

Visibility – It appears that little, if any, of the LNG facility (located about 4.5 miles southeast) would be viewed from the park. Rating: Low (possibly not seen).

Landscape Quality – The landscape viewed from the southeastern part of this park is undeveloped with a mix of open and wooded land use. Rating: Moderate.

Overall Rating – Low

Fire Station/Mole Pier Entrance [Figure A8-5]

Viewers – Potential viewers include visitors on harbor tour boats and those individuals driving to and from and work on pier F. Rating: Moderate.

Visibility – Views in this foreground location would include the entire LNG facility. Rating: High.

Landscape Quality – Views in this area are dominated by the harbor and Port facilities. Rating: Moderate to Low.

Overall Rating – Moderate

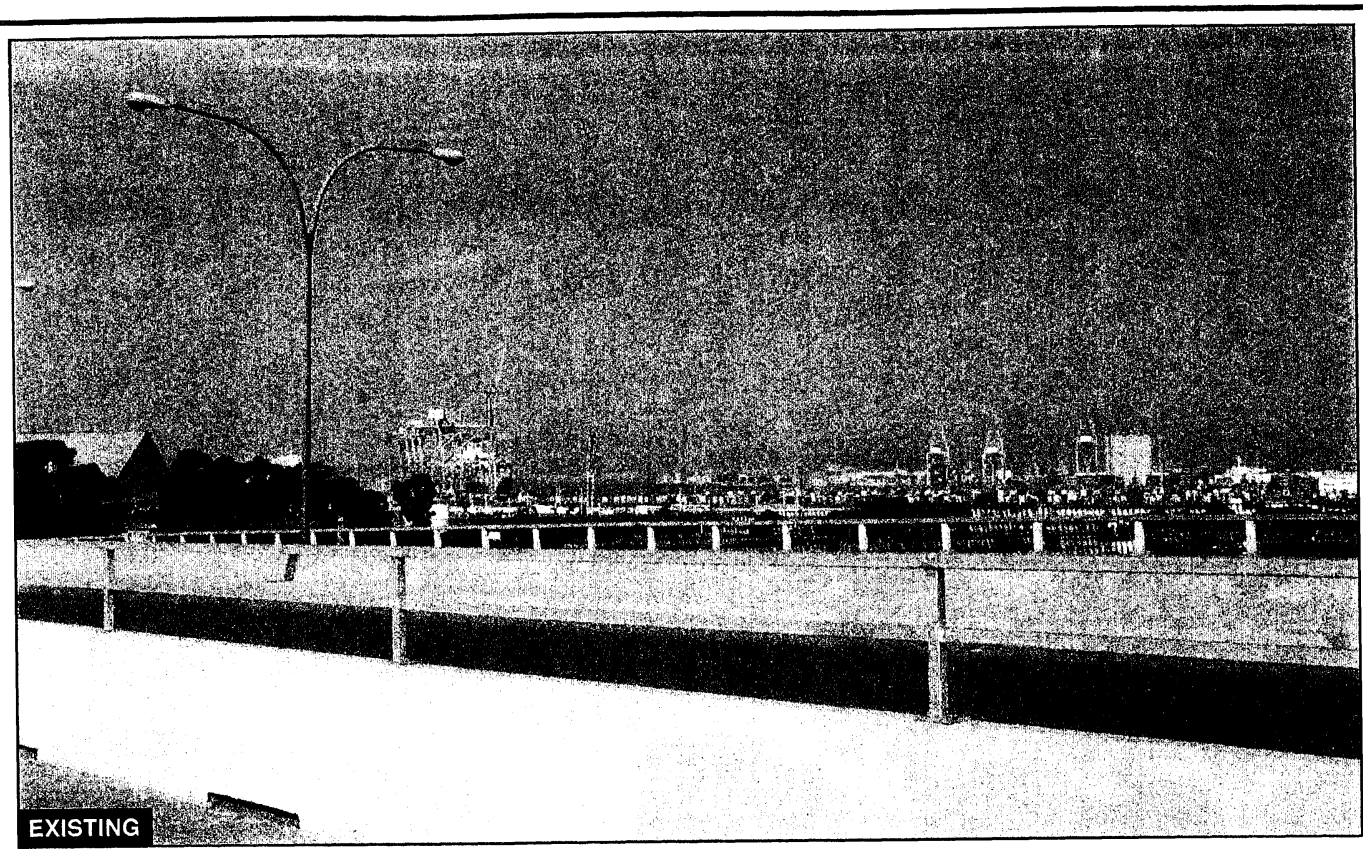
Ocean Boulevard [Figure A8-6]

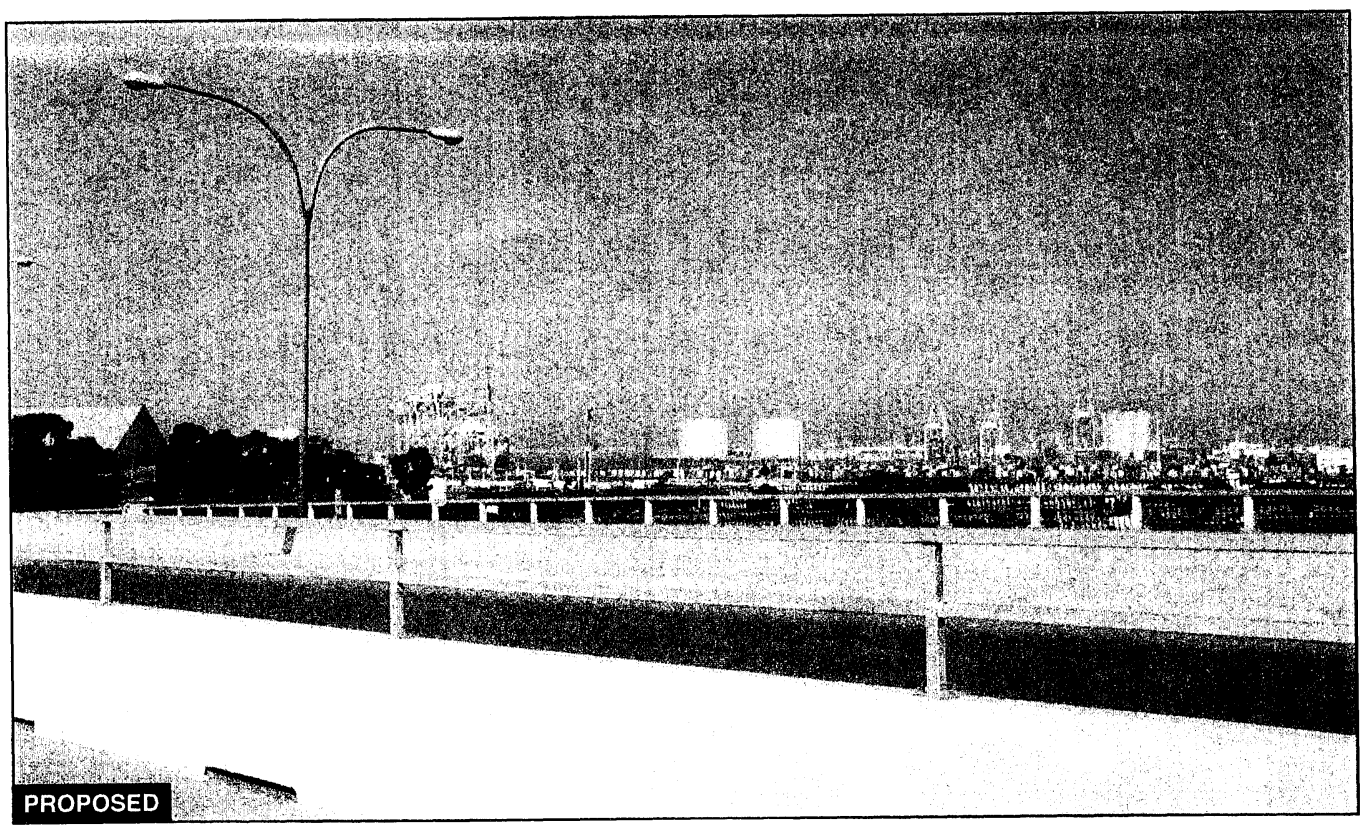
Viewers – Ocean Boulevard is a highly used highway with much of its traffic comprised of large trucks and other commercial vehicles. Rating: Moderate

Visibility – Travelers proceeding east on Ocean Boulevard in proximity to this location would view those portions of both tanks not screened by containers or other Port facilities at a distance of about 1 mile or less. Also, the LNG facility would be viewed in conjunction with light standards, cranes, and other Port facilities. Rating: Moderate.

Landscape Quality – Views from Ocean Boulevard southeast toward the LNG facilities are comprised of cranes, containers, and other Port facilities. Rating: Low.

Overall Rating – Moderate to Low





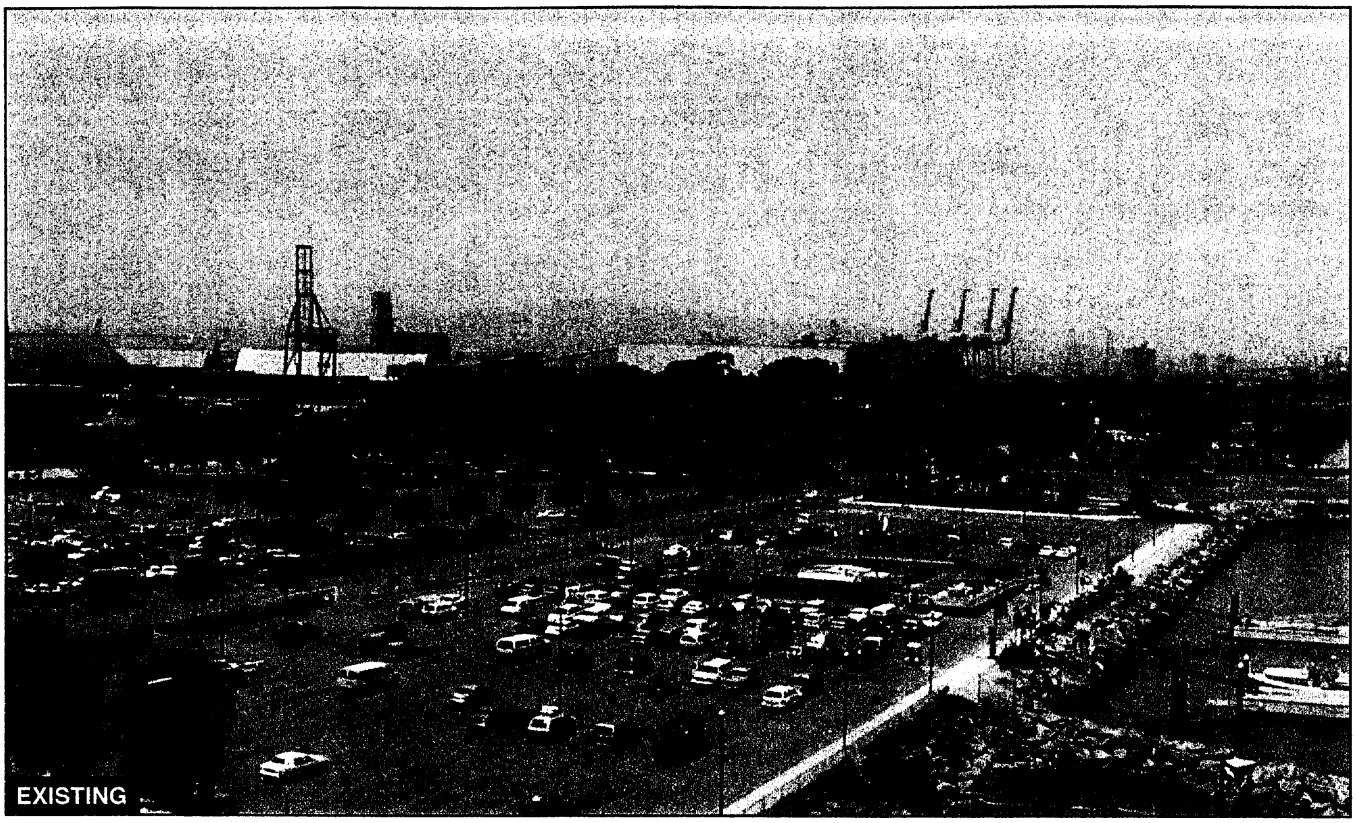
SOUND ENERGY SOLUTIONS

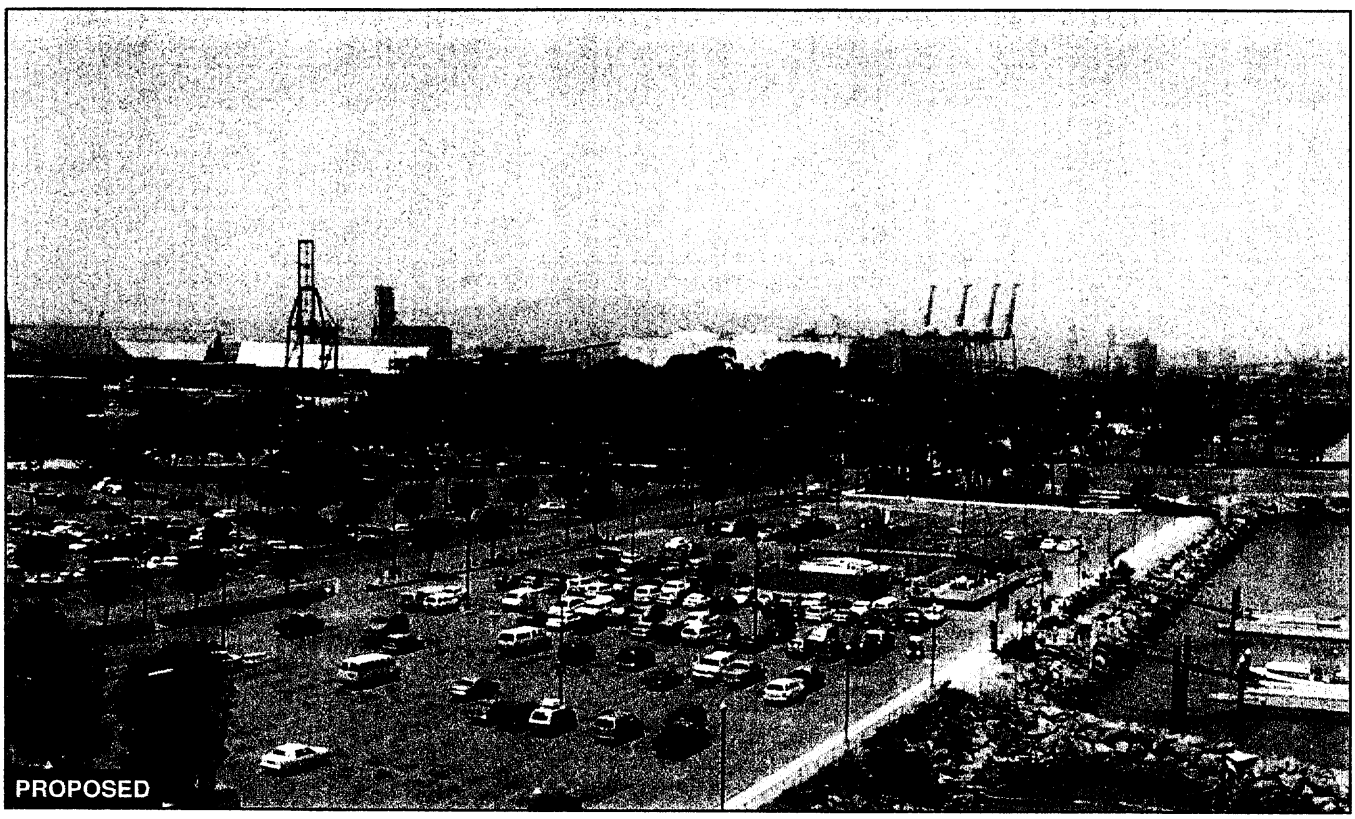
QUEENSWAY BRIDGE VISUAL ASSESSMENT POINT

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-1





SOUND ENERGY SOLUTIONS

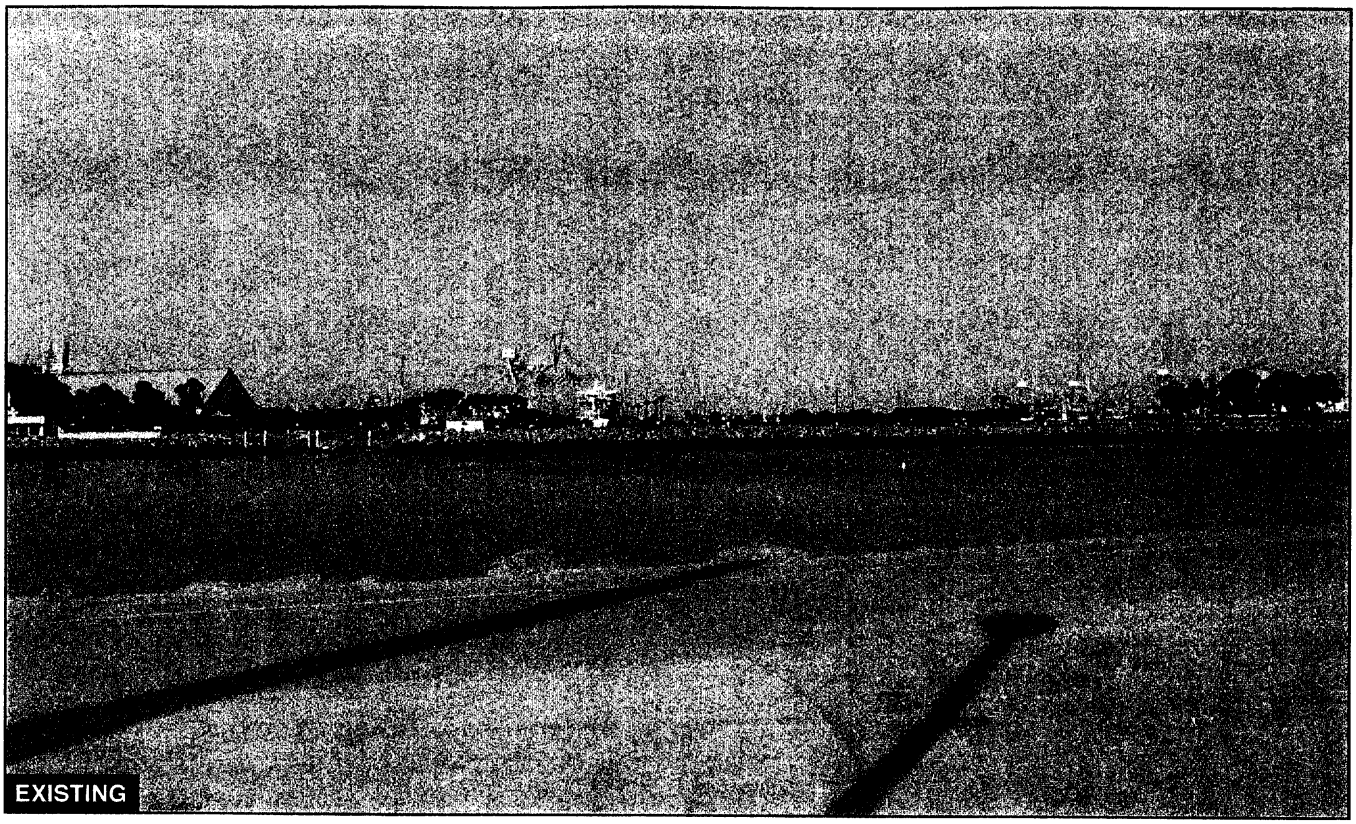
QUEEN MARY VISUAL ASSESSMENT POINT

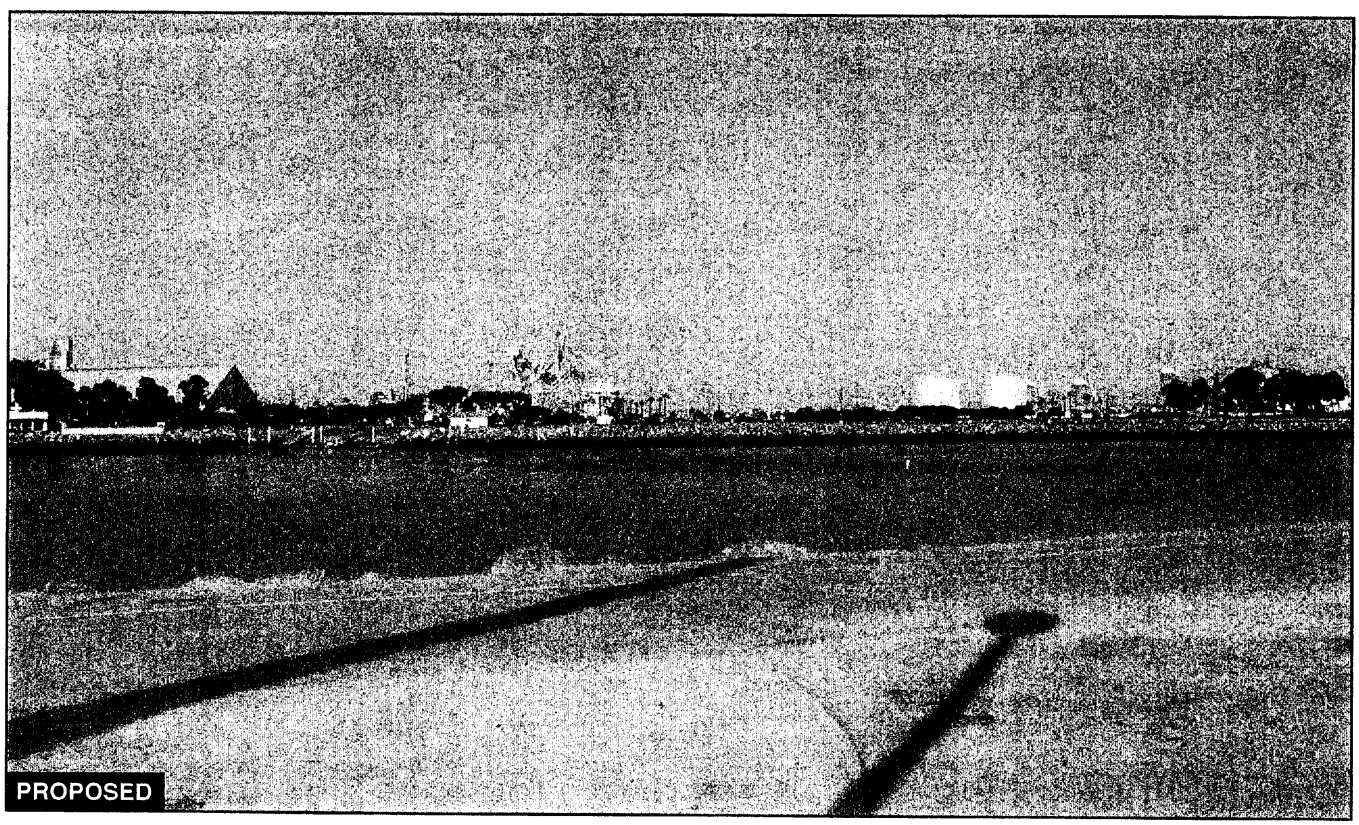
LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-2

29018301RR1-38 REV.01/12/04





SOUND ENERGY SOLUTIONS

SHORELINE PARK
NW OF QUEENSWAY BRIDGE
VISUAL ASSESSMENT POINT

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-3

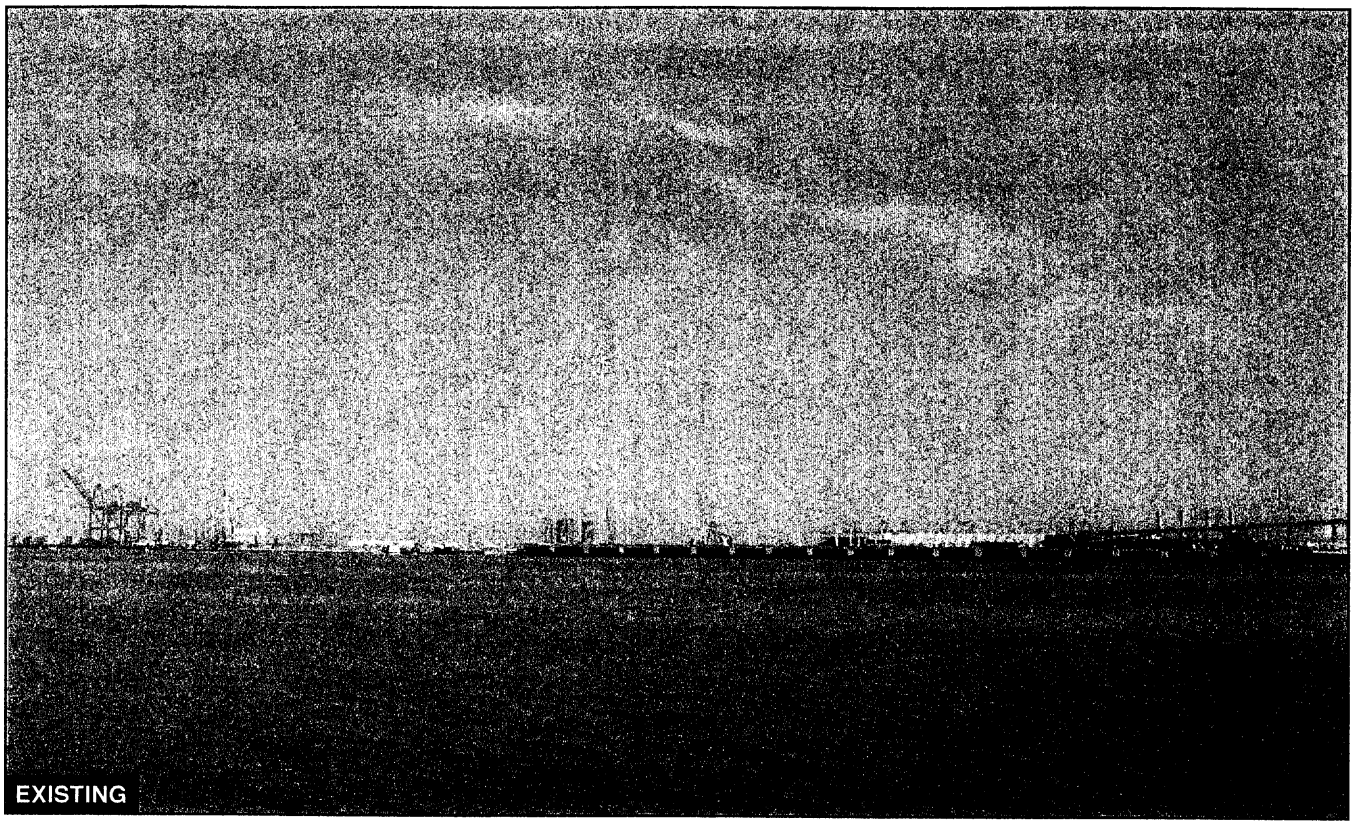
SOUND ENERGY SOLUTIONS

VINCENT THOMAS/ OCEAN BOULEVARD VISUAL ASSESSMENT POINT

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-4



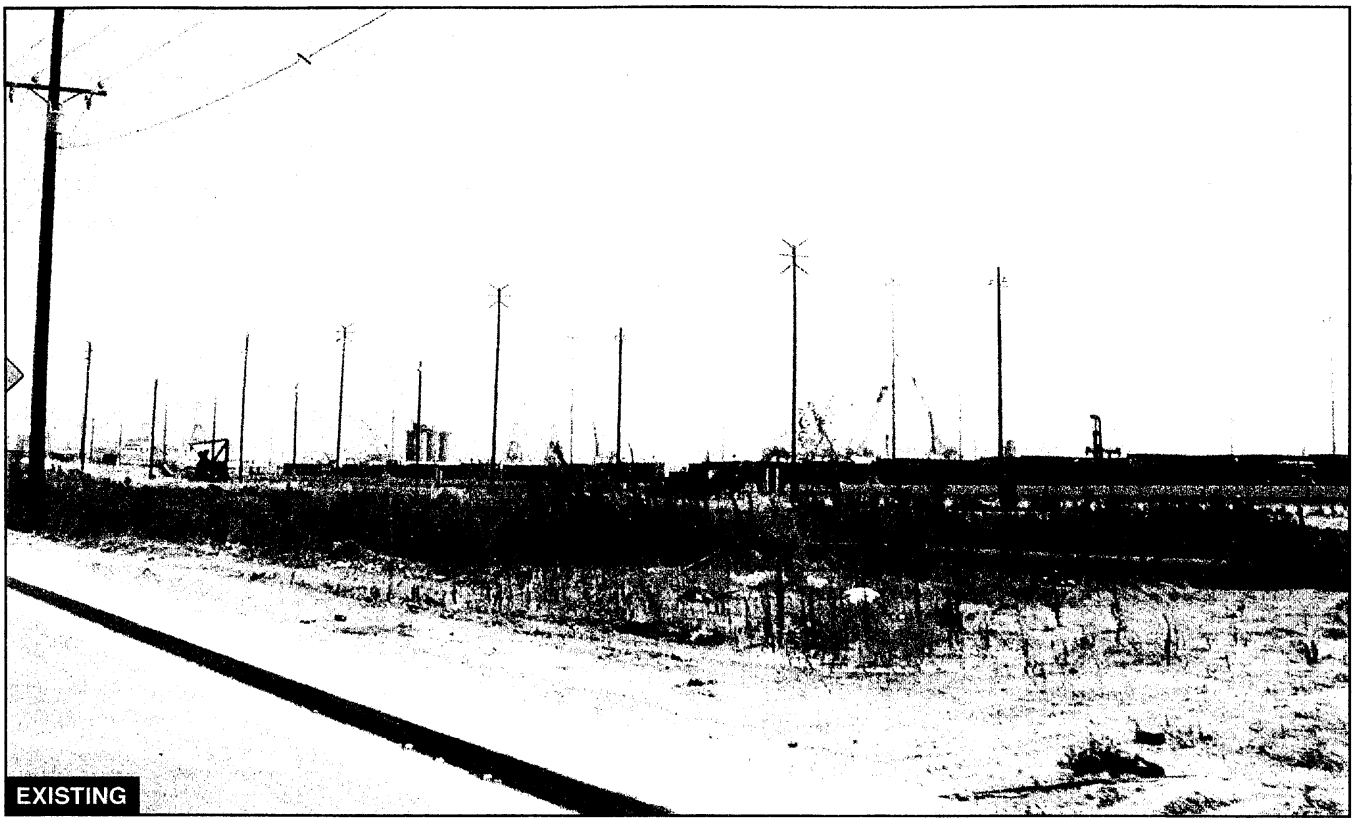
SOUND ENERGY SOLUTIONS

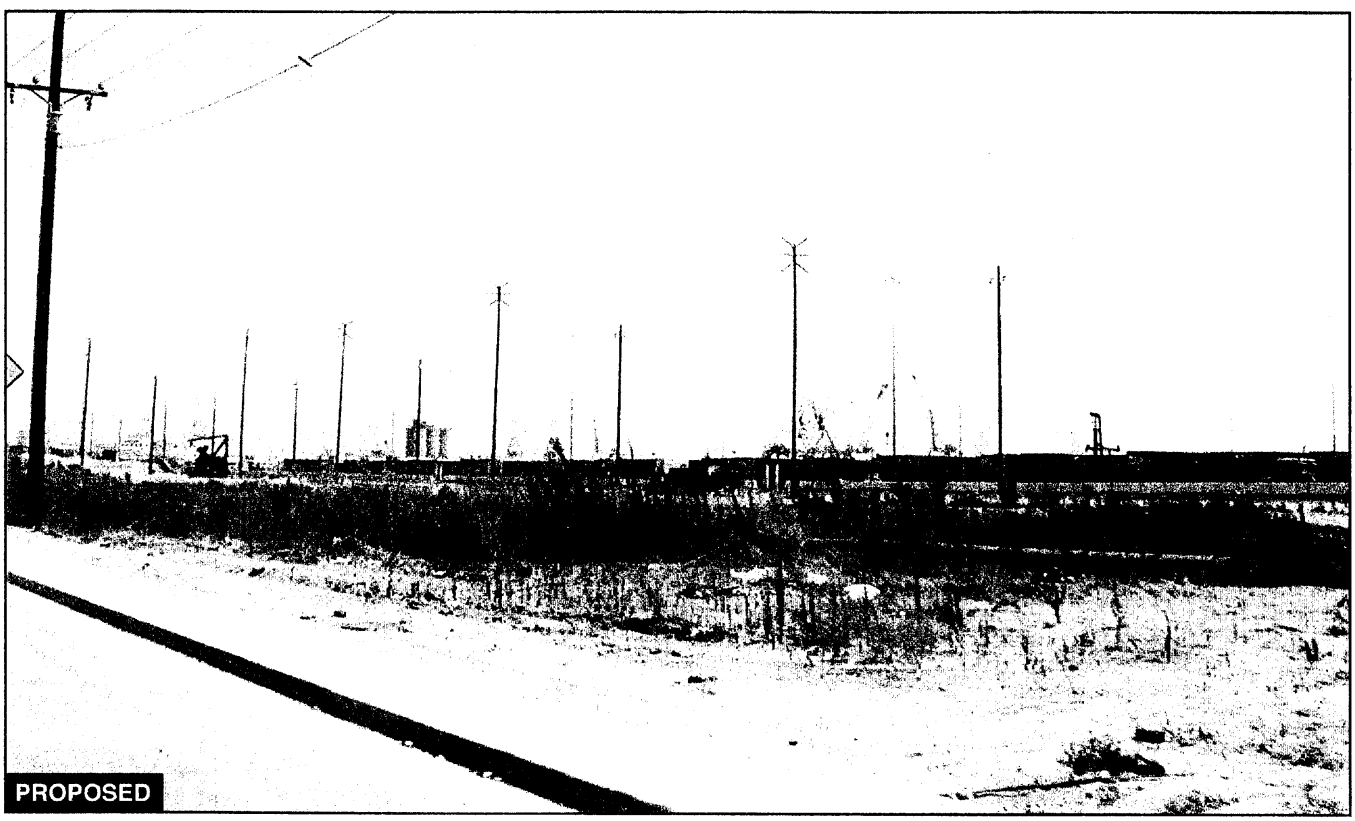
FIRE STATION/MOLE PIER ENTRANCE VISUAL ASSESSMENT POINT

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-5





SOUND ENERGY SOLUTIONS

EAST OCEAN BOULEVARD VISUAL ASSESSMENT POINT

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE A8-6

SOUND ENERGY SOLUTIONS

RESOURCE REPORT 9

AIR AND NOISE QUALITY

FERC Requirements:	Addressed in:
Describe the existing air quality, including background levels of nitrogen dioxide and other criteria pollutants that may be emitted above EPA-identified significance levels. (§ 380.12(k)(1))	Section 9.1.1.2, Ambient Air Quality
Quantitatively describe existing noise levels at noise-sensitive areas such as schools, hospitals, or residences and include any areas covered by relevant state or local noise ordinances: (i) Report existing noise levels as the Leq (day), Leq (night), and Ldn and include the basis for the data or estimates. (ii) For existing compressor stations, include the results of a sound level survey at the site property line and nearby noise-sensitive areas while the compressors are operated at full load. (iii) For proposed new compressor station sites, measure or estimate the existing ambient sound environment based on current land uses and activities. (iv) Include a plot plan that identifies the locations and duration of noise measurements, the time of day, weather conditions, wind speed and direction, engine load, and other noise sources present during each measurement. (§ 380.12(k)(2))	Section 9.2.1 Existing Noise Conditions
Estimate the impact of the project on air quality, including how existing regulatory standards would be met. (i) Provide the emission rate of nitrogen oxides from existing and proposed facilities, expressed in pounds per hour and tons per year for maximum operating conditions, include supporting calculations, emission factors, fuel consumption rates, and annual hours of operation. (ii) For major sources of air emissions (as defined by the Environmental Protection Agency), provide copies of applications for permits to construct (and operate, if applicable) or for applicability determinations under regulations for the prevention of significant air quality deterioration and subsequent determinations.	Section 9.1.3 Project Air Quality Impacts Appendix 9-5
Describe measures and manufacturer's specifications for equipment proposed to mitigate impact to air and noise quality, including emission control systems, installation of filters, mufflers, or insulation of piping and buildings, and orientation of equipment away from noise-sensitive areas.	Sections 9.1.3 and 9.2.3

CEQA Requirements:	Addressed in:
III. Air Quality – Where available, 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?	Section 9.1.3.6 Consistency with SCAQMD 1997 and 2003 Air Quality Management Plans, and Compliance with Regulations
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	Section 9.1.3.3 Analysis of Air Quality Impacts
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?	Section 9.1.3.3 Analysis of Air Quality Impacts
d) Expose sensitive receptors to substantial pollutant concentrations?	Section 9.1.3.4 Health Risk Assessment
e) Create objectionable odors affecting a substantial number of people?	Section 9.1.3.5 Other Air Quality-related Impacts
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?	Section 9.2.3.2 Potential Noise Impact
b) Exposure of persons to or generation of excessive ground-borne vibration or ground-borne noise levels?	Section 9.2.3.2 Potential Noise Impact
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	Section 9.2.3.2 Potential Noise Impact
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	Section 9.2.3.2 Potential Noise Impact
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?	Section 9.2.3.2 Potential Noise Impact
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?	Section 9.2.3.2 Potential Noise Impact

RESOURCE REPORT 9
AIR AND NOISE QUALITY
CONTENTS

ACRONYMS

ANST	American National Standards Institute
AQMP	Air Quality Management Plan
ARB	California Air Resources Board
AB	Assembly Bill
BACT	Best Available Control Technology
Basin	South Coast Air Basin
BOG	Boil-Off Gas
CAA	Clean Air Act
CalARP	California Accidental Release Prevention Program
California CAA	California Clean Air Act
CAPCOA	California Air Pollution Control Officers Association
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
CO	Carbon monoxide
CONCAWE	Conservation of Clean Air and Water in Europe
dB(A)	A-Weighted Sound Pressure Level in decibels
DOE	United States Department of Energy
EPA	United States Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
gpd	gallons per day
hp	horsepower
LAER	Lowest Achievable Emission Rate
L_{Adn}	Average Day/Night Noise Levels (also referred to as L_{dn})
L_{Aeq}	A-Weighted Equivalent Continuous Noise Level (also referred to as L_{eq})
L_{A90}	A-Weighted Sound Pressure Level Exceeded for 90 Percent of the Measurement Period
L_{A10}	A-Weighted Sound Pressure Level Exceeded for 10 Percent of the Measurement Period
L_{dn}	Average Day/Night Noise Levels (also referred to as L_{Adn})
L_{eq}	A-Weighted Equivalent Continuous Noise Level (also referred to as L_{Aeq})
LNG	Liquified Natural Gas
MATES II Study	Multiple Air Toxics Exposure Study
MMBtu/hr	Million of British thermal units per hour
MMscfd	Million standard cubic feet per day
mph	miles per hour
NAA	Non-Attainment Area
NAAQS	National Ambient Air Quality Standards
NESHAP	National Emission Standards for Hazardous Air Pollutants
NGL	Natural Gas Liquids
N/m^2	Newtons per Square Meter
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSA	Noise Sensitive Areas

NSPS	New Source Performance Standards
NSR	New Source Review
OEHHA	Office of Environmental Health Hazard Assessment (California EPA)
O_3	Ozone
$P_A(t)$	A-Weighted Instantaneous Acoustic Pressure
PM	Particulate Matter (also called total suspended particulate [TSP])
PM2.5	Particulate Matter with Diameter Less than or Equal to 2.5 Microns
PM10	Particulate Matter with Diameter Less than or Equal to 10 Microns
P_O	Reference Acoustic Pressure (equal to 2×10^{-5} N/m^2)
POLB	Port of Long Beach
ppmw	Parts per million by weight
PSD	Prevention of Significant Deterioration
RECLAIM	Regional Clean Air Incentives Market
REL	Reference Exposure Level
RMP	Risk Management Plan
ROG	Reactive Organic Gases
RTCs	RECLAIM Trading Credits
SCAQMD	South Coast Air Quality Management District
SCR	Selective Catalytic Reduction
SES	Sound Energy Solutions
SIC Code	Standard Industrial Classification Code
SIP	State Implementation Plan
SoCal Edison	Southern California Edison
SoCal Gas	Southern California Gas Company
SO_2	Sulfur dioxide
SO_x	Sulfur oxides
STV	Shell and Tube Vaporizer
T-BACT	Toxics-Best Available Control Technology
TSP	Total Suspended Particulate (also called particulate matter [PM]
USCG	United States Coast Guard
VOC	Volatile Organic Compounds
W	West

RESOURCE REPORT 9
AIR AND NOISE QUALITY

9 INTRODUCTION

Sound Energy Solutions (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

Purpose of Report

The purpose of Resource Report 9 is to describe the following:

- Existing air quality and noise environment in the vicinity of the Project
- The Project's supplying LNG for vehicle fuel
- Estimated air emissions and noise produced by the Project
- Assessment of the Project's potential impacts to air and noise quality
- Mitigations included to reduce potential impacts.

