APPENDIX F

HAZARDS AND HAZARDOUS MATERIALS BACKGROUND INFORMATION

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ENVIRONMENTAL SETTING

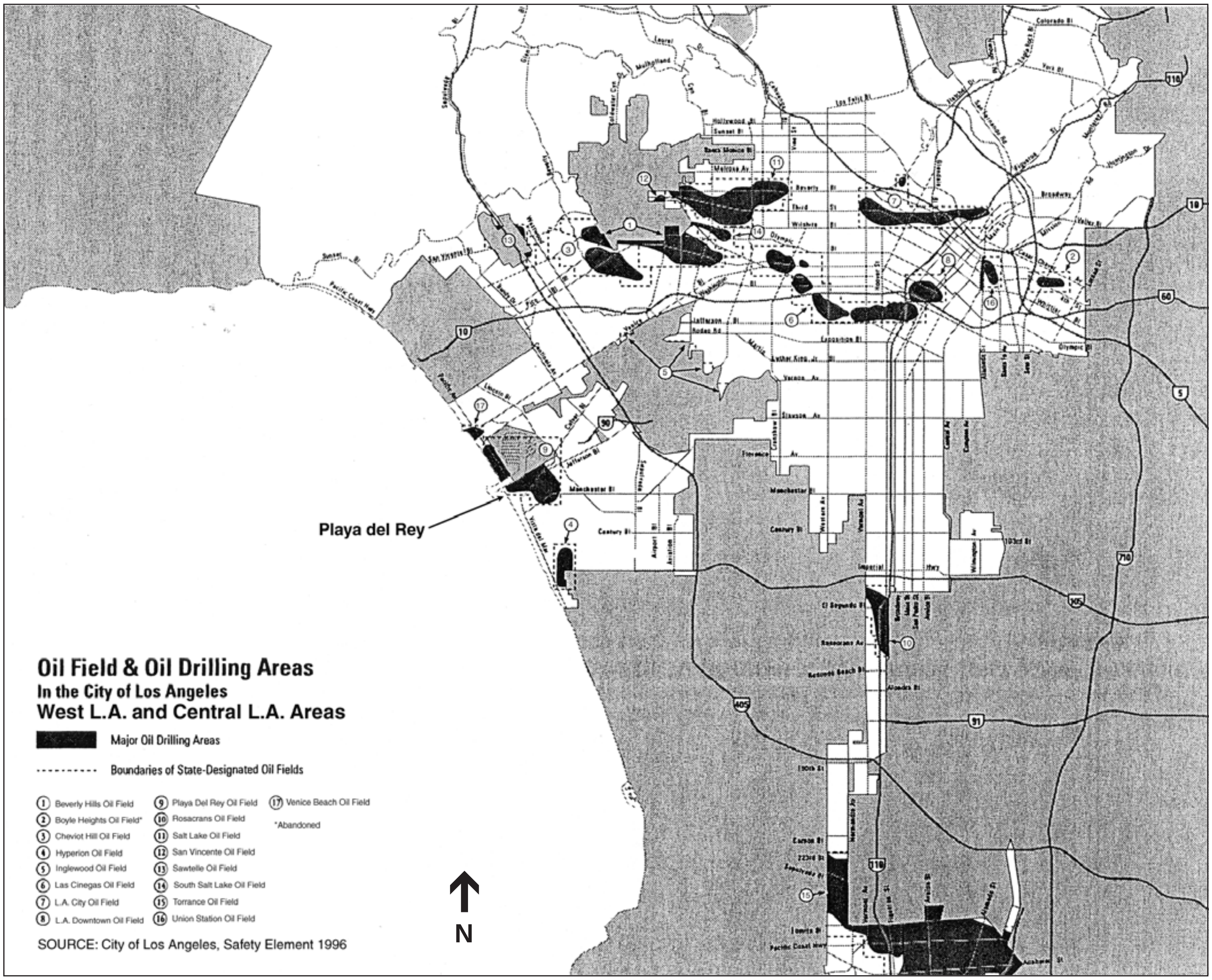
As discussed in Section VII, Geology and Soils, the project area overlies a region of oil fields as shown on Figure F-1. In the early twentieth century oil was extracted from this region and in 1942, the Southern California Gas Company (SCG) converted the depleted Playa del Rey oil field into a natural gas storage reservoir; one of five gas storage facilities operated and maintained by SCG in the Los Angeles region, within a 40 mile radius of the project area. These facilities are capable of meeting all current and anticipated SCG future needs for the Los Angeles region. Therefore, the regional value of gas storage has declined in accordance with increasing available supply of storage and available transmission capacity to serve the regional demands.

There are no designated quarry areas either on the project lots or in the vicinity of the project lots.

REGULATORY SETTING

The current regulatory framework relevant to hazards and human health encompasses process risk related to the use of hazardous materials and management of risks from hazardous materials that have been released to the environment. With respect to chemical hazards, the use, storage, and disposal of hazardous materials and wastes are regulated through a network of overlapping federal, state, and local laws and regulations. Various government agencies are responsible for implementing these laws and enforcing their requirements.

Federal and state laws require planning to ensure that hazardous materials are properly used, stored, and disposed of, and in the event that such materials are accidentally released, to prevent or to reduce injuries to human health, safety, or the environment. Businesses must store hazardous materials appropriately and train employees to manage them safely. Hazardous waste laws impose cradle-to-grave liability, requiring generators of hazardous wastes to handle them in a manner that protects human health and the environment to the extent possible. Both federal and state laws have established programs to identify hazardous waste sites, to require site remediation, and to recover the costs of site remediation from polluters. The following discussion briefly summarizes regulations that must be complied with regardless of ownership of the generating station.



SOURCE: City of Los Angeles, Safety Element 1996

Figure F-1
Oil Fields in the West and
Central Los Angeles Areas

FEDERAL

COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA)

Commonly known as Superfund, this federal law defines reportable quantities for spilled materials and the process for investigation and cleanup of contaminated sites The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) also establishes a National Priorities List and outlines a liability and response mechanism for releases of oil and hazardous materials.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) OF 1986

This law establishes public reporting of the use of certain chemicals under Title III, also known as the Emergency Planning and Community Right-to-Know Act. In California, some of the provisions of the Superfund Amendments and Reauthorization Act (SARA) Title III are implemented locally by the city or county health department through the Business Plan and hazardous material inventory requirements.

CLEAN WATER ACT (CWA)

The CWA sets up the framework through which permits to discharge waste to surface waters are authorized.   The National Pollutant Discharge Elimination System (NPDES) permit typically has conditions specific to the permitted operation and may set limits on acidity (pH), chemical concentrations, oil and grease, dissolved and suspended solids, and temperature of the discharge. The CWA also prohibits the discharge of pollutants to storm water.

OIL POLLUTION ACT OF 1990 (OPA)

The Oil Pollution Act (OPA) regulations supplement existing laws regarding the storage and handling of oil. As defined in OPA, Spill Prevention Countermeasure and Control (SPCC) Plans are required for facilities storing bulk oil. OPA also added requirements for facilities presenting a threat to navigable waters, including preparation of an Facility Response Plan (FRP) that prepares a facility for response to potential worst-case spills. OPA includes employee training requirements related to prevention of, and responses to releases.

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

The Occupational Safety and Health Administration (OSHA) regulations contained in Title 29 and the Cal-OSHA regulations codified in Title 8 contain employee safety provisions that attempt to minimize the hazards for employees in the workplace.

TOXIC SUBSTANCES CONTROL ACT (TSCA)

The Toxic Substances Control Act (TSCA) includes requirements for the storage, use, and disposal of Polychlorinated Biphenyls (PCB)-containing materials.