Agency Communications

In the preparation of this report, SES on several occasions has communicated with the South Coast Air Quality Management District (SCAQMD) to identify air quality issues and permitting requirements. Relevant correspondence is included in Appendix 9-1. The SES team has also met with the California Air Resources Board (ARB) and United States Environmental Protection Agency (EPA) to describe the Project.

Report Organization

Resource Report 9 is organized into three sections. Section 9.1 describes existing air quality (including regional climatology, regulatory setting, attainment status, and background air quality), context for LNG vehicle fuel, emissions from construction and operation of the Project, potential air quality impacts and mitigations.

Section 9.2 describes the existing noise environment around the Project, noise levels from construction and operation activities, and assessment of potential noise impacts. Noise sensitive areas (NSAs) are not present within 1 mile of the Project. Potential noise impacts at NSAs that exist at greater distances are discussed. Also included is a description of the proposed mitigation measures that assure the Project will operate in compliance with applicable noise ordinances.

Section 9.3 includes a list of references used in preparing this report. All tables and figures referred to in the text are found at the end of the report. Correspondence with regulatory agencies is contained in Appendix 9-1, while Appendices 9-2 through 9-5 contain the air dispersion modeling protocol, analysis calculations, health risk assessment information, and the applications for Permits to Construct/Permits to Operate, respectively.

9.1 AIR QUALITY

Air quality aspects of the Project include the following emission sources:

- LNG carrier emissions within SCAQMD jurisdiction, including while ships are docked and hotelling during unloading of LNG at the terminal
- Pilot boat emissions
- United States Coast Guard (USCG) escort emissions
- Tugboat emissions during maneuvering and docking at/departure from Berth 126 at Pier T
- Combustion emissions from Project process water heaters

- LNG terminal fugitive emissions
- Combustion emissions from trailer trucks (LNG and NGL) to be loaded at the terminal
- Combustion emissions from vehicles driven to the terminal by employees and visitors
- Combustion emissions from trucks driven to the terminal to deliver operating materials (e.g., maintenance supplies)
- Combustion emissions from the periodic testing of an emergency generator and fire water pump engines

The air quality discussion is in three sections describing: existing air quality conditions, applicable regulations, and Project air quality impacts.

9.1.1 Existing Air Quality Conditions

The existing air quality conditions are discussed in terms of: topography and climate; ambient air quality, and existing sources and emissions

Topography and Climate

The Port of Long Beach is located in San Pedro Bay, in the southwestern portion of the South Coast Air Basin (Basin) (see Figure 9-1). Within the San Pedro Bay, the lowland surface of the Basin is a broad, aggraded coastal plain of low relief that slopes gradually southwest to the Pacific Ocean. This plain extends offshore about 12 miles, to the edge of the San Pedro continental shelf and inland approximately 7 miles to the Newport-Inglewood fault zone.

San Pedro Bay is a natural embayment formed by a westerly protrusion of the coastline. The Palos Verdes Hills, located 3.5 miles west-northwest of Long Beach Harbor (see Figure 9-2), form an uplifted, terraced peninsula 1,400 feet in elevation (URS, 2002). The only other nearby elevation of significance is Signal Hill, which rises 400 feet above its surroundings, and is located 4 miles northeast of the Project.

The climate of the San Pedro Bay region is classified as Mediterranean, characterized by cool, dry summers and mild, wet winters. Major climatic influences are the moderating effects of the cool Pacific Ocean and a strong, persistent high-pressure system, the Eastern Pacific High, which is centered off the coast of California. This high is centered between the 140° west (W) and 150° W meridians, and oscillates in a north-south direction. In summer, the high moves to its northernmost position, which results in a strong subsidence inversion and clear skies inland. Along the coast, the weather is dominated by coastal stratus and fog caused by the cooler, more homogeneous ocean surface temperature. Often in the summer, fog comes onshore during late afternoon and persists until the middle of the following morning.

In winter, the high typically moves southwest toward Hawaii, which allows storms originating in the Gulf of Alaska to reach northern California, bringing wind and rain. About 80 percent of the region's annual rainfall (10 to 30 inches, depending on altitude and proximity to the ocean) occurs between November and March (US Dept of Commerce, 1959) generally, precipitation is lower along the coastline, increasing inland, toward higher terrain. Normal annual precipitation in Long Beach, California, is approximately 12 inches (California Dept of Water Resources, 1978). Between storms, skies are fair, winds are light, and temperatures are moderate. Temperatures are more stable along the coast than inland, due to the moderating effect of the ocean.

During winter the dominant wind direction ranges from northwest through west during the passage of storms from the Gulf of Alaska and from the east for Santa Ana winds descending into the Basin from the high-pressure areas located over the eastern deserts (National Climatic Center, 2003). The long-term annual average wind speed is 5.6 miles per hour (mph). Figure 9-3 shows the wind rose for 1981 at the Long Beach Municipal Airport (Weather Station ID 53101). The SCAQMD used meteorological data from 1981 to construct standardized format datasets for air dispersion modeling analyses throughout the Basin. This short-term database of 8,719 hours has an average wind speed of 3.8 mph and a calm wind frequency of 17.55 percent. During summer the sea breeze blows from the south.

Seasonally, the average winter and summer temperatures are in the mid-50s and mid-70s, respectively (WorldClimate, 2003).

Ambient Air Quality

The Basin has an area of approximately 6,000 square miles that consists of the non-desert portions of Los Angeles, Riverside and San Bernardino counties, and all of Orange County (see Figure 9-4).

Air quality is determined primarily by the type and amount of contaminants emitted into the atmosphere, the size and topography of the air basin, and meteorological conditions. The light winds, described in the previous section, allow emissions to accumulate within the shallow mixing layer and produce high pollutant concentrations.

Pollutants that impact air quality are divided into two categories: criteria and non-criteria pollutants. Criteria pollutants are those for which health-based ambient air quality standards have been set, while non-criteria pollutants are those that have the potential to cause carcinogenic risk and non-carcinogenic health hazards in either the short term (acute) or long term (chronic).

Criteria Pollutants

The National Ambient Air Quality Standards (NAAQS) and California ambient air quality standards for criteria pollutants are presented in Table 9-1.

The SCAQMD operates numerous ambient air monitoring stations within the Basin. The monitoring station nearest to the Project is at the Long Beach Municipal Airport, located 5-6 miles to the northeast (see Figure 9-5). Table 9-2 provides 1998 through 2001 monitoring data from that station. This ambient air quality is the result of the basin emissions shown in Figure 9-6. Monitored criteria pollutant concentrations are compared to ambient air quality standards on a county-by-county basis to establish attainment status. Table 9-3 lists the attainment and non-attainment designations for the Basin counties based upon the Year 2000 database. All four counties in the Basin exceed standards for ozone and particulate matter with a diameter less than or equal to 10 microns (PM-10), while only Los Angeles County also exceeds the standard for carbon monoxide (CO). The CO exceedances are limited to downtown Los Angeles.

As with most of the monitoring stations in the Basin, recent ambient air concentrations at Long Beach exceeded the standards only for ozone and PM-10. The exceedances occurred on 13 days at most (see PM-10 results for 1999).

The SCAQMD Governing Board adopted the 2003 Air Quality Management Plan (AQMP) on August 1, 2003. The 2003 AQMP updates the attainment demonstration for the federal standards for ozone and PM-10; replaces the 1997 attainment demonstration for the federal CO standard and provides a basis for a maintenance plan for CO for the future; and updates the maintenance plan for the federal nitrogen dioxide (NO_2) standard that the Basin has met since 1992. The AQMP was approved with changes by ARB at their October 23-24, 2003 public hearing. ARB forwards the AQMP to EPA Region 9 for their review and approval.

This 2003 revision to the AQMP also addresses several state and federal planning requirements and incorporates significant new scientific data, primarily in the form of updated emission inventories, ambient measurements, new meteorological episodes and new air quality modeling tools.

Noncriteria Pollutants

Noncriteria pollutants are present in the atmosphere in trace concentrations, and are not regularly monitored in the Basin. Most of the available monitoring data was generated during the Multiple Air Toxics Exposure Study in the Basin (MATES II study), which was conducted in 1997 (SCAQMD, 1999).

The MATES II study found the average carcinogenic risk throughout the Basin to be about 1,400 in one million ($1,400 \times 10^{-6}$), with mobile sources (cars, trucks, trains, ships, aircraft, etc.) having the most impact. About 70 percent of the risk was attributed to diesel particulate emissions, 20 percent to other toxics associated with mobile sources (e.g., benzene, 1,3-butadiene and formaldehyde) and 10 percent to stationary sources (e.g., dry cleaners and chrome plating operations).

The MATES II study identified long-term downward trends of cancer risk levels in the Basin, with all sites showing a decrease in toxic levels from 1990 through 1997. The study reported that carcinogenic risk associated with air toxics decreased about 50 percent between 1990 and

1997, both throughout the Basin and in Long Beach. Diesel particulates were identified as the significant contributor to the predicted cancer risks, with southern California having a decrease of approximately 32 percent in elemental carbon (a surrogate for diesel particulates) from the early 1980s to the early 1990s (URS, 2002).

Existing Sources and Emissions

Basin Emission Inventory

The 1997 Basin emissions inventory (see Figure 9-6) improved over the next 5 years (SCAQMD, 2003c). By 2002, approximately 4,700 tons of CO, 1,100 tons of nitrogen oxides (NOx), 800 tons of volatile organic compounds (VOC), 65 tons of oxides of sulfur (SOx), 340 tons of PM-10, 134 tons of fine particulate (with a diameter less than or equal to 2.5 microns [PM-2.5]), and 600 tons of total suspended particulate (TSP or PM) were emitted in the Basin each day. Emissions vary relatively little by season, but there are large seasonal differences in the ambient concentrations of pollutants due to seasonal variations in atmospheric conditions.

The anthropogenic inventory is comprised of both stationary and mobile sources of emissions. On-road mobile sources include light-duty passenger vehicles, light- medium- and heavy-duty trucks, motorcycles and urban buses. Off-road mobile sources include off-road vehicles, trains, ships, aircraft and mobile equipment.

Criteria Pollutants Inventory

The SCAQMD emissions inventory includes levels for criteria pollutants NOx, CO, SOx, PM-10 and VOC (a precursor of ozone). Ozone is not in the inventory because it is not a direct emission. Rather, ozone is formed by photochemical reactions involving the precursor emissions of VOC and NOx. As shown on Table 9-4 for the year 2002, mobile sources are the major contributors in the Basin, with emissions as follows: CO – 93 percent, NOx – 86 percent, SOx – 55 percent and VOC – 59 percent. PM-10 (47 percent) is mainly attributable to entrained road dust.

Noncriteria Pollutant Inventory

Data for noncriteria pollutant emissions are not as available as for criteria pollutants. Under the Air Toxics "Hot Spots" (Assembly Bill [AB] 2588) Information and Assessment Act, industrial

facilities have been required since 1989 to compile toxic emissions inventories. Companies subject to the program are required to report their toxic emissions to SCAQMD for review. The SCAQMD's first toxic emission inventory from stationary sources was compiled for the year 1982 for 30 noncriteria pollutants. The inventory was updated for the MATES studies. A summary of the 1998 toxics emissions inventory by source category is presented on Table 9-5, which provides the estimated toxic emissions for selected compounds by source category (ARCO, 2003).

Current Use of LNG as a Vehicle Fuel

Part of the rationale for this Project is the increasing demand for LNG as vehicle fuel. This section discusses the current context of LNG for use as vehicle fuel at the local, state and national levels.

Local LNG Vehicle Fuel Use

The POLB has large numbers and concentrations of diesel-fueled vehicles (e.g., container trucks) and off-road equipment (e.g., yard hostlers). Together with ship emissions, port emissions are significant enough (e.g., 5 percent of NOx) to be a line item in the SCAQMD emission inventory (see Table 9-4). The POLB encourages tenants to reduce mobile source diesel-fuel emissions by using alternative diesel fuels, and installing pollution control devices (POLB, *Voluntary Diesel Emission Reduction Program*, 2002). This POLB publication states that this program can reduce NOx and particulate emissions up to 74 and 95 percent, respectively.

Additionally, the SCAQMD has established a Clean Fuels program to increase the use of alternative fuels. This program has developed a set of fleet vehicle-related rules that encourages use of alternative fuels. These rules require the following fleet categories to acquire alternative-fuel vehicles if they have more than 14 vehicles. The fleet rules include: Sweeping service fleets (Rule 1186.1: also allows "otherwise less polluting sweepers")

- Light- and medium-duty public fleets (Rule 1191: also allows low-emitting gasoline vehicles)
- Public transit bus fleets (Rule 1192)

- Solid waste collection fleets (Rule 1193)
- Commercial airport passenger transportation service fleets (Rule 1194: also allows clean-burning vehicles)
- School bus fleets (Rule 1195)
- Public (government) fleets (Rule 1196)

The SCAQMD has also entered into contracts for four LNG fueling stations (SCAQMD, 2003b), each of which must be able to provide at least 50,000 gallons per day (gpd).

State LNG Vehicle Fuel Use

Two thousand heavy-duty vehicles in California already run on LNG. The number of LNG-fueled vehicles is expected to increase enough to demand 120,000 gpd (44 million gallons per year) in 2005, of which half would be in southern California. The California Energy Commission Transportation Fuels Office estimates that between 0.33 and 0.66 billion gallons of LNG per year would be needed by 2010 to power these vehicles. This increasing use of LNG-fueled vehicles is being encouraged by ARB's Carl Moyer Program. The Carl Moyer Program provides funding to fleets that propose to refit their heavy-duty engines to use LNG and other alternative fuels.

At this time, LNG used in California comes from eight liquefaction plants located in California and other western states. This project will be the first facility in California to import LNG rather than convert it from locally available natural gas. Five facilities in California offer LNG for vehicle use, of which only two are located in the Basin.

National LNG Vehicle Fuel Use

The EPA promotes and expands the use of environmentally-beneficial alternative fuels and vehicles by providing the states with tools such as benefits models, State Implementation Plan (SIP) Credits, and the Clean Fuels Fleet Program. The EPA states that, compared to diesel-fuel combustion, LNG combustion reduces NOx, PM and VOC emissions by at least 50 percent (EPA, 2003).

The United States Department of Energy (DOE) website, called the Alternative Fuels Data Center (www.afdc.doe.gov), provides basic information on LNG and other alternative fuels, and facilitates linkage to other sites that offer additional information.

In general, the evolution of LNG as viable vehicle fuel is following the logical sequence of starting first with the dedicated fleets of long-haul heavy-duty trucks that can abide by the limitation of very few LNG refueling stations, most likely located at their fleet terminals. Later, when public LNG refueling stations become available, a broader range of LNG trucks become available for non-fleet uses. The last part of the sequence, if it carries through all the way, would be the broad availability of LNG cars, trucks, sport-utility vehicles and LFG fueling stations.

9.1.2 Applicable Regulations

This section briefly describes the federal, state and local regulations that contain requirements applicable to the Project.

9.1.2.1 Federal Regulations

The EPA implements and enforces the requirements of many federal environmental laws. The federal Clean Air Act (CAA) of 1970, amended in 1977 and most recently in 1990, provides the EPA with the legal authority to regulate air pollution from stationary and mobile sources. EPA Region IX, which has its offices in San Francisco, administers EPA programs in California, Nevada, Arizona and Hawaii.

Clean Air Act

The CAA established NAAQS for "criteria" air pollutants (see Table 9-1) and delegated enforcement of air pollution control regulations to the states. The EPA has promulgated the following stationary source regulatory programs to implement requirements of the CAA:

- National Standards of Performance for New Stationary Sources (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- New Source Review (NSR)
- Prevention of Significant Deterioration (PSD)

- CAA Title IV: Acid Deposition Control
- CAA Title V: Operating Permits Program
- CAA Section 112r (Risk Management Program)

National Standards of Performance (NSPS) for New Stationary Sources

The NSPS (CAA §111, 42 USC §7411; Code of Federal Regulations [CFR], Title 40 Part 60) established standards of performance to limit the emission of criteria pollutants from new or modified facilities in specific source categories. The applicability of these regulations depends on the equipment size and process rate, and the date of construction, modification or reconstruction of the affected facility. NSPS Subpart Db at 40 CFR 60.40b (Industrial - Commercial-Institutional Steam Generators > 100 MMBtu/hr) is applicable because water heating is part of the steam generating unit definition in 40 CFR 60.41c.

Subpart D at 40 CFR 60.40 (Fossil Fuel Fired Steam Generators >250 MMbtu/hr) and Da at 40 CFR 60.40a (Electric Utility Steam Generators > 250 MMBtu/hr) are not applicable because the project water heaters do not generate steam. Subpart Dc at 40 CFR 60.40c (Small Industrial - Commercial-Institutional Steam Generators 10 -100 MMBtu/hr) is not applicable because the project heat rate is higher than 100 MMBtu/hour.

Subpart Kb (Standards of Performance for Volatile Organic Liquid Storage Vessels [Including Petroleum Liquid Storage Vessels] for which Construction, Reconstruction, or Modification Commenced After July 23, 1984 [from 52 FR 11429, April 8, 1987]) is not applicable to the Project's ethane and propane storage tanks because these vessels will operate at pressures above 204.9 kilopascals (40 CFR 60.110b(d)(2)).

National Emission Standards for Hazardous Air Pollutants

The NESHAPs (CAA §112, 42 USC §7412; 40 CFR Part 63) established national emission standards to limit hazardous air pollutant emissions from facilities in specific source categories. The EPA has identified hazardous air pollutants as those that cause or contribute to the adverse health effects of air pollution, but for which NAAQS have not been established. These

standards are implemented at the local level with federal oversight. No NESHAP is applicable to the Project.

New Source Review

Congress established the NSR program as part of the 1977 CAA Amendments (CAA §171-193, 42 USC §7501 et seq.; 40 CFR Parts 51 and 52). The CAA required new major stationary sources of air pollution and major modifications to stationary sources to obtain an air pollution permit before commencing construction. NSR is required whether the major source or modification is planned for an area where the NAAQS are exceeded (non-attainment areas) or an area where air quality is acceptable (attainment and unclassifiable areas). Permits for sources in attainment areas are referred to as PSD permits, while permits for sources located in non-attainment areas are referred to as non-attainment area (NAA) permits. The entire program, including both PSD and NAA permit reviews, is referred to as the NSR program.

NSR is applied on a pollutant basis. In those areas meeting NAAQS, the PSD program may be applicable depending upon site status and the quantity of facility emissions. Federal NSR does not pre-empt any state program from being more stringent than the federal program. Rather, under the CAA, states are specifically authorized to establish their own programs that may be more stringent than federal law. This is the case in the Long Beach area under regulations of the SCAQMD.

Stationary sources of non-attainment criteria pollutants, or their precursors, can only be federally and locally permitted by application of Lowest Achievable Emission Rate (LAER) control technology and elimination through offsets of at least an equal amount of the same pollutant or its precursors. Offsets are intended to assure that no net emissions increase occurs. In the Basin, federal LAER technology is labeled by the SCAQMD as Best Available Control Technology (BACT).

Performance of air quality impact analyses for a proposed new or modified source, and notification of the public concerning the NSR process are also elements of NSR.

Prevention of Significant Deterioration

The PSD program requirements were promulgated by the EPA in 1977 (CAA §160-169A, 42 USC §7470-7491; 40 CFR Parts 51 and 52). The EPA established 28 named major source categories (e.g., chemical process plant) for which PSD review would only be required if emissions of any pollutant regulated by the CAA were to be higher than 100 tons per year (40 CFR 52.21 (b) (1) (i) (*a*)), including fugitive emissions. EPA (2003) determined that the process of vaporization of LNG to natural gas does not qualify the source as a "fuel conversion plant" (40 CFR 52.21 (b) (1) (I) (*a*) and (iii) (*q*)). Based on the Distrigas draft operating permit (Massachusetts, 2003), the Project will be assigned a Standard Industrial Classification (SIC) code of 4924 for natural gas distribution. Hence, a PSD review and permit would only be needed if Project emissions exceeded the 250 ton-per-year threshold that applies under 40 CFR 52.21 (b) (1) (i) (*b*) for unnamed source categories.

CAA Title IV: Acid Deposition Control

The Title IV, Acid Rain Program (Clean Air Act §401 et seq., 42 USC §7651 et seq.; 40 CFR Part 72), requires the reduction of emissions of acidic compounds and their precursors from electric utility plants, and hence, is not applicable to the Project.

CAA Title V: Operating Permits Program

The Title V Operating Permits Program (CAA §501 et seq., 42 USC §7661; 40 CFR Part 70) requires issuance of operating permits that identify all applicable federal performance, operating, emissions monitoring, recordkeeping and reporting requirements. Title V applies to major facilities, Phase II acid rain facilities, solid waste incinerator facilities, and any facility listed by EPA as requiring a Title V Permit. The Title V requirements in the Basin are implemented at the local level (i.e., SCAQMD) with federal oversight, and hence, also require identification of applicable SCAQMD rules. New facilities in the SCAQMD are subject to Title V requirements if they have the potential to emit 10 tons/year or more of NOx, among other thresholds presented in Section 9.1.3. Based on current emission calculations, the facility will require a CAA Title V operating permit.

Risk Management Program

The Clean Air Act (Section 112r of the CAA; 40 CFR Part 68) requires that a Risk Management Plan (RMP) be prepared if a facility stores a specified regulated substance in a quantity greater than the published threshold in the single largest container, assuming multiple containers cannot be compromised by the failure of one. The federal list of regulated substances includes aqueous ammonia with a threshold quantity of 20,000 pounds if the concentration is at least 20 percent. The federal list of regulated flammable substances includes methane, ethane and propane, each with a threshold quantity of 10,000 pounds.

The RMP includes an offsite consequence analysis of the complete instantaneous failure of the largest storage container under regulatory-required meteorological conditions. The Project will prepare an RMP, as required by Section 112r, because of its large storage capacity for LNG (methane), ethane and propane, flammable components of LNG, and storage of aqueous ammonia for use in the Selective Catalytic Reduction (SCR) of NOx emissions from the process water heaters.

Clean Air Act Amendments of 1990

The 1990 Amendments to the CAA defined five classes of increasing non-attainment areas: marginal, moderate, serious, severe and extreme. The Basin is classified as extreme non-attainment of the ozone 1-hour NAAQS. New stationary sources emitting criteria air pollutants or their precursors in non-attainment areas cannot be permitted without elimination of at least an equal amount of the same pollutant or its precursors through "offsets." Areas, including the SCAQMD, that do not attain NAAQS are required by the CAA Amendments to prepare an Air Quality Attainment Plan to control existing and proposed new sources of air emissions, such that the NAAQS may be attained by a certain target date (e.g., 2010 for the Basin).

Title II of the CAA Amendments contains provisions relating to highway and off-road mobile sources. Diesel fuel for highway vehicles has been required to have a sulfur content less than 0.05 percent (500 parts per million by weight [ppmw]), a limit that is to be lowered to 15 ppmw during the period of June 2006 through June 2009. This sulfur restriction will greatly reduce emissions of diesel exhaust particulate and associated carcinogenic health effects.

Conformity of General Federal Actions

According to Section 176(c) of the CAA (40 CFR Section 51.853), a federal agency must make a conformity determination in the approval of a project having air emissions that exceed specified thresholds. The thresholds for an extreme nonattainment area are 10, 10, 70, 100, and 100 tons per year for NOx, ROG, PM-10, SOx and CO, respectively.

9.1.2.2 State Regulations

The ARB was created in 1968 by the Mulford-Carrell Air Resources Act. The primary responsibilities of ARB are to develop, adopt, implement and enforce California's motor vehicle pollution control program, administer and coordinate the state's air pollution research program, adopt and update, as necessary, the state's ambient air quality standards, review operations of the local air pollution control districts, and review and coordinate preparation of the SIP for achieving the NAAQS within California.

The ARB implements and enforces the requirements of many federal environmental laws as well as its own parallel legislation which is often more stringent than federal law. The ARB, which has its offices in Sacramento, has sought and gained delegation for most of the federal CAA programs from EPA and in turn has granted program delegations to the 35 districts (e.g., the SCAQMD) to address unique local air quality needs related to air pollution from stationary and mobile sources..

California Clean Air Act

The California Clean Air Act (California CAA) was established in 1989 (California Health & Safety Code §40910-40930). It required the ARB to set state ambient air quality standards, much like the federal CAA required the EPA to set NAAQS. The California standards had to be at least as stringent as the national standards. The California CAA requires local districts to attain and maintain both national and state ambient air quality standards (see Table 9-1) at the earliest practicable date. Local districts must prepare air quality plans demonstrating the means by which ambient air quality standards will be attained.

Comparison of the Long Beach ambient air quality data in Table 9-2 with the ambient air quality standards in Table 9-1 shows the following:

- The Long Beach-monitored concentrations are in attainment of the California ambient air quality standards for CO, NO_2, SO_2 and lead
- The standards for O_3 and PM-10 were exceeded on several days of each year
- The federal PM-10 standards were met in all years
- The federal O_3 one-hour standard was exceeded in 1999

State Implementation Plan (SIP)

The SIP is required by the CAA (California Health & Safety Code §39500 et seq.) to demonstrate the means by which all areas of the state will attain NAAQS within federally-mandated deadlines. The ARB reviews and coordinates preparation of the SIP. Local districts must adopt new rules or revise existing rules to demonstrate that the resulting emission reductions, combined with reductions in mobile source emissions, will result in attainment of NAAQS. ARB- and EPA-approved rules and regulations are incorporated into the SIP.

Toxic Air Contaminant Identification and Control Act

This Act was adopted in 1983 (California Health & Safety Code §39650 – 39675), creating a two-step process to identify toxic air contaminants and control their emissions. The ARB identifies and prioritizes the pollutants to be considered for identification as toxic air contaminants. The ARB assesses the potential for human exposure to a substance, while the Office of Environmental Health Hazard Assessment (OEHHA) evaluates corresponding health effects. Both agencies collaborate in preparation of a risk assessment report that concludes whether a substance poses a significant health risk and should be identified as a toxic air contaminant.

The ARB reviews the emission sources of an identified toxic air contaminant and, if necessary, develops air toxics control measures to reduce these emissions. In 1993, the California legislature amended the Act and identified the 189 federal hazardous air pollutants as toxic air contaminants. No measures adopted via the Toxic Air Contaminant Identification and Control Act are applicable to the Project.

Air Toxic "Hot Spots" Information and Assessment Act

This Act was adopted in 1987 (California Health & Safety Code §44300 – 44384; 17 CCR §93300-93347) to supplement the Toxic Air Contaminant Identification and Control Act by requiring development of a statewide inventory of air toxics emissions from stationary sources. This Act is implemented at the local level with state oversight. The Act requires affected facilities to prepare the following:

- Emissions inventory plan that identifies air toxics emitted by specified sources within the facility, and the methods by which the emissions will be quantified
- Emissions inventory report that quantifies the air toxics emissions
- Health risk assessment to characterize health risks to the exposed public, if requested by a district.

Facilities with toxic air emissions that are deemed to pose a significant health risk must issue notices to the exposed population. In 1992, the California legislature amended the Act to require facilities with toxic air emissions that are deemed to pose a significant health risk to implement risk management plans. The SCAQMD will evaluate the health risk assessment contained in the Environmental Impact Report to determine if preparation of an Air Toxics Inventory Plan, followed by an Air Toxics Inventory Report, will be required after operation commences in 2008.

California Accidental Release Prevention Program (CalARP)

The CalARP (California Health & Safety Code §22531 - 25543; 19 CCR §2735.1 – 2785.1) includes the requirements of the federal Risk Management Program with state additions. Much like the federal program, a Risk Management Plan (RMP) must be prepared if a facility stores a specified regulated substance in a quantity greater than the published threshold in the single largest container, assuming multiple containers cannot be compromised by the failure of one. Both the state and federal programs publish lists of the included regulated substances along with threshold quantities. The state list includes ammonia with a threshold quantity of 500 pounds, which is more stringent than the federal applicability level.

The RMP will include an offsite consequence analysis of the complete instantaneous failure of the largest storage container under regulatory-required meteorological conditions. The Project will be subject to CalARP because of its large storage capacity for LNG, in which methane, its major component, is flammable, and for storage of aqueous ammonia for use in the SCRs that control NOx emissions from the water heaters.

The POLB has a Risk Management Program that is applicable to the Project. This Program reinforces the requirements of the federal and California risk management programs to analyze risks to the local population and other resources from the potential release of toxic, flammable, and explosive substances.

9.1.2.3 Local Regulations (SCAQMD)

This section presents the SCAQMD Rules and Regulations that are potentially applicable to the Project. Most of the rules are self-explanatory by their titles. For some of the rules comments are provided to clarify their importance to the Project.

Regulation II – Permits

- Rule 201 – Permit to Construct
- Rule 203 – Permit to Operate
- Rule 204 – Permit Conditions
- Rule 212 – Standards for Approving Permits

  Rule 212 sets standards for the following:

  - public notification of the SCAQMD's intent to issue a Permit to Construct, and the 1000-foot distance of the Project boundary within which residents and schools (parents of students) must be notified.
  - emission of non-criteria pollutants in terms of maximum individual cancer risk.
- Rule 219 – Equipment Not Requiring a Written Permit Pursuant to Regulation II

Regulation III – Fees

- Rule 301 – Permit Fees

Regulation IV – Prohibitions

- Rule 403 – Fugitive Dust

  Rule 403 sets conditions on construction activities to reduce dust generation.

- Rule 463 – Storage of Organic Liquids

  Rule 463 sets requirements for tank roof seals, inspections, recordkeeping, and reporting.

- Rule 464 – Wastewater Separators

- Rule 466 – Pumps and Compressors

  Rule 466 sets requirements for pump and compressor leakage limits, inspections and recordkeeping.

Regulation XIII – New Source Review

- Rule 1301 – General

- Rule 1302 – Definitions

- Rule 1303 – Requirements

- Rule 1304 – Exemptions

  Rule 1304 provides exemptions from modeling and offsets.

- Rule 1306 – Emission Calculations

- Rule 1309 – Emission Reduction Credits and Short Term Credits

- Rule 1309.2 – Offset Budget (proposed but not yet approved by EPA for the SIP)
- Rule 1310 – Analysis and Reporting

Regulation XIV – Toxics and Other Non-Criteria Pollutants

- Rule 1401 – New Source Review of Carcinogenic Air Contaminants

Regulation XX – Regional Clean Air Incentives Market (RECLAIM)

- Rule 2000 – General
- Rule 2001 – Applicability
- Rule 2002 – Allocations for Oxides of Nitrogen (NOx) and Oxides of Sulfur (SOx)
- Rule 2004 – Requirements
- Rule 2005 – New Source Review for RECLAIM
- Rule 2006 – Permits
- Rule 2007 – Trading Requirements
- Rule 2010 – Administrative Remedies and Sanctions
- Rule 2012 – Requirements for Monitoring, Reporting, and Recordkeeping for Oxides of Nitrogen (NOx) Emissions
- Rule 2015 – Backstop Provisions

Regulation XXX – Title V Permits

9.1.3 Project Air Quality Impacts

Significance criteria and thresholds are presented to allow quantitative determination of the potential air quality impacts of the Project. Project activities are outlined, along with potential sources of air pollutants and the amount of emissions. Air dispersion modeling has been used

to estimate ground-level ambient concentrations that might be produced by the emissions from the stationary sources. Assessment of potential health risks is discussed in Section 9.1.3.4. Appendices 9-2 through 9-5 contain the air dispersion modeling protocol, air quality impact analysis calculations, health risk assessment details, and application to the SCAQMD for a Permit to Construct/Permit to Operate.

9.1.3.1 Significance Criteria and Thresholds

Separate significance criteria and numerical thresholds exist for emission rates and ambient concentrations that result from dispersion of emissions. Criteria and thresholds have been established at federal, state and SCAQMD levels. Different criteria and thresholds exist for construction and subsequent operation of a project.

Construction of the Project will be subject to the daily and quarterly emission thresholds of significance listed in Table 9-6. Operation of the Project will be subject only to daily significance thresholds, which are also listed in Table 9-6. The SCAQMD considers an exceedance of any of these emission thresholds to be a significant impact, and will require application of all feasible measures to attempt to reduce the emissions to a level of insignificance.

Additional emission thresholds, along with their associated definitions and requirements, are listed in Table 9-7 as follows:

- Major Polluting Facility according to SCAQMD NSR
- Major Source for PSD according to the USEPA
- Requirement for BACT according to SCAQMD
- Qualification for the SCAQMD RECLAIM Program
- Requirement to provide emission offsets to the SCAQMD

Ambient concentration significance criteria include the ambient air quality standards shown in Table 9-1, and the criteria and thresholds shown in Table 9-8. The allowable changes in ambient concentrations listed in the upper half of Table 9-8 are part of the NSR process

required by Rule 1303 of SCAQMD Regulation XIII. The criteria and thresholds listed in the lower half of Table 9-8 are used to determine the potential significance of attainment criteria pollutants under the PSD program managed by Region IX of the EPA. The applicability or non-applicability of PSD regulations must be discussed in a separable portion of the application for a SCAQMD Permit to Construct/Permit to Operate.

9.1.3.2 Project Activities, Air Pollutant Sources and Emissions

This section describes major construction and operational activities, specific emitting sources, and calculated emissions from each source.

Construction

Construction of the Project will require 40 to 47 months, and will include the following major activities:

- Site grading and excavation
- Construction of marine berthing and unloading facilities by the POLB
- Construction of the 2.3-mile long natural gas pipeline by others
- Construction of the 0.8-mile long electrical transmission line by SoCal Edison
- Construction of the LNG storage tanks, which will be the most important activity driving the overall project schedule, and includes the following options below the top base slab foundation:
  - soil improvement by soil replacement combined with stone columns
  - driven piles
  - replacement of excavated soil
- Construction of pipe racks, foundations, buildings, major mechanical equipment, process and utility piping, and trailer truck loading facilities.