DEPARTMENT OF TRANSPORTATION (DOT)

Physical hazards, storage field maintenance and operations defined by the Department of Oil Gas and Geothermal Resources (DOGGR) are under the federal jurisdiction of the Department of Transportation (DOT). The DOT regulates the transportation of hazardous materials between states. Both federal and state agencies specify driver training requirements, load labeling procedures, and container specifications. The DOT also indirectly regulates the transportation of natural gas through pipelines according to the Natural Gas Pipeline Safety Act. The Act requirements, including designing pipelines to maximize safety (e.g., installing corrosion protection), routinely inspecting pipelines, preparing for possible emergencies, and reporting injuries and physical damage caused by accident, have been adopted by the California Public Utilities Commission (CPUC).

STATE

Title 22 of the California Code of Regulations defines, categorizes, and lists hazardous materials and wastes. Title 22 defines a hazardous material as:

> "a substance or combination of substances which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either (1) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible illness; or (2) pose a substantial present of potential hazard to human health or environment when improperly treated, stored, transported or disposed of or otherwise managed."

Hazardous wastes are categorized in Title 22 as either hazardous wastes, as defined in the Resource Conservation and Recovery Act (RCRA) or non-RCRA hazardous wastes. Title 22 lists chemical compounds that are presumed to make a material or waste hazardous to the environment.

CALIFORNIA WATER CODE (CWC)

The California Water Code (CWC) includes provisions of the federal CWA and water quality programs specific to California. The CWC requires reporting, investigation, and cleanup of hazardous material releases that could affect waters of the state (including storm waters).

CALIFORNIA ABOVEGROUND PETROLEUM STORAGE ACT

The California Aboveground Petroleum Storage Act, which is implemented by the Regional Water Quality Control Boards (RWQCBs), regulates the storage of petroleum in aboveground storage tanks (ASTs) and requires construction methods and monitoring to prevent petroleum releases.

CALIFORNIA HEALTH AND SAFETY CODE SECTION 25534 (CAH&SC)

Section 25534 of the California Health and Safety Code (CAH&SC) requires businesses that handle amounts of Acutely Hazardous Materials (AHMs) in excess of certain quantities to develop a Risk Management Plan (RMP). The RMP encompasses process hazards, potential consequences of releases, and documentation, auditing, and training relative to the AHMs that are above specified threshold quantities at the generating station. Regulated AHMs may include aqueous ammonia and sulfuric acid, as well as other acutely hazardous substances.

CALIFORNIA DEPARTMENT OF CONSERVATION, DIVISION OF OIL, GAS AND GEOTHERMAL RESOURCES (DOGGR) AND CPUC

Physical hazards, storage field maintenance and operations within the Playa del Rey gas storage facility are under the jurisdiction of the California Department of Conservation, Division of Oil, Gas and Geothermal Resources (DOGGR) and the California Public Utilities Commission (CPUC). DOGGR regulates the operations and maintenance of natural gas storage fields, and certain aboveground piping is regulated by the CPUC. DOGGR manages oil and gas resources in California and for the Playa del Rey field. The City of Los Angeles has local responsibility and authority through land use permitting and zoning for both oil and gas production and quarry and mining operations. The City also has zoning jurisdiction through special use permits and overlays for oil and gas. Currently, SCG holds use permits and lands are currently zoned for residential (35 of the 36 lots) and commercial (1 of the 36 lots).Playa del Rey Gas Storage Facility (PDRGSF)

The Storage Field is regulated by a number of state and local agencies. The DOGGR has primary jurisdiction over gas storage operations. The storage field operates pursuant to a permit issued by DOGGR, which requires, among many other things, extensive reporting, inspections, and performance reviews. Oil production has been exercised in the Los Angeles area for over seventy years. Gas production has been exercised for over sixty years. Federal and state regulations have been established to manage current and abandoned operations. There are significant numbers of abandoned oil and gas wells throughout the Los Angeles basin. Several of these abandoned wells have buildings constructed over or adjacent to them, and their proximity may be concern for the potential for exposure to hazards if there is gas leakage from abandoned wells. The Playa del Rey Gas Storage Facility (PDRGSF) is the only operating gas storage facility left in the Los Angeles Basin.