All of the construction options were analyzed to determine the maximum possible emissions on a daily and quarterly basis. The resulting maximum daily and quarterly emission rates during construction are summarized in Tables 9-9 and 9-10, respectively. As can be seen on the tables, some significance thresholds will be exceeded. Therefore, all feasible mitigation measures will be applied to project construction.

Construction emissions from fuel combustion will be mitigated to the extent feasible by the following measures:

- The newest equipment in the construction contractors' fleets will be used to take advantage of the general reduction in emission factors that occurs with each model year.
- Equipment that would not be in use for more than 15 minutes will be turned off to minimize idling time.
- Construction contractors that have alternative-fuel equipment in their fleets will be asked to use such where possible on the Project.
- Diesel exhaust particulate traps will be used as available on contractors' construction equipment.
- When lower-sulfur fuels become available to the Los Angeles Basin, as required by regulations, they will be used to the extent feasible. The Los Angeles Basin has the advantage of receiving the benefit of such fuels at the earliest possible time because of the existing extreme non-attainment status of this area. Emulsified fuels or other alternative fuels will also be used when they are determined to be cost-effective and environmentally desirable, or mandated by regulation.
- POLB is responsible for dredging activities. Electric dredging will be considered, as appropriate.

Construction emissions of fugitive PM-10 will be mitigated by a comprehensive dust control program that includes the following measures:

- Construction equipment and vehicles will be operated at the lowest practical speed (e.g., < 15 mph).
- Vehicle movement on the site will be on paved areas as much as possible.
- Unpaved areas where construction equipment is operating will be watered frequently enough to prevent generating a visible plume from soil entrainment by wheels.
- Exits from the construction area will have a transition ramp with wheel washers, bumps or other methods to minimize track-out of soil onto public roads.
- Soil piles and other open soil areas not being used actively will be treated with dust control chemicals to eliminate wind-induced dust emissions.

Adjustment of Table 9-10 quarterly emissions to an annual basis and comparison with the federal conformity thresholds discussed at the end of Section 9.1.2.1 indicates that Project construction will potentially cause exceedances of the federal conformity thresholds for NOx, ROG and CO. Hence, the federal agency carrying out the general action of approving the Project will need to carry out the requirements of 40 CFR Section 51.853(g) and (h).

Operation

Operation of the Project will include both onsite and offsite sources of emissions. Onsite sources will include water heaters, emergency generator, fire water pump engines, hotelling of LNG carriers, and fugitive ROG sources as shown schematically in Figure 9-7 and listed in Table 9-11. These sources arise from the processing of LNG into pipeline natural gas, and the loading of LNG, ethane and propane into trailer trucks for transport to offsite locations (e.g., vehicle fueling facilities for the LNG). An alternative is being evaluated that could pipe the ethane and propane offsite (see Resource Report 1), thereby eliminating the emissions from the 141 heavy-duty trailer trucks needed to transport the NGL.

Water Heaters

The Project's primary stationary emission sources are three direct-fired water heaters that will generate hot water to be used as a process heat transfer medium for the LNG shell and tube type vaporizers (STVs) and NGL recovery unit. The heaters will be primarily fueled by ethane, and secondarily by natural gas. Each heater is rated at approximately 350 million British thermal units per hour (MMBtu/hr) for their process heat rate of absorption or delivery. The operating capacity of these heaters is described as three – 50 percent heaters, meaning two are operational on a full-time basis and needed to attain the 1,000 MMscf maximum daily production rate, while the third is on hot "pilot" standby. In the case that one of the water heaters "trips" off-line or must otherwise be shut down for maintenance, the third heater will be rapidly brought up to temperature and into service.

These heaters have an average efficiency of 92 percent during their normal run-times. Therefore, these heaters have a 380 MMBtu/hr (low heating value [LHV]) actual firing rate (350 / 0.92 = 380 MMBtu/hr). The firing rate on a high heating value (HHV) basis is given by the ratio of HHV:LHV (~1.1) or ~ 420 MMBtu/hr (380 x 1.1 = 418.4 MMBtu/hr). Air emissions calculated for the 1,000 MMscfd rate are thus based upon a total of 2 x 418 or 836 MMBtu/hr firing rate.

LNG Carriers

Emissions from the LNG carrier while hotelling at Berth T-126 and mobile sources onsite are also evaluated. Table 9-11 lists the peak daily emission rates of criteria pollutants from onsite sources, and Table 9-12 lists the annual emission rates for the same pollutants and sources. Hotelling of each LNG tanker will typically require 18 hours. Longer hotelling periods are possible because of time-of-departure logistics. Testing of the emergency generator will only emit 1 hour per week at most. The annual emission inventory accounts for 146 LNG carrier arrivals, which is equivalent to an arrival approximately every 2 to 3 days.

Table 9-12 indicates that Project operation emissions will potentially exceed the federal conformity thresholds for NOx and ROG. Hence, the federal agency carrying out the general action of approving the Project will need to carry out the requirements of 40 CFR Section

51.853(g) and (h). Project emissions will also be high enough (e.g., > 10 tons NOx per year) to require a Title V federal operating permit.

Table 9-13 shows both the daily peak and annual emissions of the offsite sources. Two tugboats, one pilot boat and one US Coast Guard escort vessel will participate in the arrival, berthing, and departure of each LNG carrier. Emissions are calculated for each of these ancillary vessels over the distance it travels to meet the LNG carrier. Emissions of the LNG carrier are calculated for the 27 nautical miles required by SCAQMD (2003e). The one-way distance traveled by the other vessels is 5.6 nautical miles for the pilot boat and first tugboat, 2.6 nautical miles for the second tugboat, and 6 nautical miles for the USCG escort vessel.

LNG carriers use boil-off LNG to fire their boilers and produce steam for propulsion. To be conservative in the analysis, the LNG carriers are assumed to be older, burning residual fuel oil No. 6 in boilers to produce steam during hotelling. When the Project starts in 2008, older LNG carriers will still populate the inventory, and could still make deliveries to the Long Beach terminal. The tugboats, pilot boat and USCG escort boat will be powered by diesel-fuel reciprocating engines..

On-Road Vehicles

Multiple types of highway vehicles will travel to and from the Project to deliver the following:

- LNG to vehicle refueling sites within the Basin
- NGL to other industries
- Aqueous ammonia, maintenance and janitorial supplies to the Project
- Employees and visitors to the Project

To analyze the worst case, the LNG and NGL trailer trucks are assumed to be diesel-fueled even though LNG-fueled trailer trucks may become available by 2008. The Project will be loading LNG and NGL into trailer trucks owned by other companies, and therefore, will not be able to control the type of fuel used in the truck engine. Similarly, because the LNG and NGL

trailer trucks will be owned by other companies, the use of diesel exhaust catalytic particulate filters cannot be guaranteed.

The LNG carriers contribute the most NO_x emissions to the peak daily and annual offsite and onsite inventories as can be seen in Tables 9-11 through 9-13.

Onsite and offsite emissions are combined in summary format in Table 9-14. Because the Project operational emissions of NOx, reactive organic gases (ROG) and SOx exceed the California Environmental Quality Act (CEQA) thresholds, these Project impacts would potentially be significant. All feasible mitigation measures will be implemented in an attempt to reduce these emissions to a level of insignificance. Emissions that remain will be offset as required by SCAQMD Regulations XIII (New Source Review) and XX (RECLAIM).

Operational emissions will be minimized as follows:

- LAER/BACT will be applied to the stationary sources (see Appendix 9-3.1) as follows:
    - Selective Catalytic Reduction (SCR) for NOx emission reduction from the water heaters
    - Oxidation catalyst, or equivalent reduction of CO and VOC emissions from the water heaters
    - Metal oxide absorption of sulfur compounds in ethane removed from LNG
- LNG and NGL trailer trucks will be loaded expeditiously and their engines will be turned off during onsite loading.
- LNG carriers will unload as quickly as possible and, where possible, generate power from combustion of boil-off LNG.
- Fugitive VOC emissions from various points in the facility will be minimized by design and a comprehensive leak detection program.

Table 9-15 lists onsite and offsite sources and emissions that must be accumulated for comparison against certain thresholds. Offsets will be required in the amounts estimated in the

table, and the Project will enter the RECLAIM Program and acquire needed RECLAIM Trading Credits (RTCs).

9.1.3.3 Analysis of Impacts

The previous section inventoried the criteria pollutant emissions from Project onsite and offsite sources. The stacks for the water heaters are the only onsite stationary point sources that are subject to NSR requirements for air dispersion modeling. Appendix 9-2 contains the detailed modeling protocol, which was approved by the SCAQMD (2003d) (see Appendix 9-1). Construction emissions are not subject to air dispersion modeling.

The approved protocol complies with the following rule requirements and technical guidance documents:

- SCAQMD Rule 1303 Requirements (b) (1) Modeling:

  "The applicant substantiates with modeling that the new facility or modification will not cause a violation, or make significantly worse an existing violation according to Appendix A or other analysis approved by the Executive Officer or designee, of any state or national ambient air quality standards at any receptor location in the District."

- SCAQMD Rule 1303 Requirements (b) (5) Major Polluting Facilities (C) Protection of Visibility:

  "Plume visibility modeling is not needed because the new source is not located close enough to federal Class I areas as specified in Table C-1 of Rule 1303."

- SCAQMD Rule 1303 Requirements (b) (1) Modeling Appendix A:

- SCAQMD Dispersion Modeling Procedures for Relevant District Rules, September 7, 2000.

- EPA, Chapter 40, CFR, Appendix W to Part 51, "Guideline on Air Quality Models" including updates through April 2003.

- EPA, Draft New Source Review Workshop Manual (October 1990).

- EPA, Guidelines for Determination of Good Engineering Practice Stack Height (EPA-Technical Support Document for the Stack Height Regulations), EPA-450/4-80-023R.

9.1.3.4 Results of Ambient Air Quality Modeling

The maximum Project ambient concentrations at or beyond the property boundary are listed in Table 9-16 and calculated in Appendix 9-3 for the modeled criteria pollutants and averaging times determined by ambient air quality standards. The Project concentrations are added to the maximum background concentrations monitored by the SCAQMD during the last three recorded years (1999-2001). The background concentrations represent the combined air quality impact of emission, dispersion, atmospheric reactions and transport that has occurred for all existing sources inside and outside of the Basin. The total concentrations are compared to the state ambient air quality standards and NAAQS. The total NO_2, SO_2 and CO concentrations are much lower than the ambient air quality standards.

The California ambient air quality standards for PM-10 and both California and national standards for PM-2.5 are already exceeded by background concentrations in Long Beach. Hence, the concentrations that will be contributed by the Project would add to the existing exceedances. The Project will contribute 4 percent, at most, to the existing background concentrations of particulate.

Operational emissions of NOx will be minimized by the measures discussed in Section 9.1.3.2. The ambient concentrations of NO_2 resulting from the NOx emissions will be further reduced by the design height of the water heater stacks, and the exit speed and exit temperature selected for the combustion emissions. These design parameters are selected on the basis of good engineering practice.

9.1.3.5 Health Risk Assessment

This section summarizes the results of a health risk assessment conducted on the non-criteria pollutants emitted by the same stationary sources addressed in the criteria pollutant air quality impact analysis discussed above plus hotelling emissions from the LNG carriers and idling emissions from the LNG and NGL trailer trucks that load at the terminal. After dispersion of these emissions to the ground-level locations of potential receptors, inhalation is the main

pathway by which emissions of these air pollutants can potentially cause public health impacts. For completeness, the analysis includes multi-pathway factors to account for potential exposure by dermal absorption, soil ingestion, water ingestion, and food ingestion via plants, animal products and mother's milk. Appendix 9-4 contains background information on health risk, the assessment methodology and modeling files. In general, the industrial location of the site on Pier T helps to minimize health risks because the nearest residences are in a recreational vehicle park approximately 1.5 miles to the east-northeast (see Figure 9-8), and possibly in live-aboard boats at the Consolidated Slip Marina and the Cerritos Channel East Basin Marinas approximately 1.3 to 1.5 miles to the northwest. These residents, as well as those at the Terminal Island Federal Correctional Institution, will not be adversely impacted by the air emissions resulting from project construction or operation.

Health risk is assessed with special attention to sensitive receptors. Sensitive receptors are groups of individuals, including infants, children, the elderly and chronically ill, that may be more susceptible to health risks due to exposure to air pollution. Schools, daycare facilities, convalescent homes and hospitals are of particular concern. The nearest non-residence sensitive receptors are the child-care facility, hospital and school shown in Figure 9-8.

Health Risk-Related Significance Criteria

Public health-related significance criteria were based on CEQA Guidelines (Remy et al, 1999), Air Toxics "Hot Spots" Risk Assessment Guidelines (California Air Pollution Control Officers Association, [CAPCOA] 1993), and SCAQMD Regulation XIV (Toxics and Other Noncriteria Pollutants). A potential public health impact at the nearest receptor may be considered significant if the Project would result in any of the following:

- Carcinogenic risk greater than 10^{-5} at any point on the boundary or offsite with the application of Toxics-Best Available Control Technology (T-BACT)
- Excess cancer burden greater than 0.5
- Chronic health hazard index greater than 1.0
- Acute health hazard index greater than 1.0

T-BACT will be applied to the water heaters in the form of the oxidation catalyst, or equivalent approach, that will minimize VOC and CO emissions. Non-criteria pollutants are constituents of the VOC group.

Table 9-17 is a list of non-criteria pollutants that may potentially be emitted by combustion of natural gas or diesel fuel along with the maximum 1-hour and annual emissions of non-criteria pollutants from the process water heaters, hotelling LNG carriers, and idling LNG and NGL trailer trucks. The cancer unit risk factors and the chronic and acute reference exposure levels (RELs), obtained from CAPCOA (1993) and ARB (2003), are listed in Table 9-18. The dispersion model computed the maximum hourly and annual arithmetic mean concentrations of each non-criteria pollutant at each receptor.

Estimated Carcinogenic Risks

The maximum annual concentrations computed by the air dispersion model are multiplied by the unit risk factors listed in Table 9-18 to obtain potential carcinogenic risks at each receptor point assuming exposure to the computed concentration 24 hours per day for 70 years. The maximum risk is shown in Table 9-19, both for the nearest residence (see Figure 9-8) and for nearby workers. The potential carcinogenic risk of a worker is adjusted from that of a resident by the ratio of 40 years for a work lifetime and 70 years for the total lifetime, and by the ratio of an 8-hour workday to the full 24-hour day (OEHHA, 2003). The carcinogenic risk at each receptor, including sensitive receptors, is less than the 10-in-one-million significance threshold.

Estimated Noncarcinogenic Risks

Table 9-19 presents the calculated maximum chronic and acute hazard indices at the nearest residential receptor and for nearby workers. Because the health hazard indices are below their significance criteria of 1.0, these impacts are considered insignificant.

Criteria Pollutants

Maximum emissions of criteria pollutants were modeled and evaluated for their impacts on air quality, as discussed in Section 9.1.3.3. Maximum predicted concentrations from the Project were compared with the ambient air quality standards, which are concentration limits that protect the health of the most sensitive individuals, including a margin of safety. Ambient standards also serve as inhalation reference exposure levels (see Appendix 9-4). Because

modeling showed that maximum concentrations of criteria pollutants will not exceed these health-protective standards on the property boundary (see Table 9-16), potential health effects from emission of criteria pollutants are below thresholds of significance.

9.1.3.6 Other Air Quality-Related Impacts

Odor

Combustion of natural gas and diesel fuel will not generate a perceptible odor onsite or offsite. The natural gas output from the Project will be odorized with a mercaptan to enable olfactory detection of leaks. The odorizing system will be a package of equipment that will include storage of the odorant at ambient temperature, delivery pumping to pipeline pressure (~700 psig), and related instrumentation and controls necessary to assure outlet concentrations of total sulfur are within acceptable limits for Southern California Gas Company (SoCAL Gas) distribution of natural gas. The odorizing system would be immediately downstream of the final custody transfer metering station.

Due to the odor threshold of odorizing agents such as methyl and propyl mercaptan being in the sub- to single-digit part-per-trillion range, and other factors affecting the efficacy of odorization for public safety, the rate of odorization of natural gas will be in accordance with 49 CFR Part 192.625 (Sub-part A) which reads as follows: "A combustible gas in a distribution line must contain a natural odorant or be odorized so that at a concentration in air of one-fifth of the lower explosive limit, the gas is readily detectable by a person with a normal sense of smell." The odorization agent rate of addition would be routinely tested to assure this standard is met in practice.

Fugitive emissions are minimized in modern odorization systems to avoid nuisance problems from the extremely low detection thresholds for these odor agents. The resulting requirement for tightness of the pumping and small bore tubing connections employed in such systems minimizes the generation of fugitive emissions.

It is common practice to maintain a small quantity of dilute chorine bleach solution at such stations to neutralize incidental spills and leaks during supply bottle changes. Use of bleach

solution and simple covering of spilled material with sand or soil is very effective at reducing off-site impacts from otherwise extremely rare release events.

The dredging of approximately 75,000 to 125,000 cubic yards of bottom material around Berth 126 will be distant enough (i.e., more than 1.24 miles) from the nearest sensitive receptor to prevent odor of the dredged material at these and more distant receptors.

LNG as Vehicle Fuel

Beneficial impacts will arise from use of some of the LNG as vehicle fuel. This section discusses physical aspects of loading LNG into specialized trailer trucks for transfer to fueling centers, and potential emission reductions that could result from the use of LNG fuel in mobile sources.

Physical Aspects of LNG Fueling in the Project

The amount of LNG that will be made available for vehicle fueling will depend on market economics. For the purpose of environmental impact analysis, it is assumed that up to 45 truck trailers, each with a capacity of 10,500 gallons would load LNG at the Project each day and transport it to LNG refueling stations in the Basin.

Potential Emission Reductions to the Local and State Environment

Substitution of LNG for diesel fuel or gasoline will reduce emissions of NOx, PM-10, SOx and CO, but not of ROG as shown in Table 9-20. The 45 trucks carrying 10,500 gallons each will make 472,500 gallons of LNG available per day or 172,462,500 gallons per year. Heavy-duty on-road trucks get approximately 2.76 miles per gallon of LNG (EF&EE, Inc., 1996), and hence, could travel 1,304,100 miles per day on 472,500 gallons of LNG. If LNG were used instead of diesel fuel to power these trucks the same 1,304,100 miles per day, then 68 million less gallons of diesel fuel would be consumed annually, and 5,739 less tons of NOx and 120 less tons of carcinogenic diesel exhaust particulate will be emitted each year. The environmental impact of the smaller increase in ROG will be less than the environmental benefit of the decrease in the other criteria pollutant emissions. Specifically, the benefit of reducing the carcinogenic effect on public health of the diesel exhaust PM-10 is far more important than the ability of the increased

ROG to generate smog, especially when the reduction of the other smog precursor, NOx, is 7.6 times greater. It is expected that heavy-duty transit bus fleets would be among the first users of LNG as vehicle fuel.

Ozone reductions that result from the reduction of NOx emissions will be greatest if the LNG fuel is used near the coast because such emissions have the most time to react to form smog before being transported to inland areas. Near-coast use could include port yard hostlers and container trucks serving the ports. If the LNG fuel is instead used elsewhere in the Basin, the air quality benefit of the NOx and PM emission reductions will still be realized in the Basin.

9.1.3.7 Consistency With 1997 and 2003 SCAQMD Air Quality Management Plans and Compliance With Regulations

The Project will comply with all applicable regulations (see compliance matrix at beginning of report) and is part of the industrial growth accounted for in both the 1997 and 2003 SCAQMD Air Quality Management Plans. These Plans include control measures that are supposed to be implemented by the federal and state governments to reduce emissions from ships and onroad trucks.

9.2 NOISE

The analysis of noise for the Project is divided into a discussion of existing conditions (Section 9.2.1), applicable noise ordinances and regulations (Section 9.2.2), and the potential noise impacts of both project construction and operation (Section 9.2.3).

9.2.1 Existing Noise Conditions

The Project will be located on Pier T within the POLB, a designated industrial zone. The closest "Noise Sensitive Area" (NSA) is more than 1 mile from the Project site. A baseline noise survey to record the existing ambient levels at the Project location was conducted at two points on the fenceline for three consecutive 24-hour periods during August 21-24, 2003. These locations were identified as Pier T North and Pier T East as shown in Figure 9-9.

Noise monitoring was conducted on a continuous basis over a 3-day period that included a weekend and weekdays. In addition to the continuous measurements, periodic short-term measurements were also made at both locations throughout the day and late at night. These

short-term measurements were conducted to collect supplemental data and to make observations on the sources of the existing ambient noise. In addition, details of prevailing meteorological conditions were recorded for each location during the survey.

The sound level meters used in the survey met American National Standards Institute (ANSI) S1.4-1983 requirements for Precision Type 1 sound instrumentation. The continuous data were collected using Bruel & Kjaer Model 2236 precision integrating Type I sound level meters. Short-term monitoring was conducted with a RION NA-27 Precision Type I octave band analyzer.

The microphones were fitted with windscreens to reduce any wind-generated noise and mounted at a height of approximately 5 feet above ground. Measurements were made with the meters set to "slow" response. All meters at each location were calibrated at the beginning and end of each measurement period with a Bruel & Kjaer Model 4231 sound level calibrator. No calibration problems were encountered during the measurements.

The instruments were programmed to measure and record the A-weighted equivalent continuous noise level (Leq) together with the following percentile noise levels using 10 minute averaging:

L_{A90} – A-weighted sound pressure level exceeded for 90 percent of the measurement period

L_{A10} – A-weighted sound pressure level exceeded for 10 percent of the measurement period

The Leq data were then used to calculate overall Ldn levels.

Existing meteorological conditions during the 3-day monitoring program included mainly clear skies with temperatures ranging from 67 °F late at night to 80 °F during the day. Winds were mainly from the south during the daytime, shifting to the north late in the afternoon. No precipitation occurred during the period.

Figures 9-10 through 9-15 depict the continuous data from both measurement locations for each of the three 24-hour periods. Table 9-21 provides a summary of the measured noise levels at each location, and Table 9-22 provides noise levels of common sources for comparison.

Existing noise sources in the area during the day consisted of a combination of industrial noises, truck traffic at the adjacent Hanjin facility, traffic on highways and bridges, and aircraft. Late at night and during the weekend, little, if any, activity was noted at the Hanjin facility, and the noise environment was characterized by less significant industrial sounds, including a ship idling at a dock. Some insect noise was noted late at night.

Figures 9-10 through 9-15 reveal that existing Leq noise levels generally ranged from approximately 50 dBA late at night to approximately 65 dBA during the day. Somewhat lower noise levels were measured during weekend days than during weekday days, due to less activity in the area. Existing ambient Ldn levels (Table 9-21) currently exceed 55 dBA at both fenceline locations for both weekday and weekend periods. Ldn levels were very consistent at both sites during the weekday periods (61 dBA).

9.2.2 Applicable Noise Ordinances, Regulations and Standards

The following discussion is divided into two parts. At the federal level, guidelines are provided by the Federal Energy Regulatory Commission (FERC), while at the local level the City of Long Beach has a noise ordinance.

9.2.2.1 FERC Guidelines

FERC guidelines (18CFR380.12) limit day/night noise levels (Ldn or LADN) to less than 55 dBA at the nearest NSA, such as a residence. The LADN level is the Equivalent Continuous Sound Level (Leq or LAeq) over a 24-hour measurement period with a +10 dB weighting for noise occurring during the defined nighttime period (i.e. 10 pm to 7 am).

For reference, definitions and details of the referenced environmental noise measurement parameters are given below:

- Equivalent Continuous Sound Level (L_{Aeq})

A-weighted energy (in dBA) mean over the measurement period. LAeq can be considered as the continuous steady-state noise level that would have the same total A-weighted acoustic energy as the measured fluctuating noise measured over the time period.

L_{Aeq} is calculated using the following equation:

$$L_{Aeq} = 10Log_{10}\frac{\frac{1}{T}\int_0^T P_A^2(t)dt}{P_0^2} dBA$$

where:

T is the total measurement time (minutes)

$P_A(t)$ is the A-weighted instantaneous acoustic pressure (newtons per square meter or N/m^2)

P_0 is the reference acoustic pressure ($2x10^{-5}$ N/m^2)

L_{Aeq} is an important number for the evaluation of a fluctuating noise level, because it reflects the actual energy content of the time varying noise.

- Day-Night Average Sound Level (L_{ADN})

The L_{Aeq} (in dBA) over a 24-hour measurement period with a +10 dB weighting for noise occurring during the defined nighttime period (i.e., 10 pm to 7 am).

L_{ADN} (in dBA) is used as an alternative to basic L_{Aeq} to reflect the increased annoyance caused by noise at night.

Due to the +10 dBA nighttime penalty added prior to the calculation of the LADN the actual constant noise level required to produce an LADN of 55 dBA is actually 48.6 dBA. Therefore, compliance with the FERC guideline of an LADN < 55 dBA at the nearest residence requires

that the facility be designed such that the actual continuous operational noise levels do not exceed 48.6 dBA at any residence.

9.2.2.2 City of Long Beach Ordinance

The City of Long Beach Municipal Code sets limits for exterior noise levels based on receiving land use district. The Project location in the POLB is designated District 4, which is "predominantly industrial with other land use types also present". In a District 4 zone the noise limit is 70 dBA and it is noted that for District 4 areas the limit applies at the facility boundary rather than for noise control within the districts. The limits also specify a requirement that if the noise contains a steady audile tone such as a whine, screech, hum or a repetitive noise such as hammering or riveting, the standard limit should be reduced by 5 dBA.

Therefore for compliance with the City of Long Beach Exterior Noise Limits the noise levels for the Project should not exceed 70 dBA at the facility boundary, provided there is no audible tonal or repetitive content as discussed above.

9.2.3 Project Noise Impact

Potential noise impacts are separately analyzed for construction of the Project and its subsequent operation.

9.2.3.1 Construction Noise

During construction the engineering contractor will follow normal procedures to control and mitigate the influence of noise from construction equipment. Example noise data for construction equipment typically utilized for this type of project are presented in Table 9-23. Not all the equipment presented will be used in each phase of construction. Furthermore, the equipment used generally will not operate continuously or be operated simultaneously.

The noise radiating from the construction site will be attenuated by a variety of mechanisms, the most significant of these being the geometric divergence of the sound waves with distance. This mechanism produces a 6 dBA decrease in the sound level with every doubling of distance from the source. The projected noise levels, accounting for distance from the plant property line and the nominal 1.5 mile distance to the nearest residential receptors, are presented in Table 9-24.

The estimated construction noise levels in Table 9-24 indicate some increase in the property line noise levels compared to the measured existing noise levels from the baseline survey. It is likely that there will be some minor impact on noise levels outside the property line but contained within the POLB Industrial Zone. These highest or worst case noise construction activities would tend to be relatively short duration, which reduces their overall impact.

The predicted noise levels in Table 9-24 at the nominal 1.5-mile distance to the nearest residence indicate that noise from construction activities at this distance are well below the FERC requirement for less than L_{ADN} 55 dBA. Noise levels of this order will likely not be noticeable at the nearest residential receptors. As such, no adverse or long term community noise impacts from construction noise are anticipated.

9.2.3.2 Operational Noise

The major equipment noise sources in the Project will include the following:

- 2 Boil-off Gas (BOG) Compressors (reciprocating-type, each driven by an 800 hp motor)
- 7 Primary LNG Booster Pumps @ 800 hp
- 7 Secondary LNG Booster Pumps @ 330 hp
- 4 Water Pumps @ 1,200 hp
- 3 Water Heaters @ 418 MMBtu/hr
- 2 Instrument Air Compressors, each driven by a 100 hp motor
- 3 Induced Draft Fans for the Heaters with 2 @ 100 hp

With the exception of the BOG compressors all the above equipment will have at least one item on stand-by and not in service during normal terminal operating conditions.

Other equipment that is not anticipated to be a significant noise source includes the following:

- 6 LNG Intake Pumps
- 2 knock-out Drum Pumps
- 2 Ethane Export Pumps
- 2 Propane Export Pumps

All project equipment will be specified to comply with an operational noise limit of 85 dBA at 3 feet.

A preliminary noise study was executed to predict the likely normal operational noise levels at both the terminal property line and at the distances to the nearest residential receptors for comparison with the existing noise levels and the FERC and City of Long Beach noise requirements. A plant noise model was developed, using the commercial software SoundPlan and industry-accepted community noise prediction methodology (CONCAWE, 1981), to estimate noise levels during normal operation of the terminal. As necessary buildings and structures such as tanks were included in the noise model with typical absorption and reflection properties for structures of this type to provide an appropriate level of screening in the simulation.

Each piece of noisy equipment was modeled by one or more point sources. Detailed sound power levels for each piece of equipment and their coordinates (x, y, z) used in the SoundPlan noise model are provided in the file SES_PNMS_New.pdf in Appendix 9-3.2. The equipment estimated sound power levels were based on KBR's field noise data for similar type and capacity equipment. The noise model included attenuation for the following:

- divergence of sound waves with distance
- absorption or reflection from different ground surfaces
- noise screening from buildings and tanks.

The ground in the process area was modeled as acoustically "hard", 100% reflective with 1 dB(A) loss. Outside the plant, the ground was modeled as acoustically "soft", as grass or trees

will absorb the noise very effectively and little noise will be reflected. The surfaces of buildings and tanks in the Project are assumed acoustically "hard" (i.e., 100% reflective with 1 dB(A) reflection loss). The buildings and tanks considered in the noise modeling included the following:

- 2 LNG storage tanks, 74 meters (m) in diameter and 30 m. in height
- 3 furnaces (water heaters), 9 m. in diameter and 12 m. in height
- 2 NGL storage tanks, 25 m. in diameter and 10 m. in height
- 1 truck trailer loading storage tank, 20 m. in diameter and 10 m. in height
- Warehouse/Workshop/Office, 15 m. (W) x 30 m. (L) x 5 m. (H)
- Switchgear room,34 m. (W) x 18 m. (L) x 2.5 m. (H)
- Administration Building, 30 m. (W) x 18 m. (L) x 3 m. (H).

The noise (sound pressure) levels predicted in the plant and on the property line are shown in Figure 9-16 and the levels predicted outside the property line are shown in Figure 9-17. The predicted noise levels in Figure 9-16 clearly show that the operational noise levels on the property line will be less than 70 dBA, the property line limit required by the City of Long Beach. The 70 dBA contour is located well within the boundary of the property line and the actual predicted noise levels for the property line are less than 60 dBA, more than 10 dBA below the City of Long Beach requirement.

Outside the property line, FERC has a noise restriction of 45 dBA at the nearest residential receptor. The predicted noise levels in Figure 9-17 show that the 45 dBA contour is located 400-450 yards outside the property line. Considering that the nearest residential receptors are approximately 1.3 miles distant it can be concluded that the Project will have no impact on noise levels at the nearest residential receptors.

The above results demonstrate that the operational noise levels from the Project will comply with both the City of Long Beach and FERC noise requirements and that operational noise from

the Project will have no significant impact. Experience with LNG import terminals has shown that ground-borne vibration is not an issue.

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Table 9-1 California and National Ambient Air Quality Standards

CRITERIA POLLUTANT	AVERAGING TIME		CALIFORNIA		NATIONAL	
			ppmv	µg/m^3	ppmv	µg/m^3
Ozone	1 hour		0.09	180	0.12	235
	8 hours		--	--	0.08 (3-year average of annual 4th highest daily maximum)	157
Carbon Monoxide	8 hours	< 3,000 ft amsl	9.0	10,000	9	10,000
		≥ 3,000 ft amsl	6.0	7,000		
	1 hour		20	23,000	35	40,000
Nitrogen Dioxide	1 hour		0.25	470	--	--
	Annual Arithmetic Mean		--	--	0.053	100
Sulfur Dioxide	1 hour		0.25	655	--	--
	3 hours		--	--	0.50	1,300[1]
	24 hours		0.04	105	0.14	365
	Annual Arithmetic Mean		--	--	0.030	80
Particulate Matter (10 Micron)	24 hours		--	50	--	150
	Annual Arithmetic Mean		--	20	--	50
Particulate Matter (2.5 Micron)	Annual Arithmetic Mean		--	12	-- (3-year average)	15
	24 hours		--	--	-- (3-year average of 98th percentiles)	65
Lead	30 days		--	1.5	--	--
	Calendar Quarter		--	--	--	1.5
Vinyl Chloride	24 hours		0.01	26	--	--
Sulfates	24 hours		--	25	--	--
H_2S	1 hour		0.03	42	--	--

(1) This is a national secondary standard, which is designed to protect public welfare.