A DOGGR Project Approval Letter defines requirements that are specific to the Playa del Rey storage field (1986). Environmental conditions and well safety equipment are inspected regularly. During these inspections, a DOGGR inspector looks for indications of any type of oil or gas leaks from wells, pipelines, pressure vessels, and tanks. They also witness testing of the automatic shut down equipment on each well. Storage project performance reviews take place annually. During these reviews, DOGGR engineers examine SCG records to ensure that all well and reservoir monitoring and leak survey requirements were met.

Storage Tanks

Hazardous materials are typically stored in underground or aboveground storage tanks. Laws and regulations regarding underground storage tanks that are used to store hazardous materials (including petroleum products) require that owners and operators register, install, monitor, and remove their tanks according to established standards and procedures. Releases are to be reported. Owners of above-ground storage tanks containing petroleum products are required to prepare and implement spill prevention and response strategies, and to contribute to the Environmental Protection Trust Fund that is used to respond to some spills. Proper drainage, dikes, and walls are required in order to prevent accidental discharges from endangering employees, facilities, or the environment.

Well Abandonment Regulations and Policies

DOGGR has adopted regulations[13] for well abandonment to ensure that it is done safely and effectively. These regulations provide well abandonment procedures that prevent future migration of oil or gas from the producing zone and the upper zones, as well as protect groundwater. Furthermore, the DOGGR is charged with ensuring that public safety is not endangered. The DOGGR has the expertise and the authority to require whatever steps are deemed necessary to protect public safety, up to and including requiring SCG to cease operations and/or remove all gas from the field. They have approved SCG operations and monitoring program. As stated above, well abandonment is discussed in more detail within the geology section of this document.

After subsurface abandonment is completed and the surface portions of the well are removed, SCG must test and remove soil that has been contaminated by oil or other well maintenance substances. At the end of abandonment operations, the DOGGR and the Los Angeles Fire Department will complete a final inspection of the well site. After this inspection, the DOGGR will review all of the abandonment records of the operator and will either provide a final abandonment approval or a notice of deficiency that must be corrected.

Regulations Regarding Construction of Buildings Over Abandoned Wells

Future development of the lots would be subject to the requirements of local permitting agencies and would include compliance with all requirements for construction over abandoned wells. The regulatory requirements for building over abandoned wells are discussed in the Geology Section of this document (Section VII).

Other local agencies that have jurisdiction over the PDRGSF facilities or operations include the Los Angeles Fire Department, the South Coast Air Quality Management District, the Los Angeles County Sanitation District, and the Occupational Safety and Health Administration.

GAS MIGRATION

Well Drilling in the Playa del Rey Oil Field and Natural Gas Storage Field

Drilling in the region began as early as 1921 (Davis, 2000b). Early holes drilled and abandoned in the area during 1925 and 1926 were not deep enough to reach the producing zones in the Schist Conglomerate. The discovery well for the Playa del Rey (PDR) oil field was completed in 1929. Primary field development continued through the mid-1930s. By the early 1940s production had reached its economic limit and operators abandoned oil production from the field.

In 1942, as part of the national war effort, the federal government condemned and took possession of approximately 240 acres of the PDR field area to use as a natural gas storage field. This gas storage field

[13] These regulations can be found in California Code of Regulations, Title 14, Chapter 4.

was later transferred to the Reconstruction Finance Corporation in 1945. Then, in 1953, the Reconstruction Finance Corporation declared the field surplus and offered it for sale in 1953. The Southern California Gas Company was the successful bidder and assumed operations in late 1953.

Facilities were completed in 1956, and then gas was injected and stored at depths of about 6,200 feet within the Conglomerate Trap Zone. By July 1958, approximately 27 billion cubic feet (bcf) of cushion gas was stored. Since that time, numerous wells have been utilized for storage and retrieval of the gas. Currently, the storage field is operated through 54 wells directionally drilled from the lowlands and hilltop of PDR. Of these 54 wells, 25 are injection/withdrawal wells used to inject and extract gas, 8 are liquid (primarily water) removal wells, 3 are lateral migration wells to control gas movement, and 18 are observation wells used to monitor pressure and liquid saturation. SCG's facility for the PDRGSF is 0.2 mile north of Manchester Avenue.

Types of Gases

The three types of gas that may exist within the geological and soil units underlying the project area are processed natural gas (or piped gas), biogenic (or swamp) gas, and thermogenic (field) gas. Biogenic gas is primarily methane with carbon dioxide and sulfide gases resulting from decomposition of organic material in former lagoon deposits or other sources. Thermogenic gas is generated at depth, when increased temperatures and pressures alter organic material. It includes a broad range of gas components (methane, propane, butane, ethane, etc.). In contrast, processed natural gas is primarily methane remaining from thermogenic gas after most of the heavier gas components are removed (usually less than 0.1% heavy thermogenic hydrocarbons). These gas types exhibit distinct chemical characteristics, which permits "finger-printing" of gases or differentiation between gas types. In addition to lacking heavier gas components (propane, butane, ethane, etc.), the presence of helium in detectible amounts is a primary fingerprint for natural gas imported from the central US and previously stored in the deep storage zone.

Natural gas can occur in subsurface environments as various phases. Understanding gas phases is important because each phase exhibits specific physical properties, and thus posses different flow characteristics. These phases include free gas, liquefied petroleum gas, and dissolved gas in both water and oil depending on pressures and temperatures. When evaluating the potential for shallow gases reaching the surface, the primary phases of concern are free gas and dissolved gas in groundwater.

Migration Pathways

Studies have detected natural gas at the surface in the PDR area, as well as areas overlying other oil fields. Surface gases can originate from biogenic, thermogenic, or storage sources, or a combination of these sources. Gas reaches the surface through various natural, man-made, or combination migration pathways.

Both biogenic and thermogenic gas were detected by ETI (2000) during a soil gas survey in the Playa Vista area. Following a second phase of evaluation ETI (2001) concluded, "storage gases are not present in any of the methane anomalies observed east of Lincoln Blvd." Routine surface monitoring SCG wells found storage gases were reaching the surface through casing leaks and along the well casings in three wells. Biogenic gas was detected in four abandoned wells in the PDR field area, resulting in re-abandonment of these wells to eliminate the leaks.

Major Pathways

Man-made structures can convey gas to the surface from deep or shallow sources. A list of the most common man-made structures that could serve as vertical conduits include:

- Old abandoned oil and gas wells or dry holes, (abandoned prior to current DOGGR regulations
- Previously undocumented wells and dry holes
- Existing water extraction or injection wells
- Old abandoned water wells
- Monitoring wells
- Recently plugged and abandoned oil and gas wells (abandoned in accordance with current DOGGR regulations)

Gas can also reach the surface through natural geologic features, which may facilitate vertical, lateral, or oblique migration. The geologic features most likely to serve as potential pathways include:

- Surficial deposits
- Porous and permeable formations
- Aquifers
- Fracture systems
- Fault planes
- Other geologic features and structures, such as unconformities

The potential gas migration reaching the surface is considered greatest through or along man-made structures. In general, geologic pathways are relatively “tight” in the “shallow” and storage zones. Fractures, faults, and spaces between individual grains are minimized due to the tremendous overburden pressure (the weight of the rock materials). Within the Project area, wells penetrate shallow and deep gas zones at various depths. Once penetrated, a poorly constructed or abandoned well can serve as a conduit for upward migration of natural gas. Such conduits can develop as old wells deteriorate (over the 70 years), even when proper construction and abandonment methods have been applied.

Natural gas of biogenic, thermogenic, and storage sources can travel through a variety of man-made structures to migrate both vertically and laterally through the subsurface. In addition to oil and gas wells, both active and abandoned water wells can serve as vertical conduits, especially in the upper 1,000 feet of geological section. Utility trenches, storm drain systems and sewer lines provide lateral migration pathways, accumulation areas, and near-surface openings for natural gas release.