Table 9-2 Criteria Pollutant Ambient Air Quality for Long Beach

CRITERIA POLLUTANT	AVERAGING TIME		MONITORING YEAR		
			1999	2000	2001
Ozone	1 hour		0.13 ppmv 3 days	0.12 ppmv 3 days	0.09 ppmv 0 days
Carbon Monoxide	8 hours	< 3,000 ft amsl	5.4 ppmv 0 days	5.8 ppmv 0 days	4.7 ppmv 0 days
	1 hour		7 ppmv 0 days	10 ppmv 0 days	6 ppmv 0 days
Nitrogen Dioxide	Annual Arithmetic Mean		0.034 ppmv	0.031 ppmv	0.031 ppmv
	1 hour		0.15 ppmv 0 days	0.14 ppmv 0 days	0.13 ppmv 0 days
Sulfur Dioxide	Annual Arithmetic Mean		0.003 ppmv	0.002 ppmv	-- ppmv
	24 hours		0.011 ppmv 0 days	0.014 ppmv 0 days	0.012 ppmv 0 days
	1 hour		0.05 ppmv 0 days	0.05 ppmv 0 days	0.05 ppmv 0 days
Particulate Matter (10 Micron)	24 hours		79 ug/cu.m. 13 days	105 ug/cu.m. 12 days	91 ug/cu.m. 10 days
	Annual Geometric Mean		36.4 ug/cu.m.	34.0 ug/cu.m.	34.8 ug/cu.m.
	Annual Arithmetic Mean		38.9 ug/cu.m.	37.6 ug/cu.m.	37.4 ug/cu.m.
Particulate Matter (2.5 Micron)	Annual Arithmetic Mean		21.5 ug/cu.m	19.2 ug/cu.m	21.4 ug/cu.m
	24 hours		67 ug/cu.m. 1 days	82 ug/cu.m. 4 days	73 ug/cu.m. 1 days
Lead	30 days		0.06 ug/cu.m. 0 months	0.05 ug/cu.m. 0 months	0.05 ug/cu.m. 0 months
	Calendar Quarter		0.05 ug/cu.m. 0 quarters	0.04 ug/cu.m. 0 quarters	0.04 ug/cu.m. 0 quarters
Sulfates	24 hours		13.7 ug/cu.m. 0 days	26.7 ug/cu.m. 1 days	15.9 ug/cu.m. 0 days

Table 9-3 Attainment Designations - 2002

Criteria Air Pollutant	South Coast Air Basin Designation [1]			
	Orange County	Los Angeles County [2]	Riverside County	San Bernardino County
Ozone	Non-Attainment	Non-Attainment	Non-Attainment	Non-Attainment
Carbon Monoxide	**Attainment**	Non-Attainment	**Attainment**	**Attainment**
Nitrogen Dioxide	**Attainment**	**Attainment**	**Attainment**	**Attainment**
Sulfur Dioxide	**Attainment**	**Attainment**	**Attainment**	**Attainment**
Suspended Particulate Matter (PM10)	Non-Attainment	Non-Attainment	Non-Attainment	Non-Attainment
Sulfate	**Attainment**	**Attainment**	**Attainment**	**Attainment**
Lead	**Attainment**	**Attainment**	**Attainment**	**Attainment**
Hydrogen Sulfide	*Unclassified*	*Unclassified*	*Unclassified*	*Unclassified*
Visibility Reducing Particulates	*Unclassified*	*Unclassified*	*Unclassified*	*Unclassified*

1) ARB, 2003 Area Designation Maps, http://www.arb.ca.gov/desig/adm/adm.htm, May 29, 2003
2) The Project is located in Los Angeles County

Table 9-4 2002 Major Pollutant Emission Inventory for the Basin

CATEGORY	STATIONARY SOURCES (tons per day)							
FUEL COMBUSTION	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
ELECTRIC UTILITIES	7.22	1.75	10.45	18.82	0.33	1.18	1.18	1.18
COGENERATION	8.75	1.72	1.74	3.01	0.33	0.67	0.59	0.52
OIL AND GAS PRODUCTION (COMBUSTION)	3.55	0.75	0.80	4.03	0.04	0.10	0.10	0.10
PETROLEUM REFINING (COMBUSTION)	1.66	0.86	9.38	13.56	6.65	1.74	1.66	1.62
MANUFACTURING AND INDUSTRIAL	39.30	4.37	16.35	18.13	2.19	1.88	1.86	1.85
FOOD AND AGRICULTURAL PROCESSING	0.44	0.21	0.76	2.23	0.04	0.22	0.21	0.21
SERVICE AND COMMERCIAL	24.84	2.99	9.78	10.39	0.77	0.92	0.91	0.90
OTHER (FUEL COMBUSTION)	3.24	2.13	14.59	26.32	0.33	1.19	1.13	1.09
TOTAL FUEL COMBUSTION	89.00	14.78	63.85	96.49	10.68	7.90	7.64	7.47
WASTE DISPOSAL	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
SEWAGE TREATMENT	0.20	0.14	0.00	0.00	0.00	0.00	0.00	0.00
LANDFILLS	155.04	2.03	0.18	0.26	0.12	0.11	0.11	0.11
INCINERATORS	0.33	0.06	0.62	1.44	0.08	0.32	0.12	0.09
OTHER (WASTE DISPOSAL)	27.61	3.43	0.00	0.11	0.00	0.17	0.12	0.07
TOTAL WASTE DISPOSAL	183.18	5.66	0.80	1.81	0.20	0.60	0.35	0.27
CLEANING AND SURFACE COATINGS	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
LAUNDERING	3.19	0.13	0.01	0.03	0.00	0.00	0.00	0.00
DEGREASING	82.38	22.31	0.00	0.00	0.00	0.00	0.00	0.00
COATINGS AND RELATED PROCESS SOLVENTS	43.53	39.56	0.14	0.15	0.06	0.16	0.15	0.15
PRINTING	6.91	6.91	0.00	0.00	0.00	0.00	0.00	0.00

CATEGORY	STATIONARY SOURCES (tons per day)							
ADHESIVES AND SEALANTS	3.97	3.47	0.00	0.00	0.00	0.00	0.00	0.00
OTHER (CLEANING AND SURFACE COATINGS)	0.94	0.68	0.01	0.01	0.00	0.00	0.00	0.00
TOTAL CLEANING AND SURFACE COATINGS	140.92	73.06	0.16	0.19	0.06	0.16	0.15	0.15
PETROLEUM PRODUCTION AND MARKETING	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
OIL AND GAS PRODUCTION	15.02	6.88	0.26	0.09	0.00	0.04	0.03	0.02
PETROLEUM REFINING	10.29	7.54	8.90	6.48	14.54	1.75	1.14	0.88
PETROLEUM MARKETING	66.24	17.41	0.00	0.01	0.00	0.03	0.03	0.03
OTHER (PETROLEUM PRODUCTION AND MARKETING)	0.16	0.14	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL PETROLEUM PRODUCTION AND MARKETING	91.71	31.97	9.16	6.58	14.54	1.82	1.20	0.93
INDUSTRIAL PROCESSES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
CHEMICAL	15.17	12.17	0.03	0.09	0.57	0.33	0.29	0.28
FOOD AND AGRICULTURE	6.28	5.60	0.14	0.03	0.00	0.58	0.23	0.08
MINERAL PROCESSES	1.50	1.17	3.40	7.68	1.45	5.25	3.50	2.31
METAL PROCESSES	1.50	1.07	1.79	0.56	0.14	1.20	0.85	0.63
WOOD AND PAPER	0.01	0.01	0.00	0.00	0.00	1.61	1.12	0.68
GLASS AND RELATED PRODUCTS	0.05	0.04	0.09	1.51	1.07	0.22	0.22	0.21
ELECTRONICS	0.00	0.00	0.01	0.02	0.00	0.01	0.00	0.00
OTHER (INDUSTRIAL PROCESSES)	1.12	0.74	0.00	0.05	0.00	0.23	0.13	0.09
TOTAL INDUSTRIAL PROCESS	25.63	20.80	5.46	9.94	3.23	9.43	6.34	4.28
TOTAL STATIONARY SOURCES	**530.44**	**146.27**	**79.43**	**115.01**	**28.71**	**19.91**	**15.68**	**13.10**
	AREA-WIDE SOURCES (tons per day)							
SOLVENT EVAPORATION	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**

CATEGORY	STATIONARY SOURCES (tons per day)							
CONSUMER PRODUCTS	139.70	116.26	0.00	0.00	0.00	0.00	0.00	0.00
ARCHITECTURAL COATINGS AND RELATED PROCESS SOLVENTS	46.23	45.14	0.00	0.00	0.00	0.00	0.00	0.00
PESTICIDES/FERTILIZERS	3.71	3.67	0.00	0.00	0.00	0.00	0.00	0.00
ASPHALT PAVING / ROOFING	0.82	0.75	0.00	0.00	0.00	0.02	0.02	0.02
TOTAL SOLVENT EVAPORATION	190.46	165.82	0.00	0.00	0.00	0.02	0.02	0.02
MISCELLANEOUS PROCESSES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
RESIDENTIAL FUEL COMBUSTION	9.13	3.96	55.41	27.12	0.40	8.62	8.20	7.97
FARMING OPERATIONS	151.63	12.13	0.00	0.00	0.00	16.66	7.85	1.22
CONSTRUCTION AND DEMOLITION	0.00	0.00	0.00	0.00	0.00	95.28	46.62	9.69
PAVED ROAD DUST	0.00	0.00	0.00	0.00	0.00	312.26	142.76	24.11
UNPAVED ROAD DUST	0.00	0.00	0.00	0.00	0.00	28.33	16.84	3.57
FUGITIVE WINDBLOWN DUST	0.00	0.00	0.00	0.00	0.00	51.00	23.78	5.25
FIRES	0.35	0.24	3.11	0.08	0.00	0.46	0.45	0.42
WASTE BURNING AND DISPOSAL	12.72	7.25	98.16	4.89	0.00	12.96	12.47	11.13
COOKING	1.55	1.08	0.00	0.00	0.00	10.57	10.57	10.46
TOTAL MISCELLANEOUS PROCESSES	175.38	24.66	156.68	32.09	0.40	536.14	269.54	73.82
TOTAL AREA-WIDE SOURCES	**365.84**	**190.48**	**156.68**	**32.09**	**0.40**	**536.16**	**269.56**	**73.84**
	MOBILE SOURCES							
ON-ROAD MOTOR VEHICLES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
LIGHT DUTY PASSENGER (LDA)	198.95	183.67	1728.28	162.48	1.14	7.22	7.08	4.06
LIGHT DUTY TRUCKS - 1 (LDT1)	51.99	48.01	552.70	50.26	0.30	1.59	1.56	0.92
LIGHT DUTY TRUCKS - 2 (LDT2)	48.47	44.33	527.38	67.78	0.39	2.52	2.46	1.57
MEDIUM DUTY TRUCKS (MDV)	26.01	23.67	260.25	37.68	0.22	1.05	1.03	0.67

CATEGORY	STATIONARY SOURCES (tons per day)							
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	8.95	8.47	55.58	6.81	0.03	0.12	0.12	0.05
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	1.79	1.68	13.58	2.60	0.01	0.03	0.03	0.01
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	9.42	8.85	74.30	8.00	0.01	0.04	0.04	0.02
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	8.11	7.31	101.54	18.86	0.01	0.04	0.04	0.02
LIGHT HEAVY DUTY DIESEL TRUCKS - 1 (LHDV1)	0.15	0.13	0.38	4.95	0.03	0.04	0.04	0.03
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.21	0.19	0.53	5.39	0.03	0.06	0.06	0.04
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	1.27	1.11	6.97	54.98	0.51	1.25	1.24	1.09
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	8.15	7.16	32.93	207.53	1.79	4.11	4.10	3.48
MOTORCYCLES (MCY)	7.10	6.71	46.36	1.34	0.00	0.07	0.06	0.04
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.97	0.85	3.60	18.03	0.18	0.34	0.33	0.30
HEAVY DUTY GAS URBAN BUSES (UB)	2.36	1.99	23.33	2.87	0.01	0.02	0.02	0.01
SCHOOL BUSES (SB)	0.49	0.43	5.49	4.62	0.04	0.16	0.16	0.14
MOTOR HOMES (MH)	1.71	1.50	49.98	5.12	0.02	0.05	0.05	0.03
TOTAL ON-ROAD MOTOR VEHICLES	376.10	346.06	3483.18	659.30	4.72	18.71	18.42	12.48
OTHER MOBILE SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
AIRCRAFT	8.64	7.71	57.07	16.46	0.75	0.77	0.75	0.75
TRAINS	1.79	1.57	5.39	31.56	1.99	0.72	0.72	0.66
SHIPS AND COMMERCIAL BOATS	4.27	3.74	5.81	48.33	27.60	3.40	3.39	3.14
RECREATIONAL BOATS	39.15	36.21	192.54	7.27	0.16	2.39	2.15	1.63
OFF-ROAD RECREATIONAL VEHICLES	4.14	3.82	56.12	0.44	0.03	0.12	0.11	0.08
OFF-ROAD EQUIPMENT	62.77	54.08	564.27	185.91	0.36	12.07	11.95	10.84
FARM EQUIPMENT	1.57	1.39	9.46	10.03	0.01	0.66	0.66	0.60
FUEL STORAGE AND HANDLING	34.07	34.07	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL OTHER MOBILE SOURCES	156.40	142.59	890.66	300.00	30.90	20.13	19.73	17.70

CATEGORY	STATIONARY SOURCES (tons per day)							
TOTAL MOBILE SOURCES	**532.50**	**488.65**	**4373.84**	**959.30**	**35.62**	**38.84**	**38.15**	**30.18**
	NATURAL (NON-ANTHROPOGENIC) SOURCES							
NATURAL SOURCES	**TOG**	**ROG**	**CO**	**NOX**	**SOX**	**PM**	**PM10**	**PM2.5**
WILDFIRES	6.02	3.43	97.05	4.50	0.00	19.82	19.05	16.95
TOTAL NATURAL SOURCES	6.02	3.43	97.05	4.50	0.00	19.82	19.05	16.95
TOTAL NATURAL (NON-ANTHROPOGENIC) SOURCES	**6.02**	**3.43**	**97.05**	**4.50**	**0.00**	**19.82**	**19.05**	**16.95**
GRAND TOTAL FOR SOUTH COAST	**1,434.8**	**828.83**	**4,707.0**	**1,110.9**	**64.73**	**614.73**	**342.44**	**134.07**

Table 9-5 1998 Annual Average Daily Non-criteria Pollutant Emission Inventory for the Basin (lbs/day)(1)

POLLUTANT	ON-ROAD	OFF-ROAD	POINT	AB2588	AREA	TOTAL
Acetaldehyde(2)	5.485.8	5,770.3	33.9	57.1	189.1	11.536.2
Acetone	4,945.8	4,824.7	3,543.5	531.4	23,447.4	37,292.8
Benzene	21,945.5	6,533.4	217.7	266.8	2,495.4	31,458.8
Butadiene [1,3]	4,033.8	1,566.1	6.7	2.0	151.3	5,759.9
Carbon tetrachloride	0.0	0.0	8.8	1.8	0.0	10.6
Chloroform	0.0	0.0	0.0	35.5	0.0	35.5
Dichloroethane [1,1]	0.0	0.0	0.0	0.1	0.0	0.1
Dioxane [1,4]	0.0	0.0	0.0	105.0	0.0	105.0
Ethylene dibromide	0.0	0.0	0.0	0.2	0.0	0.2
Ethylene dichloride	0.0	0.0	4.9	17.6	0.0	22.5
Ethylene oxide	0.0	0.0	58.1	12.3	454.1	524.4
Formaldehyde(2)	16,664.9	16,499.3	521.6	674.7	1,107.5	35,468.0
Methyl Ethyl Ketone(2)	905.1	906.9	3,240.2	385.9	14,535.4	19,973.5
Methylene chloride	0.0	0.0	1,378.6	1,673.6	9,421.7	12,473.9
MTBE	58,428.9	2,679.2	40.5	434.4	5,473.7	67,056.7
p-Dichlorobenzene	0.0	0.0	0.0	4.5	3,735.6	3,740.1
Perchloroethylene	0.0	0.0	4,622.0	2,249.1	22,813.1	29,684.2
Propylene oxide	0.0	0.0	0.00	22.3	0.0	22.3
Styrene	1,114.8	287.1	447.0	3,836.7	21.4	5,707.0
Toluene	63,187.6	11,085.9	5,689.6	3,682.4	52.246.7	135,892.2
Trichloroethylene	0.0	0.0	1.1	58.0	2.550.3	2,609.3
Vinyl chloride	0.0	0.0	0.0	4.3	0.0	4.3
Arsenic	0.1	0.3	2.7	0.7	21.4	25.2
Cadmium	1.6	1.5	0.5	0.7	27.5	31.8
Chromium	2.4	2.3	3.9	2.2	302.2	313.0
Diesel particulate	23,906.3	22,386.3	0.0	5.4	815.3	47,113.4
Elemental carbon(3)	27,572.1	6,690.3	702.8	0.0	16,770.5	51,735.7
Hexavalent chromium	0.4	0.4	0.3	1.0	0.1	2.2
Lead	0.7	0.9	1.9	24.5	1,016.3	1,044.3
Nickel	2.5	2.2	2.9	21.6	85.6	114.9
Organic carbon	16,426.2	15,381.8	0.0	0.0	108,612.1	140,420.2
Selenium	0.1	0.1	3.0	5.7	2.6	11.6
Silicon	68.6	67.6	167.2	0.0	248,614.0	248,917.4

1) Emission rates in pounds per day taken from Table 3.1-10 in ARCO (2003), which was based on SCAQMD (1999).
2) Primarily emitted.
3) Including elemental carbon from all sources, including diesel particulates.

Table 9-6 Daily and Quarterly Significant Emission Rate Thresholds

EMISSION TYPE	EMISSION PERIOD	UNITS	EMISSION RATE				
			NO_x	ROG	PM_{10}	SO_x	CO
Construction	Daily	pounds per day	100	75	150	150	550
	Quarterly	tons per quarter	2.5	2.5	6.75	6.75	24.75
Operation	Daily	pounds per day	55	55	150	150	550

Table 9-7 EPA and SCAQMD Major Source Emission Rate Thresholds

Threshold Type	Agency	Units	Emission Rate				
			NO_x	ROG	PM_{10}	SO_x	CO
Major Source for PSD (1)	EPA	tons per year	250	250	250	250	250
Major Polluting Facility for NSR (2)	SCAQMD	tons per year	10	10	70	100	50
BACT	SCAQMD	pounds per day	0	0	0	0	0
RECLAIM Program	SCAQMD	tons per year	4	NA	NA	4	NA
Offset	SCAQMD	tons per year	RTCs (3)	4	4	RTCs (3)	29

NA = Not applicable

1) PSD = Prevention of Significant Deterioration for source categories not listed in 40CFR51.21
2) NSR = New Source Review (SCAQMD Rule 1302 (s).
3) RECLAIM Trading Credits (RTCs) are purchased instead of emission reduction credits (ERCs).

Table 9-8 Ambient Offsite Concentration Significance Criteria and Thresholds

Criteria	Agency	Averaging Time	Ambient Concentration (ug/cu.m.)				
			NO_x	ROG	PM_{10}	SO_x	CO
Allowable Change (1)	SCAQMD	1 hour	20	NA	NA	NA	1,100
		8 hours	NA		NA	NA	500
		24 hours			2.5	NA	NA
		annual	1		1	1	NA
PSD Significant Ambient Impact Level (2)(3)	EPA	1 hour	NA	NA	NA	NA	2,000
		3 hours			NA	25	NA
		8 hours			NA	NA	500
		24 hours			5	5	NA
		annual	1		1	1	

NA = Not Applicable

1) Allowable significant change according to Table A-1 in Appendix A of Rule 1303 (Amended 12/6/02).

2) It should be noted that there are three separate and distinct sets of values which are considered significant within the PSD program: 1) significant emission rates (40 CFR 52.21(b)(23)); 2) significant monitoring concentrations (40 CFR 52.21(i)(8)(i)); and 3) significant ambient impacts for attainment or unclassified areas (Section III.A. of Appendix S to Part 51 -- Emission Offset Interpretative Ruling, 40 CFR 51).

3) These values would not apply to a Class I Area, where a significant impact is 1 ug/m3 on a 24-hour basis for PM10 & SO2. 40 CFR 52, Section 52

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Table 9-9 Peak Daily Construction Emission Rates

SOURCE LOCATION	SOURCE TYPE	SOURCE	EMISSION RATE (pounds/day)				
			NO_x	ROG	PM_{10}	SO_x	CO
Onsite	Stationary	Welding machines	245	20	17	16	53
		Electric generators	94	8	7	6	20
	Mobile	Materials trucks	281	22	20	19	61
		Construction equipment [1]	694	55	49	46	150
	Fugitive	Equipment Activity	--	--	1,800	--	--
Offsite	Mobile	Materials trucks (e.g., cement, rebar)	214	17	12	14	46
		Workers (commuting)	35	17	1	5	302
		Miscellaneous deliveries [2]	182	14	20	12	39
Both	All	All	1,745	153	1,926	118	671
SCAQMD Daily Construction Emission Rate Significance Thresholds			100	75	150	150	550
		Significant?	Yes	Yes	Yes	No	Yes

1) Cranes, front-end loaders, etc.
2) For example, sanitation supplies.

Table 9-10 Peak Quarterly Construction Emission Rates

SOURCE LOCATION	SOURCE TYPE	SOURCE	EMISSION RATE (tons/quarter)				
			NO_x	ROG	PM_{10}	SO_x	CO
Onsite	Stationary	Welding machines	4.0	0.3	0.3	0.3	0.9
		Electric generators	4.8	0.4	0.3	0.3	1.0
	Mobile	Materials trucks	7.2	0.7	0.6	0.6	1.6
		Construction equipment [1]	56.4	4.5	4.0	3.7	12.1
	Fugitive	Equipment Activity	--	--	7.7	--	--
Offsite	Mobile	Materials trucks (e.g., cement)	27.9	2.2	1.5	1.8	6.0
		Workers (commuting) [2]	0.95	0.46	0.02	0.14	8.15
		Miscellaneous deliveries [3]	7.1	0.6	0.8	0.5	1.5
Both	All	All	108.4	9.2	15.22	7.34	31.25
SCAQMD Quarterly Construction Emission Rate Significance Thresholds			2.5	2.5	6.75	6.75	24.75
Significant?			Yes	Yes	Yes	Yes	Yes

1) Cranes, front-end loaders, etc.
2) Assumes 18 construction days per month.
3) For example, sanitation supplies.

Table 9-11 Peak Daily Operation Emission Rates – Stationary Sources

SOURCE LOCATION	SOURCE TYPE	SOURCE	EMISSION RATE (pounds/day)				
			NO_x	ROG	PM_{10}	SO_x	CO
Onsite	Stationary	Water Heaters	80.3	108.2	58.5	28.1	148.5
		Emergency Generator	4.5	0.12	0.13	1.5	1.0
		Fire Water Pumps	4.0	0.2	0.3	0.3	0.9
	Mobile	Hotelling LNG carriers	119.4	0.2	70.3	1,066.7	14.5
	Fugitive	Equipment Leaks (Valves, Flanges)	--	24.1	--	--	--
Total [1]	All	All	208	133	129	1,097	165

1) Totals are rounded.

Table 9-12 Peak Annual Operation Emission Rates – Stationary Sources

SOURCE LOCATION	SOURCE TYPE	SOURCE	EMISSION RATE (tons/year)				
			NO_x	ROG	PM_{10}	SO_x	CO
Onsite	Stationary	Water Heaters	14.7	19.7	10.7	5.1	27.1
		Emergency Generator	0.12	0.003	0.003	0.039	0.027
		Fire Water Pumps	0.10	0.006	0.007	0.007	0.022
		Subtotal	14.87	19.7	10.7	5.2	27.15
SCAQMD Annual Operation Emission Rate Threshold for a Major Polluting Facility in New Source Review			10	10	70	100	50
Major Polluting Facility in New Source Review?			Yes	Yes	No	No	No
SCAQMD Annual Operation Emission Rate Threshold for RECLAIM Program			4	--	--	4	--
Subject to RECLAIM Program?			Yes	--	--	Yes	--
Onsite	Fugitive	Equipment Leaks (Valves, Flanges)	--	4.4	--	--	--
	Mobile	Hotelling LNG carriers[1]	8.7	0.011	5.1	77.9	1.1
Total	All	All	23.6	24.2	15.8	83.0	28.2
Federal Conformity Annual De Minimis Thresholds (CAA Section 176c (40 CFR 51.853(b)(1)[2]			10	10	70	100	100
Subject to Federal Conformity Determination?			Yes	Yes	No	No	No

1) The carriers are not owned by SES or its parent Mitsubishi.
2) The regulation also has a lead emission rate threshold of 25 tons per year. Project emissions of lead will be approximately 4 pounds per year as shown in Table 9-17.

Table 9-13 Daily Peak And Annual Emission Rates – Offsite Sources

SOURCE	NOx		ROG		PM10		SOx		CO	
	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr
Ships										
LNG Carriers	339	25	1.6	0.12	177	13	2,758	201	54	4.0
Tugboats	201	15	8.4	0.62	1.6	0.12	66.3	4.8	9.7	0.71
Pilot boat and USCG escort boat	12	0.8	1.5	0.11	0.3	0.02	12	0.87	1.7	0.13
Onroad Vehicles										
Employee and Visitor Light Duty Trucks (gasoline)	2.7	0.49	1.3	0.24	0.07	0.01	0.40	0.07	23	4.2
Delivery Trucks (light-heavy duty diesel)	0.8	0.11	0.04	0.006	0.01	0.001	0.08	0.011	0.47	0.06
NGL Truck Trailers [1] (diesel)	276	50	10.8	2.0	1.1	0.2	5.8	1.1	63	12
LNG Tank Trucks (diesel)	123	22.5	4.8	0.88	0.50	0.09	2.6	0.47	28	5.2
TOTAL [2]	954	114	29	4	181	13	2,845	209	181	26

1) These worst-case truck emissions will not occur if the Project pipelines the NGL off the site.
2) Rounded.

Table 9-14 Onsite And Offsite Emission Summary

SOURCE GROUP	CRITERIA POLLUTANT (lbs/day)				
	NO_x	ROG	PM10	SO_x	CO
Onsite	208	133	129	1,097	165
Offsite	954	29	181	2,845	181
Total	1,162	162	310	3,942	346
SCAQMD Thresholds [1]	55	55	150	150	550
Significant?	Yes	Yes	Yes	Yes	No

1) SCAQMD. CEQA Air Quality Handbook, Chapter 6, page 6-2, November 1993.

Table 9-15 Project Emissions Versus Thresholds And Expected Offset Requirements

Equipment or Parameter	Units	Criteria Pollutant				
		NO_x	CO	SO_2	PM_{10}	ROG
Water Heaters	tpy	14.6 (1,2)	27.1 (1,2)	5.1 (1)	10.7 (1)	19.7 (1,2)
RECLAIM Program Threshold [3]	tpy	4	NA	4	NA	NA
Subject to RECLAIM Program?	--	Yes	--	Yes	--	--
Emergency Generator / **Fire Water Pump Engines**	--	Emissions not offset				
Fugitive Emissions [4]	tpy	0	0	0	0	4.4
Hotelling [5]	tpy	8.7	1.1	77.9	5.1	0.01
Non-propulsion shipping [6]	tpy	4.8	0.6	42.8	2.8	0.006
Total subject to offset (Rules 1303, 1304 and 1306)	tpy	28.2	28.7	125.8	18.6	24.2
Offset Threshold (Rules 1303 (b)(2) and 1304 (d)(1) Table A)	tpy	4	29	4	4	4
Required offsets [7]	lbs/day	185	0	827	122	159

1) KBR, Calculation in workbook 15Jan04 3000-MB Water Heater Emissions 14.8 ppmv H2S, January 15, 2004.
2) SCR 90% DENOx and CATOX 60-80% CO and ROG control of water heater emissions already included.
3) SCAQMD Rule 2001 (Applicability), (b) – Criteria for inclusion in RECLAIM. RECLAIM program only applies to facilities with NOx or SO_2 emissions above 4 tpy.
4) Emissions based on Piping and Instrumentation Diagram (P&ID) equipment count, EPA emission factors and planned control systems.
5) Hotelling emissions,included in New Source Review Regulation XIII Rules 1303, 1304 and 1306 for calculating offsets.
6) Non-propulsion emissions, included in New Source Review Regulation XIII Rules 1303, 1304 and 1306 for calculating offsets, within "Coastal Waters" (distance in miles, SCAQMD [2003]) = 3
SCAQMD. Personal communication from William Thompson, Senior Manager, March 14, 2003.
7) Emissions, except CO, multiplied by 1.2 to calculate required offsets according to Rule 1306.

Table 9-16 Maximum Offsite Criteria Pollutant Concentrations

POLLUTANT	AVERAGING PERIOD	BACKGROUND CONCEN-TRATION ($\mu g/m^3$)	MAXIMUM PROJECT CONCEN-TRATION ($\mu g/m^3$)	TOTAL CONCEN-TRATION ($\mu g/m^3$)	CAAQS ($\mu g/m^3$)	NAAQS ($\mu g/m^3$)	SIGNIFICANCE
NO_2	1 hour	282	13	295	470	--	Insignificant
	Annual Arithmetic Mean	64.2	0.2	64.4	--	100	Insignificant
CO	1 hour	11,500	25	11,525	23,000	40,000	Insignificant
	8 hour	6,444	12	6,456	10,000	10,000	Insignificant
PM_{10}	24 hour	105	2.8	107.8	50	150	Significant [1]
	Annual Arithmetic Mean	38.9	0.16	39.1	20	50	Significant [1]
$PM_{2.5}$	24 hour	82	2.8	84.8	--	65	Significant [2]
	Annual Arithmetic Mean	21.5	0.16	21.7	12	15	Significant [2]
SO_2 [3]	1 hour	131	4.6	136	655	--	Insignificant
	3 hour	118 [4]	3.6	122	--	1,300	Insignificant
	24 hour	36.8	1.3	38	105	365	Insignificant
	Annual Arithmetic Mean	8.0	0.076	8.1	--	80	Insignificant

1) Background concentration already exceeds CAAQS; hence Project contributes to an existing violation.
2) Background concentration already exceeds NAAQS; hence Project contributes to an existing violation.
3) 1-hour, 24-hour and annual arithmetic mean concentrations proportioned from concentration to emission rate ratios modeled for NO_2 and PM-10.
4) 3-hour concentration proportioned from 1-hour concentrations by factor of 0.9, following guidance in OEHHA (2003), ARB (1994) AND USEPA (1992).

Table 9-17 Maximum Emission Rates of Non-Criteria Pollutants

NONCRITERIA POLLUTANT	EMISSION RATE	
	Hourly (lbs per hour) [2]	Annual (lbs per year) [2]
Acetaldehyde	7.3E-04	6.4
Acrolein	6.5E-04	5.7
Ammonia	2.2 [3]	19,000
Arsenic	2.2E-04	1.9
Benzene	1.4E-03	12
Beryllium	1.1E-05	0.096
1,3-Butadiene	1.0E-04	0.91
Cadmium	9.1E-04	8.0
Chromium VI	1.2E-03	10
Copper	7.6E-04	6.7
Dichlorobenzene	5.6E-07	4.9E-03
Diesel exhaust particulate	2.8E-05	0.25
7,12-Dimethylbenz(a)anthracene	7.5E-09	6.5E-05
Ethylebenzene	1.6E-03	14
Formaldehyde	4.3E-03	38
Hexane	1.9E-03	17
Lead	4.7E-04	4.1
Manganese	4.3E-04	3.8
Mercury	2.2E-04	1.9
3-Methylcholanthrene	8.4E-10	7.4E-06
Naphthalene	2.5E-04	2.2
Nickel	5.1E-03	45
POM/PAHs [1]	3.3E-04	2.9
Benz(a)anthracene	1.6E-06	1.4E-02
Benzo(a)pyrene	9.8E-07	8.6E-03
Benzo(b)fluoranthene	1.5E-06	1.3E-02
Benzo(k)fluoranthene	1.5E-06	1.3E-02
Chrysene	1.6E-06	1.4E-02
Dibenz(a,h)anthracene	9.8E-07	8.6E-03
Indeno(1,2,3-c,d)pyrene	1.5E-06	1.3E-02
Propylene	1.9E-01	1,700
Selenium	4.7E-05	0.41
Toluene	3.0E-03	26
Vanadium	1.3E-03	11
Xylenes (mixed)	1.2E-02	100
Zinc	2.5E-02	220

(1) POM = polycyclic organic matter PAHs = polycyclic aromatic hydrocarbons, expressed as equivalent benzo(α)pyrene, includes 7,12-dimethylbenz(a)anthracene, acenaphthene, acenaphthylene, and anthracene.
(2) Process water heater emission rates based upon emission factors in USEPA (1998) and email from Stephen Lang to Eric Walther, 9/29/03.
(3) Based upon 5 ppmvd in water heater's maximum firing case exhaust flow

Table 9-18 Carcinogenic Unit Risk Factors And Reference Exposure Levels For Noncriteria Pollutants

NONCRITERIA POLLUTANT	CARCINOGENIC UNIT RISK FACTOR [1] $(\mu g/m^3)^{-1}$	REFERENCE EXPOSURE LEVEL (REL) [2] $(\mu g/m^3)$	
		Chronic	Acute
Acetaldehyde	2.7E-06	9	--
Acrolein	--	0.06	0.19
Ammonia	--	200	3,200
Arsenic	3.3E-03	0.03	0.19
Benzene	2.9E-05	60	1,300
Beryllium	2.4E-03	7.0E-03	--
1,3-Butadiene	1.7E-04	20	--
Cadmium	4.2E-03	0.02	--
Chromium VI	0.15	0.20	--
Copper	--	2.4	100
Dichlorobenzene	1.1E-05	800	--
Diesel exhaust particulate	3.0E-04	5.0	--
7,12-Dimethylbenz(a)anthracene	7.1E-02	--	--
Ethylbenzene	--	2,000	--
Formaldehyde	6.0E-06	3.0	94
Hexane	--	7.000	--
Lead	1.2E-05	--	--
Manganese	--	0.20	--
Mercury	--	0.090	1.8
3-Methylcholanthrene	6.3E-03	--	--
Naphthalene	--	9.0	--
Nickel	2.6E-04	0.050	6.0
POM/PAHs [3]	1.1E-03	--	--
Benz(a)anthracene	1.1E-04	--	--
Benzo(a)pyrene	1.1E-03	--	--
Benzo(b)fluoranthene	1.1E-04	--	--
Benzo(k)fluoranthene [2]	1.1E-04	--	--
Chrysene	1.1E-05	--	--
Dibenz(a,h)anthracene	1.2E-03	--	--
Indeno(1,2,3-c,d)pyrene	1.1E-04	--	--
Propylene	--	3,000	--
Selenium	--	20	--
Toluene	--	300	37,000
Vanadium	--	--	30

NONCRITERIA POLLUTANT	CARCINOGENIC UNIT RISK FACTOR [1] $(\mu g/m^3)^{-1}$	REFERENCE EXPOSURE LEVEL (REL) [2] $(\mu g/m^3)$	
		Chronic	Acute
Xylenes	--	700	22,000
Zinc	--	3.5	--

-- = None available.

(1) Office of Environmental Health Hazard Assessment (OEHHA) / Air Resources Board (ARB). *Consolidated Table of OEHHA/ARB-Approved Risk Assessment Health Values*, http://www.arb.ca.gov/toxics/healthval/healthval.htm, November 7, 2002, accessed October 1, 2003.

(2) OEHHA. *The Air Toxics Hot Spots Program Guidance Manual for Preparation of Health Risk Assessments*, August 2003.

(3) POM = polycyclic organic matter /Polycyclic aromatic hydrocarbons, expressed as equivalent benzo(α)pyrene includes 7,12-dimethylbenz(a)anthracene, acenaphthene, acenaphthylene, and anthracene.

Table 9-19 Maximum Potential Health Risks

EXPOSURE CONDITIONS	CARCINOGENIC RISK		NONCARCINOGENIC RISKS	
	Probability	Excess Cancer Burden	Chronic Hazard Index	Acute Hazard Index
Long-Term (70-year) Exposure (Residential)[1]	1.4 in one million	0.08	0.001	0.002
Long-Term (44-year) Exposure (Worker)[2]	2.5 in one million		0.009	0.02
Significance Threshold	10 in one million	0.5	1.0	1.0
Significance Level	Insignificant	Insignificant	Insignificant	Insignificant

1) Based on the nearest residence (see Point D in Figure 9.1-8).
2) Highest potential risk occurs just west of Project along edge of Pier T. Worker exposure based on 44 years (vs. 70 years for residence) and 8 hours/day (vs. 24 hours for residence).

Table 9-20 Daily And Annual Changes in Basin Emissions from LNG-Fueled Trucks

SOURCE	NOx		ROG		PM10		SOx		CO	
	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr	lbs/day	tons/yr
Emission Changes	-31.445	-5.739	+4.142	+746	-656	-120	-891	-163	-4,217	-770

Table 9-21 Summary Of Measured Sound Levels (Dba)
Long Beach LNG Import Project
Long Beach California
August 21-24, 2003

Location / Parameter	August 21-22 (Thursday/Friday)	August 22-23 (Friday/Saturday)	August 23-24 (Saturday/Sunday)
Pier T East			
Max 1-hr L_{eq}	60.2	63.3	57.6
Min 1-hr L_{eq}	49.5	47.5	49.0
Max 1-hr L_{90}	54.9	57.3	52.8
Min 1-hr L_{90}	47.4	46.5	48.1
L_{dn}	61.1	61.2	59.8
$L_{eq(24)}$	56.1	56.4	54.0
$L_{90(24)}$	52.4	53.0	50.6
Pier T North			
Max 1-hr L_{eq}	66.7	67.5	60.8
Min 1-hr L_{eq}	53.8	50.0	49.1
Max 1-hr L_{90}	57.3	57.9	55.1
Min 1-hr L_{90}	50.0	47.9	48.3
L_{dn}	64.2	63.6	61.1
$L_{eq(24)}$	61.2	60.8	55.9
$L_{90(24)}$	54.9	54.7	52.2

Table 9-22
Sound Levels And Loudness Of Illustrative Noises In Indoor And Outdoor Environments
(A-Scale Weighted Sound Levels)

dB(A)	OVERALL LEVEL (Sound Pressure Level Approx. 0.0002 Microbar)	COMMUNITY (Outdoor)	HOME OR INDUSTRY	LOUDNESS (Human Judgment of Different Sound Levels)
130	UNCOMFORTABLY	Mil. Jet Aircraft Take-Off w/After-burner From Aircraft Carrier @ 50 Ft. (130)	Oxygen Torch (121)	120 dB(A) 32 Times as Loud
120	LOUD	Turbo-Fan Aircraft @ Takeoff Power @ 200 Ft. (90)	Riveting Machine (110)	110 dB(A) 16 Times as Loud
110			Rock-N-Roll Band (108-114)	
100	VERY	Jet-Flyover @ 1,000 Ft. (103) Boeing 707.DC-8 @ 6,080 Ft. Before Landing (106) Bell J-2A Helicopter @ 100 Ft. (100)	---	100 dB(A) 8 Times as Loud
90	LOUD	Power Mower (96) Boeing 737, DC-9 @ 6,080 Ft. Before Landing (97) Motorcycle @ 25 Ft. (90)	Newspaper Press (97)	90 dB(A) 4 Times as Loud
80		Car Wash @ 20 Ft. (89) Prop. Airplane Flyover @ 1,000 Ft. (88) Diesel Truck, 40 MPH @ 50 Ft. (84) Diesel Train, 45 MPH @ 100 Ft. (83)	Food Blender (88) Milling Machine (85) Garbage Disposal (80)	80 dB(A) 2 Times as Loud
70	MODERATELY LOUD	High Urban Ambient Sound (80) Passenger Car, 65 MPH @ 25 Ft. (77) Freeway @ 50 Ft. From Pavement Edge, 10:00 AM (76 + or - 6)	Living Room Music (76) TV-Audio, Vacuum Cleaner	70 dB(A)
60		Air Conditioning Unit @ 100 Ft. (60)	Dishwasher (Rinse) @ 10 Ft. (60) Conversation (60)	60 dB(A) 1/2 as Loud
50	QUIET	Large-Transformers @ 100 Ft. (50)	---	50 dB(A) 1/4 as Loud
40		Bird Calls (44) Lower Limit Urban Ambient Sound (40)	---	40 dB(A) 1/8 as Loud
	JUST AUDIBLE	(dB[A] Scale Interrupted)	---	---
10	THRESHOLD OF HEARING	---	---	---

Table 9-23
Noise Levels of Major Construction Equipment

Equipment Type	Noise Level @ 50 ft. (dBA)
Heavy Equipment (3)	85
Air Compressors (2)	84
Welders (2)	67
Concrete Truck (1)	71
Miscellaneous Trucks (3) (Pick-ups etc.)	65
Combined Noise Level @ 50 Ft.	**88**

Table 9-24 Estimated Construction Phase Noise Levels

	Estimated Distance	Estimate Noise Level (dBA)
Property Line	200-400 ft.	68-74
Nearest Residence [1]	1.24 miles	47.65

1) Potential live-aboard vessels at Cerritos Channel Marina (see Point E on Figure 9.1-8)

NON-INTERNET PUBLIC

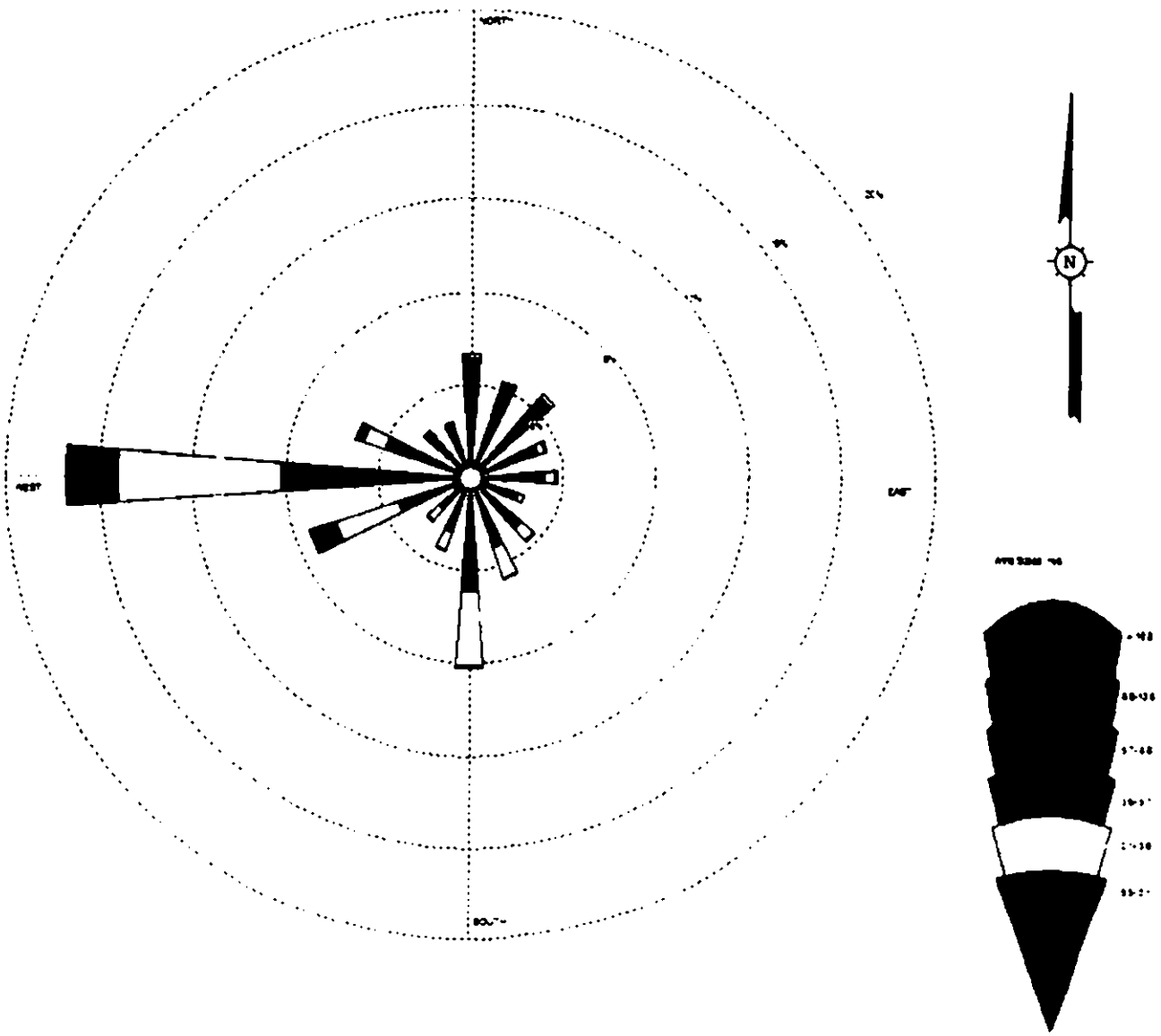
FIGURE 9-1

General Site Location Map

NON-INTERNET PUBLIC

FIGURE 9-2

Vicinity Topography



Long Beach, CA. 1981 Data from Station ID 53101, 8719 hours available, average wind speed of 3.8 mph (1.71 m/s), calm winds frequency of 17.55%.