Natural Pathways

Various studies prepared by SCG, DOGGR, US Geological Survey (USGS), and California Geological Survey (CGS) suggest faults in the PDRGSF area . The USGS and CGS publish maps showing documented faults and reports describing such faults. No through-going active surface faults have been documented by either the USGS or CDMG. None of the information or reports reviewed for this study present conclusive evidence of active surface faults in the immediate project vicinity. The Compton

Blind Thrust Fault passes beneath the project site at much greater depths (>20,000ft), but no related fault is yet known to cut through the storage zone.

The Charnock fault is considered potentially active, and crosses the northeastern edge of the PDRGSF. Smaller, shorter faults and fracture systems are inferred in various units of the storage zone within the PDR field, but are not likely to transmit large volumes of crude oil or natural gas during short time intervals (days, weeks, or months). Naturally occurring subsurface migration of petroleum hydrocarbons typically takes place over extended periods of time, possibly tens or hundreds of thousands of years or more. Natural transmission of hydrocarbons through these systems is known within the oil and gas industry as “micro seeps.” Upward migration of oil and gas through micro-seeps allowed hydrocarbon emplacement in shallow zones. Significant natural upward migration from the storage zone is unlikely during the productive life of the PDR field.

The original reservoir pressure in PDR field was 2,750 psi, which is within the range of normal pressure gradient for the storage zone depths (Davis, 2000). Operating pressures (maximum 1,700 psi) are about 38 percent lower than original reservoir pressures. Therefore, significant volumes of storage gas would not be expected to migrate to the surface through natural geologic features.

Past and proposed withdrawal of gas from the storage zone is not expected to cause downward movement of groundwater or other fluids from shallow zones. With decreased reservoir pressures, lithostatic forces (rock overburden pressures) become more dominant, further sealing (through compaction) any open fractures or void spaces in the cap rock. Thus, the potential for fluid or gas migration through geologic pathways either into or out of the storage zone is low.

Shallow gas may migrate through younger earth materials to reach the surface. Both Pleistocene and Holocene sedimentary deposits include many permeable horizons or zones. Both biogenic and thermogenic gas from shallow zones can migrate, both vertically and laterally, through these permeable layers. Gas migration would involve both free-phase and dissolved-phase gases (dissolved in water). In the Playa Vista area immediately northeast of the project site, the contact between the San Pedro Formation and overlying younger alluvium form a contact between geologic units that could affect both lateral and vertical subsurface fluid or gas movement.

Faults affecting the project vicinity are discussed above under Structure and Seismicity. Based on his review of geologic reports and well records for PDR field, Davis (2000b) concludes that there is no evidence for faults cutting through the primary or secondary seals, and there is no evidence of through going fracturing of the seal. In the project area, the northwest-southeast trending Charnock fault (potentially active) is the closest documented fault in the vicinity. It crosses through the area east of the PDRGSF and project site. Although it is possible that undocumented faults could exist and contribute to upward gas migration, rates would not be significant compared to leaking wells.

During well drilling, fractured zones were encountered in some boreholes. The type (open, closed, sealed) and extent of fracturing were not determined from the information available. This fracturing could be related to minor faulting in the immediate vicinity. Minor faults could affect subsurface gas migration, by either acting as barriers to lateral movement or pathways for vertical migration. Gas movement rates associated with minor faulting would not be significant compared to leaking wells.

The presence of shallow high-pressure gas zones encountered in the Playa Vista area indicates confinement of upward hydrocarbon migration from these intervals. At these locations, shale intervals within the Pico and Repetto Formation form effective cap rock or seals. If natural upward migration pathways were present, such as open fracture systems, gas in these shallow zones would exhibit a normal pressure gradient. High pressure was not released until these zones were penetrated during well drilling operations.

Leaking Wells

Several factors contribute to possible gas migrations through abandoned and active wells such as original drilling, development and completion, operations and redevelopment, and abandonment. Many wells and dry holes were drilled during the exploration and early field development period. Dry or non-commercial wells were abandoned. Common practice by some operators in the 1920s through 1940s was to abandon wells and dry holes by filling them with construction debris or other items, such as telephone poles or railroad ties, prior to covering the surface with soil. These improperly abandoned wells have been unearthed during grading operations for construction sites located over old oil field in several areas of the Los Angeles Basin. Many of these wells and dry holes may not have been plugged to modern standards. Current abandonment requirements have developed since the 1950s to the more stringent standards today. Old dry holes and noncommercial wells have a high potential to provide migrations pathways.

Early in the history of oil and gas development in California and the United States, noncommercial or dry holes were drilled and abandoned without proper documentation and reporting, and some of these abandoned dry holes and wells may not have been recorded by the original drillers or DOGGR. Absence of unknown abandoned holes cannot be determined with certainty. Should they exist, they could serve as migration pathways.

Well construction, redevelopment, and abandonment deficiencies can contribute to gas migration problems. If cement bonds between the casing and surrounding natural formation do not form adequate storage seals, pressurized leakage is possible. Leakage through the annular space between casing and formation can occur under the following circumstances: lack of proper seals, inadequate seal or poor cement bonds with bore walls, channels within cement, deterioration of annular seals over time, and fracturing or cavitation of enclosing walls.

When present, shallow high-pressure gas zones can create problems for cement annular seals. During the well completion process, cement slurry is pumped into the annular space between the hole drilled (rock face) and casing to form a seal. Gas from shallow high-pressure zones can enter cement within the annular space during this process. Gas bubbles within the slurry weakens the cement and can compromise seals around these zones. In turn, poor seals could allow fluid migrations and enhance corrosion of both casing and cement in these areas. If large volumes of gas enter the annular space, vertical channels within the cement seal can also form. Marlow (1989) discusses the mechanisms contributing to compromised integrity of annular cement seals associated with gas zones.

Structural integrity of well components and seals is not permanent. Over extended periods of time, they eventually deteriorate. Both casings and seals are subject to corrosion caused by exposure to chemical attack, high and fluctuating pressures, high temperatures, and earthquakes. Steel casing is susceptible to rusting from saline and sour/sulfurous water produced along with the oil. Hydrogen sulfide of sour water and sour gas can corrode both steel and cement. Differential earth stresses (e.g., local earthquakes) can affect well integrity, even causing casing to collapse. Any deterioration of well integrity can lead to leaks.

Abandoned Wells

During past routine SCG surveys of abandoned wells, SCG determined that three previously abandoned wells on the Marina del Rey Peninsula (not part of the proposed project) would be re-abandoned following detection of leaking natural gas. Well designations and locations for these wells were not provided for this study. Although the origin of detected gas was biogenic and not the storage zone, SCG assumed responsibility and re-abandoned these wells to seal the leaks.

A leak was recently discovered in a well in the MDR area designated as Block No. 11 (while this well is not part of this proposed sale of property, it is in the vicinity of Cluster 12). This well was abandoned in April 1993 and sold with the surface parcel in 1997. The leak was discovered when DOGGR reviewed and tested the well prior to construction on the site. Preliminary analyses indicate that gas may be biogenic. Based on information available for this review, gas detected in this well is probably not emanating from the PDR storage facility. SCG will assume responsibility and re-abandon this well prior to site construction.

In the Playa Vista area east of the proposed project site, ETI (2000) conducted a soil gas survey. Several gas anomalies were identified during this survey. Analyses of samples collected indicates a combination of both biogenic and thermogenic gas origins. The presence or absence of storage gas was not confirmed during this study.

An examination of DOGGR maps showing locations of abandoned wells in the gas study area indicates that at least two of these soil gas anomalies correspond with locations of old abandoned wells or dry holes (Universal City Syndicate, Inc. Vidor No. 1 and Cooperative Development Co. Community No. 1). ETI (2000) indicates that a shallow dry hole (A.L. Kitselman, Del Rey No. 1) was also present in an area with surface gas anomalies. These old wells or dry holes may not be abandoned in accordance with current DOGGR regulations. In addition, the two deep abandoned holes penetrated shallow high-pressure gas zones during drilling. As such, they could provide vertical conduits through which thermogenic gas from shallow zones could reach the surface.