SOUND ENERGY SOLUTIONS

WIND ROSE FOR LONG BEACH MUNICIPAL AIRPORT 1981

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-3

Figure 9-4 South Coast Air Basin

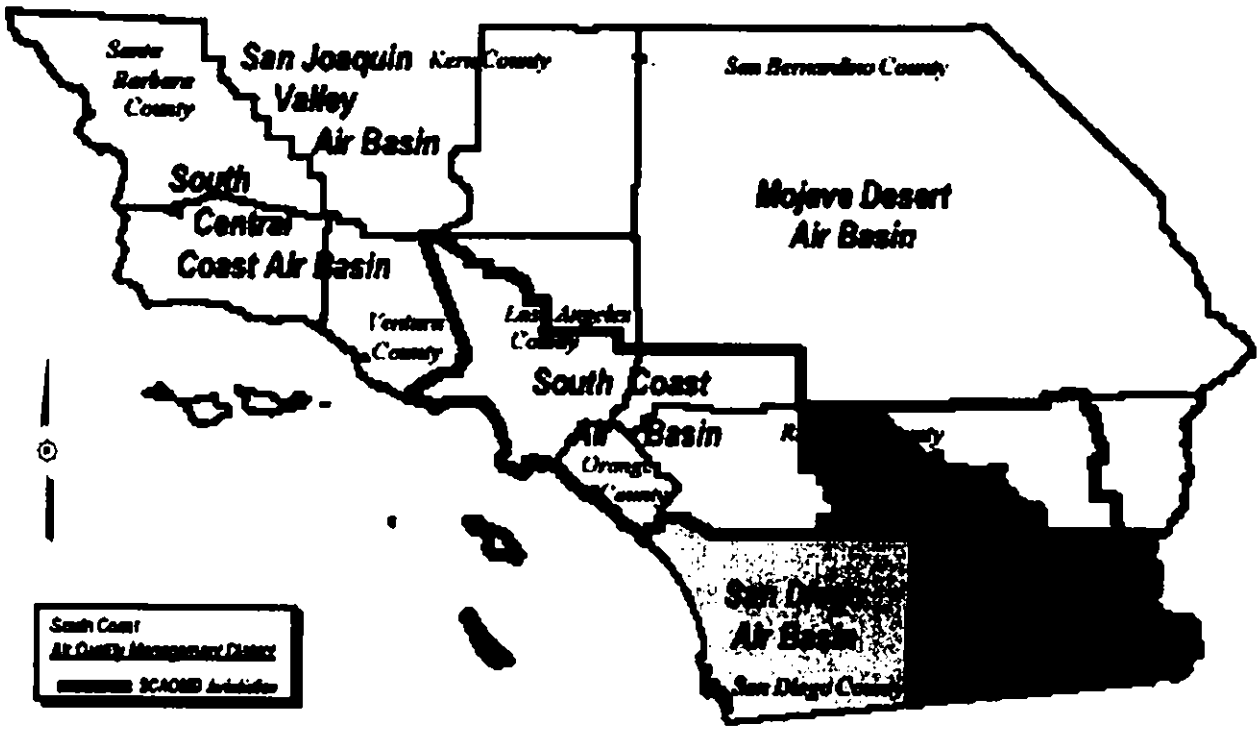
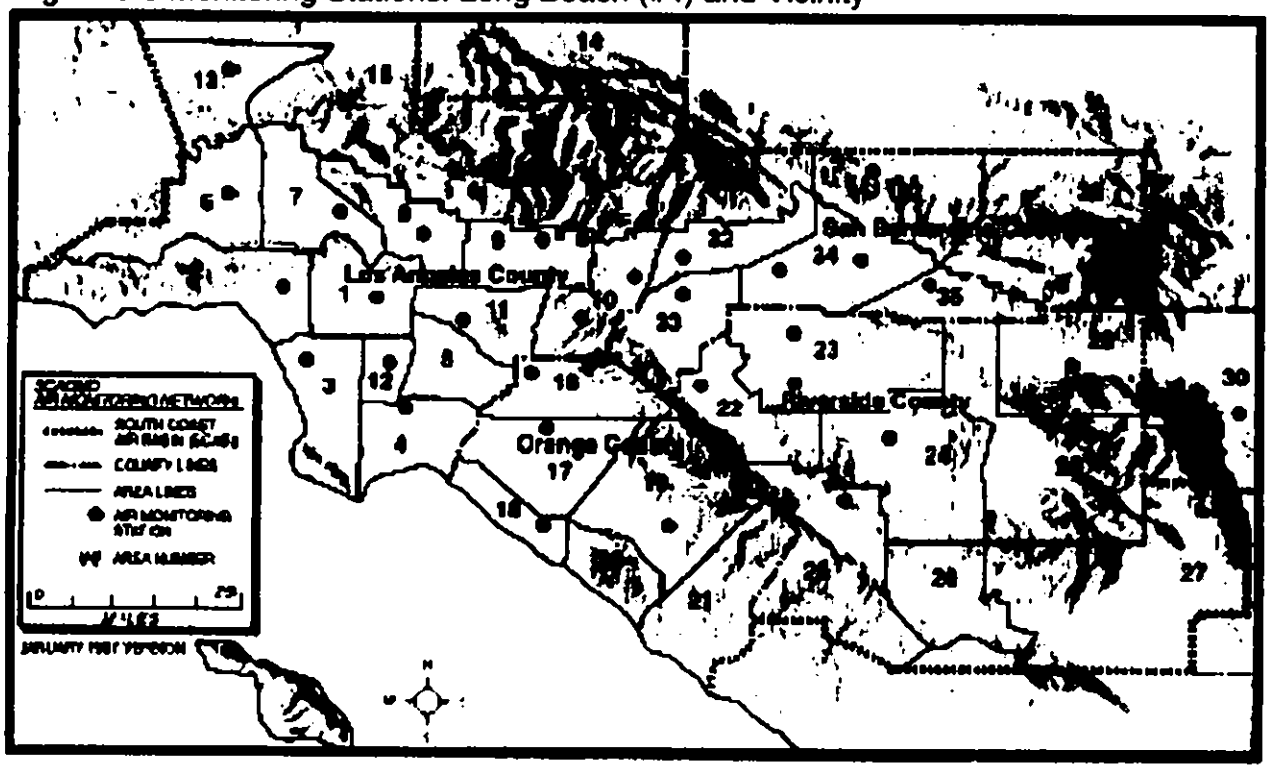
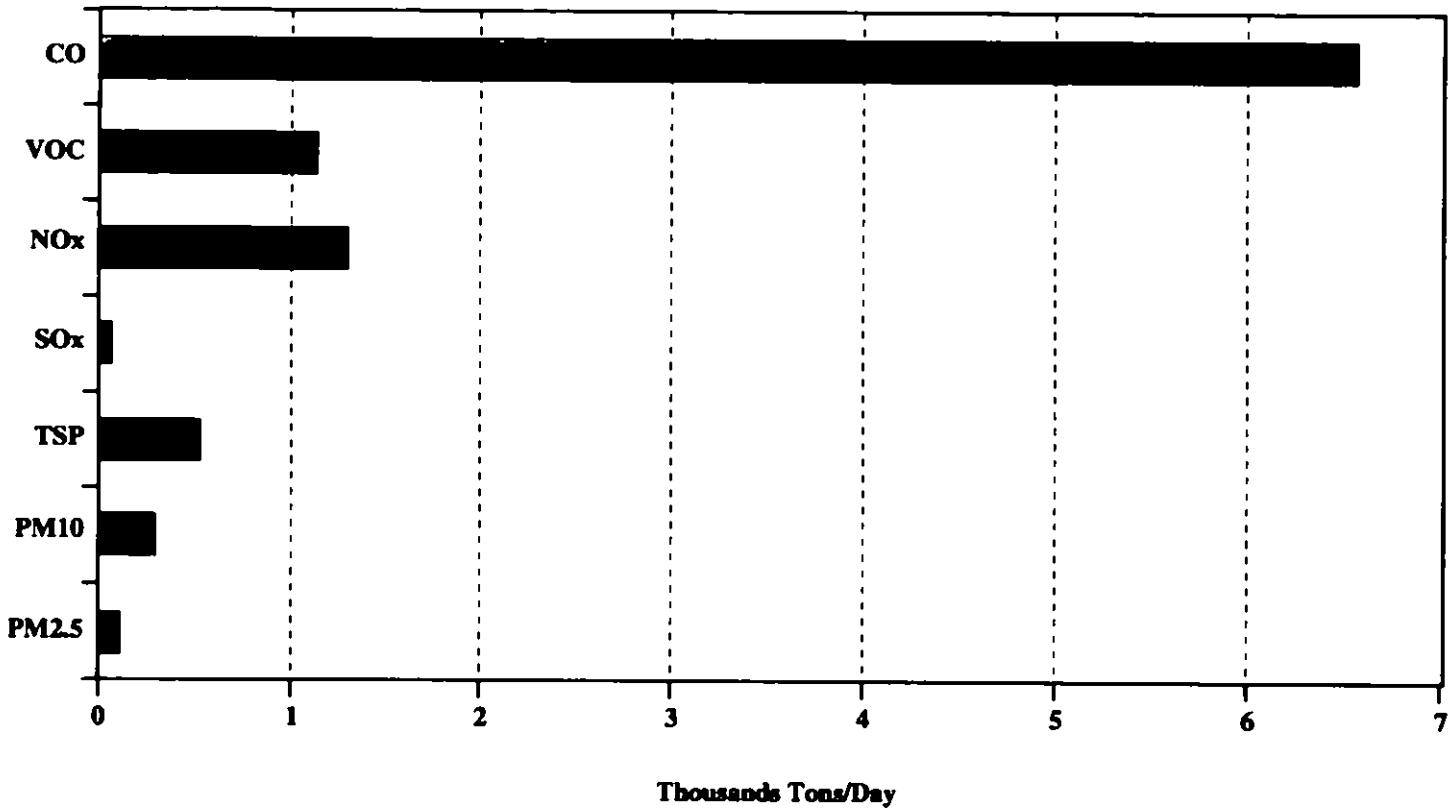


Figure 9-5 Monitoring Stations: Long Beach (#4) and Vicinity



South coast air basin and adjoining areas of Salton Sea and Mojave Desert air basins and monitoring stations.

SOUND ENERGY SOLUTIONS	
MONITORING STATIONS LONG BEACH LNG IMPORT PROJECT LONG BEACH, CALIFORNIA	
TRC	FIGURE 9-4/9-5



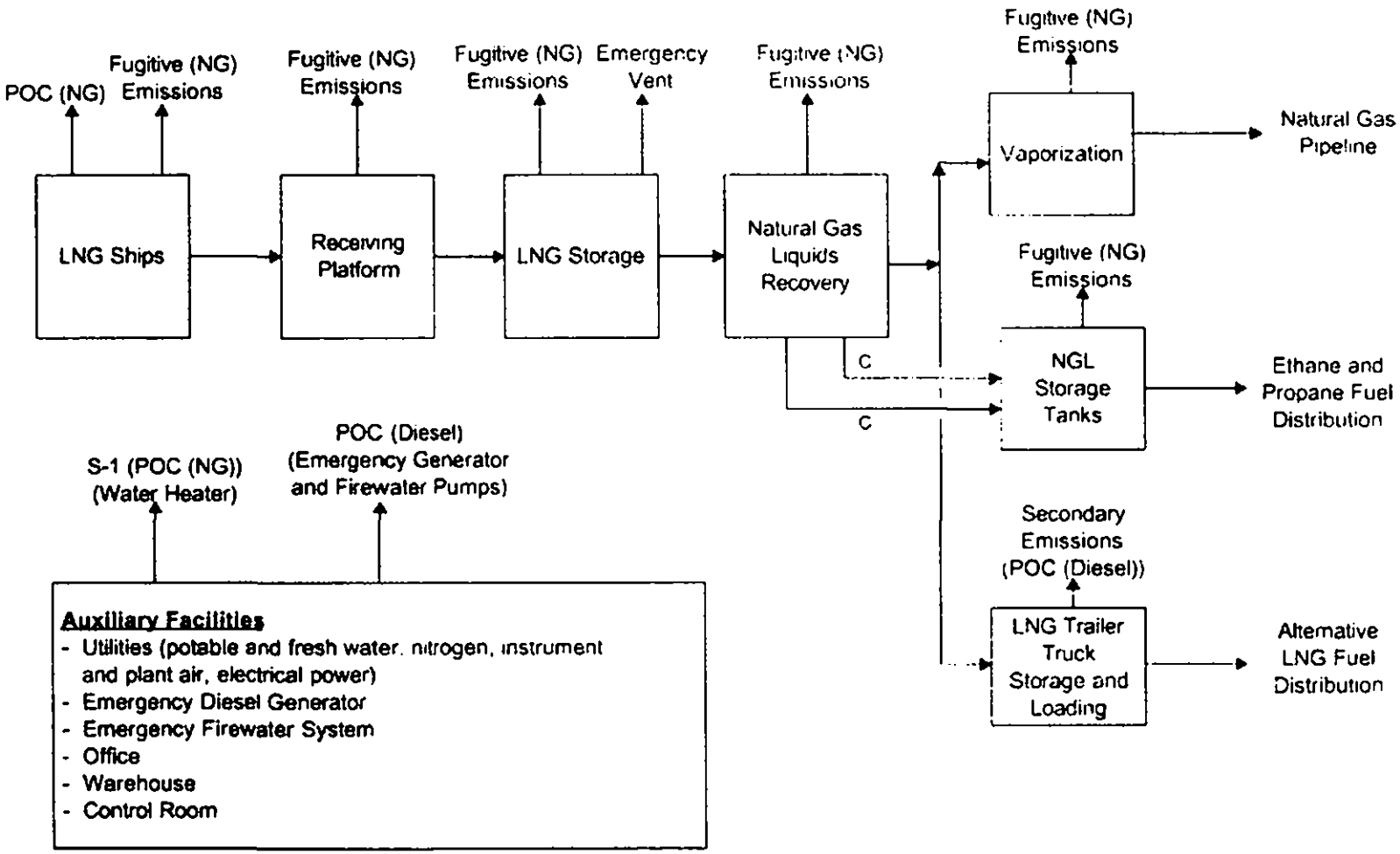
SOUND ENERGY SOLUTIONS

SOCAB CRITERIA POLLUTANT EMISSIONS INVENTORY - 1997

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-6



Notes:
S = Emission Source
S-1 = Water Heater
POC = Products of Combustion (NOx, VOC, PM10, CO, SOx)
NGL = Natural Gas Liquid (C_2, C_3)
NG = Natural Gas

SOUND ENERGY SOLUTIONS

ENVIRONMENTAL BLOCK FLOW DIAGRAM - EMISSIONS

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

KBR | FIGURE 9-7

NON-INTERNET PUBLIC

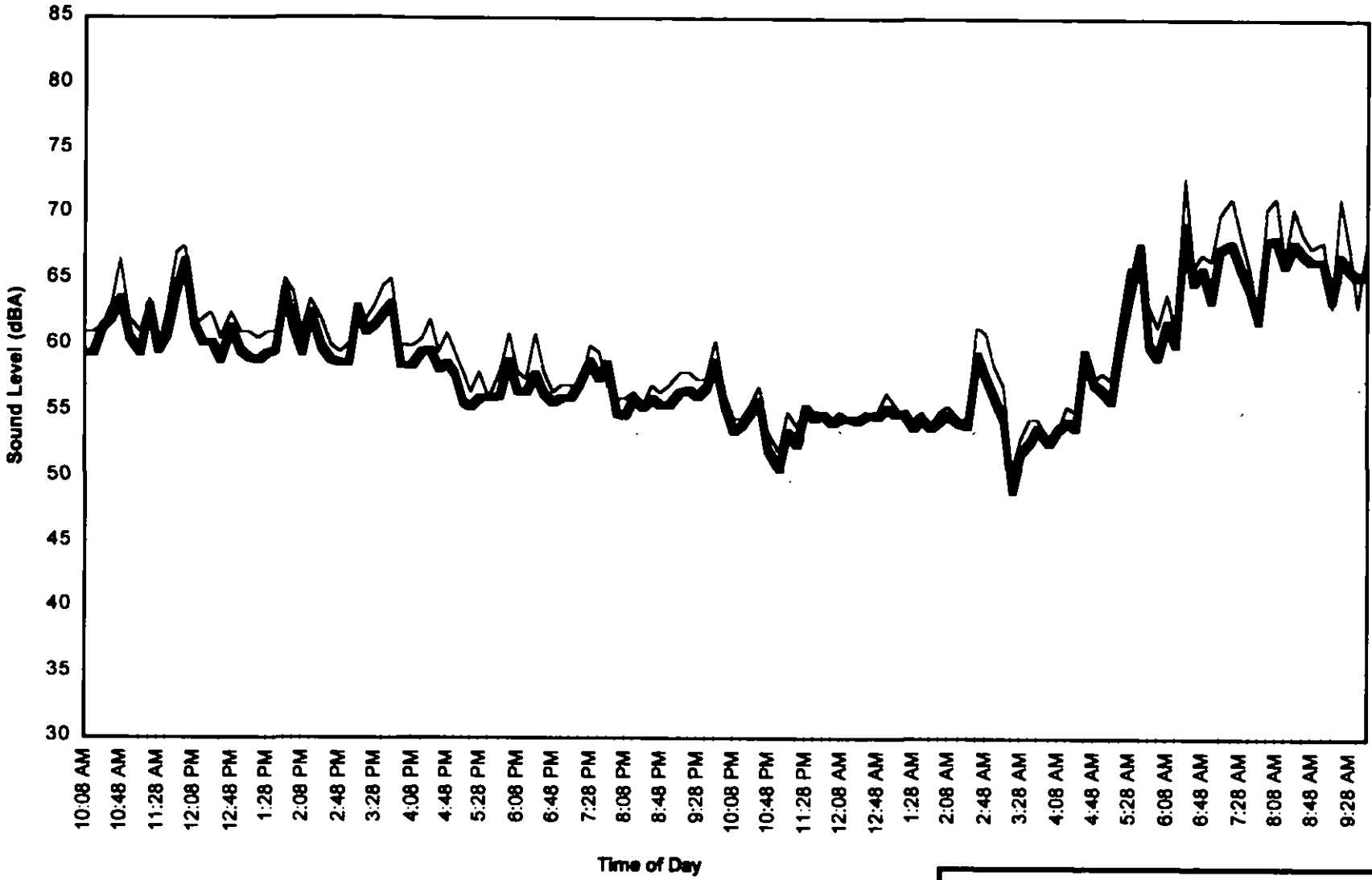
FIGURE 9-8

Location of Nearest Sensitive Receptors

NON-INTERNET PUBLIC

FIGURE 9-9

Location of Baseline Noise Survey Points
August 21-24, 2003



SOUND ENERGY SOLUTIONS

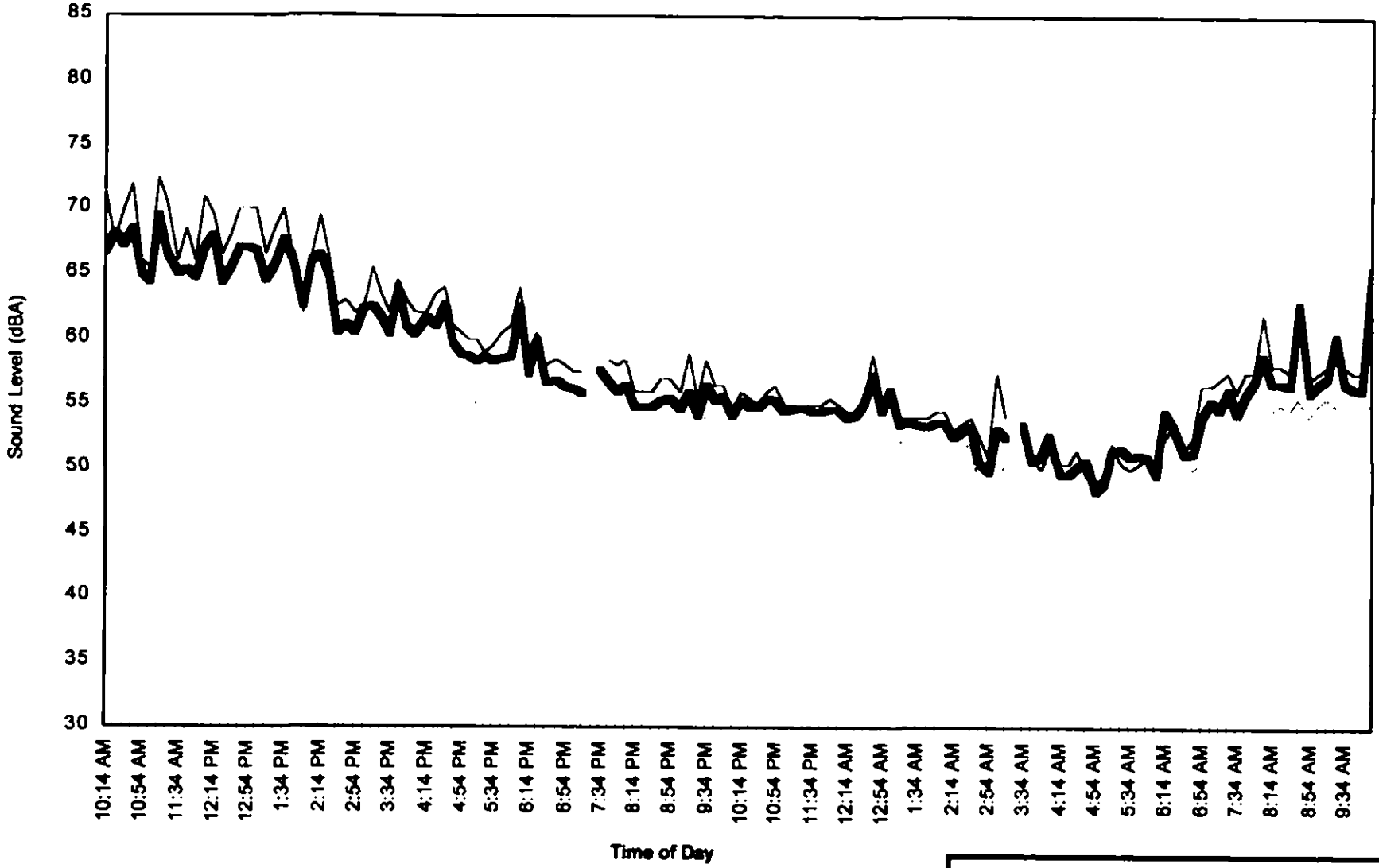
MEASURED SOUND LEVELS PIER T NORTH - AUGUST 21-22

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-10

29018301RR1-44 REV.01/12/04



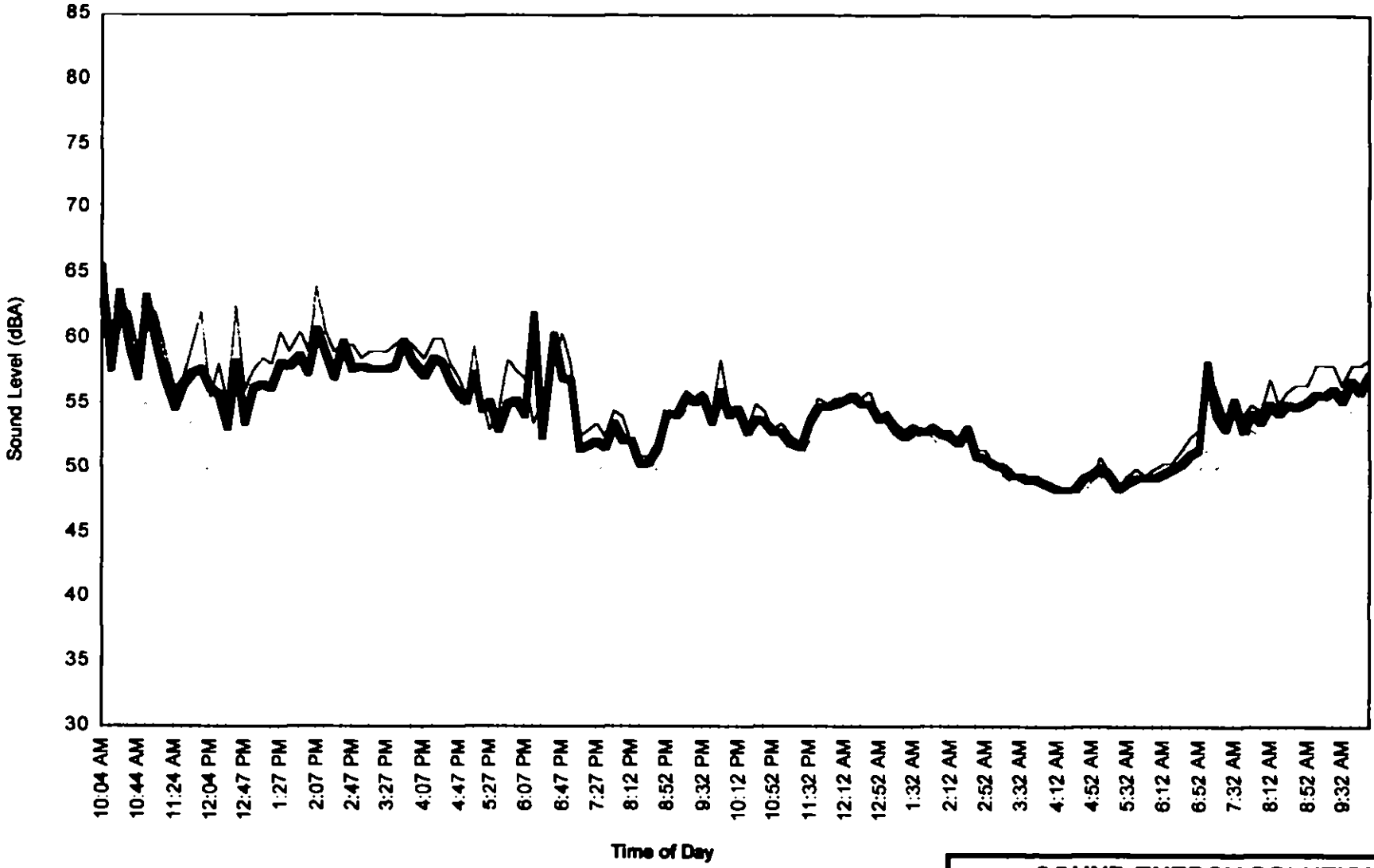
SOUND ENERGY SOLUTIONS

MEASURED SOUND LEVELS PIER T NORTH - AUGUST 22-23

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-11



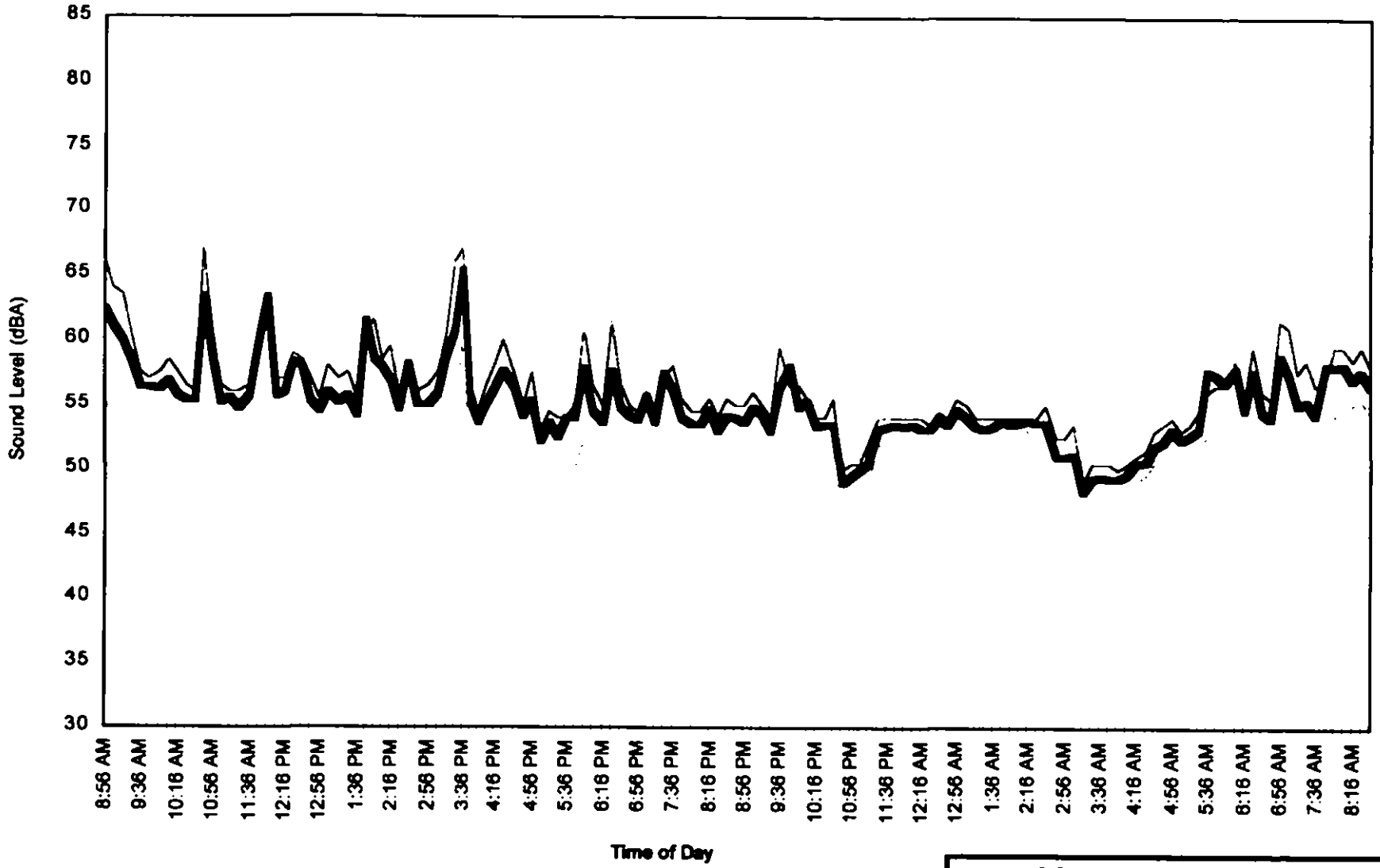
SOUND ENERGY SOLUTIONS

MEASURED SOUND LEVELS PIER T NORTH - AUGUST 23-24

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-12



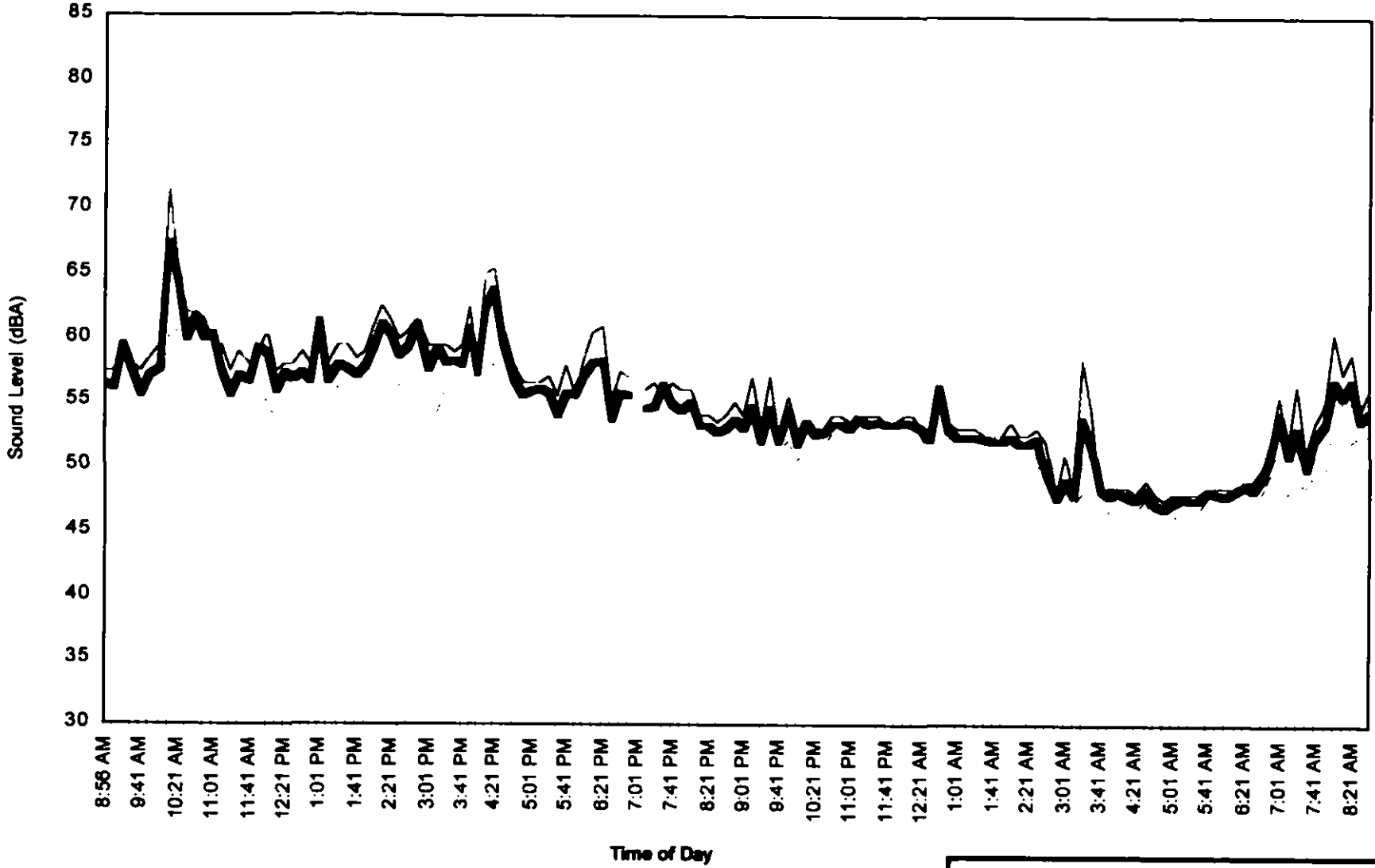
SOUND ENERGY SOLUTIONS

MEASURED SOUND LEVELS PIER T EAST - AUGUST 21-22

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-13



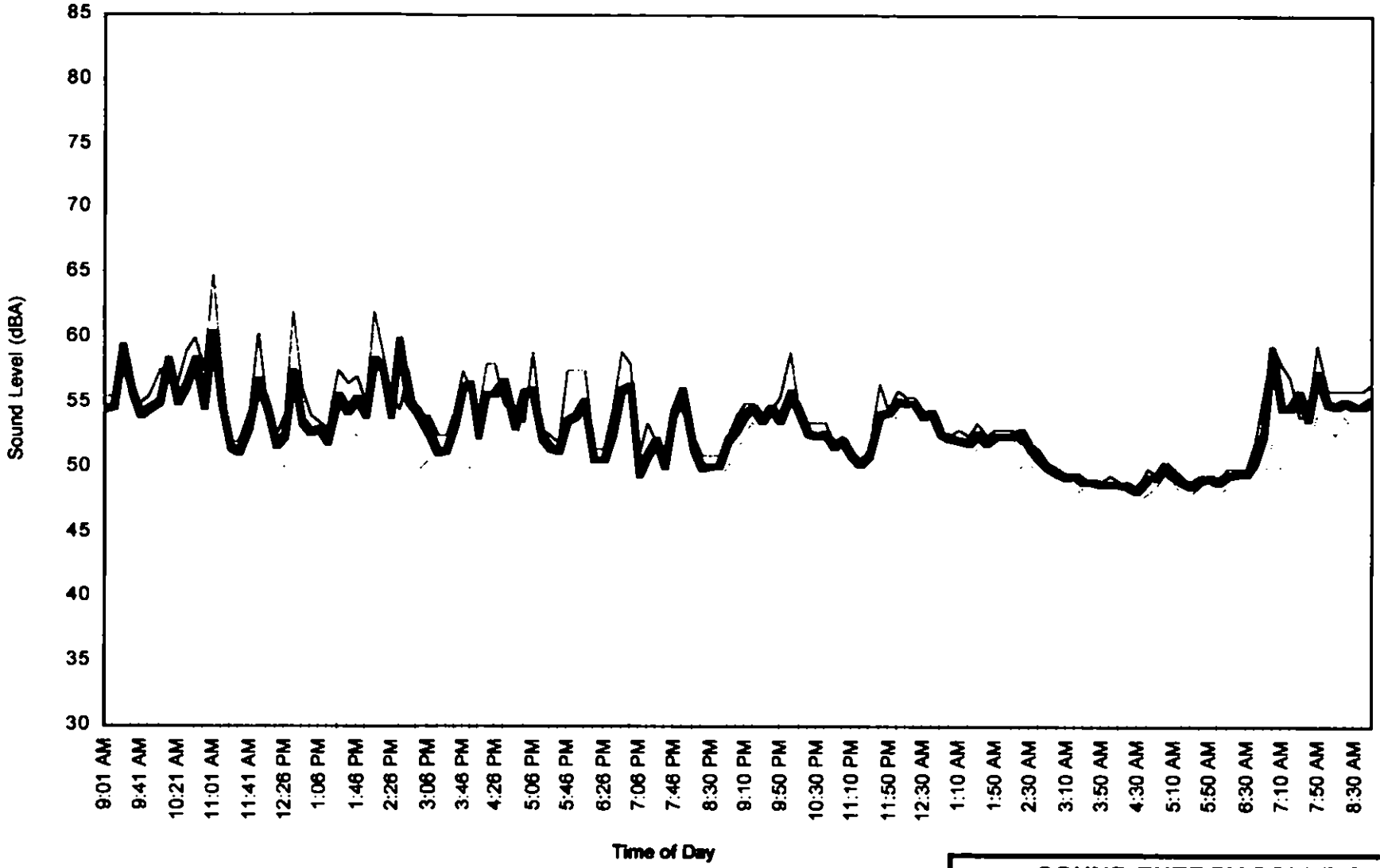
SOUND ENERGY SOLUTIONS

MEASURED SOUND LEVELS PIER T EAST - AUGUST 22-23

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-14



SOUND ENERGY SOLUTIONS

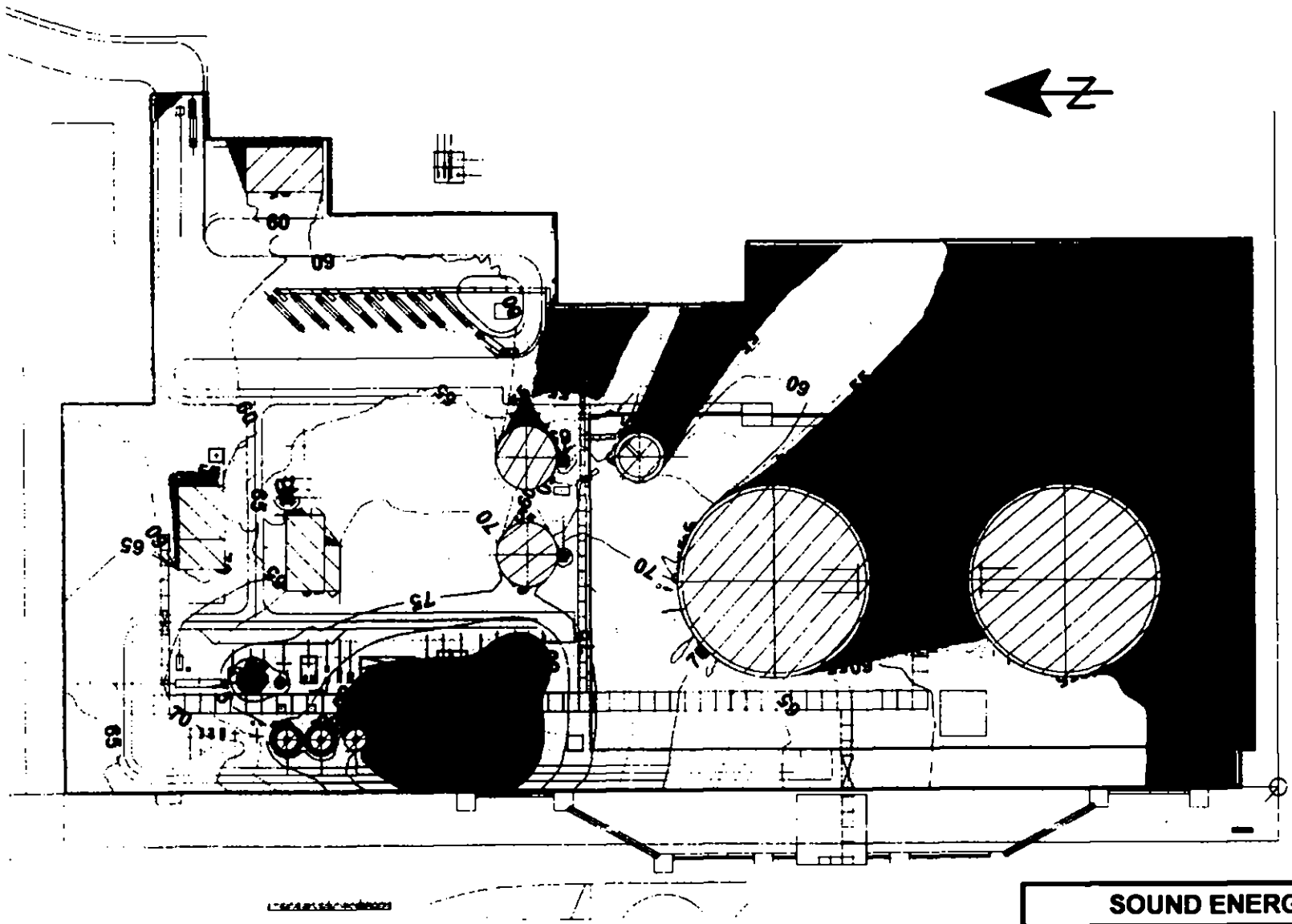
MEASURED SOUND LEVELS PIER T EAST - AUGUST 23-24

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 9-15

KBR
NOISE & VIBRATION TEAM



SOUND ENERGY SOLUTIONS

PREDICTED IN-PLANT AND PROPERTY LINE SOUND PRESSURE LEVELS

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

KBR | FIGURE 9-16

NON-INTERNET PUBLIC

FIGURE 9-17

Predicted Overall Sound Pressure Levels Outside the Property Line

Sound Energy Solutions

Long Beach LNG Import Project

Resource Report 10 – Alternatives

FERC Requirements:	Addressed in:
Discuss the "no action" alternative and the potential for accomplishing the proposed objectives through the use of other systems and/or energy conservation. Provide an analysis of the relative environmental benefits and costs for each alternative. (§ 380.12(l)(1))	Sections 10.1, 10.2, 10.3
Describe alternative routes or locations considered for each facility during the initial screening for the project. (i) For alternative routes considered in the initial screening for the project but eliminated, describe the environmental characteristics of each route or site, and the reasons for rejecting it. Identify the location of such alternatives on maps of sufficient scale to depict their location and relationship to the proposed action, and the relationship of the pipeline to existing rights-of-way. (ii) For alternative routes or locations considered for more in-depth consideration, describe the environmental characteristics of each route or site, and the reasons for rejecting it. Provide comparative tables showing the differences in environmental characteristics for the alternative and proposed actions. The location of any alternatives in this paragraph shall be provided on maps equivalent to those required in paragraph (c) (2) of this section. (§ 380.12(l)(2))	Sections 10.4, 10.5, 10.6, 10.7

RESOURCE REPORT 10
ALTERNATIVES
CONTENTS

ACRONYMS

Bcfd	billion cubic feet per day
Billiton	BHP Billiton LNG International Inc.
Btu	British Thermal Unit
CEC	California Energy Commission
CFE	Comision Federal de Electricidad
EIS	Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FSRU	Floating Storage and Regasification Unit
GB	Gasoducto Bajanorte
GBS	Gravity Based Structure
gpd	gallons per day
gpm	gallons per minute
HDD	Horizontal Directional Drill
kilovolt	kV
LADWP	Los Angeles Department of Water and Power
LAXT	Los Angeles Export Terminal
LBED	City of Long Beach Energy Department
LNG	Liquified Natural Gas
MMscfd	million standard cubic feet per day
m	meters
m^3	cubic meters
MW	megawatt
NGL	Natural Gas Liquids
NO_x	Nitrogen Oxides
OCS	Pacific Outer Continental Shelf Region
PLEM	Pipeline End Manifold
POLB	Port of Long Beach
SCAQMD	South Coast Air Quality Management District
SCV	Submerged Combustion Vaporizers
SDG&E	San Diego Gas and Electric
SES	Sound Energy Solutions
SoCal Edison	Southern California Edison
SoCal Gas	Southern California Gas Company
SO_2	Sulfur Dioxide
STV	Shell and Tube Vaporizer
TGN	Transportadora de Gas Natural de Baja California
tpy	tons per year
USC	United States Coast Guard

RESOURCE REPORT 10

ALTERNATIVES – SUMMARY

10 INTRODUCTION

Sound Energy Solutions (SES) has entered into a preliminary agreement with the Port of Long Beach (POLB) for a 25-acre site on the eastern portion of Pier T (Pier T East) of the former naval shipyard property that was transferred to the POLB. SES proposes to construct and operate a liquefied natural gas (LNG) import terminal where LNG will be received and vaporized. The project, known as the Long Beach LNG Import Project or "Project", will include an offloading dock, two LNG storage tanks, an LNG vehicle fuel tank, vaporization facilities, a natural gas liquids recovery unit, and a truck-loading facility on Pier T East. Associated facilities include an approximate 2.3-mile-long pipeline that will deliver natural gas to the existing pipeline system of Southern California Gas Company (SoCal Gas) at its Salt Works Station, and approximately 0.8 mile of electric distribution lines to connect the LNG terminal to the existing Southern California Edison (SoCal Edison) system. The pipeline and electric distribution lines will be constructed, owned, and operated by others, not SES.

Purpose Of Report

This Resource Report summarizes the various alternatives to the Long Beach LNG Import Project. In accordance with the National Environmental Policy Act and California Environmental Quality Act regulations, alternatives to the Project are evaluated to determine if any are reasonable, practical, and environmentally preferable to the proposed action.

Agency/Stakeholder Communications

The identification of alternatives is partially based on comments received from agency and stakeholder consultations that were conducted when the Project was in the preliminary stages of development (see Section 1.8 in Resource Report 1 for the list of agencies and stakeholders consulted) and from comments received as a result of the scoping meeting conducted by the Federal Energy Regulatory Commission (FERC) and the POLB.

Report Organization

This Resource Report is divided into nine sections: the no action or postponed action alternatives (Section 10.1), energy or conservation alternatives (Section 10.2), Project system alternatives (Section 10.3), alternative LNG terminal sites (Section 10.4), alternative pipeline routes for the send-out pipeline (Section 10.5), alternatives for the electric distribution lines (Section 10.6), alternative dredge disposal sites (Section 10.7), alternatives considered for the vaporization of the LNG (Section 10.8), and references (Section 10.9).

Project Objectives and Evaluation Criteria

The Long Beach LNG Import Project is designed to meet the five primary objectives listed below. Therefore, each alternative was first evaluated against these Project objectives.

1. The Project will allow access to LNG supplies and thus will provide a new, stable source of between 700 and 1,000 million standard cubic feet per day (MMscfd) of natural gas to directly meet the needs of the Los Angeles Basin (LA Basin) of southern California and, in particular, the Los Angeles metropolitan area. The Project will eliminate the existing "end of the pipeline" condition that has adversely affected California.

2. The Project will provide an abundant, stable source of LNG vehicle fuel to facilitate vehicle conversion to LNG and other natural gas-based clean fuels in the LA Basin, which will reduce air pollution. Obvious candidates for conversion in the Ports of Long Beach and Los Angeles include on-road trucks, tugboats, harbor craft and fishing fleets, cranes, and yard tractors or "yard hostlers." Other conversion candidates include regional fleet vehicles and commercial vehicles that are regularly parked at the same locations. Operations in the Port areas produce more air pollution than any other location in the South Coast Air Quality Management District (SCAQMD). In a study completed in 1999, repowering the yard hostlers with LNG would reduce nitrogen oxides (NO_x) and particulate matter by at least 50 percent per unit at the ports of Los Angeles and Oakland.[1] In addition, the Project will provide a new economical source of supply for vehicles already using LNG currently trucked in from other locations.

[1] Seaport Liquid Natural Gas Study. Prepared for Brookhaven National Laboratory by Zak Cook, CALSTART-WestStart. February 1999.

3. The Project will provide a reliable and timely source of energy using proven technology. Onshore LNG technology is a proven technology with 40 import terminals in operation worldwide, including 4 in the United States and 1 in Puerto Rico.

4. The Project will provide a facility that will allow for 320,000 cubic meters (m^3) (2,012,000 barrels) of LNG to be imported and vaporized for delivery into the immediate Los Angeles market or used for LNG refueling. The Project can accommodate fluctuating energy market demands and the logistics of intermittent ship arrivals. This is because the onshore tank capacity of 320,000 m^3 has ample capacity to follow local natural gas or LNG demand and specifically cater to the needs of natural gas users. Schedules for LNG carrier delivery can vary depending on weather or other variables. An onshore receiving tank can safely manage large quantities of LNG, thus accommodating variations in ship arrivals or natural gas demand.

5. The Project will be sited at a location that will have the least environmental and community impact. SES' 25-acre site at Pier T East is within the much larger industrial 288-acre complex that comprises the Port of Long Beach. As such, the Project will be within an existing compatible land use and surrounded by similar industrial facilities. Visual impacts, impacts to sensitive natural resources and/or community values are minimal. This location also provides nearby access to existing safety and security infrastructure, such as the United States Coast Guard (USCG), fire, and police.

Once these objectives were met, other criteria were incorporated into the analysis to assess the next range of alternatives. For example, additional criteria were applied in the selection of the port (see Section 10.4.1.1) and other criteria were applied in the selection of a preferred site (see Section 10.4.1.2) as further described in those sections.

10.1 NO ACTION OR POSTPONED ACTION ALTERNATIVE

The no action alternative would eliminate construction of the LNG terminal at the site in the Port of Long Beach. The postponed action alternative would only defer construction-related effects to a future date. The principal purposes of this Project are to develop an LNG terminal to directly serve the demand for natural gas in the Los Angeles area and to facilitate vehicle conversion to LNG to reduce air pollution. Further, the Project will be located in an industrial

port on a previously disturbed site. Although the no action or postponed action alternatives would completely avoid the environmental impacts associated with the construction and operation of the Project facilities, these alternatives would only defer construction-related effects to a future date or could stimulate other proposals by other companies that could result in greater adverse environmental effects than those associated with the Project.

These alternatives also would not achieve the Project's purpose of providing a new timely source of natural gas supply to the LA Basin area and southern California. Currently, California consumes more natural gas than any other state, but is at the end of the major natural gas pipeline systems. Concerns about gas supply are particularly acute in California, which has experienced extreme volatility in natural gas prices in recent years. Indeed, most analysts cite natural gas prices as one of the major contributing factors in the 2000-2001 power crisis in California.

In 2002, 83 percent of California's natural gas came from out of state sources, generally from five major production basins: the Western Canadian Sedimentary Basin (Alberta, Canada) in the north; the Rocky Mountain Basin (Utah, Wyoming, and Colorado) in the west; and the San Juan (New Mexico), Anadarko (Oklahoma and Texas), and Permian Basins (Texas) in the southwest (California Energy Commission [CEC], 2002). In 2002, the southwest basins provided approximately 43 percent of the natural gas supply for California and 62 percent of the natural gas supply for SoCal Gas and San Diego Gas and Electric (SDG&E), the major suppliers of natural gas for southern California (CEC, 2002).

If natural gas supplies cannot keep up with demand, as expected, users (including electric generators and industrial users) could switch to alternate fuels, such as coal, or could face supply shortages. Because the demand for energy in the United States is predicted to increase, natural gas users (particularly those at the end of the supply line) may have fewer and potentially more expensive options for obtaining natural gas supplies in the near future. This could cause natural gas customers to select other available energy alternatives such as oil or coal, to compensate for the reduced availability of natural gas or curtail business operations. Increased use of alternative fossil fuels such as oil or coal will generally result in higher emissions of NO_x, sulfur dioxide (SO_2), and particulate matter than those that result from natural gas. This may require added emission control technologies to comply with current air emission

regulations and could limit the economic viability of projects using alternative fuels. The use of less-clean burning alternative fuels without additional controls would also decrease air quality by increasing the emissions of NO_x and other pollutants.

Nearly all of the LNG currently delivered in California for LNG for vehicle fueling is produced at an 86,000 gallons per day (gpd) maximum capacity liquefaction plant in Topock, Arizona at the Arizona/California state line. The liquefier is owned and operated by El Paso Field Services and the LNG storage and the truck-loading facilities by Applied LNG Technologies USA. The LNG from this plant is provided to industrial, municipal (e.g., gas utilities), and transportation customers. It is estimated that approximately one-third of the plant output (29,000 gpd) is available for California LNG fleets. The no action or postponed action alternative would preclude the availability of a new supply of LNG for LNG vehicles at a location where it is most needed (e.g. Los Angeles area) and in much larger quantities. It would also avoid the benefits that would be available from not having to haul the LNG from the California/Arizona border.

10.2 ENERGY OR CONSERVATION ALTERNATIVES

Electricity generation is the primary driver behind the demand for natural gas. As shown in Table 10-1, natural gas was the leading fuel source for electric generation in 2002.

Table 10-1 Energy Sources for Electricity Generation in 2002 In California

Natural Gas	Nuclear	Coal	Large Hydro	Oil	Renewables	Imports
33.4%	12.6%	10.2%	9.8%	0.2%	10.7%	23.1%

Source: California Energy Commission

The preference for natural gas is mostly due to the lower air emissions associated with natural gas when compared to the significantly higher emissions associated with use of coal or oil. Use of hydro is limited by the availability of suitable sites and conditions. Nuclear plants have their own set of issues. Conservation in California is being practiced since limited energy sources tend to drive up energy costs and California utility regulators are requiring that the regulated gas and electric utilities implement aggressive, cutting edge conservation programs. In addition, California regulators are promoting use of renewable energy and energy efficient programs to

save energy and help energy efficiency become a part of business. One of these programs provides funding under the Emerging Renewables Program element of the Renewable Energy Program for use of four emerging technologies:

- photovoltaic (direct conversion of sunlight to electricity),
- solar thermal electric (the conversion of sunlight to heat and its concentration and use to power a generator to produce electricity),
- fuel cell (the conversion of sewer gas, landfill gas, or other renewable sources of hydrogen or hydrogen rich gases into electricity by a direct chemical process), and
- small wind turbines (small electricity-producing, wind-driven generating systems with a rated output of 50 kilowatts or less).

Another program is the Geothermal Program that promotes the research, development, demonstration, and commercialization of California's enormous earth heat energy sources. While conservation and renewable energy programs can contribute as an energy source for electricity, they cannot reliably replace the need for natural gas or provide sufficient energy to keep pace with demand. Neither can these programs provide an abundant supply of LNG vehicle quality fuel. The conversion to LNG fueled vehicles is an important state and regional agency objective.

LNG imports represent a near term possibility, and a long term solution, to natural gas supply shortages. A diverse fuel mix is desirable, and should include renewable energy, increased conservation, and new technologies to allow for a reduced dependence on fossil fuels in the future. In the short term, however, natural gas will continue to play an important role in our energy supply mix. LNG is an important bridge to that future.

10.3 PROJECT SYSTEM ALTERNATIVES

Project system alternatives are those alternatives that could replace all or part of the Project by making use of existing or LNG facilities or natural gas pipeline systems. Although a system alternative could replace all or part of the Project, modifications and/or additions to the existing facilities likely would be required to accommodate the volumes provided by the Project. Although these modifications or additions could result in environmental impact, this impact may

be less, similar to, or greater than those associated with construction of the Project. Discussed below are system alternatives using existing and proposed onshore and offshore LNG facilities, and the existing pipeline systems.

10.3.1 Onshore LNG Import System Alternatives

10.3.1.1 Existing LNG Import Terminals

There are no existing LNG import facilities on the west coast of the United States. The five existing LNG import terminals are located in:

- Everett, Massachusetts in Boston Harbor;
- Cove Point, Maryland;
- Lake Charles, Louisiana;
- Elba Island, Georgia; and
- Peñuelas, Puerto Rico.

Due to their geographic location, none of the five existing LNG import terminals can directly serve the LA Basin area or southern California natural gas market and cannot be considered true system alternatives for the Long Beach LNG Import Project.

10.3.1.2 Planned or Proposed Onshore U.S. LNG Projects

There are as many as 35 onshore LNG import terminal projects that are currently under consideration or in various preliminary planning stages along the east coast and in the Gulf of Mexico. The ones farthest along in the permitting and regulatory review process include the LNG import terminals proposed by Cameron LNG LLC in Hackberry, Louisiana (Cameron LNG Project); by Weaver's Cove Energy LLC and Mill River Pipeline LLC in Fall River, Massachusetts (Weaver's Cove Energy LNG Project); and by Freeport LNG Development LP in Quintana,Texas (Freeport LNG Project). Due to their geographic location, none of these currently proposed LNG projects can directly serve LA Basin natural gas market and cannot be considered true system alternatives for the Long Beach LNG Import Project.

10.3.1.3 Planned Baja California, Mexico LNG Terminals

There also are a number of onshore LNG import terminal projects under review in the Tijuana-Rosarito area of northern Baja California, Mexico. These terminals would be between 135 and 150 miles south of Los Angeles and could indirectly serve the LA Basin and greater southern California market. The projects include proposals by ChevronTexaco Corporation (ChevronTexaco), ConocoPhillips, Marathon International Oil Company (Marathon), Shell Mexico (Shell), and Sempra Energy (Sempra). All of the Mexican projects will need to obtain three key permits: an operating permit from the Mexican's energy regulatory commission (the CRE), an environmental permit from the Mexican equivalent of the Environmental Protection Agency, and local land use permits from the municipalities and states. These projects will not be regulated by the United States. The ChevronTexaco project would include both onshore and offshore facilities north of Rosarito. The offshore component has slowed the permitting process since Mexico does not yet have established regulations for offshore facilities. The ConocoPhillips project in Rosarito was denied its environmental permit last year due to significant opposition in the community. The other projects are briefly described below and are shown on Figure 10-1.

Tijuana and Costa Azul LNG Import Terminals

Integrated Regional Energy Center, Tijuana, Mexico. Marathon is leading the formation of an international consortium to develop a Regional Energy Center in Tijuana, Mexico "to establish an integrated project to supply electricity, natural gas and water to meet growing regional demand for these essential ingredients for economic growth" (Marathon, 2003). The Tijuana Regional Energy Center will be located southwest of Tijuana in the La Joya area. The integrated energy center will use LNG as its primary energy source and will convert the LNG into natural gas to fuel an advanced technology 1,200 megawatt (MW) power plant. The energy center will also incorporate a 20 million gpd seawater desalination plant to provide a new, reliable source of fresh water for the Tijuana community. Natural gas not used to fuel power generation and local demand in Mexico will be exported by pipeline to markets in the United States. Approximately 12 miles of new send-out pipeline would be required to connect the Tijuana Energy Center to the existing natural gas pipeline system. The energy center is expected to provide a total 750 MMscfd. The project has received its operating permit.

Energía Costa Azul, Costa Azul, Mexico. Sempra is developing a new LNG import terminal in Costa Azul area (approximately 14 miles north of Ensenada) with a send-out capacity of up to 1,000 MMscfd of natural gas. The natural gas will be delivered to customers in Baja California and the southwestern United States. The facility will be constructed on an approximate 300-acre site with a new 40-mile-long send-out pipeline connecting the terminal with the existing pipeline system in the region. The project has received its environmental and operating permits, and a local land-use permit from the City of Ensenada.

Baja LNG Project, Costa Azul, Mexico. Shell is also developing a new LNG import terminal in Costa Azul with a sendout capacity of 1,500 MMscfd. The project is designed to meet the long-term energy needs in Baja California, which has no domestic reserves of its own, and to provide natural gas supplies to the United States. Like the Energía Costa Azul proposal, approximately 40 miles of new send-out pipeline would be required to connect this project with the existing pipeline system. The project has received its environmental and operating permits.

All three of these projects will be located on new sites with no prior infrastructure development. Development of the LNG terminals would include ground disturbance and accompanying environmental impact that is typical of new development in relatively undeveloped areas. In addition, there would be environmental impacts associated with construction of the send-out pipeline to connect the new LNG facility with the existing pipeline system infrastructure, and with any expansions that may be needed on these other pipeline systems to accommodate the new natural gas supplies.

Transport of Natural Gas from Baja California to Los Angeles

In order for the Tijuana and Costa Azul LNG import terminal projects to serve as a system alternative for the SES Project with a send-out capacity of between 700 and 1,000 MMscfd, the vaporized natural gas supplies would need to be transported from Baja California to the Los Angeles area via one of two existing pipeline systems. These two pipeline systems are described below and shown on Figure 10-1.

Baja Norte Pipeline System. A joint project (Baja Norte) consisting of two interconnected pipeline systems was recently constructed to deliver natural gas sourced from the United States to the Rosarito generating plant near Tijuana, Mexico. The United States portion of the system

(North Baja) starts at an interconnection with an El Paso Natural Gas Company (El Paso) mainline at Ehrenberg, Arizona (at the California/Arizona border) and is comprised of a 36-inch-diameter pipeline that extends approximately 80 miles southward to the Mexican border. In Mexico, the natural gas is transported westward for approximately 135 miles by the Gasoducto Bajanorte (GB) via a 30-inch-diameter pipeline to an interconnection with the Transportadora de Gas Natural de Baja California (TGN) system near Tijuana, Mexico. The TGN 30-inch-diameter pipeline, in turn, extends north-south for approximately 23 miles from an interconnection with SDG&E in Otay Mesa, California to the Comision Federal de Electricidad's (CFE) Presidente Juarez power plant in Rosarito, Mexico. It connects with the GB pipeline west of El Florido, Mexico.

The Baja Norte and TGN system is capable of delivering 500 MMscfd of natural gas to supply current natural gas demand in northern Baja California that includes: the CFE 1090 MW Presidente Juarez Power Plant in Rosarito, Mexico; the Sempra 600 MW Thermoelectrica de Mexicali and Intergen 1050 MW Energia Azteca power plants in Mexicali, Mexico; and ECOGAS' natural gas distribution system in Mexicali, Mexico. The owners of the Baja Norte system have announced plans, and are conducting a joint open season, offering capacity on their joint systems for use by numerous shippers, including LNG terminal developers in the Baja California area.

To use the Baja Norte system to transport natural gas to the Los Angeles market that SES proposes to serve, the direction of flow on the Baja Norte system would have to be reversed. Receipt laterals of 12 or 40 miles would have to be built to link such terminal (or terminals) to the TGN system near Tijuana. TGN would then deliver gas to GB, which would deliver to North Baja, which would, in turn, deliver the natural gas to the El Paso mainline at Ehrenberg. At Ehrenberg, the gas would be delivered to Southern California on El Paso's Southern system, which interconnects with SoCal Gas' system at Blythe, California. Alternatively, the natural gas could move north from Ehrenberg to Topock and the Havasu crossover for delivery to SoCal Gas through the Mojave and Mojave/Kern systems. Under these scenarios, natural gas from an LNG terminal located near Tijuana, which is about 136 miles from Los Angeles, would travel a minimum of approximately 400 miles west to east and then east to west. The Baja Norte and SoCal Gas systems likely have the capacity to accommodate up to 500 MMscfd of new natural gas volumes without construction of significant new pipeline facilities.

SDG&E Pipeline System. The second alternative would be to utilize an existing, pipeline that originally delivered gas from the SDG&E system to the TGN pipeline in Mexico that in turn delivered natural gas to the Rosarito generating plant near Tijuana, Mexico. That service is now being provided by the Baja Norte system. This alternative would involve construction of approximately 12 to 40 miles of receipt laterals from the LNG terminals to the TGN pipeline, modification of the Otay Mesa intertie with the SDG&E system, upgrade of the SDG&E system in order to reverse the flow for delivery to the SoCal Gas system, and modification and upgrade of the SoCal Gas/SDG&E interconnection. Depending on the volume delivered at Otay Mesa, it may be necessary to loop all or part of the 23-mile-long TGN pipeline.

According to a preliminary analysis conducted by SoCal Gas and SDG&E in May 2003, facility improvements would be required on the SDG&E system to accommodate any new natural gas volumes between 300 and 700 MMscfd (Sempra, 2003). For large volumes, this would involve looping the existing pipeline from Santee to Escondido, as well as from Escondido to Rainbow, with associated environmental impacts.

Available Natural Gas Volumes from the Baja LNG Terminals

The amount of natural gas that would be available for export to the United States would depend on many factors, including: actual LNG import volumes, Mexican power plant electric generation requirements, customer contracts, amount of pipeline infrastructure installed in Mexico and the United States, and the results of the Baja Norte open season. For example, if all three existing Mexican power plants ran simultaneously at peak conditions, they would consume approximately 500 MMscfd, assuming an average heat rate of 8000 British thermal units (Btu) per kilowatt hour. Since it is unrealistic to assume that all three plants would run at peak load, the demand from these three plants would be less than 500 MMscfd. The ECOGAS Mexicali loads are small and would not significantly affect the quantities of natural gas that could be made available to the United States. If all three LNG terminals are built to proposed specifications, there would be some 3,250 MMscfd of natural gas made available for delivery to the Mexican and United States market. If only one terminal is constructed, between 750 and 1,500 MMscfd would be available for the Mexican and United States market, of which 250 to 1,000 may be available for export to the United States depending on which LNG terminal is constructed.

Conclusions

One of the key objectives of the Long Beach LNG Import Project is to support California's low emission vehicle program by supplying LNG, in the liquid state, to vehicle fueling stations for use in vehicles equipped to utilize LNG as a liquid fuel in the Los Angeles. To meet this objective, LNG from a terminal in the Baja California area would have to be moved by truck between 136 to 150 miles (depending on the location of the LNG terminal) on Mexican and United States highways to reach the target market. Delivery of natural gas via a pipeline for liquefaction near the LNG vehicle fuel stations and/or LNG storage facilities in the Los Angeles area is not a practical alternative, because this would involve the siting, construction and operation of a major industrial facility, increased air pollution from operation of the liquefier, and loss of a certain percentage of the gas which is consumed in the liquefaction process.

Neither the Baja Norte nor the SDG&E pipeline systems currently have the capability to reliably deliver equivalent natural gas volumes to the Los Angeles market as proposed by SES. The long, circular route to deliver new natural gas supplies from Baja California to Los Angeles on the Baja Norte and SoCal Gas pipeline systems would obviously increase the transportation cost for gas delivery as compared to the much shorter, more direct delivery to the Los Angeles market from the Long Beach LNG Import Project. Undoubtedly, the longer route would mean much greater use of fuel for compression and increased air pollution from operation of the compressors. Capacity constraints on the existing interstate and intrastate systems downstream from Ehrenberg also could limit the reliability of this delivery system for new alternative natural gas supplies. For example, a problem with El Paso's transmission system upstream from Ehrenberg would make it difficult for either domestic gas or imported vaporized LNG to flow to the Los Angeles area, while the Project at Long Beach would be able to mitigate the impact of any curtailments on other parts of the interstate delivery system. The rupture of the El Paso mainline near Carlsbad, New Mexico in 2000, and the resulting supply disruption and dramatic price spike in California illustrate the distinct advantage of having supply alternatives delivered directly to the market area. The reliance on existing pipeline capacity from Ehrenberg to the SoCal Gas system would not fully meet another of the SES Project's objectives of providing an alternative, competitively priced and reliable source of supply.

While the possible use of the SDG&E system is a much more direct route than Baja Norte, it too is not a reliable, practicable alternative at this time. Unlike the Baja Norte alternative, the owners of this system have not offered its use for transportation of vaporized LNG from the proposed Baja California LNG terminals. According to the preliminary May 2003 study conducted by SDG&E and SoCal Gas, the SDG&E pipeline system would require looping and/or system improvements at an estimated cost of from $28 million to accept up to 500 MMscfd to a cost of $133 million to accept up to 700 MMscfd to move natural gas from a receipt point at Otay Mesa to redelivery at SoCal at Rainbow Station (Sempra, 2003). This would not include costs for permitting, metering, unusual construction (such as freeway and river crossings), environmental concerns or regulatory proceedings. They also do not include any markup for costs in aid of construction, which are currently 27 percent of the total project cost.

If one or more terminals were built in Baja California by the project developers, the amount of gas that would be available to serve the SoCal market area cannot be readily determined at this time. In the Baja Norte open season, which concluded in September of 2003, the owners received expressions of interest from numerous prospective customers, including seven LNG terminal developers, with proposed deliveries to markets in Sonora, Mexico; Yuma; Phoenix and Topock, Arizona; and Blythe, California. A second open season was held in early November 2003 soliciting shipper interest in a lateral from northwest Mexico to Phoenix.

Thus, the diverse plans of prospective holders of the pipeline capacity, the present inability to determine who would be awarded capacity, and the uncertainty over how awarded capacity will be utilized, makes it impossible to determine how much of the capacity could be utilized to deliver natural gas to the Los Angeles market that SES proposes to serve or how much natural gas will be available for transport to the Los Angeles market. A portion of the capacity from the proposed LNG terminals in Baja California is expected to be used in the local, northern Mexico market that is also experiencing rapid economic growth and increasing demand for natural gas. Additionally, in order to reverse the direction of the Baja Norte and TGN pipelines to deliver gas to the El Paso system at Ehrenberg, the gas delivered to the Rosarito power plant by the TGN pipeline, and to the two Mexicali power plants by Baja Norte pipeline, would have to be replaced by alternative sources, which would most likely be a portion of the gas delivered from the Baja import terminal(s). Of that remaining portion that may be delivered to Ehrenberg, it is not clear

how much would be moving to the southern California SoCal market since that natural gas could also serve the growing Arizona market as well as the northern California market.

LNG gas brought into Baja California is not as reliable as LNG brought directly into the United States. International agreements regarding natural gas, and Mexico's need for natural gas, could influence the supply and again place Los Angeles at the end of the supply line. A portion of the capacity from the proposed LNG terminals in Baja California is expected to be used in the local, northern Mexico market that is experiencing rapid economic growth and increasing demand for natural gas. The need for natural gas in Los Angeles or southern California would not be the first priority of Mexican authorities that are obliged under Mexican law to secure Mexican supplies first. Therefore, the supply could be less stable over time as economic growth and energy demands increase in Baja California. Approval would also be required from the Mexican government to export the regasified LNG. Even if an LNG import terminal in Baja California could meet the same objectives and purposes of the SES Project, it is uncertain whether any of the proposed Baja California LNG import terminals and the needed pipeline delivery systems will be approved, constructed, and in operation by the time of the SES Project's start-up date.

Finally, the Baja California projects offer no significant environmental advantage over the SES Project. All of the proposed Baja California LNG import terminals would be constructed in areas without previous disturbance as compared to the SES Project that will be constructed on a 25-acre site in an industrial area. The Baja California LNG import terminals will also require send-out pipelines to connect with existing pipeline systems that are longer (e.g. a minimum of 9 to 39 miles longer) than the 2.3-mile-long send-out pipeline for the SES Project. The send-out pipelines for the Baja California LNG terminals will be, in part, through areas without previous disturbance; the send-out pipeline for the SES Project will be through a disturbed industrial area. Further, additional environmental impacts will be associated with the upgrade of the existing pipeline systems that are needed to transport the new natural gas supplies from the Baja California LNG terminals into the Los Angeles area.