Reported Leaking Wells: Southern California Gas

A review of limited Southern California Gas Company records indicates past leaks and surface seepage documented in ten wells located in the Del Rey Hills areas. Following repairs in the ten identified wells, four of these wells experienced recurrences or new leaks. These wells and information on their respective leaks are summarized in Table F-1. Data provided for review was limited; therefore, this list of documented leaks may not be comprehensive.

- Based on the data provided, three leaking wells were discovered following detection of soil gas seepage. During routine field monitoring, near surface gas was identified around three wells: Well

No. 12-1 (1974), Well No. 24-2 (1975) and Big Ben No. 1 (1991). Leaks in Wells No. 12-1 and 24-2 were repaired, while Big Ben No. 1 was plugged and abandoned in 1991.

- Of the ten wells with documented leaks, three of them are included in the subject project: Well No. 29-1 (1959), Lor Mar No.1 (1981) and Joyce No.1 (1987). Casing leaks in each respective well were repaired. These three wells are on parcels (lots) subject to sale following approval of the proposed project. The Lor Mar No. 1, Joyce No. 1 and Well No. 29-1 were plugged and abandoned in 1992, 1993 and 1994, respectively.

- The ten wells are located between 1/2 mile and 1 mile south to southwest of the Universal City Syndicate Inc. Vidor No. 1. The Vidor No. 1, an old abandoned well, experienced a "blow-out" when shallow gas was encountered during drilling at depths from 1,140 to 1,150 feet. Multiple shallow gas zones were penetrated by this well. At least 4 other wells drilled in the Vidor No. 1 vicinity also penetrated various shallow gas zones at depths ranging from 510 to 3,434 feet.

Leaks in several of the ten wells listed occurred at similar depths to where shallow gas was encountered in old wells experiencing "blow-outs". These old wells were located immediately east and northeast of the subject project. Insufficient data was provided to correlate documented leaks with shallow gas zones.

Gas Responsibility and Rights

SCG owns most, if not all mineral rights in the PDR field and storage zone. As such, SCG is responsible for any gas leaks originating the PDRGSF area of influence and from thermogenic sources. Due to the nature of recent alluvial deposits, the generation of natural biogenic gas at the project site is likely. Biogenic gas in the area is probably related to decomposition of organic material deposited within a lagoon environment. In addition, some biogenic gas could also result from alteration of other hydrocarbons, including thermogenic gas, crude oil, or spilled materials. SCG is not responsible for occurrences of biogenic gas at the project site.

TABLE F-1
SUMMARY OF DETECTED GAS LEAK

Well Name	Problem	Depth (ft bgs)	Year Detected	Well Location
Well No. 29-1	Stage collar leak	723	1959	Between Falmouth Ave. & Calabar Ave., south of intersection with Cabora Dr.
Big Ben No. 1	Casing leak	150	1964	Between 79th St. & Veraqua Dr., northeast Zayenta Dr.
	Surface seepage		1991	
Blackline No. 1	Casing leak	1,064	1969	South of Cabora Dr., west of Veraqua Dr. and Zayenta Dr. intersection
	Casing leak	1,060	1986	
SoCal No. 4	Casing leak	3,216	1971	NW of Cabora Dr., about 1,000 ft. NE of intersection with Falmouth Ave. [a]
SoCal No. 3	Casing leak	3,300	1972	NW of Cabora Dr., about 1,000 ft. NE of intersection with Falmouth Ave.[a]
	Casing leak	3,300	1975	
	Casing leak	2,109	1977	
Well No. 12-1	Surface seepage	481	1974	Southeast of 81st St., north of intersection with 83rd St.
	Casing leak	210	1979	
Well No. 24-2	Surface seepage	191	1975	Northwest of 79th St., west of Zayanta Dr.
Pomoc No. 1	Casing leak	2,815	1975	West of Zayanta Dr., between 79th St and Cabora Dr.
Joyce No. 1	Casing leak	750	1987	Northwest of 82nd St., east of Saran Dr.
Lor Mar No. 1	Casing leak	720	1981	South of 83rd St., east of Saran Dr.

[a] Surface location of directionally drilled well. Bottom hole locations were not made available.

SOURCE: (DOGGR, various dates)