SoCal Gas owns and operates an integrated transmission system consisting of pipeline and storage facilities. With approximately 48,000 miles of transmission and distribution pipeline and 44,000 miles of service lines, the system delivers to over 5 million residential and business

customers and can support a peak demand of 6 billion cubic feet per day (Bcfd). The capacity of the interconnecting pipeline will be sufficient to accommodate the Project's peak capacity of 1,000 MMscfd, and the capacity of the SoCal Gas system at the Salt Works Station is sufficient to accommodate the sendout of the terminal of on a firm basis of 600 MMscfd and the peak capacity of the terminal of 1,000 MMscfd on an "as available" basis. Therefore, SES does not anticipate the need for any upgrade on the SoCal Gas system other than the interconnecting pipeline, metering, and associated facilities (SoCal Gas/SDG&E, 2001). At an interconnection with SDG&E at Otay Mesa, approximately 140 MMscfd could be accepted without upgrades to the existing pipeline systems (SoCal Gas/SDG&E, 2001). No information is available on facilities that may be required on the SoCal Gas system to accept natural gas deliveries via Ehrenberg and the Baja Norte pipeline system, although it is assumed that the SoCal Gas system likely could accept up to 500 MMscfd without upgrades. As stated previously, a system alternative using the Baja California LNG terminals would not offer a practical or economic means of providing LNG to the Los Angeles market or for vehicle refueling stations in the Los Angeles area, thus losing one of the environmental benefits of the SES Project – reducing air pollution.

10.3.2 Pipeline System Alternatives

The primary existing pipeline system that serves southern California are the SoCal Gas pipelines that extend from the California/Arizona border at Blythe/Ehrenberg, Topock, and Needles west to the Los Angeles metropolitan area (see Figure 10-1). Other secondary distribution pipelines include SDG&E that serves the San Diego metropolitan area, and the City of Long Beach Energy Department (LBED) and Los Angeles Department of Water and Power (LADWP) that serve the metropolitan areas of Long Beach and Los Angeles, respectively. SoCal Gas receives the bulk of its natural gas supplies from El Paso and Transwestern Pipeline Company (Transwestern) at receipt points at the California/Arizona border, and from Mojave and Kern/Mojave at receipt points within California. SDG&E, LBED, and LADWP receive the majority of their gas supplies from SoCal Gas. A third pipeline is the Questar Southern Trails Pipeline Company's (Questar) pipeline that would eventually extend from the California/Arizona border to Long Beach. The FERC has approved the conversion of this pipeline from an oil pipeline to a natural gas pipeline. Approximately one-half of this pipeline has been converted and is providing natural gas service. FERC recently granted an extension of time until 2005 to

complete the conversion which would allow natural gas service all the way to Long Beach. As originally proposed, the western half of the pipeline would have a capacity of 120,000 decatherms per day.

One of the Project objectives is to provide a facility that would allow for LNG to be imported and vaporized for delivery into the Los Angeles market or used for LNG refueling. A second objective is to provide a new stable source of natural gas to directly meet the needs of the LA Basin and southern California. While the SoCal Gas pipeline system is capable of absorbing the Project natural gas volumes at the Project receipt point, it may not be capable of receiving an additional 700 to 1,000 MMscfd elsewhere on its system without construction of new facilities. The extent of required facility upgrades would require SoCal Gas to complete a system capacity study for the specifically defined gas supply scenario(s), identifying receipt and delivery points, and source and volumes of natural gas provided at the receipt point. Since SoCal Gas depends on others for the source of natural gas supplies, additional supplies would need to be made available elsewhere along the pipeline systems serving California. Therefore, there is no true pipeline system that would not require construction of new facilities, such as the Long Beach LNG Import Project, for the import and transportation of 700 to 1,000 MMscfd of natural gas.

10.3.3 Offshore LNG Import System Alternatives

Historically, LNG has been shipped to onshore terminals in harbors that have sufficient water depth to accommodate the LNG ships, appropriate onshore sites, and good logistics for onshore delivery of natural gas into the existing natural gas pipeline system. Currently, there are no offshore LNG terminals in operation. However, over the past few years, companies have begun evaluating methods of importing LNG into the United States through the use of offshore or "deepwater" ports. As defined in the Deepwater Port Act of 1974 (amended by the Maritime Transportation Security Act of 2002 to include natural gas), deepwater ports include "a fixed or floating man-made structure, other than a "vessel", or a group of structures, located beyond the territorial sea and off the coast of the United States and that are used, or intended for use, as a port or terminal for the transportation, storage, and further handling of oil or natural gas..." (33 U.S.C 1502(9)). This legislation further requires the Department of Transportation (Maritime Administration) and the USCG to regulate the licensing, siting, construction, and operation of

deepwater ports for natural gas. Although an offshore LNG import facility has not yet been built, guidance documents for building offshore LNG storage and terminals have recently been produced.

This section discusses the advantages and disadvantages of offshore and onshore technologies, the recent proposals for development of offshore LNG terminals in the Gulf of Mexico and along the west coast of California, and conclusions.

10.3.3.1 Offshore LNG Technologies

Currently, developers have proposed offshore LNG terminals in the Gulf Coast region, off the coast of California, and other locations abroad. Potential offshore deepwater port concepts for LNG import include fixed terminals for LNG storage and/or vaporization, floating terminal designs, and the use of specially equipped LNG transport and vaporization vessels with a fixed buoy for offloading. Another option under consideration is conversion of decommissioned oil platforms using these technologies.

Gravity Based Structure (GBS)

GBS terminals are designed for the storage of LNG on fixed structures in relatively shallow water. LNG would be offloaded from conventional LNG vessels to storage tanks on the fixed, bottom-supported facility. The LNG would be regasified on the platform and transported to onshore markets via an undersea natural gas pipeline. GBS terminals are feasible only in relatively shallow water. At water depths of greater than 60 feet, the costs rise rapidly. LNG ships require a minimum of 45 feet of water depth. Thus, the feasible locations for a GBS terminal are offshore areas with water depth between 45 and 60 feet. Currently, no known GBS terminals are planned for the California coast, but such a project in the Gulf Coast is in the permitting process.

Typical GBS Terminal

Source: DEIS for the Port Pelican LLC Deepwater Port License Application, May 2003.

The components of a GBS terminal include a reinforced concrete box-shaped structure embedded in the ocean bottom and extending above the highest possible water level. An LNG storage tank is built on the concrete structure, along with high-pressure pumps that transfer LNG from the LNG storage tank to the LNG vaporizers. An LNG vaporizer converts LNG to natural gas that is then metered and transferred to the undersea pipeline that transports the natural gas to shore. The high-pressure pumps, LNG vaporizers, and transfer metering station are located on the platform of the concrete structure, and remain above water at all times. Living accommodations for terminal personnel are provided either on top of the GBS terminal or on a separate platform to meet requirements for safety setbacks from the LNG tanks.

The GBS terminal design uses the combination of modern high-strength cement and steel reinforcing to provide a structure that can withstand environmental conditions, including severe wave loads and other unintended events such as vessel impact. While not previously designed for cryogenic materials, the concrete is adaptable to extreme temperatures, and would tolerate contact with the super-chilled LNG (minus 260 degrees Fahrenheit). In addition, the concrete structure acts as the secondary containment for the LNG storage tank, which is insulated stainless steel or aluminum, and constructed against the concrete interior.

In the operations phase, the LNG ship offloads LNG to the GBS terminal via one of two berths with loading arms on each side. The LNG ship pumping capacity, which can typically transfer a cargo of 145,000 m^3 in 12 to 14 hours, controls cargo offloading. The complete tanker unloading cycle is typically approximately 24 hours, including berthing, hook-up, offloading, disconnect and unberthing.

The GBS terminal is a proven technology for offshore petroleum production, with existing offshore facilities along the east coast of Canada and in the North Sea with petroleum product (oil) storage in the structure base.

However, the GBS terminal is not yet a proven technology for the storage and subsequent vaporization of LNG. In addition, offshore terminal options do not bypass adverse onshore impacts, such as those to wetlands and other sensitive land uses associated with the onshore natural gas pipeline from the offshore facility, or onshore construction activities related to the offshore project. For example, the construction of a GBS terminal requires fabrication of the

GBS in a graving dock that must be of sufficient size and in an area adjacent to sufficient water depth to float the GBS. The graving dock must have one side directly adjacent to the water body so that the GBS can be floated and towed from the dock to its final destination. Graving docks for the size of the proposed LNG terminal can be on the order of 50 to 100 acres.

The perceived favorable attributes associated with the GBS terminal concept include:

- Experience in offshore oil production that could be adapted to LNG import terminals;
- Receiving volume capable of accommodating fluctuating energy market demands and the logistics of intermittent ship arrivals;
- Utilizes a fixed, stable structure;
- Provides receiving and send-out capability similar to a land-based LNG terminal with potential modular expansion capability (i.e., addition of a GBS and LNG tank);
- Requires shallow water which results in relatively shorter lengths of new, undersea pipeline; and
- Depending on location, provides sheltered berth options.

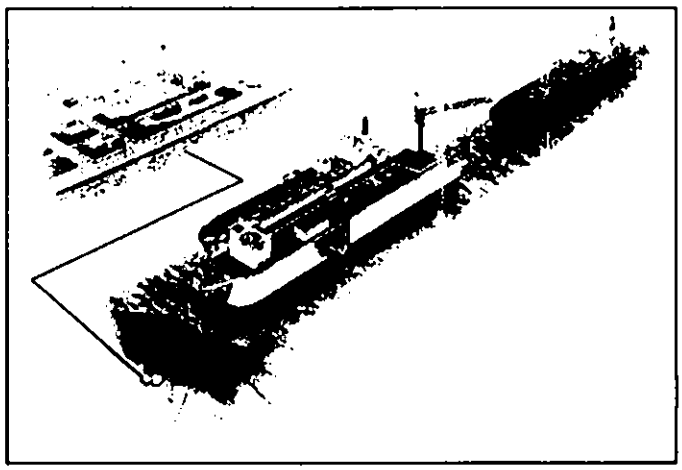
Other perceived attributes associated with the GBS terminal that affect the siting decision include:

- Suitable locations are limited by shallow water requirements (i.e., depths of 80 feet or less), and the required distance from established shipping lanes and existing offshore platforms;
- Environmental concerns are associated with interconnecting onshore and offshore pipeline and associated construction issues;
- Lack of safety or security infrastructure in close proximity to the GBS, leaving the site relatively exposed to third-party threats and actions;
- Inability to provide LNG vehicle fuel because fuel comes onshore already vaporized (not in vehicle fuel form);
- Visual impacts associated with the placement and operation of the terminal in the relatively near shore area (i.e., within 5 miles of the shoreline)

- Ecological impacts resulting from GBS terminal and permanent removal of seafloor and other habitat due to the embedded structure and the construction of a new underwater pipeline;
- Foundation costs are dependent on substrate and seismic conditions;
- Construction costs are higher than a typical onshore facility;
- Fabrication of the GBS terminal would require a suitable onshore site for the graving dock, followed by installation at the offshore site;
- Restricted to use when significant wave height is less than 8 feet;
- Reliability and timeliness can be affected by weather conditions;
- Higher cost of personnel and maintenance offshore; and
- Isolated from onshore emergency services.

Floating Storage and Regasification Units (FSRU)

FSRUs are proposed vessels that receive, store and vaporize LNG onboard a specialized vaporization vessel. Conventional LNG carriers would transport LNG to the offshore facility and a ship-to-ship transfer would occur at sea between the conventional vessel and the FSRU. The LNG would then be stored and vaporized onboard this specialized vessel. Once vaporized, the natural gas would be transported to onshore markets through an undersea, pressurized natural gas pipeline or connection to an existing offshore pipeline system. The FSRU design provides the capability of receiving and storing approximately 290,000 m^3 of LNG, or twice the current capacity of the largest LNG ship and can be redeployed at a different geographic location, assuming available infrastructure and pipeline connections to shore.



Typical FSRU Terminal

Source: IHI Marine United.

The perceived favorable attributes of the FSRU concept include:

- Receiving volume capable of accommodating fluctuating energy market demands and the logistics of intermittent ship arrivals;
- Location is not dependent on substrate conditions;
- Minimal impacts to flora/fauna from the anchor spread footprint compared to that affected by the GBS terminal; and
- Ability to relocate.

Other perceived attributes associated with the FSRUs that affect the siting decision include:

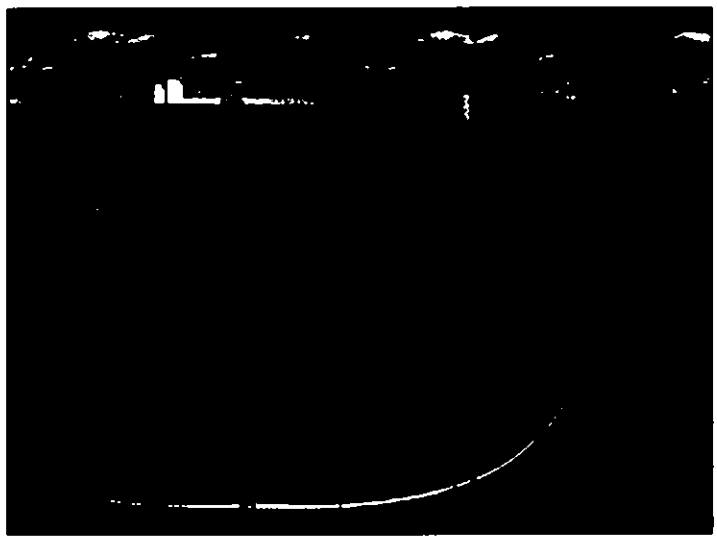
- Inability to provide LNG vehicle fuel because fuel comes onshore already vaporized (not in vehicle fuel form);
- Higher construction costs than a typical onshore facility;
- Lack of safety or security infrastructure in close proximity, leaving site relatively exposed to third-party threats and actions;
- Potential for LNG storage tank sloshing and instability with partial inventory;
- Potential for reduced berth operability due to weather conditions;
- Depending on unloading system configuration, the relative motion of two vessels at sea could increase difficulty of cargo transfers;
- Larger restricted zone requirement for mooring than the GBS terminal (1,000 meters [m] compared to 500 m);
- Need for periodic scheduled dry-docking for both vessels;
- Close proximity of living quarters to the process facilities;
- Limited deck space and restricted layout flexibility;
- Ecological impacts from the construction of FSRU structure and new underwater pipeline; and
- Unpredictable natural gas delivery and send-out due to weather conditions at mooring site or other factors that could adversely affect natural gas delivery schedule.

Transport and Regasification Vessels

This new technology involves an offshore gas delivery system typically consisting of a mooring buoy system (including a flexible riser), pipeline end manifold (PLEM), seabed pipeline, and a meter platform. LNG would be transported on a conventional LNG carrier modified to include

complete vaporization equipment onboard the ship. At full capacity, the carrier with vaporization can transport approximately 138,000*m^3 of LNG. When the vessel arrives at the gas delivery site, it would vaporize the LNG to deliver natural gas to downstream infrastructure at a rate of 0.5 Bcfd.

After the LNG is regasified, it is transferred off the vessel through a submerged turret buoy and flexible riser leading to a seabed natural gas pressurized pipeline to the metering platform. From the metering platform, the natural gas would then be processed into the undersea, pressurized natural gas pipeline(s). The system design utilizes suction-piled mooring anchors to hold the buoy in place, whether it is connected or unconnected to a transport and vaporization vessel. When not in use, the buoy would drop to a depth of approximately 98 feet below the surface of the water, and maintain that position until retrieved by the vessel. The location and design of these anchors would be engineered uniquely for the currents that are encountered in the selected location. The PLEM serves as the interconnection between the flexible riser and the undersea pipeline. Similar to the mooring anchors, the PLEM would be designed specifically for the local environment of the proposed project location. The PLEM also would be suction seated into the seafloor according to local soil conditions.



Transport and Regasification Facility

Source: El Paso Global LNG

The meter platform could be a fixed, unmanned platform that would provide room for a boat landing, helipad, power generator, gas custody transfer meter stations, platform utility equipment, control room, and living space.

The submerged turret buoy and mooring system can operate effectively in water depths of approximately 130 feet to 492 feet. Depths outside this range present additional design,

construction, and/or operational problems for the system. At North Sea oil (not LNG) locations, connections have taken place at the buoy during 18.0-feet sea states, and unloading can be accomplished with sea states at of over 40 feet. For the LNG transport and regasification vessels, a 16 feet maximum connection and 39 feet maximum discharge (unloading) design criteria have been established. To compensate for changing weather and varying sea conditions after connection to the buoy, the submerged turret buoy will rotate on an internal swivel allowing the vessel to "weathervane," or adjust position with changing wind and/or current directions. The buoy serves as the vessel mooring system, and no propulsion or maneuvering power would be used after connection to the buoy.

The location of the buoy in proximity to shipping lanes presents an important navigational consideration. Although having a nearby shipping lane is important for the transportation of the LNG, the buoy should be located enough distance from shipping lanes to reduce the possibility of interference with vagrant ships. The preferred distance from the nearest shipping lane is between five and 10 nautical miles.

The perceived favorable attributes of the transport and regasification vessel concept include:

- Minimal impacts to flora/fauna from the anchor spread footprint compared to that of the GBS terminal; and
- Direct send-out of natural gas eliminates the need for fixed LNG storage.

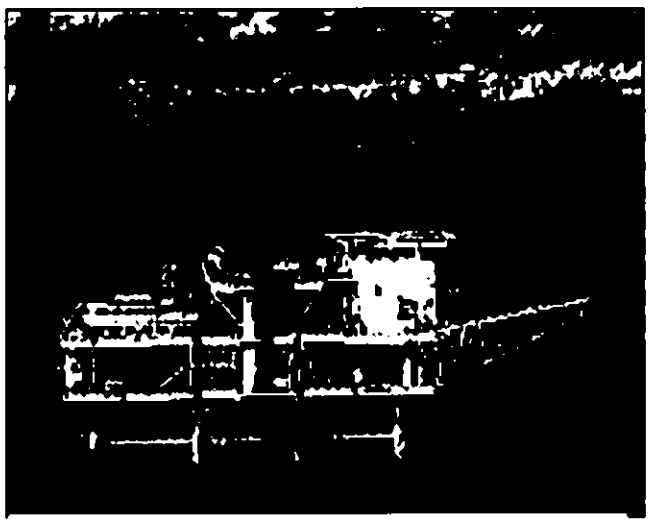
Other perceived attributes associated with the transport and regasification vessel concept that affect the siting decision include:

- Inability to provide LNG vehicle fuel because fuel comes onshore already vaporized (not in vehicle fuel form);
- Higher capital costs than a typical onshore facility in that the fleet would always depend on an "extra" ship, as one ship will always be attached to the buoy, and each vessel must be equipped with a complete pumping and vaporization system;
- In order to maintain continuous send-out, two buoys are required to cover the transition between successive ships (for example, during the transition from one ship to the next, the first ship has decreased sendout as the cargo tanks are emptied, the ship disconnects, the buoy is lowered, and the ship releases its moorings and departs. The

incoming ship then reverses this procedure and must cool down and reestablish full LNG flow);

- No safety or security infrastructure in close proximity, leaving site relatively exposed to third-party threats and actions;
- Need for specialized, wholly new LNG carrier fleet with vaporization equipment on all of the vessels (existing vessels, with 40+ year safety history, could not be used);
- Potential for outages of natural gas supply due to severe weather conditions;
- Lack of storage limits the reliability of gas supply and flexibility of send-out rate;
- Larger restriction zone requirement than the GBS terminal (1,000 m compared to 500 m);
- Extended unloading time, up to six days, is controlled by the essentially constant send-out rate;
- Ecological impacts would result from the construction of structures to support offloading concept and new undersea pipeline;
- Receiving volume capable of accommodating fluctuating energy market demands and the logistics of intermittent ship arrivals; and
- Reliability and timeliness will be affected by weather conditions.

Reuse Of Existing Oil Platform



Platform Edith

This concept involves the conversion of abandoned oil platforms that exist in various parts of southern California coastline for use for importing LNG. For example, three production platforms (Edith, Ellen, and Eureka) and a processing platform (Elly) are located offshore Long Beach in federal waters at depths ranging from 161 feet to 700 feet. These four platforms are located in the Beta Unit of the Pacific Outer Continental Shelf (OCS) Region, approximately 8.5 miles from shore. Although these four platforms were completed between 1980 and 1984, available information indicates that these facilities remain active with no publicly announced plans for decommissioning.

In addition to these four OCS platforms, three additional platforms (Esther, Eva and Emmy) are located within state waters less than 2 miles offshore Seal Beach and Huntington Beach. Water depths at these facilities range from 22 feet to 57 feet. Platforms Emmy and Eva were installed in 1963 and 1964, respectively, and Platform Esther was installed in 1990; available information indicates that these facilities remain active with no publicly announced plans for decommissioning.

On a conceptual level, use of any of these platforms for an LNG receiving and vaporization terminal would require decommissioning of the existing production facilities, installation of mooring and LNG vaporization facilities, and construction of a new underwater, pressurized natural gas pipeline with an interconnection to an existing onshore pipeline. Detailed engineering analyses would be needed to determine if any of these platforms would be structurally suitable for use as an LNG vaporization terminal. Further analysis would also be needed to determine the extent of any onshore pipeline facilities needed to connect to the existing pipeline system.

The perceived favorable attributes of the existing offshore platform concept include:

- Proven technology for oil that may potentially apply to LNG use and could conceivably provide a new source of natural gas to meet some of the needs of southern California;
- Constructive reuse of existing offshore infrastructure;
- Reuse of existing platform could cut construction time;
- Reduced construction costs relative to construction of a new offshore terminal; and
- Direct send-out of natural gas reduces the need for fixed LNG storage.

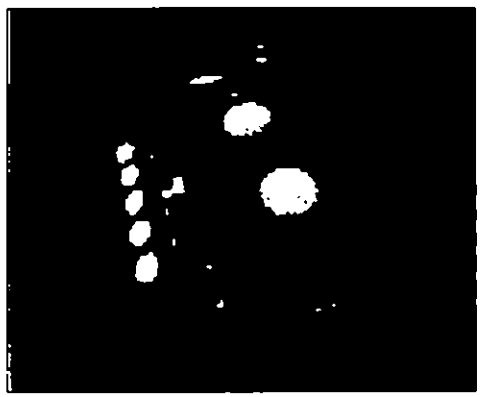
Other perceived attributes associated with reuse of the existing offshore platform concept that affect the siting decision include:

- Inability to provide LNG vehicle fuel because fuel comes onshore already vaporized (not in vehicle fuel form);
- In order to maintain continuous send-out, an LNG carrier must be connected to an unloading at the platform at all times, implying that two berths will be needed;
- Displacement of existing oil and gas production and associated contamination risk, and decommissioning requirements;
- Potential for outages of natural gas supply due to weather conditions and other factors;
- Lack of storage prevents load following or storage;
- Lack of storage limits the reliability of gas supply since the platform cannot structurally support any significant amount of storage and might have difficulty with mooring and fendering loads;
- No safety or security infrastructure in close proximity, leaving site relatively exposed to third-party threats and actions;
- Ecological impacts would result from new, offshore construction (conversion of existing platform) and construction of a new underwater pipeline;
- No receiving storage volume capable of accommodating fluctuating energy market demands and the logistics of intermittent ship arrivals; and
- Reliability and timeliness of natural gas supply can be affected by weather conditions.

10.3.3.2 Onshore LNG Technology

An onshore LNG import terminal requires a docking facility with a minimum water depth of approximately 40 feet; an onshore site large enough to accommodate the docking facility, LNG storage tank(s), and associated vaporization equipment and vapor-handling systems; and good logistics for onshore delivery of natural gas into the existing natural gas pipeline system. All of the existing LNG terminals in the United States are conventional onshore terminals.

At most onshore terminals, LNG is pumped from the ocean-going LNG carriers to double-walled storage tank(s) at atmospheric pressure for storage. It is then pumped at high pressure through various terminal components, warmed in a controlled environment, regulated for pressure, and transported as natural gas into the natural gas pipeline system or loaded on to trucks for delivery to vehicle fueling stations. Where the LNG has a higher heating value than that acceptable by local natural gas distribution companies or that of the LNG for vehicle fueling, the LNG can be processed in a natural gas liquids recovery unit to remove a portion of the higher Btu components.



SES Onshore LNG Import Terminal

An LNG import terminal's natural gas send-out capability (distinct from its ability to produce LNG vehicle fuel) functions similar to a traditional pipeline in that it provides natural gas to a customer or distribution system. However, there are significant differences in meeting fluctuating demands. A pipeline must essentially meet the short-term peak demands by real time delivery through the pipeline. Pipelines have some limited peaking capacity from line pack by withdrawing some of the pipeline gas inventory, which reduces the pressure. The reduction of the pipeline pressure simultaneously decreases the pipeline throughput capacity such that using line pack is a limited, short term expedient. The size of the pipeline directly affects the capital cost such that the investment is keyed to the peak rate. This results in poor utilization of the pipeline most of the time and an under utilization of the investment. In geologically suitable areas, such as the Los Angeles area, underground storage in depleted oil fields can be used for

storage but require refilling (cycling). In New England, for example, underground storage is not geologically feasible and aboveground seasonal LNG storage is used.

An onshore LNG terminal serves essentially both distribution functions – baseload supply (pipeline equivalent) and load following capability (peak shaving equivalent). An onshore terminal will typically have storage volume equivalent to 2½ ship cargos and can vary the send-out rate greatly to follow demands so long as the average send-out rate allows maintenance of proper inventory to accommodate ship logistics. The averaging period for normal logistics would be 2 or 3 cargo arrivals. For the Long Beach LNG Import Project, this would be 10 to 15 days compared to a pipeline line pack "averaging out" period of 10 to 15 hours.

The perceived favorable attributes of onshore LNG technology include:

- Proven technology;
- Ability to directly or economically provide LNG vehicle fuel to reduce air pollution;
- No need for a specialized, new LNG carrier fleet with vaporization equipment;
- Receiving volume capable of accommodating fluctuating energy market demands and the logistics of intermittent ship arrivals;
- Load following capability to ensure the reliability of gas supply and flexibility of send-out rate;
- Sheltered berth options that are not as susceptible to downtime or inventory loss from weather restrictions or wave height;
- No requirement for construction and operation of embedded undersea structures or interconnecting offshore pipeline or;
- Availability of nearby safety or security infrastructure to minimize third-party threats and actions;
- Generally lower construction costs in comparison to offshore alternatives;
- No need for living quarters in close proximity to the terminal; and
- Sufficient space to allow for facility layout flexibility.

Other perceived attributes associated with onshore LNG terminals GBS terminal that affect the siting decision include:

- Potential visual impacts to surrounding areas;
- Inability to relocate;
- Fixed LNG storage is required.

10.3.3.3 Planned or Proposed Offshore LNG Projects

In early October 2003, ChevronTexaco revealed plans to build an offshore LNG import receiving and regasification terminal 8 miles off the Baja California coast near the Coronado Islands. As stated in Section 10.3.1.3, Mexico is developing appropriate regulations for offshore facilities that may slow the permitting process. In addition, this project has similar disadvantages as the onshore Baja California LNG projects in providing a reliable source of natural gas to the Los Angeles area (see Section 10.3.1.3).

Two offshore LNG projects have been proposed in the Gulf of Mexico. In November 2002, a Deepwater Port License Application was filed by Port Pelican LLC, an affiliate of ChevronTexaco Corporation, to develop a GBS terminal for the import of LNG. The USCG issued a Draft Environmental Impact Statement (EIS) for the Port Pelican project on May 30, 2003 and the Final EIS on August 29, 2003. The U.S. Maritime Administration issued the license for the project in November 2003. In December 2002, El Paso Energy Bridge Gulf of Mexico L.L.C. (Energy Bridge GOM) filed a Deepwater Port License Application to construct and operate the Energy Bridge GOM Project that would use transport and regasification vessels. In February 2003, El Paso announced that it plans to exit the LNG business. Neither of these projects can directly serve California market.

10.3.3.4 Proposed Oxnard, California Offshore LNG Projects

Two offshore projects have been announced for California. Crystal Energy LLC (Crystal Energy) and BHP Billiton LNG International Inc. (Billiton) have announced plans to construct offshore LNG projects in the vicinity of Oxnard in Ventura County, California. These projects are described below and shown on Figure 10-2.

Crystal Energy, Platform Grace

In early 2003, Crystal Energy announced that it had signed a long-term lease for the use of Platform Grace, an existing oil platform off the coast of Ventura County, and that it planned to convert the platform to LNG receiver and regasification terminal. Platform Grace, located offshore in 318 feet of water in the Santa Barbara Channel approximately 11 miles west of Oxnard, California, began operations in 1980 and ceased oil production in 1997. The platform has four operating decks, a jacket walkway near sea level, crewboat landings, a heliport, cranes, control room, galley and substantial personnel accommodations. The platform is state-of-the-art and in good condition.

A conventional buoy mooring system will be installed approximately 200 feet from the platform and a counterbalanced pivoting boom cryogenic transfer system with an articulated LNG unloading arm will be deployed from the platform, attached to arriving vessels and the cargo transferred to the platform through the system. The platform will be modified to operate as an LNG receiving and processing facility through installation of an LNG transfer system, a cool-down tank, four LNG pumps, four LNG vaporizers, and reinstallation and upgrade of the platform's power production capability. Once the LNG is vaporized on the platform, it will be pumped to shore through a 24-inch undersea pipeline. The undersea pipeline will extend approximately 11 miles from Platform Grace to a landing near the Mandalay Generating Station in Oxnard, generally adjacent to existing undersea pipeline rights-of-way. A horizontal directional drill (HDD) will be used to install the pipeline at the shoreline. Once ashore, the pipeline will extend approximately 13 miles to a tie-in with a 30-inch-diameter SoCal Gas pipeline near Camarillo. Approximately 40 millions gallons of pure, desalinated water that is created during the process of converting the LNG to natural gas will be contributed to the City of Oxnard. Initially, no LNG storage facilities would be provided on the platform, and send out capacity would be approximately 600 MMscfd.

Billiton – Cabrillo Port

In September 2003, Billiton announced that it had filed applications with the California State Lands Commission and the USCG to construct and operate the Cabrillo Port Project, a FSRU. The Cabrillo Port will be located approximately 13.9 miles from shore, 21 miles from Anacapa

Island, and 18 miles from the boundary of Channel Islands Marine Sanctuary. The FSRU will be a ship-shaped, double-sided, double-bottom new LNG storage and regasification vessel, typically 938 feet long, 213 feet wide, and 148 feet tall. It will have three LNG storage tanks with a total storage capacity of 270,000 m^3, as well as a submerged combustion vaporizer system that will require no seawater for the heat exchange process. The FSRU will be moored to the seabed in the Santa Monica Basin in waters 2,900 feet deep by a fixed, turret-style mooring point that uses nine cables and anchor points. At the mooring point, three 14-inch-diameter flexible riser pipes and PLEM on the sea floor will connect to a new 30-inch-diameter, concrete-coated subsea pipeline. The pipeline will be laid directly on the sea floor surface and will extend from the FSRU for 22 miles to shore and will include approximately 0.65 miles on land to an interconnection with SoCal Gas, north of the Reliant Ormond Beach Generating Station in Ventura County. The pipeline will be installed by HDD from the onshore landing out to a water depth of 43 feet, which is approximately 3,000 feet from shore. SoCalGas, with minor modifications to its existing facilities, can accommodate the natural gas flow from the Project and will install an approximate12-mile connecting pipeline from Ormond Beach to their central line along the existing gas pipeline right of way. The FSRU will be able vaporize up to a maximum capacity of 1,500 MMscfd, with a normal rate between 600 and 900 MMscfd.

Conclusions

Many factors influence siting decisions for each of these alternative deepwater port designs including safety, shipping, environmental impacts, receiving storage volume, access to onshore pipelines, required process equipment, depth of water, weather, design criteria and environment. For example, navigation restriction zones surrounding both fixed terminals and floating structures are required to avoid ship collisions with the facilities. This would exclude certain ship traffic from operating in the vicinity of an offshore LNG terminal. As such, offshore LNG terminals need to be located in areas far from shipping lanes and operating oil or gas platforms. In addition, an LNG import terminal located in an offshore setting would be highly exposed to the effects of meteorological and oceanographic forces such as high winds, waves, and currents. A key technical issue for the successful operation of an LNG terminal in this environment includes the design of the LNG transfer system (i.e., unloading arms) to compensate for the relative motion between the terminal and LNG transport vessel during unloading operations. Since the LNG terminal will also send out the vaporized natural gas,

there is also the need for undersea and onshore pipelines to interconnect into the existing natural gas infrastructure.

Onshore LNG facilities have more than 30 years of technical development and have an outstanding safety record. The onshore facilities have a straightforward design and a lower cost. They also benefit from close proximity to existing safety and security infrastructure. For example, a Long Beach Fire Boat station is housed less than 0.25 miles from the Project, with other security and other safety resources in close proximity as well.

Originally, oil companies located oil (not LNG) production and shipping facilities offshore solely because of the offshore location of oil reserves. This approach is not well suited for handling and storing very cold LNG. Offshore oil import terminals are essentially just a means to move product to shore from tapped reserves. The purpose of these offshore oil terminals is to unload the ship quickly, whereas an LNG carrier, which can also be used as a storage terminal, must provide a sustained, regulated flow. The greatest incentive for an offshore terminal is that offshore facilities potentially allow for LNG import terminals where no suitable onshore sites exist.

There are presently no LNG offshore receiving terminals proposed anywhere in the world that could offer relatively the same facilities and benefits as the onshore facility proposed by SES. Offshore terminals do not provide, and are not designed to maintain, LNG inventory and maintain gas send-out that can follow local load demands. For example, it is estimated that the receiving storage costs for FSRUs are 4 to 5 times more than corresponding systems for onshore facilities. Thus, every effort is made to maintain a constant send-out rate. For transfer/vaporization vessels and reused oil platforms, the unloading carrier must comply with the ship arrival schedule by a tightly controlled prescheduled send-out rate. Neither of these offshore concepts lend themselves to load following.

Moreover, offshore facilities cannot accommodate the somewhat variable arrival schedules of LNG ships from various ports after 35 to 50 days of sailing. An onshore LNG storage tank compensates for variations in ship arrivals and fluctuations in onshore natural gas demand. Almost all weather delays that might occur are of little significance to an onshore facility. A delay of several days of weather (e.g. high seas) on an offshore facility would require either

more storage or a curtailment of natural gas supply. These factors present an additional challenge for off-loading on offshore facilities, as well as significantly increased costs and reduced availability of the berth due to weather and other factors. The potential for unpredictable weather equates with a need for increased storage volume at offshore terminals to maintain anything near a predictable, almost constant flow of natural gas to shore. This is a very expensive proposition, which limits potential locations and does not offer concomitant safety or environmental benefits.

Offshore facilities also present more environmental and safety issues than onshore facilities. For example, offshore terminals pose increased safety concerns for operating personnel because of operational and space limitations. An offshore location also complicates both emergency response and normal operations. The personnel operation costs increase because of the lost time and expense of moving operating and maintenance crews to the offshore facility. End users (power consumers) then bear the increase in terminal capital and operating cost. The technical challenges and cost disincentives are barriers.

Offshore facilities cannot provide LNG for vehicle fuel. While theoretically possible to transfer vehicle specification LNG to shore through a cryogenic pipeline, such a design would pose substantial cost, environmental concerns, safety concerns, and an unacceptable temperature rise in the LNG. As a result, current offshore proposals only call for the offshore facility to vaporize the LNG into natural gas and transfer the natural gas to shore via a pressurized pipeline. Once vaporized into natural gas, it becomes impractical and costly to re-liquefy the product onshore. Vehicle fueling facilities have their liquid trucked to them. This is not possible for offshore facilities.

Finally, one of the technical challenges for LNG importers who wish to supply natural gas for the California grid will be conformance to the California pipeline gas quality composition requirements. In the Pacific, only LNG from Kenai, Alaska is lean enough to inject directly into California's distribution system. The composition of most of the LNG export plants in the Pacific Ocean and Middle East generally contain large amounts of ethane and propane that require additional processing before being injected into the California system. Table 10-2 compares gas quality for Sempra Energy Utilities (comprised of SoCal Gas and SDG&E) and potential Pacific Ocean and Middle East LNG.

Table 10-2 Gas Quality Comparison

	Sempra Energy Utilities System Average	Potential LNG Supply
Heating value	1020 Btu per cubic foot	1063 – 1166 Btu per cubic foot
Carbon dioxide	1.25%	Trace
Air (N_2, O_2)	0.7%	Trace
Total inerts	1.95%	Trace
Methane	95.4%	83.2 – 87.9%
Ethane	2.1%	7.1 – 13.2%
C3+	0.5%	3.1 – 5.0%
C6+	Trace	Trace

Source: Sempra Energy Utilities

SES has incorporated into its Project design a NGL recovery and storage system that will bring imported LNG into conformance with California natural gas composition requirements. This will allow SES to import LNG from any of the available Pacific Ocean and Middle East LNG suppliers, thus taking advantage of lower costs for LNG and allowing for complete flexibility in LNG supplies. While this technology is easily incorporated into the design of an onshore facility, offshore technologies face storage and transportation challenges to bring Pacific or Middle East LNG to California pipeline gas specifications.

10.3.4 Cost Comparison: Baja California, Long Beach, and Oxnard Alternatives

SoCalGas has performed preliminary studies to determine the cost of adding additional receipt points and enhancing access to their system for new LNG projects (SoCal Gas, December 2003). These studies considered LNG access to the SoCal Gas system at Otay Mesa (from the Baja California LNG plants), Long Beach (from the SES Project), and Oxnard (from the Crystal Energy and Billiton projects). The costs do not include the facilities required to transport gas from the LNG terminal to the SoCalGas/SDG&E system, and assume only one LNG terminal is connected to their system. Costs for non-incremental access (meaning new supplies back out existing supplies) are summarized below and are as presented by Sempra in December 2003:

- Otay Mesa – Up to 140 million cubic feet per day (MMcfd) can be supplied at almost no cost; $10 million will provide up to 400 MMcfd; $30 million will provide up to 500 MMcfd; $80 million will provide up to 600 MMcfd; $150 million will provide up to 900 MMcfd; and $300 million will provide up to 1,000 MMcfd.

- Long Beach – Up to 500 MMcfd can be delivered at almost no cost; $5 million will provide up to 800 MMscfd; and $35 million will provide up to 1,000 MMcfd.

- Oxnard – Up to 300 MMcfd can be supplied at almost no cost; $20 million will provide up to 800 MMcfd; and $60 million will provide up to 1,000 MMcfd.

Based on these cost estimates, receipt of LNG supplies at Long Beach would be $265 million less than receipt at Otay Mesa and $25 million less than receipt at Oxnard. On January 5, 2004, SoCal Gas confirmed that it "currently has sufficient capacity at Salt Works Station to receive 600 MMscfd on a firm basis and up to 1,000 MMscfd as local demand warrants."

10.4 LNG TERMINAL SITE ALTERNATIVES

10.4.1 Alternative Onshore Sites

SES conducted a comprehensive process to identify the site for the Long Beach LNG facility that included consideration of the environmental, engineering, economic, and safety aspects for this type of project. One of the first steps was to identify the region in California where a new supply of LNG was most needed because of a high demand for natural gas and some demand for LNG for vehicle conversion. An equally important consideration was the availability of nearby existing pipeline systems that could deliver the new natural gas supplies to the marketplace.

Southern California, and particularly the Los Angeles area, met these initial criteria. Mitsubishi Corporation, the parent company of SES, is the largest supplier of LNG into Tokyo, Japan market. The Los Angeles area represented a similar market with air quality problems that could be partially offset through a reliable supply of natural gas and LNG fuel for vehicles. To identify the most suitable setting for an LNG terminal that would serve this market area, two regional siting criteria were used: 1) the existence of ports that could be used by the LNG ships, and 2) proximity of existing pipeline systems that could provide physical access from the LNG import terminal to the market.

10.4.1.1 Identification of the Preferred Port

Ships that are used to transport LNG have capacities that range up to 145,000 m^3. A 145,000 m^3 ship are about 950 feet long with a typical draft of 38 feet. To ensure that the LNG ships do not easily or frequently run aground, an additional 2 feet of water is preferred under the keel. This means that LNG ships require ports with minimum depths of 40 feet; ports with 50 feet or greater depth would also allow for future, newer ships with deeper drafts. Although shallow water areas could be dredged to the required depth, the environmental impacts associated with development of a shallow water port and associated greenfield site were considered prohibitive and impractical for this Project. Consequently, LNG terminal sites that were outside of existing deepwater ports and/or in areas with minimum depths of less than 40 feet were excluded from further analysis.

In addition, an essential component for the development of an LNG import project with the capacities proposed by SES is access to the marketplace. Since SoCal Gas is the only utility that serves the primary Los Angeles market and most of southern California, it was important to locate the import terminal in an area with reasonable access to SoCal Gas and thus the market in Los Angeles and other areas of southern California. To avoid impacts associated with extensive expansions of the SoCal Gas system, the interconnect would have to be in an area where the SoCal Gas pipeline is at least 30 inches in diameter to allow for delivery of the 700 to 1,000 MMscfd volumes associated with the Project. Figure 10-3 depicts existing ports and pipe infrastructure in Southern California.

There are a total of 12 established ports/harbors along the southern California coastline in Ventura, Los Angeles, Orange, and San Diego Counties. Of these, eight harbors have water depths that average about 20 feet and primarily support recreation, and sport and commercial fishing. These harbors include Ventura Harbor and Channel Island Harbor in Ventura County; Marina del Rey and Redondo Beach-King Harbor in Los Angeles County; Newport Beach Harbor and Dana Point Harbor in Orange County; and Oceanside Harbor and Mission Bay Harbors in San Diego County. Given the primarily recreational nature of these harbors, the need to dredge a channel for the LNG ships that would almost double the current water depth, and the likely difficulty in finding an appropriate site for the LNG terminal and associated

facilities including the send-out pipeline, these harbors were considered inappropriate for development of an LNG import terminal and were dropped from further consideration.

Port Hueneme is a relatively small deepwater port located about 60 miles northwest of Los Angeles in the Cities of Port Hueneme and Oxnard in Ventura County. It is roughly divided into two jurisdictions: the Port Hueneme U.S. Naval Construction Battalion and the Oxnard Harbor District that operates the Port Hueneme facilities for niche markets, such as for the import and export of cars, fresh fruit and produce, and forest products. Port Hueneme is the top seaport in the United States for citrus export and ranks among the top ten ports in the country for automobile and banana imports. There are limited facilities for small boating or leisure craft. Harbor depths are currently 35 feet, somewhat shallow for LNG vessels. In addition to the need to dredge the harbor to 40 to 50 feet for the LNG vessels, an LNG terminal is not entirely compatible with existing port uses in that there is little heavy industrial uses in the port.

Further, approximately 10 miles of onshore pipeline would be required to the nearest interconnection with SoCal Gas. SoCal Gas estimates that it could accept up to 400 MMscfd in this area. Receipt capacity could be increased by 121 MMscfd by construction of approximately 12 miles of 34-inch-diameter pipeline at an estimated cost of $16 million. Since Port Hueneme offered no clear advantage over the Ports of Long Beach and Los Angeles, which are better suited for the siting of an LNG terminal, Port Hueneme was dropped from further consideration.

San Diego Harbor is a major naval, commercial and recreational harbor, located approximately 110 miles south of Los Angeles and several miles north of the Mexican border. This crescent shaped 18-mile long harbor and bay is separated from the ocean by the "Silver Strand," a low peninsula that has been extensively developed for residential and recreation purposes. To enter the harbor, ships must travel north for 4 miles to enter the channel at the north end of the Silver Strand, and then several miles east around the tip of the Naval Air Station and south by the municipal yacht basin and commercial fish harbor to the harbor entrance and central and southern harbor areas. The entrance channel depth is 53 feet and the main channel depths are 42 feet from the entrance to the turning basin. The harbor is home to a major Naval fleet, the Naval Communications Station, an Air Station, and a Naval supply center. It is a major shipping point for agricultural goods from southern California, as well as a major recreational harbor that has over 4,000 boat slips for recreational craft, a sport-fishing fleet, and cruise ships. It is also

the center of the west coast commercial tuna fishing industry. Although the Port of San Diego could be linked to the SoCal Gas pipelines through the SDG&E pipelines, facility improvements would be required along the SDG&E system to transport new natural gas supplies. San Diego Harbor was eliminated from further consideration for an LNG import terminal because of the length of access to the harbor; the potential for incompatibility of an LNG terminal with current naval, recreational, and port uses; and the environmental impacts that may be associated with upgrading of the SDG&E system to transport natural gas to SoCal Gas.

The Ports of Los Angeles and Long Beach, although politically divided into two jurisdictions, are adjacent to each other and, together, are the third busiest port complex in the world, after Hong Kong and Singapore. The combined port complex comprises over 7,500 acres of land and is dominated by container cargo terminals, bulk terminals for the import/export of other products including automobiles, as well as oil and gas production facilities. Because of the size and industrial nature of these ports, there are established areas for the import of hazardous cargo. Although there is some recreational boating and fishing fleets within the complex, the ports are primarily an industrial facility. Access to the ocean is through "gates" in the stone breakwaters that extend along the 50-foot bottom contour which mark the seaward limit of the harbors. Channels are dredged to at least 50 feet and major entrances are dredged to over 65 feet. Access to a SoCal Gas mainline pipeline is within 2 to 4 miles and could likely accommodate the natural gas volumes from the LNG terminal.

Of all the southern California harbors, the Ports of Los Angeles and Long Beach offered the most compatible site for developing an LNG import terminal to serve the Los Angeles area. First, the ports maintain sufficient channel depth to accommodate LNG ships. Second, these are highly industrialized ports with limited recreational boating facilities or nearby (within 1 mile) residential areas. Third, both the Ports and the nearby cities could easily benefit from an ample and readily available supply of LNG vehicle quality fuel to reduce air pollution. Fourth, vaporized natural gas can be transported into SoCal Gas system with a minimum of new pipeline and at a location where the SoCal system can accommodate the volume.

10.4.1.2 Identification of a Preferred Site

When the selection process narrowed the ports down to the ports of Los Angeles and Long Beach, the evaluation criteria focused on another set of considerations for each site including: availability of adequate land for the LNG facility, ability of site to comply with regulatory requirements for LNG facility design and safety features, ability to incorporate additional features into the project design based on public and agency outreach, environmental characteristics, and construction constraints. These considerations were used to evaluate and compare different sites to identify the site with least environmental impacts.

The first site considered was a site in the Port of Los Angeles that is partly owned by Mitsubishi (Long Angeles Export Terminal [LAXT] site). The second was a site owned by the POLB that is physically located within the city limits of Los Angeles (Tidelands Oil - Pier A West site). The third site was the currently proposed location in the Port of Long Beach within the former Navy Base (Pier T East site). The fourth site was the only other potential available site in the Port of Long Beach and would require new fill (Navy Mole Site). With the exception of the Navy Mole site, all of these sites have been, at least partially, disturbed by prior industrial or dredge disposal activities. An environmental comparison of these LNG terminal site alternatives and the proposed LNG terminal site is provided in Table 10-3 and summarized below. Figure 10-4 shows the location of each of the alternative terminal sites.

An average of about 3,000 vessels use the Port of Long Beach on annual basis and there were 3,150 ship calls at the Port in 2002 (see Resource Report 11 and Appendix 11-2). Ship traffic in the Port of Los Angeles is even greater. LNG vessel traffic associated with use of any of the three alternative terminal sites would be controlled by the vessel traffic service that operates out of Point Fermin and monitors vessel movements for both ports on a 24-hour basis. There would be no new impacts to existing vessel traffic within the ports, except for those impacts associated with the moving security zone ahead and astern of arriving LNG ships. This would result in minor delays to ship traffic near the moving security zone on days when arriving LNG ships pass by. Although vessel traffic was considered during review of the alternative sites, it was not believed to be a critical factor in the selection of the preferred site since operation of an LNG terminal at any one of the three sites would not prohibit or permanently restrict other vessel traffic in San Pedro Bay

LAXT Site. Mitsubishi, the parent company of SES, is a co-lessee of the LAXT site. This site consists of a remote terminal facility, currently configured for the receipt, storage, blending, and reclaiming of bulk coal and petroleum coke; a ship loading facility on Pier 301; and a conveyor corridor about 5,200 feet in length that connects the remote terminal and ship loading facilities. Global market conditions have made export of coal and coke from the United States uneconomical, and the LAXT shareholders, including Mitsubishi, were considering the conversion of this facility to LNG importation.

Conversion of this site to LNG would require modification of the ship unloading facility; removal of the conveyor corridor and replacement with a 5,200-foot-long cryogenic pipeline, and containment for the cryogenic pipeline, to carry the LNG from the ship loading to the remote terminal facility; and the demolition of the existing remote terminal facilities and replacement with the LNG storage tanks, vaporizers and associated structures. The cryogenic pipeline would cross the site in a northeast-southwest line, then follow the current conveyor corridor from the remote terminal facility across one road to the ship loading area. The berth at Pier 301 is already over 50 feet in depth and could easily accommodate current and future LNG ships. Its location at the western tip of Terminal Island in the Port of Los Angeles and the new Terminal 300 container dock would also accommodate LNG tankers with a minimum of navigational challenges. The send-out pipeline would be approximately 3.9 miles in length, or 1.6 miles longer than the proposed 2.3-mile-long pipeline.

Although the LAXT site was originally considered, it is not available for use for the LNG terminal site. Further, it was found to have no environmental or cost advantage over the proposed site and had a number of disadvantages that included: the need for containment for the cryogenic pipeline that would be difficult and costly, as well as the crossing of the road which would likely have to be underground; the higher construction costs because of the extent of the demolition required; the greater potential for disruption of the fishing fleet and cruise lines that also use the channel; the nearby prison southwest of the site; and the potential for visual impacts to residents facing the channel on the west side of the site. Although no dredging would be required at this site, as compared to 75,000 to 125,000 cubic yards for the proposed site, the proposed dredging is not expected to result in any significant environmental impact considering the highly disturbed nature of the dredge area and did not outweigh the site's other disadvantages.

Tidelands Oil – Pier A West Site. The POLB suggested that SES evaluate this site since it is available for lease. However, there is an active oil extraction occurring on the site, and significant remediation of a 25-acre portion of this larger site would be needed prior to installation of the LNG import terminal.

Further, this site has no docking facilities and a berth would have to be developed for the LNG ships. If the dock were developed north of the site along the Dominguez channel, the channel would have to be dredged to a 40-foot depth from its current average of 15 to 20 feet. The area along the consolidated slips (north of the site) is known to contain sediment contamination that would be more costly and potentially result in more environmental impact than the dredging at the proposed site on Pier T (500,000 cubic yards of dredging for this site versus 75,000 to 125,000 cubic yards for the proposed site). If the dock were developed on the south side of the site in the Cerritos Channel, recreational boating docks would have to be removed to accommodate the new pier. This would require review and approval from the California Coastal Commission. Some nearshore dredging also would be needed, although the Cerritos Channel is generally dredged to accommodate the container ships that dock just east of this site. Access for the LNG ships to this inner part of the harbor is more difficult than for the proposed site and would require several turns in narrow channels and a much longer route from the open ocean. However, this site would have the shortest send-out pipeline, 1.7 miles versus 2.3 miles for the proposed site.

Because of the dock construction, the site remediation, and the added distance for the LNG ships, this site was found to have no environmental advantage over the preferred site.

Navy Mole Site. The Navy Mole site is part of the naval complex that has been leased to the POLB. It was installed as a breakwater for the naval shipyard harbor and currently still houses the SeaLaunch facility. The POLB is considering filling in areas along the north side of the Navy Mole to accommodate future container terminal expansion, and suggested that the LNG terminal could be placed on fill at the southern or seaward side of the Navy Mole.

Since the LNG terminal would need a minimum of 25 acres, development of this site would require 25 acres of fill in the soft bottom on the south side of the Navy Mole. The loss of soft bottom habitat would be permanent and would require mitigation. In addition, there is a

Macrocycstis kelp bed 25 to 30 feet wide that is anchored to the rocky substrate for the entire length of the south side of the Navy Mole. The necessary removal of this kelp bed would be considered a significant environmental impact also requiring mitigation. The fill could also adversely impact essential fish habitat, although the rocky substrate habitat would be restored and even enhanced by additional shoreline. In addition, use of this site would require approximately 4.8 miles of send-out pipeline, over twice as much as the proposed 2.3-mile pipeline. Because of the significant adverse environmental impacts requiring extensive off-site mitigation, there is no environmental advantage to this site.

10.4.2 Alternative Offshore Sites

As stated in Section 10, the Project objectives are to provide a new stable source of natural gas, an abundant, economic, and stable source of LNG vehicle fuel, a reliable and timely source of energy, and a facility capable of accommodating fluctuating energy market demands. SES's proposed site on Pier T and onshore LNG terminal meets all of these objectives without significant environmental impacts.

Onshore LNG facilities have been in operation for 30 years and have benefited from technical and design development and improvements over the years. There are presently no LNG offshore receiving terminals offering relatively the same facilities as proposed by SES anywhere in the world. This is due in large part to the fact that offshore terminals do not provide, nor are designed to maintain LNG inventory and natural gas send-out that can follow the load demands. Offshore facilities are also more susceptible to interruptions in supplies due to weather and high seas. There also technological challenges associated with construction of a "first-of-a-kind" offshore LNG facility. Since SES did not identify any significant environmental or technological advantage with offshore technologies or any significant environmental issues with the proposed onshore site, no offshore technologies or sites were evaluated.

10.5 SEND-OUT PIPELINE ROUTE ALTERNATIVES

Currently, there are no pipeline systems that could transport natural gas from the LNG terminal site to the SoCal Gas natural gas pipeline system north of Anaheim Way. However, there are numerous existing product lines throughout the Port. Because of the industrial nature of the land between the LNG terminal site and the interconnection with SoCal Gas, the siting criteria considered the following:

- Availability of utility slots through the Port areas;
- Workspace requirements for a HDD of the Cerritos Channel;
- Siting of the HDD in area where HDDs had been successfully completed in the past;
- Avoidance of areas congested with active and abandoned pipelines;
- Minimizing disruption to other Port tenant's activities including crane, truck, and rail traffic; and
- Minimizing overall length of the pipeline.

Using these criteria, three alternative routes were identified. The two alternatives are described below, compared with the proposed route in Table 10-4, and shown on Figure 10-5.

Table 10-4 Comparison of Routes 1 and 2 with the Proposed Route

Comparison Factor	Proposed Route (ABCDE)	Route 1 (ABCE)	Route 2 (ABDE)
Total Length (miles)	2.3	2.0	4.0
Number of bores	8	7	12
Total length of bores (feet)	3,200	3,300	5,020
Length of HDD (feet)	2,700	2,700	2,230
Length on aboveground supports (feet)	0	0	5,000
Length of stovepipe construction (feet)	3,970	3,570	1,300

Route 1 (ABCE). Route 1 follows essentially the same route as the proposed pipeline (ABCDE) to the intersection of Carrack Street and Pier A Way. At that point, instead of turning west like the proposed route, Route 1A would continue north for the full length of Carrack Street. A scraper/launcher would be installed at the city boundary. At the intersection of Carrack Street

and the new Pier C Street, Route 1 rejoins the proposed route and continues north across the railroad tracks and Anaheim Street to tie-in with SoCal Gas.

Route 1 is approximately 0.3 mile shorter than the proposed route, but would require continued construction in Carrack Street. The northern segment of Carrack Street (north of Pier A Way) is a major pipeline corridor that carries about 7 crude oil pipelines (one 42-inch, one 30-inch, three 24-inch, one 16-inch, and one 14-inch), two products lines (a 24- and a 16-inch) serving Terminal Island Berth 121, the EPTC Terminal, and Berths 875 through 887, as well as a SoCal Gas distribution line, and water and sewer lines. There are also a minimum of 17 crossings of pipelines that connect to the pipelines in the street. The proposed route avoids approximately 1,400 feet of construction in this northern segment of Carrack Street through the most congested segment of this street. Since the Route 1 would require construction through this segment of Carrack Street, it was dropped from further consideration.

Route 2 (ABDE). Route 2 follows the same route as the proposed route from the LNG terminal site to Ocean Boulevard. At this point, Route 2 would turn west and generally follow the south side of Ocean Boulevard through the "W Strip" oil wells to the Terminal Island Freeway. A series of slick bores, totaling 1,140 feet with a minimum of 6-feet of cover, would be used to install the pipe under the entrances to the new container cargo terminals and to get to the north side of Ocean Boulevard at the Terminal Island Freeway. On the north side of Ocean Boulevard, the pipeline would continue north across Henry Ford Avenue and Dock Street, to the drill side of the HDD for Cerritos Channel crossing. The drill side of the HDD would be within an oil production area adjacent to two existing HDDs; the pipeline string for the HDD would be laid out within an oil field on the north side of Cerritos Channel. A scraper receiver would be installed on the north side of Cerritos Channel.

Route 2 would continue north from Cerritos Channel and would be laid on precast concrete pipe supports through the oil field. At the north end of the oil field, the pipeline would turn east and be bored under the railroad, Terminal Island Freeway, and Hanjin Way. After crossing Hanjin Way the pipeline would be laid on precast concrete supports, adjacent to other existing steam and oil pipelines, to Pier C Street where it would rejoin the proposed route.

Route 2 is approximately twice as long (1.7 miles longer) than the proposed route. Due to its additional length and the need for nearly a mile of aboveground construction, Route 2 was eliminated from further consideration.

10.6 ELECTRIC DISTRIBUTION LINE ALTERNATIVES

SoCal Edison will construct and operate the electric distribution lines and new substation to provide a dedicated and redundant service for the SES Project. This will involve installation of a new 66 kV interconnection to provide 66 kV service to the new Sound Substation that will be located within the northern end of the Project site. The 66 kV two-line service to the new station will be provided by reconfiguring the existing APL – Dock – Long Beach 66 kV Line to create the two new APL – Long Beach – Sound and Dock – Sound 66 kV Lines. The APL – Long Beach – Sound 66 kV Line will require the installation of approximately 830 circuit feet of overhead conductor on three tubular steel poles. The Dock – Sound 66 kV line will require the installation of approximately 3,330 circuit feet of overhead conductor on seven tubular steel poles. In addition, the SES load will require upgrade of a section of the existing newly formed APL – Long Beach – South 66 kV Line between the Long Beach Generating Station and the formed tap point, replacement of 2,100 circuit feet of existing conductor with new conductor, and re-framing of five wood poles along Pier T Avenue to support the heavier conductors. Further, one existing pole-mounted switch will be relocated to an existing wood pole before the Sound Substation tap point, and one additional wood pole will be re-framed in the APL Substation leg to accommodate the relocated pole-mounted switch.

No practical alternatives were identified for this upgrade of the SoCal Edison system since the Project requires a dedicated and redundant 66 kV service. While the new connecting electric distribution lines could be installed underground, this alternative was considered impractical because the difficulty associated with installation of an underground circuit through the Project site and along roads already occupied with other utilities. Further, the additional cost of installing and maintaining underground electric distribution lines is not warranted to mitigate for potential visual or other environmental impacts since this area is highly industrialized and developed.

10.7 DREDGE MATERIAL DISPOSAL SITE ALTERNATIVES

Construction of the LNG marine unloading facility will require dredging of approximately 75,000 to 125,000 cubic yards of material. Based on past investigations, the POLB believes that both contaminated and clean sediment material likely would be found in the dredge area. The POLB plans to place the clean material in the Western Anchorage Disposal Site and the contaminated materials in an approved landfill such as Pier J. Since these are approved disposal areas, no other disposal alternatives were evaluated or considered.

10.8 VAPORIZER ALTERNATIVES

In selecting the vaporization technology for the Project, SES evaluated a number of options with the goal of developing an integrated process that would optimize LNG vaporization with the heat supply to the NGL extraction facility. Factors considered included proven technology, stability, operational advantages, environmental controls, space requirements, and reliability of the technology.

The heat input needed to vaporize the LNG can be accomplished in several ways, depending on the terminal operation and what type of heat source is readily available, and can be obtained by one of three methods: air, water such as seawater, or combustion of fuel. The advantage of an air or water vaporization system is that there would be little or no air emissions because these emissions would only be associated with powering the fans for the air system or the pumps for the water system. However, an air vaporization system, utilizing ambient air-heated vaporizers, is limited by weather conditions and requires a much larger footprint compared to a water or combustion vaporization system. Due to the limited space available and limitations associated with necessary weather conditions, this technology was considered inappropriate for the Project.

A seawater vaporization system would require withdrawal from Long Beach Harbor of approximately 78,000 gpm of seawater, or over 40 billion gallons of seawater per year. Typical water usage for each type of vaporizer is listed below in Table 10-5. As part of the Project objective of developing the site with the least environmental impact, SES eliminated seawater as a method to vaporize the LNG. This decision was supported by resource agencies and non-governmental organizations.

Table 10-5 Typical Water Usage Associated with Vaporizers

Vaporizer Type	Water Usage[1]	
	Seawater (gpm)	Fresh Water (total gallons)
Open rack vaporizer	78,000	-
Submerged combustion vaporizer	-	57,000
Shell & Tube Vaporizer (using water as an intermediate heat transfer fluid in a closed loop system)	-	325,000

Note:
1) Based on heat necessary for 1 BCFD of natural gas

Vaporization options through combustion includes direct or indirect fired (e.g. heat transfer fluid) or submerged combustion. Typical air emissions for each of these technologies are listed in Table 10-6. The submerged combustion vaporizers (SCV) take combustion flue gases and sparge it into a water bath where the LNG coils are located. The SCV was excluded as an alternative because of its limited ability to meet stringent air pollutant emission control requirements for the Los Angeles region (e.g., using selective catalytic combustion type methods to control emissions has not proven to be reliable).

Table 10-6 Typical Air Emissions Associated with Vaporizer Combustion

Combustion Type	Air Emissions		
	NOx (tpy)	CO (tpy)	PM (tpy)
Submerged combustion[1]	110	94	19
Direct combustion[2]	14	25	27

Note:
1) Emissions is based vendor quote with utilizing water injection as a control method for NOx.
2) Emissions are based on utilizing selective catalytic reduction and oxidation catalyst on the fired heaters to control both NOx and CO emissions

Shell and tube vaporizers (STV) work on simple heat exchange between the LNG on the tube side and the source of heat on the shell side of the exchanger. There are various types of STVs including direct heating with seawater, vertical STV design, and double tube bundle which uses an intermediate heat transfer fluid (i.e., propane, freon, etc.) with seawater. The type of STV

selected depends on the source of heat. The direct heating with seawater and double tube bundle type STVs were again eliminated due to the impact on the marine environment.

The vaporization option selected for the Project is the vertical STV design with a closed loop hot water system that provides heat to both the NGL extraction reboilers and the STVs. The water is heated using direct fired heaters. This selected option is the optimum design, based on the available source of heat, integration with the NGL extraction system, proven technology for vaporizers, control technology options for air emissions for the fired heaters (such as selective catalytic reduction systems and oxidation catalyst), and economic considerations. STVs are also the most compact LNG vaporizers available, and in general, have high heat transfer coefficients for the process.

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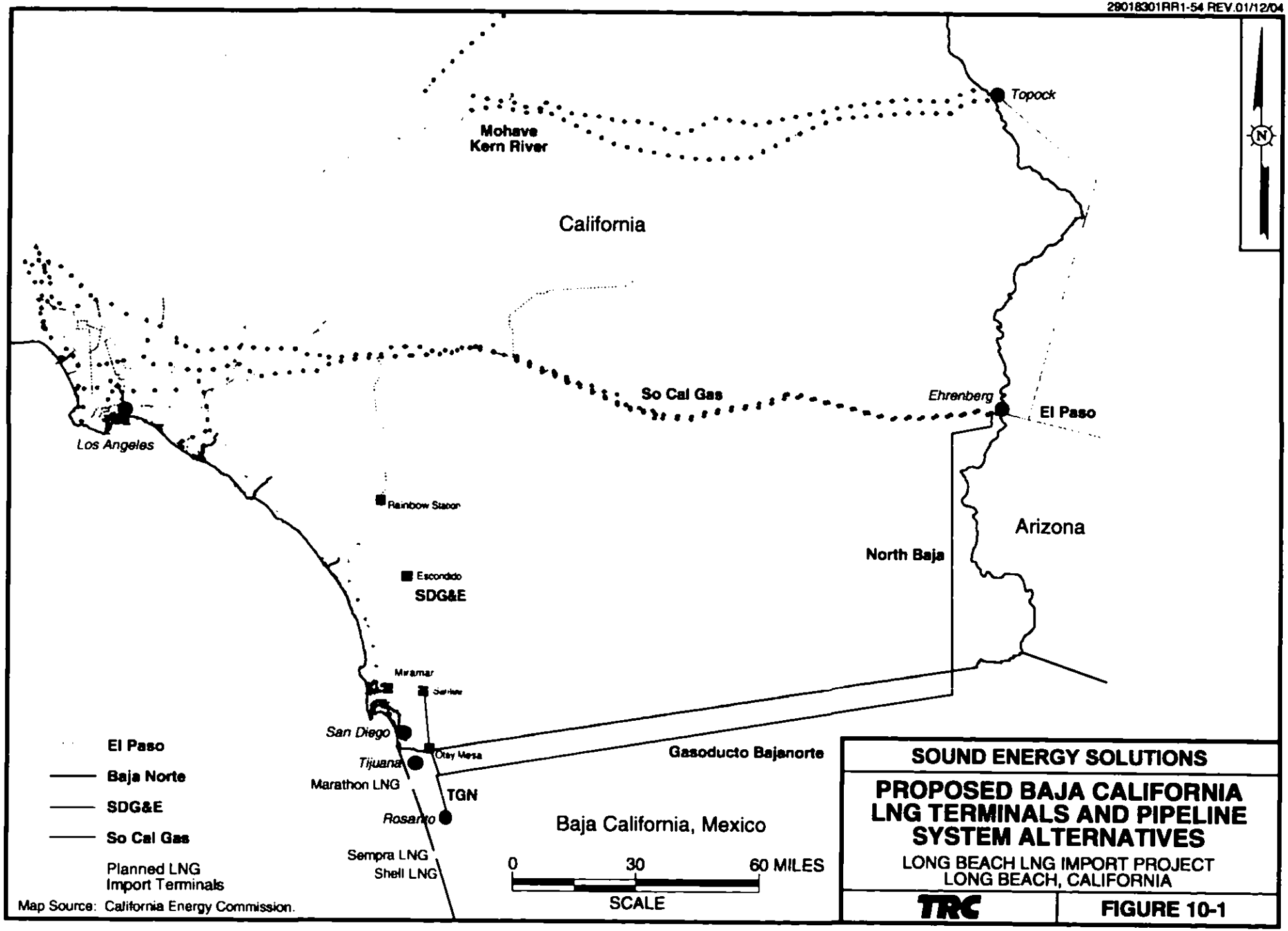

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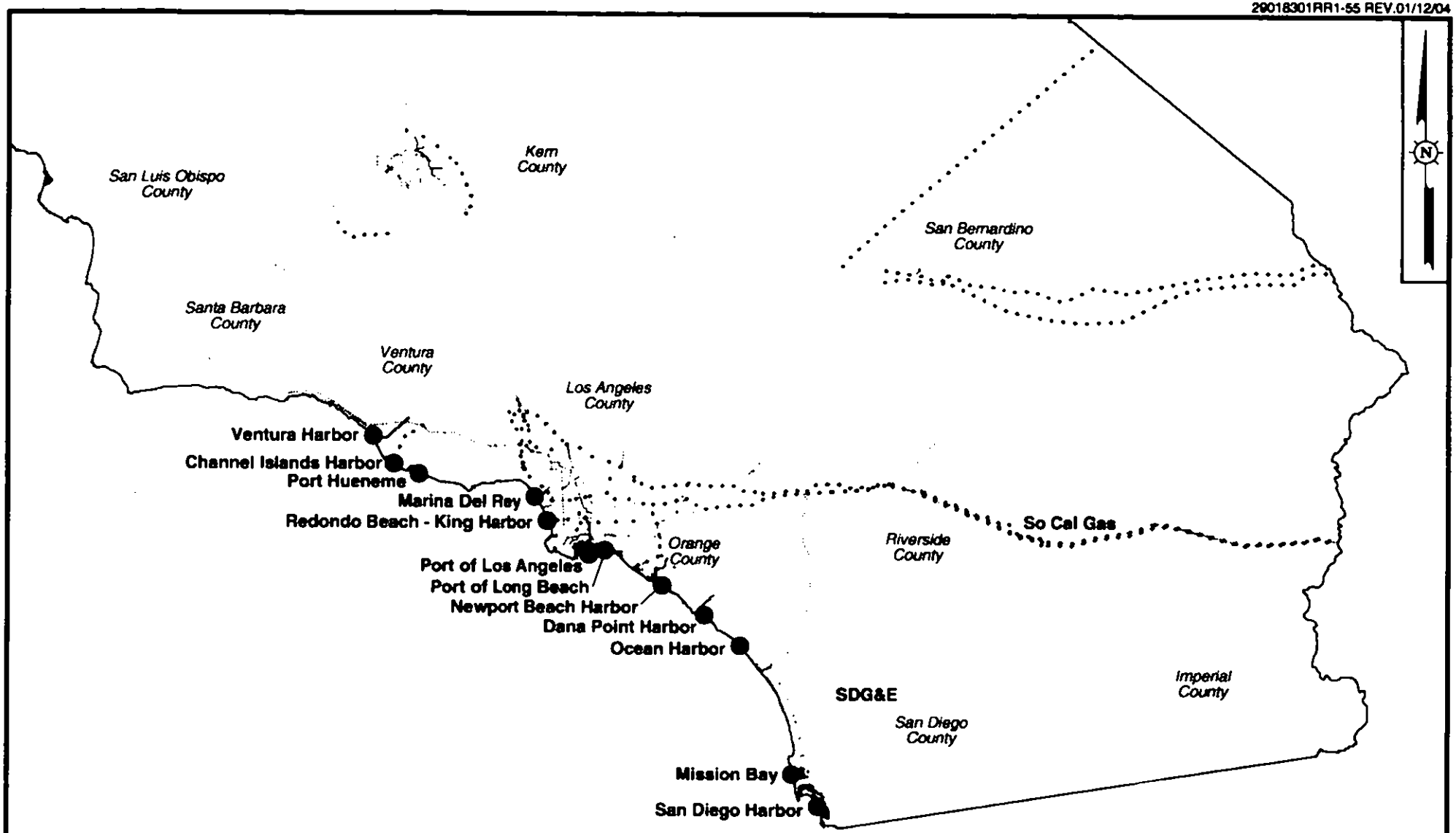


Map Source: California Energy Commission.

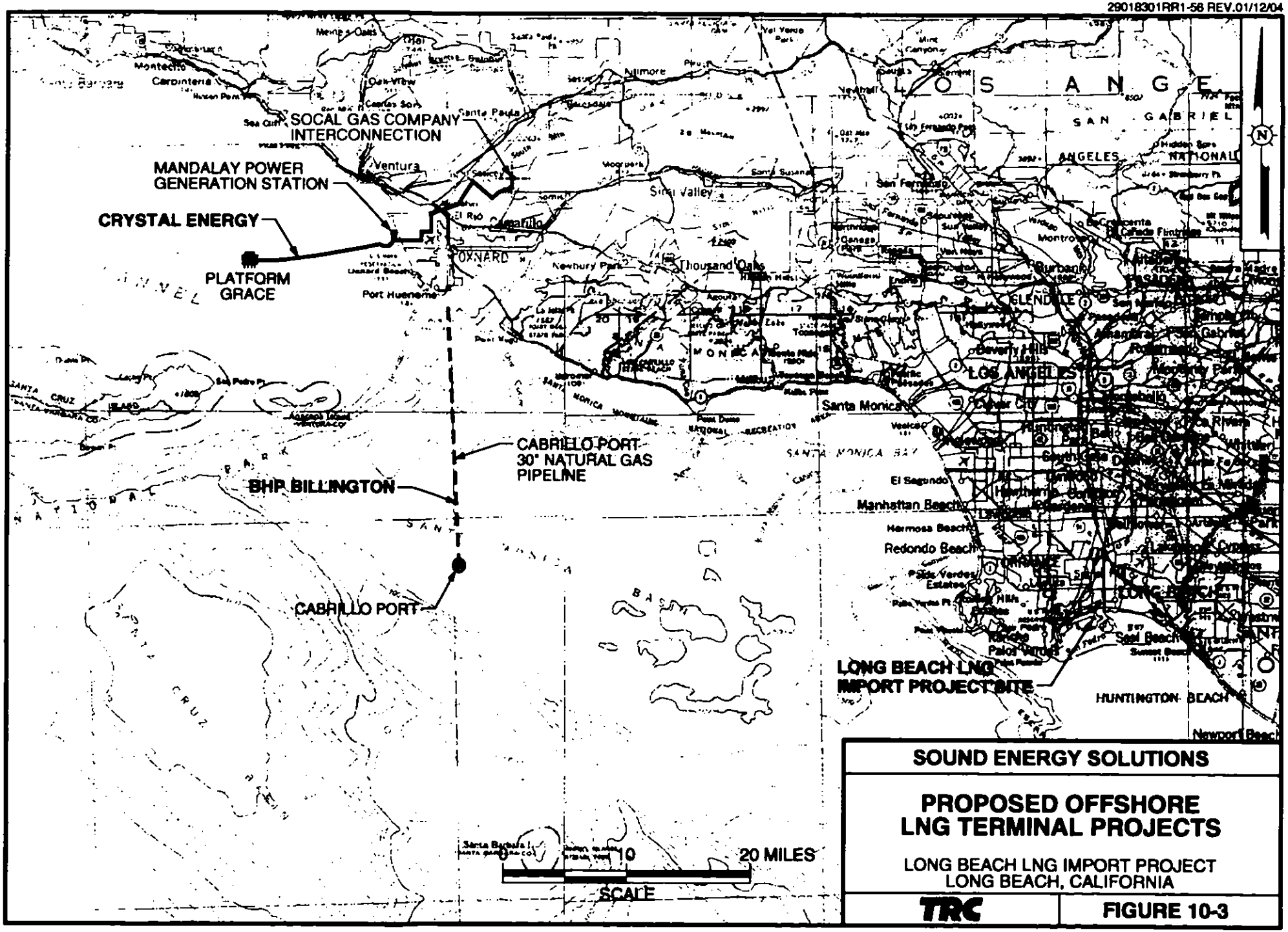
SOUND ENERGY SOLUTIONS

EXISTING PORTS AND PIPELINE INFRASTRUCTURE

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 10-2



SOUND ENERGY SOLUTIONS

PROPOSED OFFSHORE LNG TERMINAL PROJECTS

LONG BEACH LNG IMPORT PROJECT
LONG BEACH, CALIFORNIA

TRC

FIGURE 10-3

NON-INTERNET PUBLIC

FIGURE 10-4

Alternative Sites in the Ports of Los Angeles and Long Beach

NON-INTERNET PUBLIC

FIGURE 10-5

Alternative Pipeline Routes